Autoridad de Acueductos y Alcantarillados
GOBIERNO DE PUERTO RICO

Puerto Rico Aqueduct and Sewer Authority

Final Report

# Fiscal Year 2010 Consulting Engineer's Report

## for the Puerto Rico Aqueduct and Sewer Authority

February 2011

MP ENGINEERS of PUERTO RICO and its subcontractor MALCOLM PIRNIE

**Puerto Rico Aqueduct and Sewer Authority**

#618 Barbosa Ave. • Hato Rey, Puerto Rico 00918

## FINAL REPORT

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February 2011

Report Prepared By:

**MP Engineers of Puerto Rico, PSC**
**and its subcontractor**
**Malcolm Pirnie, Inc.**

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## Acronyms

Capitalized and abbreviated terms contained in this report are defined below. The terms listed below appear in multiple sections of this report, and are thus defined here for reference.

| Acronym | Definition |
|---|---|
| ABT | Additional Bonds Test |
| AON | AON Risk Services |
| AOP | Advanced Oxidation Processes |
| APU | Alternate Power Unit |
| AWWA | American Water Works Association |
| B | Billion |
| CAA | Coefficient of Annual Adjustment |
| CAB | Annual Base Coefficient |
| CD | Coefficient of Deficiency |
| CER | Consulting Engineer's Report |
| CGL | Commercial General Liability |
| CIP | Capital Improvement Program |
| CMMS | Computerized Maintenance Management System |
| CPA | Certified Public Accounting |
| CWA | Clean Water Act |
| CWS | Community Water System |
| DBP | Disinfection Byproduct |
| DBPR | Disinfection Byproduct Rule |
| DMR | Discharge Monitoring Report |
| DNER | Department of Natural and Environmental Resources |
| DSC | Debt Service Coverage |
| EDC | Endocrine Disrupting Compounds |
| EPC | Energy Performance Contract |
| EQB | Puerto Rico Environmental Quality Board |
| FY | Fiscal Year |
| GDB | Government Development Bank |
| GIS | Geographic Information System |
| gpm | Gallons per minute |
| GWR | Groundwater Rule |
| HAA | Haloacetic Acid |
| HIEPAAA | Hermandad Independiente de Empleados Profesionales de la Autoridad de Acueductos y Alcantarillados |

| Acronym | Definition |
|---|---|
| IPMP | Integrated Preventive Maintenance Program |
| LOC | Line of Credit |
| LRAA | Locational Running Annual Average |
| LT2 ESWTR | Long Term 2 – Enhanced Surface Water Treatment Rule |
| M | Million |
| MAT | Master Agreement of Trust |
| MCL | Maximum Contaminant Level |
| M-DBP | Microbial and Disinfection Byproducts Rules |
| MW | Megawatts |
| MG | Millions of Gallons |
| MGD | Million Gallons per Day |
| MPPR | MP Engineers of Puerto Rico, PSC |
| NDMA | N-nitrosodimethylamine |
| NF | Nano Filtration |
| NPDES | National Pollutant Discharge Elimination System |
| NRW | Non-Revenue Water |
| NRWRP | Non-Revenue Water Reduction Program |
| NTU | Nephelometric Turbidity Units |
| OCI | Puerto Rico Office of the Commissioner of Insurance |
| OCIP | Owner Controlled Insurance Program |
| O&M | Operations and Maintenance |
| OSHA | Occupational Safety and Health Administration |
| PAN | Programa de Asistencia Nutricional |
| PAP | Proyectos Apremiantes (“Urgent Projects”) |
| PM | Preventive Maintenance |
| PMC | Program Management Consultant |
| PML | Probable Maximum Loss |
| PPA | Power Purchase Agreement |
| ppb | Parts per Billion |
| PPCP | Pharmaceuticals and Personal Care Products |
| PRASA | Puerto Rico Aqueduct and Sewer Authority |
| PRDOH | Puerto Rico Department of Health |
| PREPA | Puerto Rico Electric Power Authority |
| PRIFA | Puerto Rico Infrastructure Financing Authority |
| PSSSEP | Preliminary Sanitary Sewer System Evaluation Plan |
| PWS | Public Water Systems |
| RAA | Running Annual Average |

| Acronym | Definition |
|---|---|
| RFP | Request for Proposals |
| RO | Reverse Osmosis |
| R&R | Renewal and Replacement |
| SAP | Systems, Applications, and Products in Data Processing |
| SAP-ISU | Systems, Applications, and Products in Data Processing Industry Specific Solution for Utilities |
| SDWA | Safe Drinking Water Act |
| SEP | Supplemental Environmental Project |
| SOP | Standard Operating Procedure |
| SOW | Scope of Work |
| SRCP | Spill Response and Cleanup Plan |
| SSSEP | Sanitary Sewer System Evaluation Plan |
| SSSRP | Sanitary Sewer System Repair Plan |
| STS | Solids Treatment System |
| SRF | State Revolving Fund |
| SWTR | Surface Water Treatment Rule |
| TANF | Programa de Asistencia Temporal para Familias Necesitadas |
| TOC | Total Organic Carbon |
| TTHM | Total Trihalomethane |
| UIA-AAA | Unión Independiente Auténtica de la Autoridad de Acueductos y Alcantarillados |
| U.S. | United States |
| USACE | United States Army Corps of Engineers |
| USEPA | United State Environmental Protection Agency |
| USGS | United States Geological Survey |
| UV | Ultra Violet |
| WPS | Water Pump Station |
| WTP | Water Treatment Plant |
| WWPS | Wastewater Pump Station |
| WWTP | Wastewater Treatment Plant |

# Executive Summary

## E.1. Introduction

MP Engineers of Puerto Rico, PSC and its subcontractor Malcolm Pirnie, Inc (MPPR/Malcolm Pirnie) have been retained by the Puerto Rico Aqueduct and Sewer Authority (PRASA) as its Consulting Engineer to assist in satisfying several requirements of the Master Agreement of Trust (MAT) between PRASA and the Trustee with bondholders. MPPR/Malcolm Pirnie understands that PRASA entered into a MAT on March 2008 to enable it to issue revenue bonds and incur other indebtedness to partially finance its Capital Improvement Program (CIP) and to repay and refinance existing debt.

This 2010 Consulting Engineer's Report (CER) documents changes in the System and PRASA as they relate to the requirements of the MAT, through June 30, 2010. The primary purpose of this CER is to meet the requirements of Section 7.07 of the MAT by providing an independent opinion regarding the condition of PRASA's water and wastewater (sewer) systems (collectively, the System), its organization, the operations and management (O&M) of the System, the planned capital improvements, its current insurance program, and financial forecast that includes fiscal year (FY) 2010 results and projections for FY2011 through FY2014[1].

## E.2. Organization Updates and Changes Evaluation

In general, the overall PRASA organizational structure has changed little since 2008. PRASA is managed by an Executive staff that provides the day to day management oversight and coordination for all institutional activities. The current decentralized approach of having front-line management execute certain activities enables PRASA to provide more agile services to its customers. Also, the selected functional disciplines that have been centralized help PRASA standardize and develop common initiatives and policies to be executed across all Regions while providing significant synergies in management cost.

PRASA's overall staff levels continue to be high when compared to industry standards. However, from FY2008 through FY2010, PRASA has reduced its staffing levels by 15%, which represents a reduction of approximately 840 employees. PRASA continues to assess administrative and operational performance with the purpose of improving System performance and customer service. PRASA continues to engage with numerous internationally recognized consultants to assist with several aspects of its operation. PRASA's organizational and management changes have been smoothly implemented to ensure continuance of policy and program implementation and System O&M.

[1] In both the 2008 and 2009 CERs a five-year forecast period projection was included. At the time of preparation of this CER, PRASA was in the process of updating its financial projections past FY2014; hence, only a four-year projection has been reviewed and presented in this CER.

## E.3. Condition of System

PRASA owns a large variety of assets, including land, buildings, dams, wells, water and wastewater treatment facilities and pump stations, ocean outfalls, buried infrastructure, vehicles, equipment, and water meters. MPPR/Malcolm Pirnie has assessed the condition of PRASA's System by inspecting major elements of the System. The purpose of these inspections was to identify the overall condition of the facilities and to determine if they are being operated and maintained in a manner consistent with their operating goals. The assessment also provided an opportunity to verify PRASA's CIP alignment with System needs.

The criteria used in the facility inspections were: compliance, operations / process control, equipment / maintenance, and staffing / training. An overall facility rating was then determined based on the calculation of a weighted average of the ratings for each criterion. Table ES-1 presents the general condition assessment of PRASA's assets that were inspected as part of the preparation of this CER.

**Table ES-1:**
**Condition of System by Asset Category**

| Asset Category | Total PRASA Facilities | Inspections Performed | | General Condition |
|---|---|---|---|---|
| | | Quantity | Percent | |
| Regulated Dams | 8 | 8 | 100% | Adequate |
| Wells | 299 | 39 | 13% | Adequate |
| Water Treatment Plants | 127 | 67 | 53% | Adequate |
| Water Pump Stations | 1,182 | 52 | 4% | Adequate |
| Water Storage Tanks | 1,723 | 54 | 3% | Adequate |
| Wastewater Treatment Plants | 60 | 30 | 50% | Adequate |
| Wastewater Pump Stations | 1,004 | 51 | 5% | Adequate |
| Total | 4,403 | 301 | | |

The condition of the facilities visited varied from new to those requiring significant capital upgrades. Compliance with discharge permit limits and drinking water standards varied depending on the plant age, condition and experience of operators. Facility conditions averaged an adequate rating overall.

Despite some operational compliance issues, the treatment facilities are generally producing and delivering potable water and conveying and treating wastewater adequately. PRASA has shown that with the implementation of several initiatives that include O&M improvements and the establishment of a planned CIP, among others, the overall conditions rating for these facilities continues to improve as shown in Table ES-2.

**Table ES-2:**
**Asset Condition Ratings by Category**

| Asset Category | Overall Condition Ratings | | | Change 2008 vs. 2010 | | Change 2009 vs. 2010 | |
|---|---|---|---|---|---|---|---|
| | 2008 CER | 2009 CER | 2010 CER | Overall Score | Percent | Overall Score | Percent |
| Regulated Dams | Adequate | Adequate | Adequate | 0.0 | 0% | 0.2 | 10% |
| Water Treatment Plants | Adequate | Adequate | Adequate | 0.1 | 5% | -0.1 | -4% |
| Wastewater Treatment Plants | Adequate | Adequate | Adequate | 0.1 | 5% | 0.0 | 0% |
| Wells | Adequate | Adequate | Adequate | 0.1 | 5% | 0.2 | 11% |
| Water Pump Stations | Adequate | Adequate | Adequate | 0.1 | 5% | 0.1 | 5% |
| Water Storage Tanks | Adequate | Adequate | Adequate | -0.3 | -16% | 0.0 | 0% |
| Wastewater Pump Stations | Adequate | Adequate | Adequate | 0.3 | 18% | 0.0 | 0% |

Although buried infrastructure was not inspected, MPPR/Malcolm Pirnie analyzed the data collected by PRASA on water leaks and sewer overflows. Reported active leaks and sewer overflows remain at very high levels when compared to other utilities in the United States (U.S.) and Canada. Also, PRASA's unaccounted-for water, or non-revenue water (NRW), percentage continues at 64% in FY2010. Based on a comparison to other utilities in the U.S. and Canada, PRASA's NRW is extremely high. In a recent utility survey, the median unaccounted for water for all survey participants ranged from 8.5% to 9.9%[2].

## E.4. Operations and Maintenance Practices Evaluation

PRASA's O&M practices are adequate. One recurring finding in the facility inspections is the need for facility-specific O&M plans or manuals for treatment plants. Also, there is an identified need of standardized processes for prioritizing and scheduling preventive, corrective and routine maintenance activities.

The American Water Works Association (AWWA) has collected benchmarking data from water and wastewater utilities throughout the U.S. and Canada. Table ES-3 provides a comparison of PRASA's metrics to several key benchmark performance indicators.

PRASA currently has some staffing needs at individual facilities or within its executive and management teams. Also, given the recent reductions in staff, in FY2010 PRASA decreased its number of field personnel, which include meter readers and buried infrastructure repair crews. As a result, certain PRASA metrics (i.e., percent meters read and effectiveness in repairing leaks and overflows) have fallen.

[2]Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, published by the AWWA (2008).

**Table ES-3:**
**PRASA Metrics vs. Water/Wastewater Utilities Benchmarks**

| Benchmark Category | Utility Category | Top Quartile | Median | Bottom Quartile | PRASA |
|---|---|---|---|---|---|
| Training Hours per Employee | Serve > 500,000 | 31.8 | 16.8 | 12.3 | FY2005: 3<br>FY2006: 13<br>FY2007: 16<br>FY2008: 14<br>FY2009: 29<br>FY2010: 21 |
| | Combined W & WW | 34.9 | 22.5 | 12.7 | |
| | All Utilities | 31.7 | 20.0 | 11.8 | |
| Water O&M Cost per Account[1] | Serve > 500,000 | $163 | $233 | $319 | FY2007: $329<br>FY2009: $294<br>FY2010: $292 |
| | Combined W & WW | $134 | $247 | $411 | |
| | All Utilities | $148 | $258 | $374 | |
| Wastewater O&M Cost per Account[1] | Serve > 500,000 | $120 | $209 | $303 | FY2007: $242<br>FY2009: $216<br>FY2010: $214 |
| | Combined W & WW | $114 | $209 | $291 | |
| | All Utilities | $127 | $213 | $306 | |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008)
(1)Includes total operation and maintenance costs (less depreciation). PRASA reported values include payroll and related, power, chemicals, Superaqueduct service contract, insurance and other expenses, less capitalized operating expenses.

In order to monitor the progress of its initiatives, PRASA has developed its own set of operational metrics. Table ES-4 presents a summary of these operational metrics. As illustrated in the table, PRASA's metrics show that significant improvements have been achieved in the reduction of the clients without water service. However, the percent actual meter readings has been reduced, approximately 23%, from FY2009 to FY2010, mainly due to a reduction in temporary employees. The remaining areas have remained near the same results as of the 2008 and 2009 CER.

**Table ES-4:**
**Operational Metrics**

| Area | Metric | June 2005 | June 2007 | June 2009 | June 2010 |
|---|---|---|---|---|---|
| Clients without water service | No. of clients without service/ week | 14,483 | 9,459 | 5,189 | 4,632 |
| Generators | % Operational | 66% | 98% | 98% | 98% |
| Purchase/ Logistics | -Days to process purchase order | 30 | 14 | 10-15 | 10 |
| | -Days to process warehouse reserve | 25 | 9 | 7-10 | 10 |
| | -Inventory turns | N/A | 1.8 | 1.7 | 1.9 |
| | -Value of excess/obsolete inventory | $3.5M | $3.5M | $3.6M | $3.6M |
| Actual meter readings | % Actual meter readings | 73% | 87% | 82.5% | 59.0% |
| Customer service | Average telephone call wait time for customers (<5 minutes) | >4 min | 52 sec. | 1:34 min. | 2:08 min. |

## E.5. Capital Improvement Program and Regulatory Compliance Status

PRASA's CIP has a comprehensive listing of projects and budgets for the ten years ending on June 30, 2020[3]. In FY2010, PRASA's capital expenditures were approximately $299 million (M). Additionally, as of June 2010, PRASA's CIP includes $1.44 billion (B) in capital expenditures over fiscal years 2011 through 2015, of which approximately $502M correspond to capital expenditures for mandatory (compliance-driven) projects. PRASA has also preliminarily programmed $2.30B in capital expenditures for the subsequent five-year period of the CIP that starts on FY2016 and ends on FY2020.

There are 681 projects currently included in the CIP for the period FY2010 – FY2020, with 387 projects that commenced project development activities during or prior to FY2010, 195 projects programmed to commence during FY2011 through FY2015 and 99 projects programmed to commence between FY2016 and FY2020. There are 33 additional projects programmed to commence beyond FY2020. Projects included in the CIP cover major capital improvements identified throughout all five PRASA Regions, as well as island-wide initiatives such as technological advancements, telemetry, preventive maintenance, meter replacement, and renewal and replacements (R&R) to the System.

Of the 681 projects included in the FY2010 – FY2020 CIP, 192 projects have been categorized by PRASA as mandatory, which includes projects required by consent decrees and agreements with regulatory agencies. These 192 projects represent an estimated $1.71B of programmed capital expenditures, or approximately 42% of the total CIP over this time period.

PRASA's CIP addresses the requirements of the 2006 United States Environmental Protection Agency (USEPA) Wastewater Consent Decree (2006 Consent Decree, or the "Mega" Consent Decree) and the 2007 Puerto Rico Department of Health (PRDOH) Drinking Water Settlement Agreement[4] (PRDOH Agreement). Review of PRASA's CIP showed that all of the WTP and WWTP facilities that were considered unacceptable in terms of compliance currently have CIP projects identified to either rehabilitate or close the facility, thus addressing existing compliance problems.

PRASA's FY2010 record of compliance with the milestones of the 2006 Consent Decree and PRDOH Agreement supports PRASA's ongoing commitment to bring its System into compliance. Additionally, a new consent decree was signed on April 6, 2010 between PRASA and USEPA. This consent decree addresses non-compliance with National Pollutant Discharge

[3]CIP version used: "PMC & Cash Flow 2010-2014 All Inclusive 02262010 JD"
[4] In the 2008 CER the PRDOH Drinking Water Settlement Agreement was referred to as the PRDOH Consent Decree.

Elimination System (NPDES) of Sludge Treatment Systems (STSs) in WTPs and consolidates all related STS projects. As such, PRASA II and PRASA III consent decrees were closed.

PRASA is in the process of updating its long-term Master Plan. The 20-year (2010-2030) Master Plan is projected to be completed by FY2011 and will provide PRASA with a clear roadmap of its CIP as it will serve as a planning tool for the review of existing and future capital needs, as well as future capital investment.

With the possible exception of buried infrastructure improvements, the planned CIP along with the O&M initiatives are generally in alignment with the System needs. No additional CIP needs at plant facilities were identified for this CER, although improvements to ancillary facilities are needed. Those improvements could be addressed out of the existing R&R budget within the CIP. Based on the condition assessment and CIP review completed by MPPR/Malcolm Pirnie, PRASA has an adequate CIP implementation program that, if well managed, it is expected to meet PRASA's needs.

## E.6. Insurance Program

In order to meet the requirements of the MAT as it regards to PRASA's insurance program, MPPR/Malcolm Pirnie subcontracted AON Risk Services (AON) to review PRASA's current insurance coverage and determine its adequacy considering the type and value of PRASA's fixed assets. AON also provided a professional opinion on the appropriateness of such coverage and recommendations related to PRASA's insurance coverage.

AON concluded that the insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. AON has provided several recommendations to PRASA's insurance program. Particularly, PRASA should address the following key recommendations:

1. Review of the adequacy of the property insurance limit.
2. Complete a Probable Maximum Loss study to assist in the evaluation of the property insurance limit.
3. Review the downstream liability exposure for PRASA's dams.
4. Consider adding underground storage tank coverage to the pollution liability policy.

The OCIP covering PRASA's exposures to risks of accidental property and liability losses arising from construction activities provides reasonable coverage. AON has provided several recommendations to PRASA's OCIP. Particularly, PRASA should address the following key recommendations:

1. Revise Endorsement 1 on the builder's risk policy to include coverage for underground property.

2. Remove the Wrap Up exclusion in the Contractor's Limitation Endorsement contained in the excess liability policy.

## E.7. System Assets and Financial Analysis

Table ES-5 shows that, as of June 30, 2010, PRASA reported an estimated book value of fixed assets of approximately $5,469M, which represents an increase of $1,069M (24%) over the FY2009's reported value of fixed assets. Additionally, PRASA reported approximately $1,616M of assets that are currently under construction or as "Work in Process", which represents an increase of approximately $24M (2%) over that reported in FY2009. As such, total fixed assets increased by approximately $1,092M (18%) over FY2009's reported value. This increase is primarily attributable to a $933.4M capital assets transfer from the Puerto Rico Infrastructure Financing Authority (PRIFA).

**Table ES-5:**
**Fixed Assets through June 30, 2010 (Preliminary)**
**(in Thousands)**

| | Original Cost | Accumulated Depreciation | Book Value |
|---|---|---|---|
| Fixed Assets | $8,111 | ($2,642) | $5,469 |
| Work in Process | $1,616 | - | $1,616 |
| Total Fixed Assets | $9,727 | ($2,642) | $7,085 |

In the preparation of this CER, MPPR/Malcolm Pirnie reviewed the PRASA-prepared FY2011 through FY2014 financial forecast (the Forecast or PRASA's Base Case or Base Case) shown in Exhibit 1 (enclosed at the end of this section) and results for FY2010. MPPR/Malcolm Pirnie opined on the reasonableness of this forecast and included recommendations for select revenue and expense categories, included as the Alternate Case in Exhibit 2.

The purpose of MPPR/Malcolm Pirnie's review was to assess the adequacy of the current and proposed rates to provide the revenues necessary to support the projected costs shown in Exhibit 1, including capital expenditures, management, and O&M expenses. Additionally, the Forecast (presented on a modified accrual basis) illustrates the anticipated debt service coverage (DSC) for the four fiscal years from July 1, 2010 through June 30, 2014 (the forecast period).

The Forecast presents PRASA's estimate of the expected results of operations and DSC for the forecast period. Thus, the Forecast reflects PRASA's judgment, based upon present circumstances, as to the most likely set of conditions and course of action. However, there will usually be differences between forecasted and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material. MPPR/Malcolm Pirnie has no responsibility for updating this CER for changes that occur beyond June 30, 2010.

Although PRASA experienced a reduction in service revenues of approximately $19M from FY2009 to FY2010, in FY2010 it was able to collect $73M of prior years from customers and reimbursements from entities such as the State Revolving Fund. Also, PRASA has continued to successfully implement its operational initiatives which to date have generated approximately $80M[5] in additional revenue for PRASA. In terms of expenses, PRASA has continued to reduce some of its operational costs, achieving reductions in several expense categories, with significant recorded reductions in the payroll and benefits expense category. However, electricity costs continue to be high.

Given the current economic conditions in Puerto Rico, PRASA was not able to implement the rate adjustments projected in its 2008 Official Statement (OS). In FY2010, PRASA received a special assignment of $27M from the Central Government Funds through the Government Development Bank of Puerto Rico (GDB). For FY2011, PRASA will again receive a special assignment of $105M from the Central Government General Fund. For FY2012 through FY2014, PRASA has projected approximately $150M to $160M in additional revenues in each fiscal year from Other Sources of Funds which are yet to be identified. These other sources may include, but are not limited to, additional General Fund Special Contributions.

PRASA is looking into alternate sources of financing, and continues to implement operational initiatives to help improve its financial situation. While PRASA is committed to the initiatives, there is a possibility that the projected results, and more specifically, the timing of those results, will not be achieved. In the event that PRASA is unable to secure future special assignments from the Central Government General Fund or generate sufficient revenues to meet its operational and debt service obligations, a rate increase of at least 32% in FY2012 would be necessary, as shown in Exhibit 2.

## E.8. Conclusions and Recommendations

Set forth below are the principal opinions which MPPR/Malcolm Pirnie has reached regarding the review of PRASA's water and wastewater system. For a complete understanding of the assumptions upon which these opinions are based, this report should be read in its entirety.

1. PRASA's overall staff levels have been historically high compared to industry standards, although some individual facilities and PRASA departments have staffing shortages. Also, as a result of recent staff reductions, PRASA's performance regarding meter readings and effectiveness in repairing leaks and overflows in a timely manner have fallen. As such, PRASA could benefit from a utility-wide organizational assessment to identify staffing needs, and opportunities for staff reductions and position consolidations where surplus staff is identified.

[5] Based on the total results for FY2009 ($11.8M) and FY2010 ($67.3M).

2. Although PRASA's training record since FY2006 has improved considerably, the staff needs additional training to improve effectiveness and increase safe work practices. PRASA recognizes this need and has continued providing a comprehensive training program which provided an average of 21 hours of training per employee in FY2010 compared to an average of 13 hours per employee in FY2006, 16 hours in FY2007, and 14 hours in FY2008. Between FY2009 and FY2010 the training hours were reduced from 29 to 21 hours. With the new facilities automation process and chemical reduction efforts, it is recommended to PRASA to increase or at least maintain the training hours for the next fiscal year. As this program continues, the capabilities and performance of staff working at PRASA is expected to improve over time.

3. The condition of the facilities visited varied from new to those requiring capital upgrades. The condition of most facilities with implemented CIP projects improved from FY2009 to FY2010. However, certain facilities are operating out of compliance with discharge permit limits and drinking water standards. Despite these compliance problems, the facilities are generally producing and delivering potable water and conveying and treating wastewater to a level of competency. PRASA demonstrates a thorough understanding of the System shortcomings and continues to work towards correcting them.

4. PRASA must continue to maintain its commitment for the implementation of the Integrated Preventive Maintenance Plan (IPMP). In addition, PRASA must continue a focused corrective maintenance and R&R program in order to improve fallen metrics, to maintain and improve the condition of the System, and to provide a program for the long-term preservation of the System assets. PRASA has included in its CIP provisions for the continuous implementation of the IPMP. Additionally, PRASA has budgeted, on average, approximately $47M annually from FY2011 through FY2015 for R&R. However, PRASA should evaluate and adjust its R&R budget to improve its performance metrics.

5. PRASA should review its performance metrics and standardize the way these metrics are calculated to facilitate their interpretation and application including, but not limited to, how the data is collected, how it is reported, and how it is used by PRASA management.

6. A review of PRASA's commercial services showed that PRASA has significant opportunities to reduce its current volume of NRW and commercial losses, and to improve its billing procedures and collections. In MPPR/Malcolm Pirnie's opinion, PRASA is losing significant amounts of revenue due to:

   - Water theft
   - Non-optimal collection practices
   - Poor customer billing database management
   - High levels of estimation
   - Reading bi-monthly instead of monthly
   - Malfunctioning and obsolete customer meters

PRASA should review its current collections efforts in order to establish effective and proactive procedures that can lead to a reduction in its uncollectibles. An analysis of key accounts should be completed so that collection efforts target higher value customers.

7. With the possible exception of buried infrastructure improvements, the planned CIP along with the O&M initiatives are generally in alignment with the System needs. No additional CIP needs at plant facilities were identified for this CER, although improvements to ancillary facilities are required. Those improvements could be addressed through PRASA's R&R program, included within the CIP. Hence, an analysis of PRASA's R&R needs and budget is recommended to develop a sound R&R program that will allow PRASA to improve and extend the useful life of its System. Because PRASA has not budgeted contributions to the Capital Improvement Fund, the planned capital improvements for FY2010 ($299M) were paid from the proceeds of Federal funding and Interim Financing Loans. Facilities that underwent upgrades or improvements through the CIP showed overall improvement. Review of PRASA's CIP showed that most of the WTPs and WWTPs that were considered unacceptable in terms of compliance currently have CIP projects identified to either rehabilitate or close the facility, thus addressing existing compliance problems. Once implemented as planned, these initiatives are expected to result in significant improvements in the performance of the System, including substantial advances towards complying with existing regulatory requirements.

8. The full impact of future regulations on the water treatment and supply system are not known at this time. In some cases, future regulations are expected to require minor process changes (such as moving the point of chlorination within a facility) and in other cases major capital improvements, such as construction of new treatment plants. Although, the existing CIP does not include projects specifically to address future regulations, PRASA is making allowances in its new designs to improve capabilities to meet certain future regulations. As the impact of future regulations becomes more defined, PRASA may need to modify its CIP to accommodate resulting needs.

9. PRASA's insurance program has reasonable insurance policies to meet PRASA's insurable risks and exposures. Insured amounts and values are reasonable to meet or exceed industry standards. PRASA has in place a risk management and loss prevention regime that reasonably addresses the pro-active process of avoiding losses and accidents in all its operations in accordance with modern industry standards.

10. Although PRASA's financial Forecast is, for the most part, reasonable, it depends on revenue sources that for FY2012 through FY2014 are yet to be identified. Currently, PRASA's Forecast does not include rate adjustments or rate increases. However, PRASA continues to implement operational initiatives to help improve its financial situation. While PRASA is committed to the initiatives, there is a possibility that the results projected to be achieved and more specifically, the timing of those results, will not be achieved. This possibility is

reflected in the adjustments and recommendations made by MPPR/Malcolm Pirnie in select revenue and expense categories and conclusions presented herein. In the event that PRASA is unable to secure future special assignments from the Central Government General Fund or generate sufficient revenues to meet their operational and debt service obligation in FY2012 through FY2014, in FY2012 PRASA would have to increase its rates by as much as 32%.

**EXHIBIT 1**

| | PRASA BASE CASE ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|---|
| 1 | **REVENUES** | | | | | |
| 2 | Base Fee and Service Charges | $740,993 | $754,000 | $754,000 | $754,000 | $754,000 |
| 3 | Average Annual Growth/(Decrease) | - | - | - | - | - |
| 4 | Rate Increases | - | - | - | - | - |
| 5 | Rate Adjustments | - | - | - | - | - |
| 6 | General Fund Special Contribution / Other Sources of Funds | 27,240 | 105,000 | 150,000 | 160,000 | 150,000 |
| 7 | Operational Initiatives (Includes NRWRP & Commercial Contracting) | 67,330 | 65,000 | 68,654 | 85,113 | 119,456 |
| 8 | Collections Lag and Uncollectibles Reserve | (100,147) | (98,280) | (98,719) | (100,694) | (104,815) |
| 9 | Reimbursements from Prior Years | 72,543 | - | - | - | - |
| 10 | Subsidy | (3,533) | (3,630) | (3,993) | (4,392) | (4,832) |
| 11 | Subsidy to Public Housing (Includes recommended subsidy reduction) | (7,000) | (12,000) | (12,360) | (12,731) | (13,113) |
| 12 | Other Income | 7,692 | 10,000 | 8,000 | 8,000 | 8,000 |
| 13 | Special Assessments | 6,502 | 7,000 | 7,500 | 8,000 | 8,500 |
| 14 | Interest Income | - | - | - | - | - |
| 15 | **Total Operating Revenues, Net** | **$811,620** | **$827,090** | **$873,082** | **$897,296** | **$917,196** |
| 16 | | | | | | |
| 17 | **OPERATING EXPENSES** | | | | | |
| 18 | Payroll and Benefits (Includes staff reductions through attrition) | $299,948 | $270,584 | $200,364 | $194,302 | $186,458 |
| 19 | Electric Power | 140,131 | 138,000 | 132,000 | 128,600 | 123,030 |
| 20 | Chemicals | 26,264 | 27,703 | 27,980 | 28,260 | 28,542 |
| 21 | Superaqueduct Service Contract | 22,800 | 24,000 | 24,240 | 24,482 | 24,727 |
| 22 | Insurance | 9,443 | 12,280 | 12,648 | 13,028 | 13,419 |
| 23 | Other Expenses | 152,801 | 150,616 | 142,609 | 136,587 | 140,685 |
| 24 | Operational Initiatives (PPP Project) | - | - | 80,802 | 84,332 | 89,199 |
| 25 | Capitalized Operating Expenses | (42,340) | (37,391) | (31,032) | (30,480) | (30,303) |
| 26 | **Total Operating Expenses, Net** | **$609,047** | **$585,792** | **$589,611** | **$579,111** | **$575,757** |
| 27 | | | | | | |
| 28 | **OTHER FINANCING SOURCES** | | | | | |
| 29 | Surplus Funds & Non-Cash Adjustments | - | - | - | - | - |
| 30 | Other Sources of Fund ($150M Facility) | - | - | - | - | - |
| 31 | | | | | | |
| 32 | **TOTAL NET REVENUES AVAILABLE FOR DEBT SERVICE** | **$202,573** | **$241,298** | **$283,471** | **$318,185** | **$341,439** |
| 33 | | | | | | |
| 34 | **TOTAL DEBT SERVICE (Includes CSO)** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |
| 35 | | | | | | |
| 36 | **TOTAL (DEFICIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$1,726** | **$2,446** | **$5,208** | **$6,163** |
| 37 | **CUMULATIVE (DERCIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$11,992** | **$14,438** | **$19,646** | **$25,809** |

| **DEBT SERVICE COVERAGE** | | | | | |
|---|---|---|---|---|---|
| **Senior** | $68,756 | $132,158 | $149,310 | $223,683 | $236,121 |
| Coverage Required = 1.20 | 2.95 | 1.83 | 1.90 | 1.42 | 1.45 |
| **Senior Subordinated** | $10,751 | $10,853 | $1,309 | - | - |
| Coverage Required = 1.10 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Subordinated** | - | - | - | - | - |
| Coverage Required = 1.00 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Commonwealth Guranteed Indebtedness** | $85,561 | $69,324 | $102,692 | $75,854 | $78,882 |
| Coverage Required = 1.00 | 1.23 | 1.14 | 1.12 | 1.06 | 1.08 |
| **Commonwealth Supported Obligations** | $27,240 | $27,237 | $27,714 | $13,441 | $20,273 |
| Coverage Required = 1.00 | 1.05 | 1.01 | 1.01 | 1.02 | 1.02 |
| **Total Debt Service** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |

*Numbers may not add up due to rounding

**EXHIBIT 1**

| ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|
| **USES OF FUNDS** | | | | | |
| Repair & Replacement of Fixed Assets | $9,403 | $30,094 | $38,491 | $51,738 | $56,444 |
| CIP Infrastructure Projects | 289,841 | 331,231 | 343,497 | 156,217 | 143,012 |
| **Total Uses** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |
| | | | | | |
| **SOURCES OF FUNDS** | | | | | |
| Federal Funds – Rural Development Bonds / LOC | $20,190 | $12,810 | $12,000 | $12,000 | $12,000 |
| Federal Funds – State Revolving Funds | 34,320 | 35,000 | 35,000 | 35,000 | 35,000 |
| Federal Economic Stimulus – Grants | 14,381 | 30,409 | 16,825 | 0 | 0 |
| Federal Economic Stimulus – Loans | 2,701 | 6,705 | 10,446 | 2,100 | 0 |
| Local Stimulus | 2,147 | 4,271 | 5,016 | 1,002 | 0 |
| Interim Financing | 225,504 | 272,130 | 0 | 0 | 0 |
| Bond Proceeds (Subsequent Issues) | 0 | 0 | 302,701 | 157,854 | 152,456 |
| **Total Sources** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |

**EXHIBIT 2**

| | ALTERNATE CASE ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|---|
| 1 | **REVENUES** | | | | | |
| 2 | Base Fee and Service Charges | $740,993 | $741,000 | $741,000 | $974,415 | $1,018,264 |
| 3 | Average Annual Growth/(Decrease) | - | - | - | - | - |
| 4 | Rate Increases | - | - | 200,070 | - | - |
| 5 | Rate Adjustments | - | - | 33,345 | 43,849 | - |
| 6 | General Fund Special Contribution / Other Sources of Funds | 27,240 | 105,000 | - | - | - |
| 7 | Operational Initiatives (Includes NRWRP & Commercial Contracting) | 67,330 | 65,000 | 68,654 | 85,113 | 119,456 |
| 8 | Collections Lag and Uncollectibles Reserve | (100,147) | (104,780) | (103,740) | (136,418) | (142,557) |
| 9 | Reimbursements from Prior Years | 72,543 | 19,000 | - | - | - |
| 10 | Subsidy | (3,533) | (3,630) | (3,993) | (4,392) | (4,832) |
| 11 | Subsidy to Public Housing (Includes recommended subsidy reduction) | (7,000) | (12,000) | (12,360) | (12,731) | (13,113) |
| 12 | Other Income | 7,692 | 10,000 | 8,000 | 8,000 | 8,000 |
| 13 | Special Assessments | 6,502 | 7,000 | 7,500 | 8,000 | 8,500 |
| 14 | Interest Income | - | - | - | - | - |
| 15 | **Total Operating Revenues, Net** | **$811,620** | **$826,590** | **$938,476** | **$965,835** | **$993,718** |
| 16 | | | | | | |
| 17 | **OPERATING EXPENSES** | | | | | |
| 18 | Payroll and Benefits (Includes staff reductions through attrition) | $299,948 | $275,084 | $251,444 | $246,347 | $222,537 |
| 19 | Electric Power | 140,131 | 145,000 | 146,250 | 149,863 | 154,856 |
| 20 | Chemicals | 26,264 | 27,703 | 28,534 | 29,390 | 30,272 |
| 21 | Superaqueduct Service Contract | 22,800 | 24,000 | 24,720 | 25,462 | 26,225 |
| 22 | Insurance | 9,443 | 12,280 | 12,648 | 13,028 | 13,419 |
| 23 | Other Expenses | 152,801 | 150,616 | 142,609 | 136,587 | 140,685 |
| 24 | Operational Initiatives (PPP Project) | - | - | 80,802 | 84,332 | 89,199 |
| 25 | Capitalized Operating Expenses | (42,340) | (38,081) | (34,350) | (34,250) | (33,860) |
| 26 | **Total Operating Expenses, Net** | **$609,047** | **$596,602** | **$652,657** | **$650,757** | **$643,333** |
| 27 | | | | | | |
| 28 | **OTHER FINANCING SOURCES** | | | | | |
| 29 | Surplus Funds & Non-Cash Adjustments | - | - | - | - | - |
| 30 | Other Sources of Fund ($150M Facility) | - | - | - | - | - |
| 31 | | | | | | |
| 32 | **TOTAL NET REVENUES AVAILABLE FOR DEBT SERVICE** | **$202,573** | **$229,988** | **$285,819** | **$315,078** | **$350,385** |
| 33 | | | | | | |
| 34 | **TOTAL DEBT SERVICE (Includes CSO)** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |
| 35 | | | | | | |
| 36 | **TOTAL (DEFICIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **($9,584)** | **$4,794** | **$2,101** | **$15,109** |
| 37 | **CUMULATIVE (DERCIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$682** | **$5,476** | **$7,577** | **$22,686** |

| **DEBT SERVICE COVERAGE** | | | | | |
|---|---|---|---|---|---|
| **Senior** | $68,756 | $132,158 | $149,310 | $223,683 | $236,121 |
| Coverage Required = 1.20 | 2.95 | 1.74 | 1.91 | 1.41 | 1.48 |
| **Senior Subordinated** | $10,751 | $10,853 | $1,309 | - | - |
| Coverage Required = 1.10 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Subordinated** | - | - | - | - | - |
| Coverage Required = 1.00 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Commonwealth Guranteed Indebtedness** | $85,561 | $69,324 | $102,692 | $75,854 | $78,882 |
| Coverage Required = 1.00 | 1.23 | 1.08 | 1.13 | 1.05 | 1.11 |
| **Commonwealth Supported Obligations** | $27,240 | $27,237 | $27,714 | $13,441 | $20,273 |
| Coverage Required = 1.00 | 1.05 | 0.96 | 1.02 | 1.01 | 1.05 |
| **Total Debt Service** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |

*Numbers may not add up due to rounding

**EXHIBIT 2**

| ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|
| **USES OF FUNDS** | | | | | |
| Repair & Replacement of Fixed Assets | $9,403 | $30,094 | $38,491 | $51,738 | $56,444 |
| CIP Infrastructure Projects | 289,841 | 331,231 | 343,497 | 156,217 | 143,012 |
| **Total Uses** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |
| | | | | | |
| **SOURCES OF FUNDS** | | | | | |
| Federal Funds – Rural Development Bonds / LOC | $20,190 | $12,810 | $12,000 | $12,000 | $12,000 |
| Federal Funds – State Revolving Funds | 34,320 | 35,000 | 35,000 | 35,000 | 35,000 |
| Federal Economic Stimulus – Grants | 14,381 | 30,409 | 16,825 | 0 | 0 |
| Federal Economic Stimulus – Loans | 2,701 | 6,705 | 10,446 | 2,100 | 0 |
| Local Stimulus | 2,147 | 4,271 | 5,016 | 1,002 | 0 |
| Interim Financing | 225,504 | 272,130 | 0 | 0 | 0 |
| Bond Proceeds (Subsequent Issues) | 0 | 0 | 302,701 | 157,854 | 152,456 |
| **Total Sources** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |

# 1 Introduction

## 1.1 Introduction

MP Engineers of Puerto Rico, PSC and its subcontractor Malcolm Pirnie, Inc. (MPPR/Malcolm Pirnie) have been retained by the Puerto Rico Aqueduct and Sewer Authority (PRASA) as its Consulting Engineer to assist in satisfying several requirements of the Master Agreement of Trust (MAT) between PRASA and the Trustee with bondholders. MPPR/Malcolm Pirnie understands that PRASA entered into a MAT on March 2008 to enable it to issue revenue bonds and incur other indebtedness to partially finance its Capital Improvement Program (CIP) and to repay and refinance existing debt. MPPR/Malcolm Pirnie prepared a Consulting Engineer's Report (CER) on January 2008 (2008 CER) to document and assess technical, operational and financial issues and related matters of PRASA's water and wastewater systems (the System). The 2008 CER was included in PRASA's Official Statement (OS) related to its March 2008 bond issuance.

As required by Section 7.07 of the MAT, for as long as the Senior Bonds have been rated investment grade by at least two Rating Agencies, the Consulting Engineer shall prepare a CER for two consecutive years to document the current condition and changes, if any, in PRASA's operation and the performance of the System. In March of 2010, MPPR/Malcolm Pirnie issued the 2009 CER, which covered the period from July 1, 2008 to June 30, 2009. The information presented in this 2010 CER covers the period from July 1, 2009 to June 30, 2010.

Since March 2008, PRASA has incurred additional subordinated indebtedness to continue to fund its CIP, which currently consists of 681 projects that address upgrades to existing treatment plants, consolidation of some smaller plants, addition of new treatment plants, and improvements to the sanitary sewer collection system and water supply and distribution system. It also includes vehicle fleet replacements, implementation of preventive maintenance programs, technology improvements in telemetry, renewals and replacements (R&R), and various other projects related to the System.

## 1.2 PRASA Overview

PRASA is a public utility responsible for the production and distribution of potable water and collection, treatment, and disposal of a large portion of domestic and industrial pretreated wastewaters in Puerto Rico. PRASA serves a population of approximately four million residents plus approximately five million visitors annually[6]. PRASA can be considered a monopoly since it is the only water and wastewater utility in Puerto Rico, providing water and wastewater service to about 97% and 58% of Puerto Rico's population, respectively. While this is positive in terms of sales of services it also makes PRASA a critical entity for the wellbeing of Puerto Rico. The

[6] Source: Puerto Rico Tourism Company statistics for fiscal years 2004 through 2009.

effective operation of this vital public service is essential to the health and economic prosperity of Puerto Rico and its citizens.

PRASA provides water and wastewater service throughout the island, which has an approximate area of 3,535 square miles. Due to the fact that Puerto Rico is an island with varied topography, isolated demographic distributions, and a diverse mix of users, PRASA has a somewhat fragmented and localized system of water sources, treatment systems and delivery systems. As a result, PRASA has many more treatment facilities than most utilities serving a similar number of customers. This results in a higher degree of diversity in PRASA's assets in terms of size, treatment technologies, and age when compared to systems in the United States (U.S.) and Canada, which tend to have more centralized systems with larger regional facilities. These facts add complexity to the management of the System and contribute to higher operation and maintenance (O&M) costs compared to other utilities serving similar populations. At the time of this assessment and based on PRASA's updated Geographic Information System (GIS) database, as of FY2010 PRASA operates eight regulated dams, 127 water treatment plants (WTPs), 60 wastewater treatment plants (WWTPs), 1,182 water pump stations (WPSs), 1,004 wastewater pumping stations (WWPSs), 299 wells, and 1,723 water storage tanks.

## 1.3 Purpose

As stated in Section 7.07(a)-(g) of the MAT, it shall be the duty of the Consulting Engineer to prepare and file reports with [PRASA] and the Trustee…setting forth the following:

- the recommendations of the Consulting Engineer as to the proper maintenance, repair and operation of the Systems during the ensuing fiscal year, and an estimate of the amounts of money necessary for such purposes;
- the recommendations of the Consulting Engineer as to the amount that should be deposited in each month during the ensuing fiscal year to the credit of the Capital Improvement Fund;
- the recommendations of the Consulting Engineer as to the Improvements which should be made during the ensuing fiscal year, and an estimate of the amounts of money necessary for such purposes, showing separately (i) the amount to be expended during such fiscal year from moneys to the credit of the Capital Improvement Fund and the Surplus Fund and (ii) the amount to be expended during such fiscal year from the proceeds of Bonds and other Indebtedness;
- the recommendations of other Consultants retained by or relied upon by the Consulting Engineer as to the insurance to be carried under the provisions of Section 7.08 of this Article;
- a statement by the Consulting Engineer of the cost of all additions made to the Systems and of the cost (if the cost cannot be accurately determined, the estimated cost) of all retirements of property made in such fiscal year;

- a report of the Consulting Engineer (which may retain other Consultants as necessary) as to the adequacy of existing rates and charges for purposes of the Rate Covenant contained in Section 7.01 hereof for the then current Fiscal Year to date and recommendations as to any necessary or advisable revisions of rates and charges and such other advices and recommendations as they may deem desirable; and
- the findings of the Consulting Engineer whether the properties of the Systems have been maintained in good repair and sound operating condition, and their estimate of the amount, if any, required to be expended to place such properties in such condition and the details of such expenditures and the approximate time required therefore.

This CER presents MPPR/Malcolm Pirnie's opinion with respect to the technical, operational and financial issues and related matters of the System through June 30, 2010. Any statements in this CER involving estimates or matters of opinion, whether or not so specifically designated, are intended as such, and not as representations of fact. Changed conditions occurring or becoming known after the issuance of or beyond the period covered by this CER could affect the material presented to the extent of such changes. MPPR/Malcolm Pirnie has no responsibility for updating this CER for changes that occur beyond June 30, 2010.

MPPR/Malcolm Pirnie has performed inspections of a sampling of the major and minor assets that comprise the System. MPPR/Malcolm Pirnie has also evaluated the CIP, the regulatory compliance situation, the organizational structure, the insurance program and PRASA's financial situation and projections. MPPR/Malcolm Pirnie has not independently verified the accuracy of the reports and other information provided by PRASA for the conduct of this assignment. To the extent that the information provided to MPPR/Malcolm Pirnie by PRASA is not accurate, the conclusions and recommendations contained in this CER may vary and are subject to change.

## 1.4 Conventions

PRASA's fiscal year begins on July 1st and ends June 30th. Throughout this CER, fiscal year is identified as "FY" followed by the calendar year in which the fiscal year ends, i.e., FY2010 is the fiscal year from July 1, 2009 through June 30, 2010.

## 1.5 Acronyms

A listing of acronyms or abbreviations of terms used in this report is included in the Table of Contents.

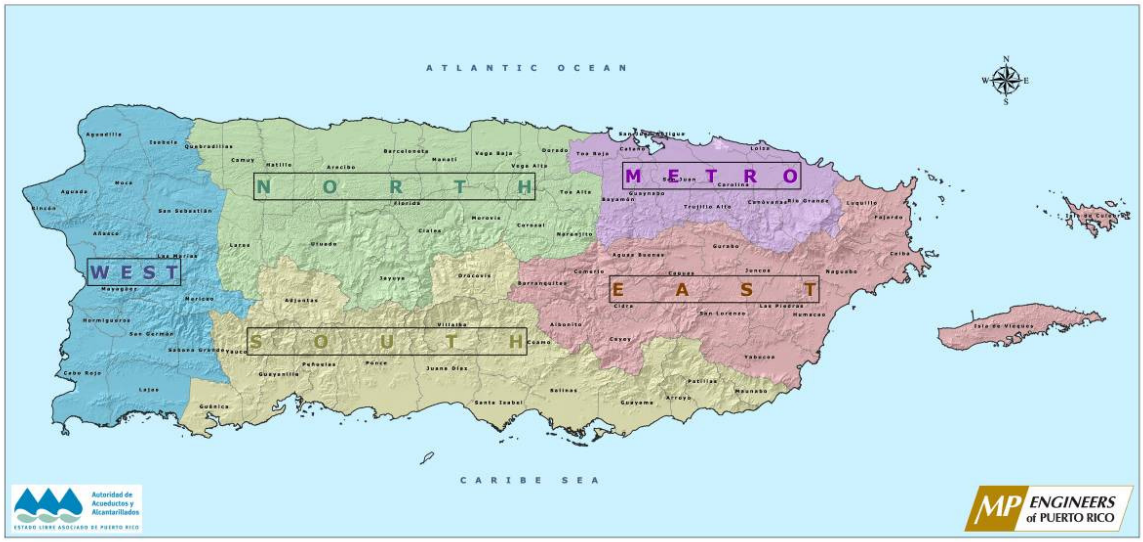
# 2 Organizational Updates and Changes

## 2.1 Introduction

This section describes changes within PRASA's organization since the issuance of the 2008 and 2009 CERs and provides opinions regarding the adequacy of PRASA's organizational structure and initiatives.

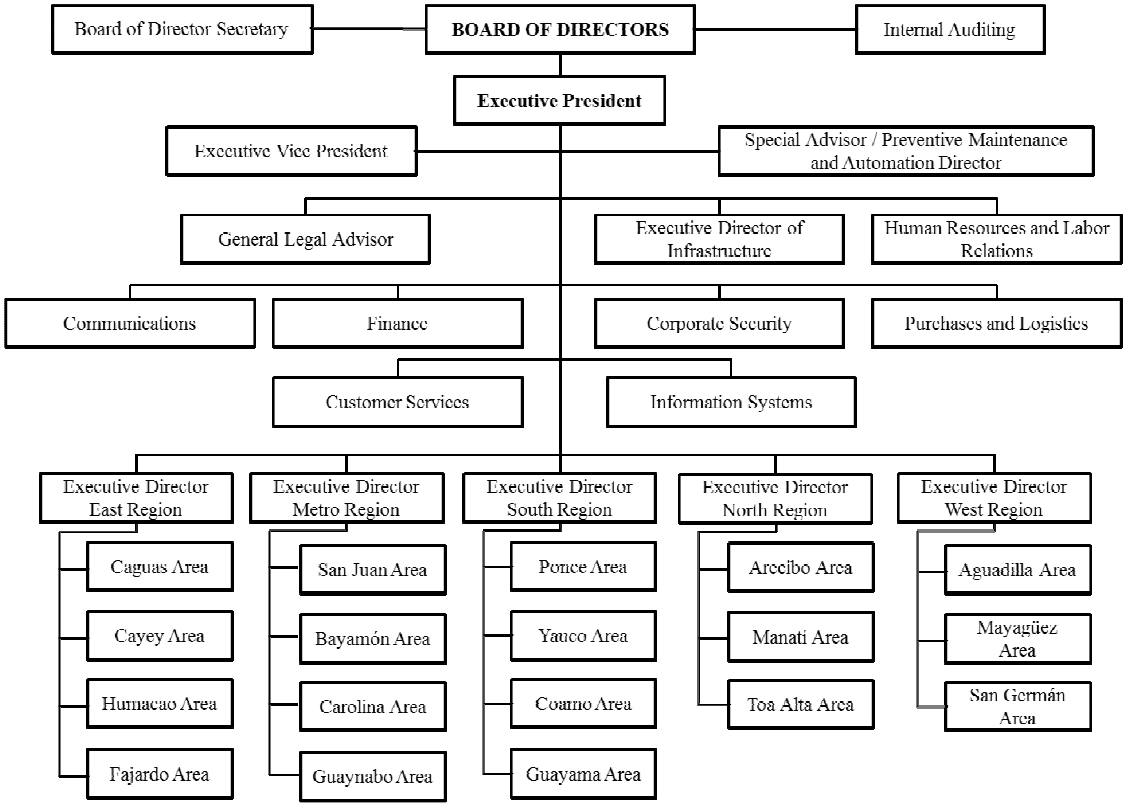
As shown in Figure 2-1, PRASA is organized into five operational Regions (North, South, East, West and Metro), as a result of the enactment of Act No. 92 on March 31, 2004.

**Figure 2-1: PRASA Regions**




In general, the overall PRASA organizational structure has not significantly changed since 2008. PRASA is managed by an Executive staff that provides the day to day management oversight and coordination for all institutional activities. The Executive Staff is supported by various departments in the organization including, but not limited to, finance, customer services, and information systems. Figure 2-2 provides a chart of PRASA's organization.

**Figure 2-2: PRASA Legislated and Executive Management Structure**




## 2.2 Updates and Changes in PRASA's Organization and Management

### 2.2.1 Board of Directors

There have been several changes in the makeup of PRASA's nine-member Board of Directors (the Board) since the 2008 CER. These changes are due either to expiration of appointment terms of previous members or personnel changes in government entity directors. Table 2-1 shows the Board members list. The term of each Board member varies according to Act No. 92.

**Table 2-1:**
**PRASA Nine-Member Board of Directors as of June 30, 2010**

| Name | Board Position | Government Position | Term Ends |
|---|---|---|---|
| 1. Mr. Edgardo Fábregas Castro | Interim President | Not Applicable | June 30, 2013 |
| 2. Eng. Bernardino Feliciano Ruiz | Independent Director | Not Applicable | June 30, 2014 |
| 3. Mrs. Aura González Ríos, Esq. | Independent Director | Not Applicable | June 30, 2013 |
| 4. CPA Carlos Dávila Torres | Independent Director | Not Applicable | June 30, 2014 |
| 5. Eng. Héctor Morales Vargas | Governmental Director | President, Puerto Rico Planning Board | Ex-Oficio |
| 6. Mr. Jaime García García | Governmental Director | Executive Director, Mayors Association | Ex-Oficio |
| 7. Mr. Reinaldo Paniagua Látimer | Governmental Director | Executive Director, Mayors Federation | Ex-Oficio |
| 8. Eng. Miguel Cordero López | Governmental Director | Executive Director, Puerto Rico Electric Power Authority (PREPA) | Ex-Oficio |
| 9. Mrs. Carmen Ana Culpeper | Independent Director | Not Applicable | June 30, 2015 |

### 2.2.2 Executive Staff

Since Act No. 92 was implemented in 2004, PRASA has gone through several management changes at many levels of its organization including the executive level. In general, these changes and their resulting successions and transitions have been smooth and have not affected the stability of the organization or the continuity of the operations. For example, on January 2007, the first Executive President appointed under Act. No. 92 was appointed as Executive Director of PREPA and was replaced by PRASA's Executive Director for Infrastructure at the time. This event resulted in a series of changes within PRASA's management that included the replacement of the Executive Director for Infrastructure with the Engineering Director. These successions were well managed and continuity was maintained for all the initiatives that had begun in the prior three years.

In FY2010, PRASA named Eng. Francisco Martínez as the new Executive Director of the West Region, and new Operational Area Directors were named for the Manatí, Toa Alta, San Juan, Carolina, San Germán, Aguadilla, Yauco, Coamo and Guayama Operational Areas. These transitions, in similar fashion to those of FY2008 and FY2009, were executed smoothly and with close to no impact on the Regions' normal operations.

### 2.2.3 Customer Services Department

PRASA's customer services are performed by the Customer Service Department, which consists of a central administration office located at PRASA's central administration building in San Juan, a Regional management team that includes a Deputy Director in each Region, and the island-wide customer service offices. During FY2010, the island-wide customer offices were reduced from 28 to 26, consolidating the Levittown office with the Canton Mall office, and the San Juan office with the 65 Infantería office. Additionally, there are two satellite customer service offices, which

offer limited services to PRASA customers, located in the municipalities of Culebra and Lares. The Customer Service Department handles issues such as:

- Customer Billings
- Customer Payments
- Meter Reading
- Meter Installation
- Complaints Management
- Investigations

In FY2010, the management and supervision of personnel that perform meter reading, meter installation, and other field related activities was transferred from the Customer Service Department to PRASA's Operations Department in each Region. Additionally, Regional Executive Directors began to directly oversee certain activities including, but not limited to, service connections and disconnections and meter readings, to help PRASA reduce its rate of uncollectible accounts and amount of unauthorized water consumption and theft.

### 2.2.4 Staffing Profile and Size

Historically, PRASA's ratio of number of customers to staff has been low in comparison to industry standards. At the end of FY2010, PRASA had a total staff of 5,001 with 1,279,757 total accounts: 1,279,298 water customer accounts and 746,680 wastewater customer accounts; resulting in a ratio of about 405 customer accounts per employee (up from 340 at end of FY2008 and 360 at the end of FY2009). Current industry averages typically range from 390 to 780, with a median of approximately 550 customer accounts per employee[7]. Given the large number of PRASA facilities and wide geographic distribution of facilities, PRASA's comparatively low ratio of accounts to employees is not surprising; however, PRASA's organization could be optimized and reduced to a more lean structure.

PRASA's existing staff is categorized into five primary categories described below:

- Appointed Employees: This category includes: the executive staff, deputy directors, area directors and administrative assistants that provide support to key management personnel of the utility.
- Management Employees: These employees manage the day-to-day operations of the utility. They hold management positions both in the central and regional offices.
- HIEPAAA Employees (Hermandad Independiente de Empleados Profesionales de la Autoridad de Acueductos y Alcantarillados): These employees are the unionized professional staff that includes accountants, engineers, insurance specialists, project inspections, and surveyors.

[7] Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, American Water Works Association (2008). Note that a customer with water and sewer service is counted as two accounts for the purpose of this benchmark. Benchmarks reported for "all utilities" category.

- UIA-AAA Employees (Unión Independiente Auténtica de la Autoridad de Acueductos y Alcantarillados): These employees are the unionized plant and system operators, maintenance and support staff, meter readers, customer service specialists, and administrative assistants.
- Temporary Employees: These employees are those that are hired and classified as temporary until formally assigned to a position. New hires are placed in a 90-day probationary period. They do not have full benefits during the probationary period. If still employed after probationary period, they either become full-time employees or remain temporary employees pending position confirmation, but mostly with the same benefits as full-time employees.

Table 2-2 shows the staff levels by staff category over the last eight fiscal years. Since FY2009, PRASA is utilizing methods for reductions of staff, such as early retirement, re-training existing staff from overstaffed positions to reduce the need for new hires, and using staff attrition as a means to reduce staff levels.

**Table 2-2:**
**Staff Levels**

| End of FY | Appointed Employees | Management Employees | HIEPAAA Employees | UIA-AAA Employees | Temporary Employees | Total Employees |
|---|---|---|---|---|---|---|
| 2003[1] | 36 | 942 | 204 | 4,428 | 181 | 5,791 |
| 2004[1] | 56 | 920 | 200 | 4,383 | 115 | 5,674 |
| 2005 | 127 | 872 | 196 | 4,323 | 196 | 5,714 |
| 2006 | 146 | 882 | 194 | 4,205 | 154 | 5,581 |
| 2007 | 156 | 940 | 190 | 4,046 | 509 | 5,841 |
| 2008 | 167 | 991 | 178 | 3,814 | 690 | 5,840 |
| 2009 | 165 | 1029 | 182 | 3,663 | 536 | 5,575 |
| 2010 | 161 | 960 | 171 | 3,391 | 318 | 5,001 |

(1) Includes some employees categorized as "contract" employees, and does not include ONDEO (contract) employees. PRASA is not categorizing any employees as "contract" employees for FY2006 through FY2010.

During FY2010, PRASA reduced their staff from 5,575 to 5,001 (a 10% reduction); 574 employees less than the previous fiscal year. Of those 574 employees, 272 (47%) were UIA-AAA employees, 218 (38%) were temporary employees, 69 (12%) were management employees, 11 (2%) were HIEPAA employees and four (less than 1%) were appointed employees.

## 2.3 Organizational Challenges and Accomplishments

PRASA continues to work to achieve the objectives set forth by its Executive Management Team. These are:

- Re-establish the confidence in PRASA's ability to provide water and wastewater services consistent with the highest standards in the industry for the people of Puerto Rico.
- Transform the culture of PRASA and modernize the organizational structure.
- Revitalize PRASA so that it becomes a financially stable and self-sufficient entity.

To achieve these objectives, PRASA embarked on a series of strategies to transform the entire utility. These strategies include:

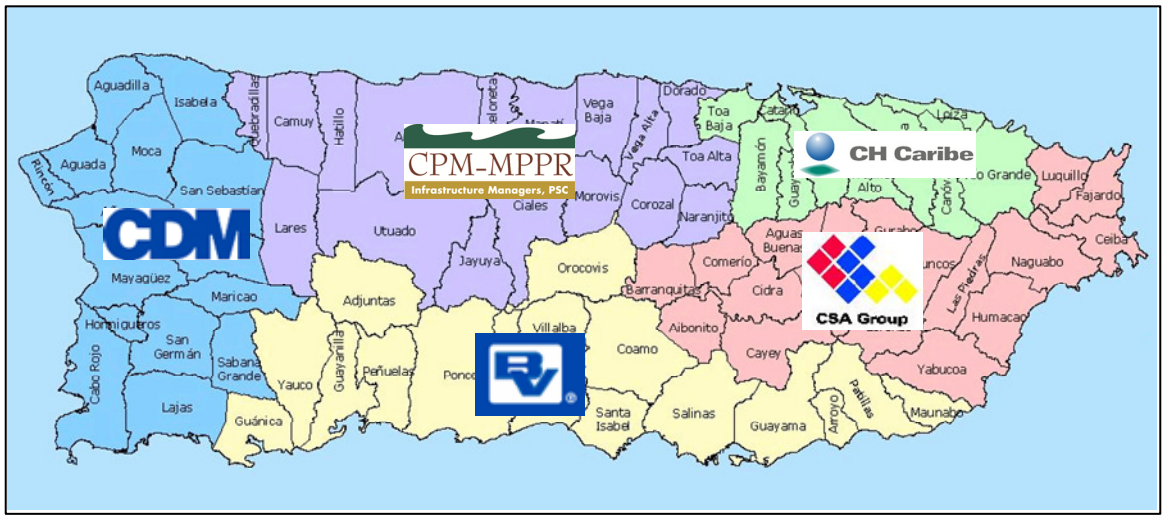
- Compliance with local and Federal regulatory requirements.
- Development of needed projects within a comprehensive CIP.
- Optimization of the system efficiency and use of available reservoirs.
- Reduction of non-revenue water (NRW).
- Protection of watersheds and management of aquifers.
- Implementation of a water conservation plan.
- Pipeline replacement to decrease water main breaks and sewer overflows.
- Improvement of the preventive maintenance program.
- Development of a comprehensive training and education program.
- Modernization of the System and use of advanced technologies.
- Cost reductions and revenue increases.

Some of the specific programs to implement the identified strategies, as developed and implemented by PRASA in the last few fiscal years, are addressed below and in following sections.

### 2.3.1 Infrastructure and Capital Improvements Program

Prior to 2004, many of the projects required to improve the System were not being delivered due to insufficient funding and internal execution resources. Recognizing the need to successfully implement an aggressive and robust infrastructure program, PRASA contracted the services of five major firms or program management consultants (the PMCs) to plan, design, and manage the CIP in each of the five Regions. These firms, which began managing the CIP in FY2005, are listed below and their respective geographic areas of responsibility are shown in Figure 2-3.

**Figure 2-3: Program Management Consultants and their Respective Regions through June 30, 2009**




A. CDM: A local affiliate (known as CDM Caribe) of Camp, Dresser, and McKee (CDM) has managed the CIP in the West Region since August 2005. CDM is a large stateside consulting firm that provides technical support services and serves as the financial guarantor.

B. CH Caribe: A local affiliate (known as CH Caribe) of CH2M Hill has managed the CIP in the Metro Region since August 2005. CH2M Hill is a large stateside environmental consulting firm that provides technical support and serves as the financial guarantor.

C. CPM-MPPR: CPM-MPPR Infrastructure Managers, PSC managed the CIP in the North Region since August 2005. CPM-MPPR is a professional services corporation created by Caribbean Project Management (CPM) and MPPR. Malcolm Pirnie, a large stateside environmental consulting firm, provides technical support services and serves as the financial guarantor.

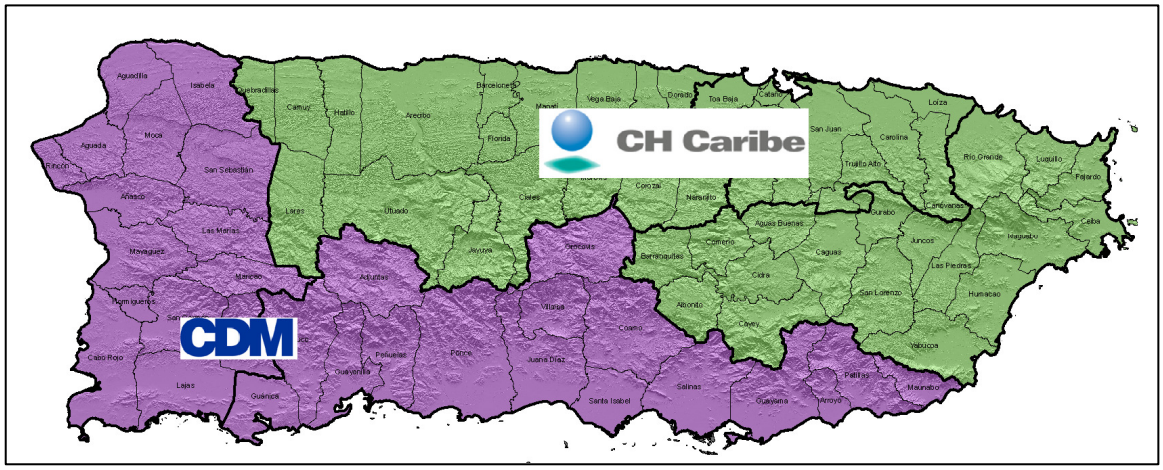
C. Black & Veatch of Puerto Rico: A local affiliate (known as Black & Veatch of Puerto Rico) of Black & Veatch (B&V) managed the CIP in the South Region since August 2005. B&V is a large stateside environmental consulting firm that provides technical support and serves as the financial guarantor.

D CSA: The CSA Group headquartered in San Juan is the largest Puerto Rican environmental engineering firm and the largest Hispanic engineering firm in the U.S. CSA managed the CIP in the East Region since August 2005. CSA serves as its own financial guarantor.

As a result of PRASA's CIP implementation plan and the economic situation currently affecting Puerto Rico, the number of CIP projects being implemented has been reduced over recent years. Therefore, effective July 1, 2009, PRASA decided to reduce the number of PMCs from five to

two. As a result, the associated program overhead costs yielded cost savings to PRASA of approximately $7M. Nonetheless, PRASA continue working with the firms not selected to continue as PMCs in areas such as planning, design, land acquisition and other special projects. PMC changes are listed below and shown on Figure 2-4.

**Figure 2-4: Program Management Consultants and their Respective Regions through June 30, 2010**




A. CDM: CDM is responsible for the CIP management in the West and South regions.

B. CH Caribe: CH Caribe is responsible for the CIP management of the Metro, North and East regions.

C. CPM-MPPR: This Company no longer manages the CIP of the North Region, effective on July 1, 2009. As separated consultants of CH Caribe and PRASA, CPM continues to provide construction inspection services in the North Region; whereas MPPR/Malcolm Pirnie, in addition to serving as Consulting Engineer to PRASA, it continues to provide planning and design services, and is responsible for the development and/or management of other special projects such as the Master Plan.

C. Black & Veatch of Puerto Rico: This Company no longer manages the CIP of the South Region. As a consultant of CDM, Black & Veatch of Puerto Rico continues to provide services in the South region.

E. CSA: CSA no longer manages the CIP of the East region. As a consultant to PRASA, CSA continues to provide land acquisition support services and is responsible of other special projects.

Further discussion of the CIP status is provided in Section 5 of this CER.

### 2.3.2 Human Resources

Over the years, PRASA has had numerous human resource management challenges ranging from inefficient work rules to insufficient training of its personnel. The collective bargaining agreements of the past did not sufficiently align the union's practices with management's goals and programs. Additionally, personnel lacked fundamental training in areas such as compliance, operations, client services, information technologies, and health and safety.

As of June 30, 2010, a new collective bargaining agreement between PRASA and the UIA-AAA was not yet signed. In 2009, the Central Government's Board of Labor Relations ruled in favor of the UIA-AAA, and ratified the existence of an active collective bargaining agreement through December 2008, even though the collective bargaining agreement between the UIA-AAA and PRASA expired in 2003. PRASA and the UIA-AAA continue to maintain open channels of communication to resolve this matter. In April 2010, the UIA-AAA performed internal elections and changed their administration, which triggered negotiations to start over. New negotiations for a collective bargaining agreement are scheduled to begin in September of 2010.

With respect to the HIEPAAA, their collective bargaining agreement with PRASA was signed on July 5, 2005 and was to remain in effect until 2009. However, the validity period of the agreement, including an automatic extension clause and excluding economic terms, was extended until the end of FY2010. A new collective bargaining agreement is currently being negotiated between PRASA and the HIEPAAA.

PRASA continues its commitment to its employees and customers, and continues to offer training programs to its employees. Training topics range from technical-oriented seminars to excellence, conflict resolution and team building sessions. In FY2010, PRASA offered over 102,000 training hours to its employees. Additional information on training is presented in Section 4.

### 2.3.3 Information Technology

PRASA continues to make information technology one of the key areas for management improvement. Information technology currently supports the development of technological advancements in PRASA, such as telemetry and several client service initiatives, including but not limited to:

- Up-keeping of PRASA's website (includes e-payment option).
- Installation of electronic payment machines.
- Continuance of a remote/automatic meter reading pilot project.
- Implementation of a new commercial system (SAP-ISU[8]).

[8] In 2008 CER the new commercial system platform was referred to as SAP PM.

Implementation of effective computerized maintenance management systems (CMMS) throughout all Regions was an initiative of PRASA's Integrated Preventive Maintenance Program (IPMP). During FY2010, PRASA's telemetry and CMMS initiatives were integrated into the Plants Automation Program (later described in Section 4) with the objectives of combining and aligning the goals and efforts of these existing PRASA initiatives into a single program.

## 2.4 Conclusions

PRASA continues to be diligent about addressing the organizational shortcomings identified in 2004 after the enactment of Act No. 92. The current organization is sufficient for the operation, management and maintenance of the System. PRASA has been able to perform executive management transitions smoothly ensuring a continuance of policy and program implementation, and System O&M. Although PRASA currently has some staffing needs at individual facilities or within its executive and management teams, PRASA's overall staff levels continue to be high when compared to industry standards.

PRASA continues to assess administrative and operational performance with the purpose of emphasizing System performance and customer service. PRASA continues to engage with numerous internationally recognized consultants to assist with several aspects of the operation and improvement of the System. The engagement of experienced PMCs for the implementation of its infrastructure program, and the engagement of well-qualified consultants for the improvement of its O&M programs demonstrates PRASA's commitment to the transformation of the utility to raise it to world-class standards.

# 3 Condition of System

## 3.1 Introduction

PRASA owns a large variety of assets, including land, buildings, dams, wells, water and wastewater treatment facilities and pump stations, ocean outfalls, buried infrastructure, vehicles, and water meters. MPPR/Malcolm Pirnie has assessed the condition of PRASA's System through an inspection program of major portions of the System. The purpose of these inspections is to identify the overall condition of the facilities to determine if they are being operated and maintained in a manner to achieve their operating goals and to evaluate if PRASA's CIP is aligned with identified needs. These inspections were performed from January 28, 2010 through March 16, 2010.

Tables 3-1 and 3-2 present the categories of PRASA's assets that were inspected as part of this CER, along with the total quantity of PRASA assets, number of facilities inspected, and percent of total facilities inspected. The quantity of PRASA assets included in Tables 3-1 and 3-2 are based on the latest data obtained from PRASA's GIS database. These numbers vary from those reported in previous years given that PRASA continues to digitize and incorporate both existing and new infrastructure data. As it is expected from any GIS, this information will fluctuate from year to year as a result of its further development and expansion, and the deletions and additions of assets to the System.

As shown in Table 3-1, all regulated dams were inspected, due to the value of these individual assets. Approximately 50% of the WTPs and WWTPs were inspected. Those inspected were facilities that served a considerable amount of clients and/or that had a lower rating in previous inspections. The remaining 50% was not inspected since in the two previous inspections they had good or adequate ratings. As shown in Table 3-2, only a portion of the wells, pump stations and storage tanks (minor facilities) were inspected because of their lower individual facility value.

**Table 3-1:**
**Large Value Assets (Major Facilities) Inspected by Asset Category**

| Asset Category | Total PRASA Facilities | Inspections Performed | |
|---|---|---|---|
| | | Quantity | Percent |
| Regulated Dams | 8 | 8 | 100% |
| Water Treatment Plants | 127 | 67 | 53% |
| Wastewater Treatment Plants | 60 | 30 | 50% |
| Total | 195 | 105 | 54% |

**Table 3-2:**
## Lower Value Assets (Minor Facilities) Inspected by Asset Category

| Asset Category | Total PRASA Facilities | Inspections Performed | |
|---|---|---|---|
| | | Quantity | Percent |
| Wells | 299 | 39 | 13% |
| Water Pump Stations | 1,182 | 52 | 4% |
| Water Storage Tanks | 1,723 | 54 | 3% |
| Wastewater Pump Stations | 1,004 | 51 | 5% |
| Total | 4,208 | 196 | 5% |

In total, 301 inspections were performed out of a total of 4,403 facilities. Furthermore, it should be noted that no inspections were performed on the following assets: small dams and weirs, buried infrastructure, meters, ocean outfalls, buildings, land, and other ancillary facilities. To ensure consistency between inspections performed in 2008, 2009 and 2010, MPPR/Malcolm Pirnie utilized the same inspection forms used for the 2008 and 2009 CERs with some minor modifications. To standardize documentation and ratings, new inspectors were trained by MPPR/Malcolm Pirnie's water and wastewater experts who also participated in the 2009 CER.

Inspections were performed throughout PRASA's five operational Regions. An attempt was made to obtain a representative sampling of the minor facilities by inspecting a large number of facilities within several focused Operational Areas across the island. The Operational Areas selected were those with a greater number of clients (Caguas, Ponce, Arecibo, Mayagüez, and San Juan). As the specific assets to be inspected were not pre-determined, this approach provided some assurance that MPPR/Malcolm Pirnie would not be inspecting only the best assets in an Operational Area. Upon arrival to a specific Operational Area, PRASA representatives guided inspectors to a selection of the minor facilities within their Operational Area.

Table 3-3 shows the number of facilities inspected within each Region. Because the Metro Region has fewer, but larger, WTPs and WWTPs (100% of which were inspected) compared to the other Regions, the total number of inspections in the Metro Region is less than in the other Regions. However, the Metro Region was inspected to an overall level consistent with the other Regions.

**Table 3-3:**
## Summary of Inspections by Region

| ***Higher Value/Major Facilities*** | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Category** | **East** | **Metro** | **North** | **South** | **West** | **Total** |
| Regulated Dams | 3 | 2 | 1 | 1 | 1 | **8** |
| Water Treatment Plants | 15 | 5 | 16 | 16 | 15 | **67** |
| Wastewater Treatment Plants | 7 | 3 | 6 | 7 | 7 | **30** |
| **Subtotal Higher Value Facilities** | **25** | **10** | **23** | **24** | **23** | **105** |

| *Lower Value/Minor Facilities* | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Category** | **East** | **Metro** | **North** | **South** | **West** | **Total** |
| Wells | 1 | 0 | 17 | 11 | 10 | **39** |
| Water Pump Stations | 11 | 10 | 12 | 10 | 9 | **52** |
| Water Storage Tanks | 10 | 11 | 13 | 11 | 9 | **54** |
| Wastewater Pump Stations | 11 | 9 | 11 | 10 | 10 | **51** |
| **Subtotal Lower Value Facilities** | **33** | **30** | **53** | **42** | **38** | **196** |
| | | | | | | |
| **Total Inspected Facilities** | **58** | **40** | **76** | **66** | **61** | **301** |

As in previous CERs, each category of asset was inspected using an inspection form, criteria, and criteria weighting customized to that specific asset category. The evaluation criteria were chosen from the following list for each asset inspection.

- Compliance– degree to which the performance of the asset is in compliance with its permit limits and regulatory requirements.
- Equipment / Maintenance – assessment of the adequacy of the maintenance practices and the condition of the facility.
- Operations / Process Control – degree to which asset condition and features allow it to be operated and controlled to meet its performance objectives.
- Staffing / Training – assessment of the adequacy of facility staffing coverage and training.

Within each of the evaluation criteria, the asset inspected was assigned a numerical rating between zero and three ("0-3"). An overall facility rating was then determined based on the calculation of a weighted average of the ratings for each criterion. The numerical ratings are described below:

| Rating | Range |
|---|---|
| Good (Most of the criteria are adequately addressed) | 2.5 – 3.0 |
| Adequate (Many of the criteria are adequately addressed) | 1.5 – 2.4 |
| Poor (Many of the criteria are not adequately addressed) | 0.5 – 1.4 |
| Unacceptable (Most of the criteria are not adequately addressed) | 0.0 – 0.4 |

A summary of the inspection results for each asset category is discussed separately below. Digital copies of the inspection forms for each visited facility were provided to PRASA for its information and use along with this CER.

## 3.2 Dams

PRASA operates approximately 163 water supply systems that can be divided into two primary categories. The first type is large regulated dams that impound reservoirs of greater than 50 acre-

feet or have a measured height of greater than 25 feet. Currently only eight of PRASA's water supply systems are classified as regulated dams. This includes a large regulated dam (Río Blanco), located in the East Region, that is preparing for first filling and was included in the inspections performed for this report. The second type is weirs that create minor impoundments on active streams or rivers, but do not meet the regulatory criteria to be classified as dams. Regulated dam structures are operated under the jurisdiction of the Dam Safety Unit of PREPA. PREPA administers the Dam Safety Program in association with the Department of Natural and Environmental Resources (DNER), Puerto Rico Planning Board, PRASA, and public sector appointees by the Governor. A Dam Safety Committee, of which PRASA is a member as required by law, oversees the Dam Safety Program.

In addition to size classification, the regulated dams in Puerto Rico are also assigned a Hazard Classification, which is based upon the downstream impacts that would result from failure of the dam where the impounded reservoir is released into the lower watershed. The failure of a low hazard dam would result in the loss of the structure itself, but little to no additional damage to other property. The failure of an intermediate hazard dam would result in very little loss of life and significant damage to property and project operation. The failure of a high hazard dam would cause more than very little loss of life and serious damage to communities, industry, and agriculture.

PREPA's Dam Safety Unit performed inspections from 2006 to 2009 of the seven PRASA regulated dams that are in operation, creating summary reports addressing the dam structure, appurtenant works, operations and safety for each facility. MPPR/Malcolm Pirnie utilized these reports as a baseline from which to perform independent visual inspections and evaluations of the dam structures. PRASA's newest dam facility, Río Blanco, (considered as a large, regulated dam), was completed in spring FY2010. It is not included in the inspections performed by PREPA; however, MPPR/Malcolm Pirnie performed a visual inspection and evaluation of the dam structure for this assessment.

According to Puerto Rico's Dam Safety regulations, regulated dam facilities are to be inspected every three years. Timely and ample inspection of these dams is essential for permitting or approval required for construction, modification, repair, or removal of the dam or the appurtenant works. Aside from the daily observation and operations of the fully-staffed dam facilities, all of these structures are given a cursory safety inspection annually by PREPA prior to hurricane season. Each recommendation based on an inspection, is rated indicating the priority for action. The ratings are defined as follows:

- Priority A – Immediate corrective actions are needed when item affects immediately the safety of the dam; can potentially lead to unsafe condition of the dam or endangers public safety.
- Priority B – Corrective actions is needed within one to five years.

- Priority C – Involves routine maintenance or surveillance activity.

Table 3-4 summarizes the evaluation categories and assigned weighting factors used in the evaluation of regulated dams.

**Table 3-4:**
**Regulated Dams – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Regulatory Compliance | 25% |
| Equipment/Maintenance | 45% |
| Operations/Process Control | 15% |
| Staffing/Training | 15% |

## 3.2.1 Inspection Results

### 3.2.1.1 Regulated Dams

All of PRASA's regulated dams, a total of eight, were inspected for this 2010 CER, including one nearing completion of construction to be filled this year. Table 3-5 provides a summary of the facility ratings by each of the evaluation criteria, as well as the overall facility rating. Of the eight regulated dams inspected, one dam (Las Curías) rated as poor in 2009 has been raised to an adequate rating based on a closer evaluation of seepage along the downstream toe of the dam and a walk through the outlet structure which showed the outlet structure was in good condition. The Las Curías dam is the same facility that received the unacceptable rating in Regulatory Compliance. The Las Curías dam is no longer used for drinking water storage and PRASA is in negotiations with the DNER to transfer the property for DNER management, inspection and operation. In addition to Las Curías dam, four other dams were rated as adequate. The remaining three dams received a good rating.

**Table 3-5:**
**Regulated Dams**
**(Number and Percentage of Ratings by Category)**

| Rating Range | Regulatory Compliance | | Ops/Process Control | | Equipment/ Maintenance | | Staffing/ Training | | Overall Rating | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| Poor (0.5-1.4) | 1 | 13% | 0 | 0% | 0 | 0% | 1 | 13% | 0 | 0% |
| Adequate (1.5-2.4) | 3 | 37% | 6 | 75% | 5 | 63% | 3 | 37% | 5 | 63% |
| Good (2.5-3.0) | 4 | 50% | 2 | 25% | 3 | 37% | 4 | 50% | 3 | 37% |
| **Average Rating** | **2.2** | | **2.1** | | **2.3** | | **2.3** | | **2.3** | |

The inspection results of the seven dam facilities obtained as part of the 2008 CER and the eight facilities obtained as part of the 2009 and 2010 CERs were compared to analyze facilities' performance since the initial inspection. As mentioned, the Río Blanco Dam has just been completed this spring and was not evaluated in 2008 and therefore, there is no entry for 2008 in our comparison. Table 3-6 presents the comparison of the average rating of the facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for facilities inspected in each year are also presented. In general, there is little change in rating of the four categories evaluated. However, the average rating has benefited from the improved score for the Las Curías dam which was raised by a value of 1.0 from poor to adequate based on the conclusion that the embankment seepage and outlet structure represent more stable and sound conditions than previously assessed.

**Table 3-6:**
**Comparison of Average Results for Dam Facilities for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008[1] | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Regulatory Compliance | 2.2 | 2.2 | 2.2 | 0.0 | 0.0 |
| Equipment/Maintenance | 2.3 | 2.2 | 2.3 | 0.0 | 0.1 |
| Operations/Process Control | 2.2 | 2.1 | 2.1 | -0.1 | 0.0 |
| Staffing/Training | 2.1 | 2.1 | 2.3 | 0.2 | 0.2 |
| **Overall** | **2.3** | **2.1** | **2.3** | **0.0** | **0.2** |

(1)Based on seven facilities.

### 3.2.2 Conclusions

PRASA's regulated dams are in adequate to good condition. These facilities have been inspected at the appropriate intervals by PREPA. It is important to note that the Las Curías (Río Piedras) Dam condition rating would likely improve significantly with completion of the Priority A, B and C action items detailed in the March 2009 PREPA inspection report. This dam is no longer utilized for drinking water storage but still represent a high hazard in the event of an uncontrolled release of impounded water. Similarly, the condition ratings of Isabela and Cidra could be improved by addressing the PREPA Priority action items. Isabela Regulator Lake requires maintenance of the geomembrane liner to avoid a potential reduced lifespan for this facility. Sloughing of cover geomembrane soils will continue to expose the liner to rodents and puncture. Lastly, with the exception of Fajardo Dam, all the facilities need to address the common outstanding Priority A action item requiring an Emergency Action Plan be in place at the facilities. With attention to these items, the large dams will have a greater level of safety and can be expected to continue to play their vital role in the water supply system.

## 3.3 Water Treatment Plants

PRASA operates 127 WTPs to provide potable water to the citizens and industries of Puerto Rico. The facilities range in size from several hundred gallons per day up to 100 million gallons per day (MGD). Approximately 53% of all PRASA's WTPs in operation were inspected as part of this evaluation. Each visit consisted of a site walkthrough and an interview with the operator, plant supervisor or designated personnel. Thus, information was at least in part based on the understanding of the person that was being interviewed. Table 3-7 summarizes the evaluation categories and assigned weighting factors used in the evaluation of WTPs.

**Table 3-7:**
**WTPs – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Regulatory Compliance | 35% |
| Equipment/Maintenance | 20% |
| Operations/Process Control | 30% |
| Staffing/Training | 15% |

### 3.3.1 Inspection Results

Table 3-8 provides a summary of the WTP ratings by each of the four evaluation categories, as well as the overall facility rating. The average WTP overall rating was in the adequate range with an overall rating of 2.3. This is indicative of the fact that approximately 84% of the WTPs are able to produce water which has a disinfectant residual and meets standards for turbidity and disinfection byproducts (DBPs) at least most of the time. The WTPs that were rated as poor (Caguas Norte, Cedro Arriba and San Germán) need prompt attention to ensure their continued ability to produce potable water.

**Table 3-8:**
**Water Treatment Plants**
**(Number and Percentage of Ratings by Category)**

| Rating Range | Regulatory Compliance | | Ops/Process Control | | Equipment/ Maintenance | | Staffing/ Training | | Overall Rating | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 3 | 4% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| Poor (0.5-1.4) | 8 | 12% | 2 | 3% | 0 | 0% | 1 | 1% | 3 | 4% |
| Adequate (1.5-2.4) | 32 | 48% | 14 | 21% | 44 | 66% | 18 | 27% | 37 | 55% |
| Good (2.5-3.0) | 24 | 36% | 51 | 76% | 23 | 34% | 48 | 72% | 27 | 40% |
| **Average Rating** | **2.1** | | **2.6** | | **2.3** | | **2.4** | | **2.3** | |

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from 2010 CER to analyze performance changes since the previous inspections. Table 3-9 illustrates the comparison of the average rating of all facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years are also presented.

**Table 3-9:**
**Comparison of Average Results for WTPs for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Regulatory Compliance | 2.2 | 2.3 | 2.1 | -0.1 | -0.2 |
| Equipment/Maintenance | 2.1 | 2.3 | 2.3 | 0.2 | 0.0 |
| Operations/Process Control | 2.2 | 2.5 | 2.6 | 0.4 | 0.1 |
| Staffing/Training | 2.2 | 2.6 | 2.4 | 0.2 | -0.2 |
| **Overall** | **2.2** | **2.4** | **2.3** | **0.1** | **-0.1** |

In comparison with the 2009 CER a slight reduction in rating was observed in the Regulatory Compliance, Staff/Training, and overall ratings. The Equipment/Maintenance and Operation/Process Control ratings remain similar to the previous CER. In comparison with the 2008 CER, all categories show an improvement, with the exception of Regulatory Compliance that experienced a reduction in score. It is important to note that the results show an adequate standing of PRASA's WTPs and demonstrates a positive result of the CIP and other programs related to the improvement, maintenance and operations of the WTPs.

### 3.3.2 Conclusions

The WTPs are generally in adequate condition and are expected to continue to serve their intended function of providing potable water supply. Eleven of the WTPs inspected (approximately 16%), however, are considered poor or unacceptable in terms of compliance, typically due to multiple violations of combined filter effluent turbidity limits. Nine of 11 WTPs rated as poor or unacceptable from a compliance perspective are being addressed by measures identified in PRASA's 2007 Drinking Water Settlement Agreement with the Puerto Rico Department of Health (PRDOH)[9] or are otherwise being addressed in the CIP or by the operational Region. The performance of these WTPs will be expected to increase in the future. Although PRASA intends to close several of the worst performing WTPs, such closures are typically several years or more in the future and have been included in the 2007 PRDOH Drinking Water Settlement Agreement (PRDOH Agreement). In February of 2010, PRASA began planning efforts for improvements at the Caguas Norte WTP, one of the two facilities rated as poor or unacceptable and currently not included in the CIP or addressed by the consent decrees

[9] In the 2008 CER the PRDOH Water Settlement Agreement was referred to as the PRDOH Consent Decree.

or agreements. PRASA indicates that this project will be included in the next version of the CIP that will be submitted to its Board for approval. The remaining facility, Ponce Vieja WTP, does not have a programmed project to address the issues identified during the inspections.

Many of the WTPs have inadequate sludge treatment systems (STSs) and are out of compliance with their National Pollutant Discharge Elimination System (NPDES) effluent limits. On April 6, 2010, PRASA and the U.S. Environmental Protection Agency (USEPA) signed the new STS Consent Decree which addresses issues identified in the WTP STSs. The STS Consent Decree substitutes, and in turn closes, the existing WTP STS Consent Decrees known as PRASA II and PRASA III (defined in Section 5).

Future regulatory requirements (as discussed in Section 5.4) may require additional capital improvements to achieve higher levels of treatment at certain facilities depending on the characteristics of the source water and the distribution system. The effects of these future regulations will not be known until PRASA performs data collection and studies to determine what, if any, additional capital improvements will be needed to comply with these future regulations.

## 3.4 Wastewater Treatment Plants

PRASA operates 60 WWTPs. The facilities range in size from several hundred gallons per day up to 75 MGD. Approximately 50% of PRASA's WWTPs in operation were inspected as part of this evaluation. Each visit consisted of a site walkthrough and an interview with the operator, plant supervisor or designated personnel. Thus, information was at least in part based on the understanding of the person that was being interviewed. Table 3-10 summarizes the evaluation categories and assigned weighting factors used in the evaluation of WWTPs.

**Table 3-10:**
**WWTPs – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Regulatory Compliance | 35% |
| Equipment/Maintenance | 20% |
| Operations/Process Control | 30% |
| Staffing/Training | 15% |

### 3.4.1 Inspection Results

Table 3-11 provides a summary of the WWTP ratings by each of the four evaluation categories, as well as the overall facility rating. The average WWTPs overall rating was in the adequate range with an overall rating of 2.0.

**Table 3-11:**
**Wastewater Treatment Plants**
**(Number and Percentage of Ratings by Category)**

| Rating Range | Regulatory Compliance[1] | | Ops/Process Control | | Equipment/ Maintenance | | Staffing/ Training | | Overall Rating | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 9 | 31% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| Poor (0.5-1.4) | 4 | 14% | 1 | 3% | 0 | 0% | 6 | 20% | 5 | 17% |
| Adequate (1.5-2.4) | 7 | 24% | 16 | 53% | 17 | 57% | 21 | 70% | 19 | 63% |
| Good (2.5-3.0) | 9 | 31% | 13 | 43% | 13 | 43% | 3 | 10% | 6 | 20% |
| **Average Rating** | **1.5** | | **2.3** | | **2.4** | | **1.8** | | **2.0** | |

(1)One WWTP (Playa Santa) that discharges to underground injection was not evaluated under this criterion because compliance information was not available.

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from 2010 CER in order to analyze performance changes since the previous inspections. Table 3-12 illustrates the comparison of the average rating of all facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years are also presented.

**Table 3-12:**
**Comparison of Average Results for WWTPs for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Regulatory Compliance | 1.3[1] | 1.5[1] | 1.5[2] | 0.2 | 0.0 |
| Equipment/Maintenance | 2.2 | 2.2 | 2.4 | 0.2 | 0.2 |
| Operations/Process Control | 2.4 | 2.4 | 2.3 | -0.1 | -0.1 |
| Staffing/Training | 1.8 | 2.0 | 1.8 | 0.0 | -0.2 |
| **Overall** | **1.9** | **2.0** | **2.0** | **0.1** | **0.0** |

(1) Two WWTPs (Playa Santa and La Parguera) that discharge to underground injection were not evaluated under this criterion because they do not have an approved NPDES Permit.
(2)One WWTP (Playa Santa) that discharges to underground injection was not evaluated under this criterion because it does not have an approved NPDES Permit.

As shown in Table 3-12, the overall condition of the facilities remained the same from 2009 to 2010. The Equipment/Maintenance conditions improved; a possible effect of the IPMP. The Operations/Process Control and Staffing/Training conditions experienced a minor reduction in rating. The Staffing/Training rating reduction could be related to the reduction in employees and training hours in this fiscal year. In comparison to the 2008 inspections results, the rating for all

categories improved or remained the same, with the exception of the Operations/Process Control that experienced a minor reduction in rating. These results indicate a constant trend and an adequate standing on PRASA's WWTPs, due to the CIP and others initiatives related to the improvements of maintenance and operations of the WWTPs.

### 3.4.2 Conclusions

The WWTPs generally range from adequate (63%) to good condition (20%). Those that are rated as poor (17%) have issues primarily associated with compliance and staffing/training. Compliance with NPDES effluent limits has been the greatest challenge for many of the WWTPs. Approximately 43% of the WWTPs received a poor or unacceptable compliance score (compared to 50% in the 2008 CER, and 38% in the 2009 CER), indicating a negative trend in performance in comparison with the 2009 CER, but an improvement in comparison with the 2008 CER. The most common compliance violations were related to the presence of total and fecal coliforms, and nitrite and nitrate removal. The total fecal coliforms violations could be related to the presence of suspended solids after the clarification tanks, or that adjustments to the chlorine doses are required. The nitrite and nitrate violations could be related to shortcomings, as these facilities may not be designed to achieve nitrogen removal. Nevertheless, PRASA has CIP projects planned that will improve process performance in the near future. Once these improvements are complete, it is anticipated that the effluent quality will improve and that the overall combined compliance rating for the WWTPs will further improve.

The existing frequency of site visits to monitor WWTPs that are not staffed 24 hours per day is insufficient to provide prompt notice of problems. However, PRASA has included a telemetry program in its CIP and the five regions are currently implementing it, with the objective of remote monitoring the facilities. The facilities to be included in the telemetry program have been prioritized to first include those where telemetry is necessary to comply with the 2006 USEPA Wastewater Consent Decree (2006 Consent Decree, or the "Mega" Consent Decree) and PRDOH Agreement, followed by other facilities where it is deemed operationally critical, as verified with Operational Area directors.

## 3.5 Wells

PRASA has a large number of drinking water wells, most of which deliver water directly into a distribution system with little or no treatment, except chlorination. PRASA's wells vary in size from 100 to 1,200 gallons per minute (gpm). Table 3-13 summarizes the evaluation categories and assigned weighting factors used in the evaluation of wells.

**Table 3-13:**
**Wells – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Equipment/Maintenance | 50% |
| Operations/Process Control | 50% |

While compliance information is relevant to the evaluation of wells, insufficient information is available to evaluate that criterion. Wells are not generally staffed and have a limited amount of equipment; therefore the staffing and training category was not included in the evaluation of wells.

### 3.5.1 Inspection Results

A total of 39 wells, 13% of total PRASA wells, were inspected for the 2010 CER, as compared to 72 and 59 in the 2009 and 2008 CERs respectively. Table 3-14 provides a summary of the facility ratings by each of the evaluation categories, as well as the overall facility rating. The average wells overall rating was in the adequate range with an overall rating of 2.1.

**Table 3-14:**
**Wells (Number and Percentage of Ratings by Category)**

| Rating Range | Ops/Process Control | | Equipment/ Maintenance | | Overall Rating | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 0 | 0% | 1 | 3% | 0 | 0% |
| Poor (0.5-1.4) | 2 | 5% | 4 | 10% | 2 | 5% |
| Adequate (1.5-2.4) | 26 | 67% | 15 | 38% | 24 | 62% |
| Good (2.5-3.0) | 11 | 28% | 19 | 49% | 13 | 33% |
| **Average Rating** | **2.2** | | **2.1** | | **2.1** | |

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from 2010 CER to analyze performance changes since the previous inspections. Table 3-15 illustrates the comparison of the average rating of all facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years is also presented.

**Table 3-15:**
**Comparison of Average Results for Wells for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Equipment/Maintenance | 2.1 | 1.8 | 2.1 | 0.0 | 0.3 |
| Operations/Process Control | 1.8 | 2.1 | 2.2 | 0.4 | 0.1 |
| **Overall** | **2.0** | **1.9** | **2.1** | **0.1** | **0.2** |

As shown in Table 3-15, the rating for all categories improved or remained equal to the 2008 and 2009 CER ratings. All categories evaluated remain in the adequate range. The deficiencies noted were minimal and were due in part to a decrease in equipment conditions as a result of missing vent screens, faulty or non-operating pressure gages and flow meters, and deficiencies in chemical containment.

### 3.5.2 Conclusions

The wells are generally in adequate condition and are expected to continue to serve their intended function of supplemental water supply. Most of the deficiencies noted can be addressed through PRASA's R&R program and may not require major capital improvements. Compliance data should be collected to determine if a well is in compliance with the water quality parameters and to assist with preparation and planning for possible impacts of future regulations. Future regulatory requirements (as discussed in Section 5.4) may require additional treatment for certain wells which would require significant capital improvements or closure of certain wells.

## 3.6 Water Pump Stations

PRASA operates a total of 1,182 water pump stations (WPSs). The WPSs consist of two major categories: (1) above ground pumps and (2) below ground pumps in vaults with heavy covers that cannot be readily removed by field inspectors (underground booster stations). For this report, and as on previous CERs, no underground booster stations were inspected due the heavy covers that cannot be removed by the inspector. Consequently, 52 of the above ground pump stations were fully inspected and the assessment of those stations is described below. PRASA's WPSs vary in pumping capability from less than 100 gpm to over 9,000 gpm. Table 3-16 summarizes the evaluation categories and assigned weighting factors used in the evaluation of WPSs.

**Table 3-16:**
**WPS – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Equipment/Maintenance | 50% |
| Operations/Process Control | 50% |

Because the WPSs do not treat the water, the compliance category is not significant to the evaluation of water pump stations. Pump stations are generally not staffed and have a limited amount of equipment; therefore, the staffing and training category was also excluded.

### 3.6.1 Inspection Results

Table 3-17 provides a summary of the facility ratings for each of the two evaluation criteria, as well as the overall facility rating for the 52 facilities inspected. The average wells overall rating was in the adequate range with an overall rating of 2.3.

**Table 3-17:**
**Water Pump Stations (Number and Percentage of Ratings by Category)**

| Rating Range | Ops/Process Control | | Equipment/ Maintenance | | Overall Rating | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 0 | 0% | 0 | 0% | 0 | 0% |
| Poor (0.5-1.4) | 0 | 0% | 7 | 13% | 1 | 2% |
| Adequate (1.5-2.4) | 15 | 29% | 27 | 52% | 28 | 54% |
| Good (2.5-3.0) | 37 | 71% | 18 | 35% | 23 | 44% |
| **Average Rating** | **2.5** | | **2.1** | | **2.3** | |

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from 2010 CER in order to analyze performance changes since the previous inspections. Table 3-18 illustrates the comparison of the average rating of all facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years are also presented.

**Table 3-18:**
**Comparison of Average Results for WPS for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Equipment/Maintenance | 2.3 | 1.7 | 2.1 | -0.2 | 0.4 |
| Operations/Process Control | 2.1 | 2.6 | 2.5 | 0.4 | -0.1 |
| **Overall** | **2.2** | **2.2** | **2.3** | **0.1** | **0.1** |

On average, equipment conditions improved measurably between the 2009 CER and 2010 CER inspections mostly due to the fact that at the time of inspections most of the pumps were in operation, and the facilities were equipped with emergency generators. Although the facilities Operations/Process Control rating reduced, the overall ratings show a slight improvement and remain in the adequate range. The percent of facilities with a poor rating reduced from 14% to 2%. In comparison with the 2008 CER, the overall rating experienced slight improvements, the Operation/Process Control improved considerably, changing from adequate to good condition, while the Equipment/Maintenance rating reduced but still remains in good condition.

### 3.6.2 Conclusions

The WPSs are generally in adequate to good condition and are expected to continue to serve their intended function of delivering drinking water throughout the distribution systems. The deficiencies noted were minimal and are related to lack of features to optimize maintenance practices and equipment of facilities. Other noted deficiencies, such as leaks and overgrown vegetation can be addressed through routine maintenance or PRASA's R&R program and may not require major capital improvements.

## 3.7 Water Storage Tanks

PRASA owns and operates a wide range of water storage tanks that vary in storage capacity (size) from 100 to 10,000,000 gallons. They also vary in shape: some are circular and others are rectangular. Construction materials used are steel and concrete. Table 3-19 summarizes the evaluation categories and assigned weighting factors used in the evaluation of water storage tanks.

**Table 3-19:**
**Water Storage Tanks – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Equipment/Maintenance | 50% |
| Operations/Process Control | 50% |

Since the water storage tanks inspected are not used to treat the water, the compliance criterion was not considered in their evaluation; however, presence of chlorine boosters at facilities was noted. Because water storage tanks are not generally staffed and have a limited amount of equipment, the staffing and training category was also not considered in the evaluation of the water storage tanks.

### 3.7.1 Inspection Results

A total of 54 or 3% of the total water storage tanks were inspected. Table 3-20 provides a summary of the facility ratings for each of the two evaluation criteria, as well as the overall facility rating. The average tanks overall rating was in the adequate range with an overall rating of 1.6.

**Table 3-20:**
**Water Storage Tanks**
**(Number and Percentage of Ratings by Category)**

| Rating Range | Ops/Process Control | | Equipment/ Maintenance | | Overall Rating | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 5 | 9% | 6 | 11% | 3 | 6% |
| Poor (0.5-1.4) | 19 | 35% | 19 | 35% | 18 | 33% |
| Adequate (1.5-2.4) | 21 | 39% | 18 | 33% | 27 | 50% |
| Good (2.5-3.0) | 9 | 17% | 11 | 20% | 6 | 11% |
| **Average Rating** | **1.6** | | **1.6** | | **1.6** | |

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from 2010 CER in order to analyze performance changes since the previous inspections. Table 3-21 illustrates the comparison of the average rating of all facilities by each category

evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years are also presented.

**Table 3-21:**
**Comparison of Average Results for Water Storage Tanks for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Equipment/Maintenance | 2.2 | 1.6 | 1.6 | -0.6 | 0.0 |
| Operations/Process Control | 1.6 | 1.5 | 1.6 | 0.0 | 0.1 |
| **Overall** | **1.9** | **1.6** | **1.6** | **-0.3** | **0.0** |

On average, equipment conditions, operations and process control and overall ratings remain similar from the 2009 CER inspections to the 2010 CER inspections. In comparison with the 2008 CER the Equipment/Maintenance category experienced a considerable reduction in rating, but facilities still remain in adequate condition. This reduction in rating was reflected in the overall condition rating. PRASA's tanks require more aggressive O&M and R&R programs, as many were found to have substantial cracking problems, missing vent screens, overgrown vegetation, and safety deficiencies (i.e., access hatches were not secured or locked). Also, access to the facilities was difficult in some cases. Finally, there is no tank interior inspection plan in place. However, both categories remain in adequate range.

### 3.7.2 Conclusions

The water storage tanks are generally in adequate condition and are expected to continue to serve their intended function of providing potable water storage throughout the distribution systems. Some of the noted deficiencies are related to lack of features to optimize O&M of the tanks (e.g. local or remote tank level monitoring) and are not critical to basic function of the tanks. However, there were a few deficiencies that should be addressed to ensure that the tanks provide a safe, reliable source of stored potable water. These deficiencies do not require significant capital upgrades, but rather a modification to O&M practices (e.g. removal of overgrown vegetation, routine water tank water quality testing and periodic tank internal inspections) or can be addressed through PRASA's R&R program (e.g. repairs to tank hatches, vents and security fences).

## 3.8 Wastewater Pump Stations

PRASA operates a total of 1,004 wastewater pump stations (WWPSs). A total of 51 or 5% of these WWPSs were inspected. In general, the inspected WWPSs predominantly used wet pit type submersible pumps, although several dry pit type stations were also inspected. PRASA's WWPSs vary in pumping capability from less than 100 gpm to over 10,000 gpm, depending on the surrounding population density and proximity to the receiving WWTP. Table 3-22 summarizes the evaluation categories and assigned weighting factors used in the evaluation of WWPSs.

Because the WWPSs do not treat the wastewater and there are no effluent standards, the compliance category was not considered in the evaluation of WWPSs.

**Table 3-22:**
**WWPS – Evaluation Categories and Weighting Factors**

| Category | Weighting Factor |
|---|---|
| Equipment/Maintenance | 35% |
| Operations/Process Control | 45% |
| Staffing/Training | 20% |

### 3.8.1 Inspection Results

Table 3-23 provides a summary of the facility ratings for each of the three evaluation criteria for the 51 pump stations inspected, as well as the overall facility rating. The average WWPS overall rating was in the adequate range with an overall rating of 2.0.

**Table 3-23:**
**Wastewater Pump Stations**
**(Number and Percentage of Ratings by Category)**

| Rating Range | Ops/Process Control | | Equipment/ Maintenance | | Staffing/ Training | | Overall Rating | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Unacceptable (0-0.4) | 2 | 4% | 1 | 2% | 0 | 0% | 0 | 0% |
| Poor (0.5-1.4) | 17 | 33% | 4 | 8% | 3 | 6% | 6 | 12% |
| Adequate (1.5-2.4) | 28 | 55% | 17 | 33% | 22 | 43% | 37 | 73% |
| Good (2.5-3.0) | 4 | 8% | 29 | 57% | 26 | 51% | 8 | 16% |
| **Average Rating** | **1.6** | | **2.3** | | **2.3** | | **2.0** | |

The inspection results obtained as part of the 2008 and 2009 CERs were compared with the results from this CER to analyze performance changes since the previous inspections. Table 3-24 illustrates the comparison of the average rating of the facilities by each category evaluated in the 2008, 2009 and 2010 CERs. The overall average rating of each evaluation criteria for the three years is also presented.

**Table 3-24:**
**Comparison of Average Results for WWPS facilities for Inspection Years 2008, 2009 and 2010**

| Criteria | 2008 | 2009 | 2010 | Change 2008 vs. 2010 | Change 2009 vs. 2010 |
|---|---|---|---|---|---|
| Equipment/Maintenance | 2.2 | 2.2 | 2.3 | 0.1 | 0.1 |
| Operations/Process Control | 1.3 | 1.6 | 1.6 | 0.3 | 0.0 |
| Staffing/Training | 2.1 | 2.4 | 2.3 | 0.2 | -0.1 |
| **Overall** | **1.7** | **2.0** | **2.0** | **0.3** | **0.0** |

The overall condition between the 2009 and 2010 CERs reflects no change in rating. Equipment/Maintenance and Staff/Training categories experienced minor positive and negatives changes respectively, remaining in adequate condition. The Operation/Process Control reflects no change in rating. In comparison with the 2008 CER, all categories show an improvement trend that was already reflected in the 2009 CER results.

### 3.8.2 Conclusions

The WWPSs are in adequate condition. In most cases where inspected WWPSs were rated as poor under the Equipment/Maintenance criterion, it was because the facility had at least one major (critical) piece of equipment out of service (e.g. pumps, generator, etc.). In some cases the equipment had been out of service for an extended period of time. However, it should be noted that the number of facilities in poor condition has been reduced from 18% (2009 CER) to 12% (2010 CER), and the facilities with generators in operation increased. This could be as a result of the preventive maintenance efforts performed in the facilities. Nonetheless, greater attention to WWPS equipment maintenance is necessary to maintain and improve reliability.

## 3.9 Buried Infrastructure

Although buried infrastructure (i.e. water mains, buried valves, sewer mains, manholes, etc.) was not inspected, the following sections provide some discussion regarding indirect indicators of the condition of these assets. PRASA continues to update its GIS database as infrastructure projects are completed and as additional information is obtained regarding existing infrastructure. Furthermore, PRASA has used this data to conduct hydraulic models of specific service areas in the Metro, East and West Regions to identify optimization opportunities in the System.

PRASA continues with its buried infrastructure R&R program, although at a slower pace than in previous years. Pipe R&R, which targets pipe break and leak-prone areas, are identified by PRASA's Operational Areas and prioritized according to severity of the problem. PRASA reported that approximately 305,000 meters (190 miles) and 240,000 meters (149 miles) of water and wastewater piping (combined) were renewed and replaced in FY2007 and FY2008, respectively. However, for FY2009, PRASA reports to have renewed and replaced approximately 188,000 meters (117 miles) of piping, which represents a decrease of approximately 22% from FY2008 results. This decrease could be a result of the reduction in PRASA's R&R budget from FY2008 to FY2009. Nonetheless, PRASA plans to continue replacing and repairing piping in order to bring the System to optimal operating conditions. At the time this CER was being prepared, the metrics of pipe R&R for FY2010 were not available.

### 3.9.1 Water Distribution System

According to PRASA's fixed asset registry, PRASA owns over 7,500 miles of water pipelines, which include both transmission and distribution pipes, with sizes ranging from 2 inches to 72 inches. However, as a result of PRASA's GIS development efforts, PRASA has improved and expanded its buried infrastructure knowledge and database. Based on the latest GIS database

information, PRASA owns over 14,031 miles of water pipelines. PRASA is in the process of reconciling these values in its fixed asset registry. For purposes of this CER, the calculations included in this section will be shown for both values. However, it is expected that in future reports, PRASA's GIS-based values for buried infrastructure will be used. As in previous years, MPPR/Malcolm Pirnie did not inspect the water transmission and distribution system. However, it is reasonable to assume that a portion of the water distribution system will require some structural repairs, as well as rehabilitation to reduce leakage.

### 3.9.1.1 Non-Revenue Water (NRW)

NRW is water that has been produced but is not billed to customers. NRW consists of two main components: commercial (apparent) losses and physical (real) losses as shown in the water balance summary presented in Figure 3-1. For purposes of this report, NRW is defined as follows:

$$NRW = \frac{(\text{volume produced} - \text{volume billed})}{\text{volume produced}}$$

**Figure 3-1: Water Balance Summary**

<table>
<tr><td rowspan="9">System Input Volume (Dispatched Water)</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Accounted for Water</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td></tr>
<tr><td>Unbilled Unmetered Consumption</td><td rowspan="7">Unaccounted for Water</td><td rowspan="7">Non-Revenue Water</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="3">Commercial Losses<br><br>(Apparent Losses)</td><td>Unauthorized Consumption (theft)</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Data Handling (Billing) Errors</td></tr>
<tr><td rowspan="3">Physical Losses<br><br>(Real Losses)</td><td>Main Line Leakage</td></tr>
<tr><td>Storage Tank Overflows</td></tr>
<tr><td>Service Connection Leakage</td></tr>
</table>

Source: American Water Works Association and International Water Association

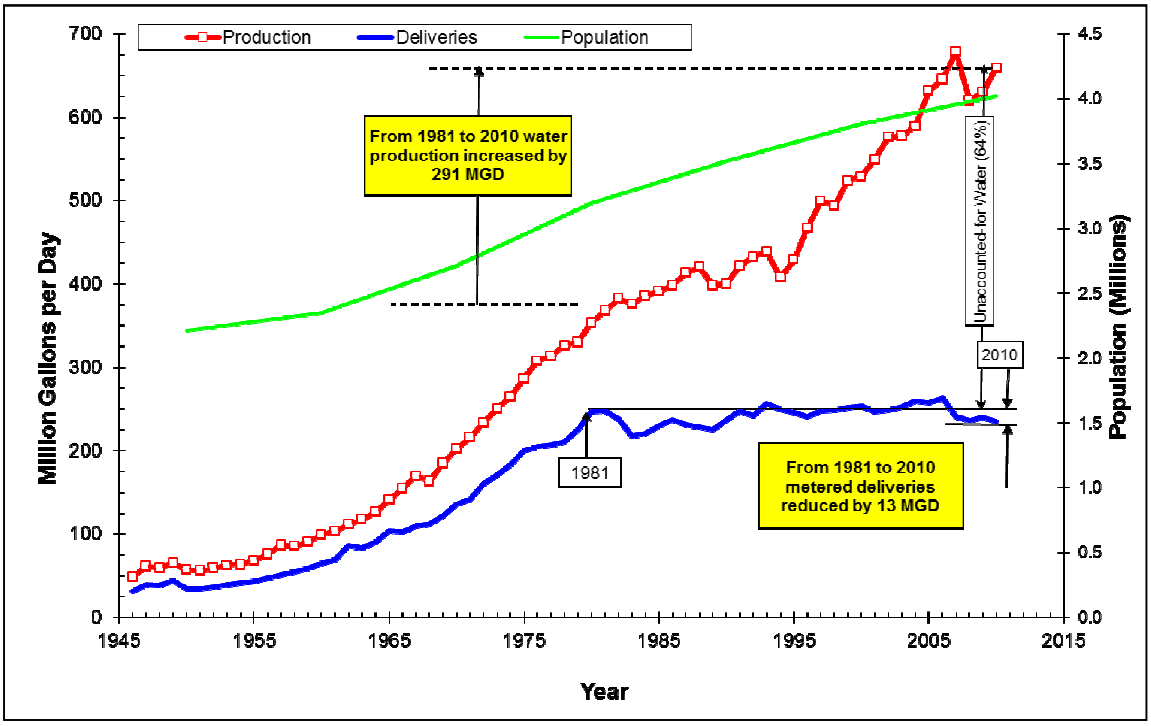
PRASA has recently invested resources in several studies and evaluations to address its NRW problem. Specifically, between 2007 and 2009, PRASA conducted a Water Accountability Pilot Project, which included extensive field research, to further identify the sources of PRASA's

NRW as well as to understand its causes and estimated magnitude of the various sources. In summary, the main sources of NRW[10] include:

- Commercial Losses
  - Theft or unauthorized consumption.
  - Metering deficiencies at plants, wells and at the point of delivery (customer meters).
  - Use of meter reading estimates and misreads.
  - Customer database problems.
- Physical Losses
  - Leakage in water mains and breaks.
  - Storage tank overflows and leaks.
  - Hydrant use for firefighting and other authorized, but unmetered uses.

Historically, PRASA's NRW has increased as water production has increased. As illustrated in Figure 3-2 below, PRASA's NRW has dramatically increased over the past 25 years.

**Figure 3-2: PRASA Production and Delivery of Water**




[10] Source: Gregory L. Morris Engineering: Water Accountability Project Final Report (June, 2009).

As summarized in Table 3-25 below, for the past seven fiscal years PRASA has annually billed, on average, over 340 million cubic meters of water to customers. This amount represents approximately 39% of PRASA's annual water production. The remaining water produced is NRW, which has varied from 56% in FY2004 to 64% in FY2010. Based on the water consumptions calculated by CDM Caribe in the report titled "Update of Puerto Rico Water Demand Forecast", it was estimated that 15% of produced water is NRW due to commercial losses, whereas the other 49% is due to physical losses. The commercial losses are the difference between the water consumption estimated by CDM and the water consumption invoiced by PRASA. The physical losses are the difference between the water production and the consumption estimated by CDM.

**Table 3-25:**
**Water Sales and NRW**

| Fiscal Year | Water Sales by Client Type ($m^3$) | | | | | Estimated Total Water Produced ($m^3$) | Non-Revenue Water ($m^3$) | Volume NRW as Percentage of Total Water Production |
|---|---|---|---|---|---|---|---|---|
| | Residential | Commercial | Industrial | Government | Total | | | |
| 2004 | 261,394,615 | 47,134,046 | 14,385,261 | 35,371,383 | 358,285,305 | 813,012,299 | 454,726,994 | 56% |
| 2005 | 260,659,631 | 46,387,796 | 12,520,946 | 35,848,482 | 355,416,855 | 871,429,383 | 516,012,528 | 59% |
| 2006 | 265,730,819 | 45,891,974 | 12,140,996 | 35,647,756 | 359,411,545 | 887,456,941 | 528,045,396 | 60% |
| 2007 | 263,088,570 | 42,712,379 | 11,858,269 | 32,653,127 | 350,312,345 | 934,019,760 | 583,707,415 | 62% |
| 2008 | 244,623,520 | 41,160,542 | 11,952,555 | 28,867,287 | 326,603,904 | 857,109,800 | 530,505,896 | 62% |
| 2009 | 246,561,753 | 41,628,183 | 11,575,856 | 31,058,569 | 330,824,361 | 893,225,775 | 562,401,414 | 63% |
| 2010 | 244,324,000 | 38,284,000 | 9,807,000 | 32,757,000 | 325,172,000 | 910,487,463 | 585,315,463 | 64% |
| **7-Year Average** | **255,197,558** | **43,314,131** | **12,034,412** | **33,171,943** | **343,718,045** | **880,963,060** | **537,245,015** | **61%** |

Source: PRASA customer and billing database. Numbers may not add up due to rounding.

Based on a comparison to other utilities in the U.S. and Canada, PRASA's NRW volume is extremely high. In the most recent utility survey available at the time this CER was being prepared, the distribution system water losses median for all survey participants ranged from 8.5% to about 9.9%[11]. The benchmarks results published in the report are summarized below in Table 3-26:

**Table 3-26:**
**Distribution System Losses (%) Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | 6.4 | 9.9 | 15.0 |
| Water Only | 4.9 | 8.6 | 12.4 |
| Combined W & WW | 3.7 | 8.5 | 13.0 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

[11] Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, published by the AWWA (2008).

As indicated above, PRASA's NRW falls well outside the normal range for this performance metric. PRASA management recognizes this amount of NRW is unacceptable and has designated this as a top improvement priority. PRASA also recognizes that if it can reduce NRW, it will increase revenue, reduce O&M expenses, and reduce the need for capital improvements to increase water supply. Therefore, PRASA is developing and implementing a series of actions to address the primary contributors of these water losses. These initiatives are further described in Section 4 of this CER.

#### 3.9.1.2 Leak Monitoring and Control

In February of 2009, PRASA began tracking reported leaks in its SAP system and, as a result, modified the tracking methodology (PRASA began using the SAP system as the application software to support its O&M and asset management process in March of 2007). Prior to this change, the leaks were reported directly by each PRASA Region to PRASA's central offices, and a leak reported more than once could not be deleted from the system unless it was reported as repaired, which in turn could artificially increase the number of both reported and repaired leaks. As such, FY2009 and FY2010 values are deemed more accurate than the historical values recorded for fiscal years 2006 through 2008. Also, on previous CERs, given the information made available to MPPR/Malcolm Pirnie, the recorded weekly pending leaks were annualized and reported as PRASA's annual reported leaks. For this CER, a new information database was made available by PRASA, which includes the number of weekly reported and repaired leaks. Compared to the database used for the 2008 and 2009 CERs, this database is more appropriate for calculating both PRASA's total annual leaks and repair effectiveness described below. Although it has been improved, PRASA's system still does not filter out all duplicate leak reports and PRASA has indicated that not all leaks are reported. Therefore, the total number of actual leaks may still vary from the quantities being reported.

As shown in Table 3-27, in FY2010 PRASA indicates that a total of 55,897 leaks were reported. Comparing the data that has been recorded directly through the SAP system, the total number of leaks reported annually reduced by 5% from FY2009 to FY2010. Table 3-27 also shows the average annual leaks occurrence per 100 miles of water piping. These values have been calculated using the updated total annual reported leaks data and the two water piping lengths: the one based on the total length included in PRASA's fixed asset registry (used in the 2008 and 2009 CERs) and the one based on the values included in PRASA's updated buried infrastructure GIS database. As previously described, as a result of PRASA's GIS development efforts, PRASA has improved and expanded its buried infrastructure knowledge and database which has contributed to the increase in the total length of water distribution pipeline owned by PRASA. Although the increase in total water pipeline length improved PRASA's rate of leak occurrence per 100 miles, as shown in Table 3-28, PRASA's rate of leak occurrence continues to be very high compared to other utilities in the U.S. and Canada. This high rate of occurrence contributes to PRASA's NRW.

**Table 3-27:**
**Reported Leaks from FY2006 to FY2010**

| Fiscal Year | Total Annual Reported Leaks | Annual Leaks per 100 miles Using 7,537 miles of Water Pipeline[1] | Annual Leaks per 100 miles Using 14,031 miles of Water Pipeline[2] |
|---|---|---|---|
| 2006 | 80,195 | 1,064 | 572 |
| 2007 | 83,634 | 1,110 | 596 |
| 2008 | 83,675 | 1,110 | 596 |
| 2009 | 58,875 | 781 | 420 |
| 2010 | 55,897 | 742 | 398 |

(1) Value included in included in PRASA's fixed asset registry; used in 2008 and 2009 CERs.
(2) Value extracted from PRASA's updated GIS database.

**Table 3-28:**
**Water Distribution System Integrity Utility Benchmarks**
**(Annual leaks and breaks per 100 miles)**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | 31.2 | 48.7 | 115.8 |
| Water Only | 21.7 | 34.3 | 56.1 |
| Combined W & WW | 16.6 | 41.9 | 101.2 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

The average weekly reported and repaired leaks per fiscal year are shown in Figure 3-3. For FY2010, PRASA reports an average of approximately 1,055 leaks per week. Comparing the weekly reported leaks in each fiscal year, it can be observed that the reported leaks increased from FY2006 to FY2008, but decreased from FY2008 to FY2010. Although PRASA's island-wide average of weekly pending overflows was approximately 1,055 in FY2010, it should be noted that PRASA ended the fiscal year with 1,199 pending overflows. Also shown in Figure 3-3 is the percentage of repaired leaks with respect to the number of leaks reported in each fiscal year. This percentage has decreased from 101% in FY2006 to 71% in FY2010.

Figure 3-4 shows the active leaks with duration greater than seven days before being repaired. As shown in the figure, the number of leaks with duration greater than seven days was greatly reduced from FY2006 to FY2007. However, since FY2008 these have increased by almost 300 leaks per year. This jump can be attributed to the change from manually compiled and reported data prior to FY2009, to data tracked and monitored through the SAP system from FY2009 onward. Although PRASA's island-wide average of weekly pending leaks with duration greater than seven days was approximately 891 in FY2010, it should be noted that PRASA ended the fiscal year with 473 pending leaks with duration greater than seven days.

**Figure 3-3: Island-Wide Average of Weekly Reported and Repaired Leaks**

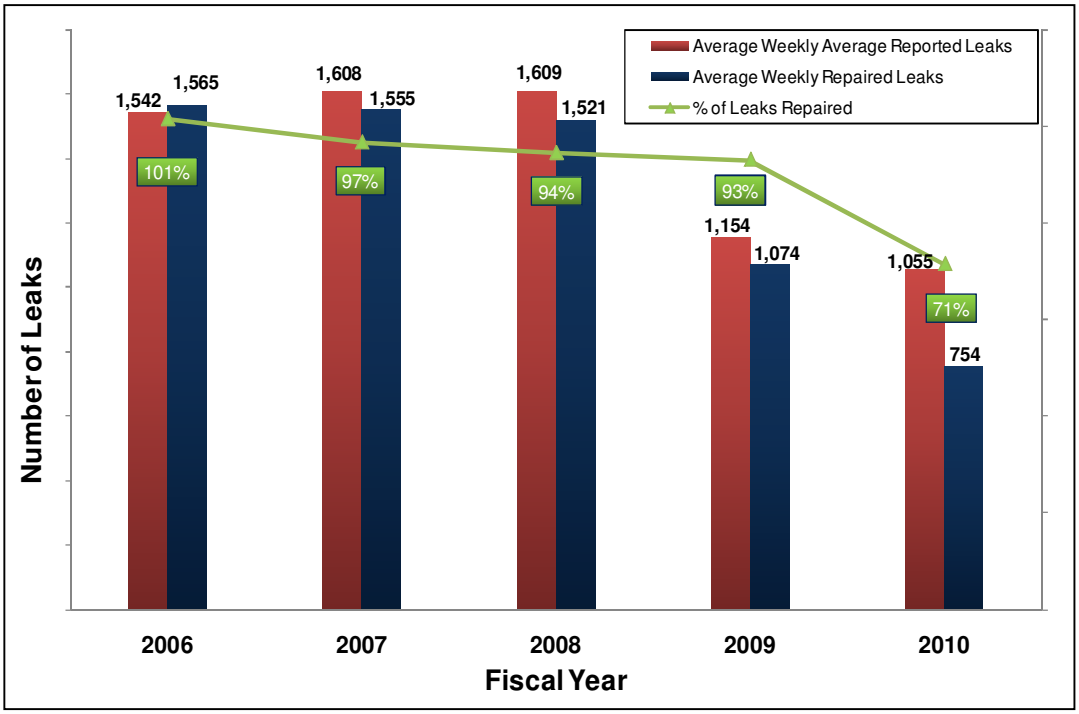



**Figure 3-4: Island-Wide Average of Weekly Pending Leaks with Duration >7 Days**

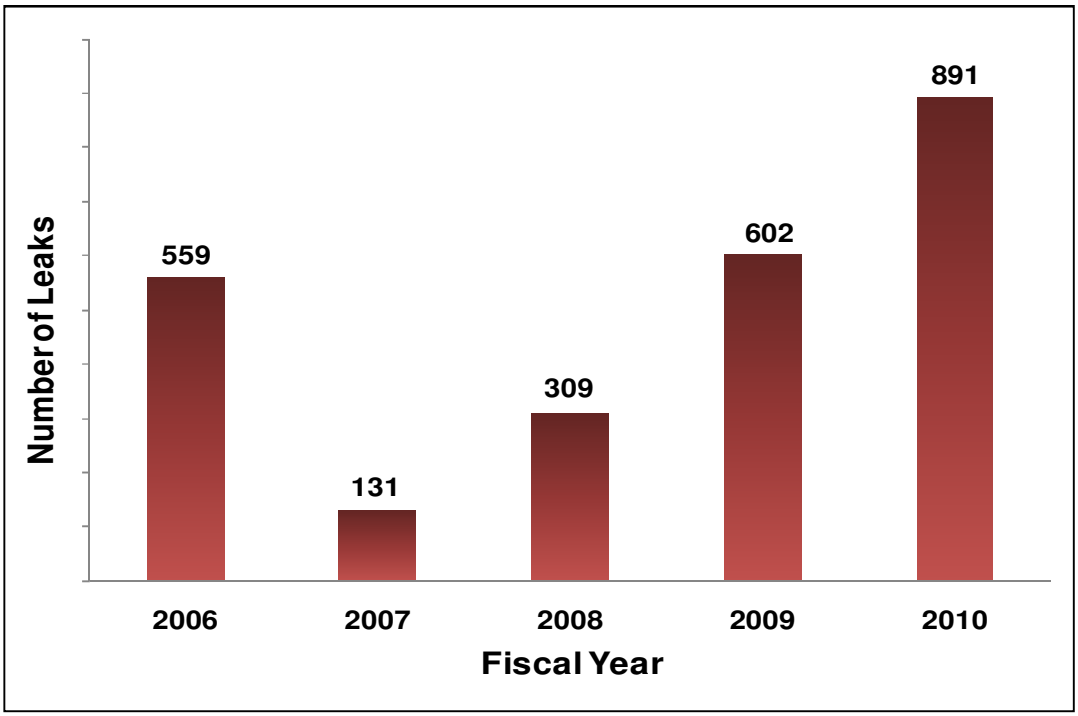


Table 3-29 includes the weekly average of repaired leaks per working day. Based on the weekly average pending leaks and weekly average pending leaks with duration greater than seven days, it can be observed that in FY2010 PRASA averaged a backlog of approximately 11.6 days of pending leaks and a backlog of approximately 5.9 days of pending leaks with duration greater than seven days. However, it should be noted that PRASA ended FY2010 with a backlog of pending leaks of approximately seven days and a backlog of pending leaks with duration greater than seven days of approximately three days. Nonetheless, PRASA's effectiveness in repairing pending leaks in a timely manner has decreased over the last four years. This could be a result of inadequate data processing (i.e., completed work orders are not closed in the SAP system in a timely manner), inadequate prioritization of repairs and/or lack of personnel allocated to perform the repairs in a timely manner.

**Table 3-29:**
**Annual Average Backlog of Pending Leaks**

| Fiscal Year | Average Weekly Pending Leaks | Average Weekly Pending Leaks >7 Days | Average Repaired Leaks per Working Day[1] | Average Backlog Days for Pending Leaks | Average Backlog Days for Pending Leaks >7 Days |
|---|---|---|---|---|---|
| 2006 | 1,506 | 559 | 313 | 4.8 | 1.8 |
| 2007 | 1,040 | 131 | 311 | 3.3 | 0.4 |
| 2008 | 1,337 | 309 | 304 | 4.4 | 1.0 |
| 2009 | 1,616 | 602 | 215 | 7.5 | 2.8 |
| 2010 | 1,750 | 891 | 151 | 11.6 | 5.9 |

(1) Assumes five working days per week.

### 3.9.2 Wastewater Collection System

Similar to the water pipeline, PRASA's documented total length of sanitary pipelines has increased as a result of the GIS development and sewer system expansion. According to PRASA's fixed asset registry, PRASA owns approximately 4,048 miles of wastewater pipelines, including collection systems and trunk sewers. However, based on the latest GIS database information, PRASA owns over 5,325 miles of wastewater pipelines. As previously described, PRASA is in the process of reconciling these values in its fixed asset registry. For purposes of this CER, the calculations included in this section will be shown for both values. However, it is expected that in future reports, PRASA's GIS-based values for buried infrastructure will be used. Although the wastewater collection system was not inspected, it is reasonable to assume that a significant portion of the wastewater collection system will require some structural repairs, as well as rehabilitation to reduce inflow and infiltration. The 2006 Consent Decree requires PRASA to develop and implement a sanitary sewer system evaluation plan (SSSEP) and a sanitary sewer system repair plan for collection systems associated with seven WWTPs. For the balance of its wastewater system, PRASA is to develop and implement a Preliminary Sanitary Sewer System Evaluation Plan (PSSSEP). Based on the results of the PSSSEP, PRASA is to develop and implement a SSSEP for these remaining systems.

PRASA has already commenced this process, which was divided in two phases: the first includes the evaluation and repairing of the seven most critical sanitary sewer systems and the second phase includes the remaining sanitary sewer systems. The island-wide sanitary sewer system evaluation phase 1 report was submitted to the USEPA on June 3, 2009. For the seven most critical sanitary sewer systems, field studies are on-going and/or PRASA is in negotiations with the USEPA to finalize the repair plans. Details of the status of these projects are discussed in Table 5-5.

#### 3.9.2.1 Overflow Monitoring and Control

As described above, PRASA began tracking reported leaks in its SAP system and, as a result, modified the tracking methodology. Also, a new information database was made available by PRASA, which includes the number of weekly reported and repaired overflows. Compared to the database used for the 2008 and 2009 CERs, this database is more appropriate for calculating both PRASA's total annual overflows and repair effectiveness described below. Although it has been improved, PRASA's system still does not filter out all duplicate overflows reports and PRASA has indicated that not all overflows are reported. Therefore, the total number of actual overflows may still vary from the quantities being reported.

As shown in Table 3-30, PRASA indicates that in FY2010, 25,735 overflows were reported. Data is not available regarding frequency of overflows in (a) combined sewer systems compared to separate systems or (b) dry weather overflows compared to wet weather overflows. Dry weather overflows are often caused by (a) insufficient cleaning and maintenance of the collection system, resulting in a buildup of roots or grease, restricting or blocking flow or (b) pump station failures due to old or insufficiently maintained equipment, poor design, or lack of reliable backup power supply. Wet weather overflows are an indicator of leaking sewers, storm water connections to sanitary sewer systems, or under-sized pipes or pump stations.

Table 3-30 also shows the average annual overflows occurrence per 100 miles of sewer. These values have been calculated using the updated total annual reported overflows data and the two wastewater piping lengths: the one based on the total length included in PRASA's fixed asset registry (used in the 2008 and 2009 CERs) and the one based on the values included in PRASA's updated buried infrastructure GIS database. As previously described, as a result of PRASA's GIS development efforts, PRASA has improved and expanded its buried infrastructure knowledge and database which has contributed to the increase in the total length of wastewater pipeline owned by PRASA. In FY2010, an average of 483 overflows per 100 miles of sewer was reported. Although the increase in total wastewater pipeline length improved PRASA's leak occurrence rate per 100 miles, as shown in Table 3-31, PRASA's rate of overflow occurrence continues to be very high compared to other utilities in the U.S. and Canada.

**Table 3-30:**
**Reported Overflows from FY2006 to FY2010**

| Fiscal Year | Reported Overflows | Annual Overflows per 100 miles Using 4,048 miles of Wastewater Pipeline[1] | Annual Overflows per 100 miles Using 5,325 miles of Wastewater Pipeline[2] |
|---|---|---|---|
| 2006 | 40,366 | 997 | 758 |
| 2007 | 34,121 | 843 | 641 |
| 2008 | 29,080 | 718 | 546 |
| 2009 | 24,592 | 608 | 462 |
| 2010 | 25,735 | 636 | 483 |

(1) Value included in PRASA's fixed asset registry; used in 2008 and 2009 CER.
(2) Value extracted from PRASA's updated GIS database.

**Table 3-31:**
**Sewer Overflow Rate Utility Benchmarks**
**(Annual overflows per 100 miles)**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | 1.8 | 6.1 | 9.7 |
| Wastewater Only | 0.9 | 3.0 | 5.2 |
| Combined W & WW | 1.0 | 2.7 | 7.6 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA.

The average weekly reported and repaired overflows per fiscal year are shown in Figure 3-5. For FY2010, PRASA reports an average of approximately 486 overflows per week. Comparing the weekly reported overflows per each fiscal year, it can be observed that the reported overflows decreased from FY2006 to FY2009. However, there was no significant change from FY2009 to FY2010. Although PRASA's island-wide average of weekly pending overflows was approximately 486 in FY2010, it should be noted that PRASA ended the fiscal year with 368 pending overflows. Also shown in Figure 3-5 is the percentage of repaired overflows with respect to the number of overflows reported in each fiscal year. This percentage has decreased from 102% in FY2006 to 81% in FY2010.

Figure 3-6 shows the active overflows with duration greater than seven days. As shown in the figure, the number of overflows with duration greater than seven days decreased from FY2006 to FY2007. However, since FY2008 the overflows increased from eight to almost 200 per week. This jump can be attributed to the change from manually compiled and reported data prior to FY2009, to data tracked and monitored through the SAP system from FY2009 onward. Although PRASA's island-wide average of weekly pending overflows with duration greater than seven days was approximately 193 in FY2010, it should be noted that PRASA ended the fiscal year with 84 pending overflows with duration greater than seven days.

**Figure 3-5: Island-Wide Average of Weekly Overflows Reported and Repaired**

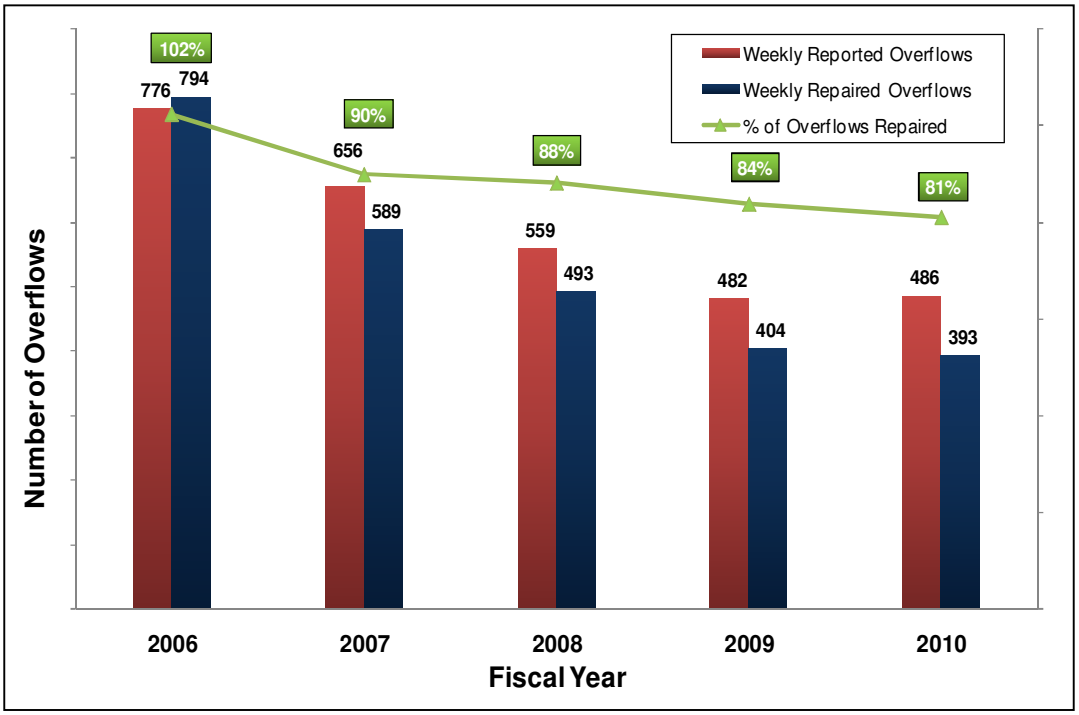



**Figure 3-6: Island-wide Average of Weekly Pending Overflows with Duration >7 Days**

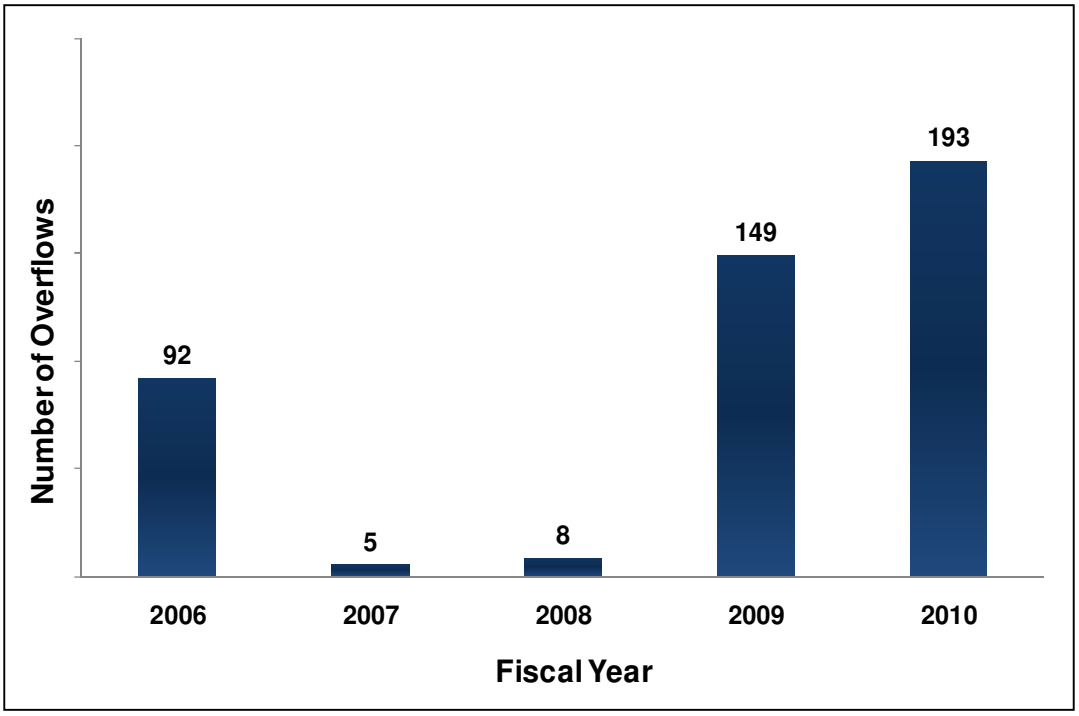


Table 3-32 includes the average of repaired overflows per working day. Based on the average pending overflows and average pending overflows with duration greater than seven days, it can be observed that in FY2010 PRASA averaged a backlog of approximately 5.9 days of pending overflows and a backlog of 2.4 days of pending overflows with duration greater than seven days. However, it should be noted that PRASA ended FY2010 with a backlog of pending overflows of approximately 4.5 days and a backlog of pending overflows with duration greater than seven days of approximately one day. Nonetheless, PRASA's effectiveness in repairing pending overflows in a timely manner has decreased over the last four years. This could be a result of inadequate data processing (i.e., completed work orders are not closed in the SAP system in a timely manner), inadequate prioritization of repairs and/or lack of personnel allocated to perform the repairs in a timely manner.

**Table 3-32:**
**Annual Average Backlog of Pending Overflows**

| Fiscal Year | Average Weekly Pending Overflows | Average Weekly Pending Overflows >7 Days | Average Repaired Overflows per Working Day[1] | Average Backlog Days for Pending Overflows | Average Backlog Days for Pending Overflows >7 Days |
|---|---|---|---|---|---|
| 2006 | 389 | 92 | 159 | 2.4 | 0.6 |
| 2007 | 250 | 5 | 118 | 2.1 | 0.0 |
| 2008 | 265 | 8 | 99 | 2.7 | 0.1 |
| 2009 | 398 | 149 | 81 | 4.9 | 1.8 |
| 2010 | 467 | 193 | 79 | 5.9 | 2.4 |

(1) Assumes five working days per week.

## 3.10 Summary of Findings and Conclusions

The condition of the facilities visited varied from new to those requiring capital upgrades. Table 3-29 presents a summary of how the results from this CER correlate, in terms of percentage, to the results of the 2009 CER. A positive percent change indicates an improvement in the asset condition when compared to the 2009 CER results. A negative percent change indicates a reduction in the asset condition when compared to the 2009 CER results.

**Table 3-33:**
**Percent Change of Condition Assessments from 2009 CER to 2010 CER**

| Asset Category | Regulatory Compliance Percent Change | Ops/Process Control Percent Change | Equipment/ Maintenance Percent Change | Staffing/ Training Percent Change | Overall Percent Change |
|---|---|---|---|---|---|
| Regulated Dams | 0% | 0% | 5% | 10% | 10% |
| Water Treatment Plants | -9% | 4% | 0% | -8% | -4% |
| Wastewater Treatment Plants | 0% | 4% | -9% | -10% | 0% |
| Wells | NA | 5% | 17% | NA | 11% |

| Asset Category | Regulatory Compliance Percent Change | Ops/Process Control Percent Change | Equipment/ Maintenance Percent Change | Staffing/ Training Percent Change | Overall Percent Change |
|---|---|---|---|---|---|
| Water Pump Stations | NA | -4% | 24% | NA | 5% |
| Water Storage Tanks | NA | 7% | 0% | NA | 0% |
| Wastewater Pump Stations | NA | 0% | 5% | -4% | 0% |

(1)NA = Not Applicable

Compliance with discharge permit limits and drinking water standards varied greatly depending on the plant age and condition, and experience of the operators. A number of PRASA's WTPs and WWTPs are included in the 2006 Consent Decree and the PRDOH Agreement, and some of these facilities are either scheduled for closure (through consolidation to regional facilities) or have ongoing or planned capital improvements to address compliance problems and/or increase treatment capacity. Despite some compliance problems, the System is producing and delivering potable water and conveying and treating wastewater. The condition of many facilities is not entirely unexpected, due to historically insufficient commitment of capital and operational resources over the years. The planned capital programs along with the O&M improvements are generally in alignment with the System needs, although the needs of PRASA's buried infrastructure (i.e. water and sewer pipelines) must be assessed to better identify measures to improve performance.

Annual results for leak and overflow metrics show that PRASA should look into the causes of its high reported frequency and duration of these events so that corrective measures can be implemented and performance is improved. Possible adjustments to PRASA's buried infrastructure R&R budget, as well as an evaluation of available staff resources to perform repairs, may be necessary to improve performance levels regarding number and duration of leaks and overflows. Also, PRASA should evaluate and revise its data processing and collection practices regarding reported and repaired leaks and overflows. Finally, PRASA must continue to aggressively work on identifying and addressing its high level of NRW.

# 4 Operations and Maintenance Practices Evaluation

## 4.1 Introduction

The evaluation of the adequacy of PRASA's O&M practices is based on compliance with regulatory requirements, interviews with PRASA personnel and facility observations by field inspectors, with the purpose of satisfying the requirements of Section 7.07 (a) of the MAT. With respect to maintenance, MPPR/Malcolm Pirnie's evaluation focuses on those critical assets that require continuous maintenance attention including, but not limited to, large dams, WTPs, WWTPs, WPSs and WWPSs facilities.

Many high-performing water and wastewater utilities are developing formal asset management plans that support the development, security, and preservation of utility assets. Asset management is broadly defined as managing the life cycle costs (both capital and O&M expenses), use and reliability of a utility's assets to optimize their value in support of utility operations. A utility's O&M policies and procedures should include the following:

- A process for prioritizing and scheduling maintenance activities.
- A formal process for tracking maintenance activities and costs by specific asset.
- A process that compares scheduled maintenance activities with actual maintenance tasks performed.
- A set of performance measures for rating maintenance performance.
- A formal and effective O&M plan.
- Standard operating procedures (SOPs) for all equipment operation and maintenance activities.

The operational and performance history of the facilities and systems is of critical importance to evaluating the adequacy of O&M practices. This operational performance history is fundamentally measured by compliance with potable water and wastewater effluent quality requirements. As part of the condition assessment described in Section 3 of this CER, compliance ratings were developed for WTPs and WWTPs. A total of 11 WTPs and 13 WWTPs received poor or unacceptable ratings in the compliance category. Although this may be some indication of the effectiveness of O&M practices, in many cases capital projects (or in some cases planned plant closures) are needed to achieve reliable compliance (9 WTPs and 12 WWTPs that received poor or unacceptable compliance ratings are either scheduled for closure or have planned capital improvements). The net effect of these substantial physical modifications or closures should result in improved compliance. After implementation of these projects, a better assessment of the effectiveness of O&M practices as it relates to compliance issues can be made.

As part of the facility visits to conduct the condition assessments described in Section 3, MPPR/Malcolm Pirnie also evaluated the O&M practices and conditions by which the assets are maintained and long-term compliance is achieved. It should be mentioned that while each facility was only visited once, which represents a "snapshot" in time; collectively, there were many common O&M practices observed consistently across the inspected assets. The following sections present a summary of the work that has been performed by PRASA, achievements in its O&M practices, implemented and planned operational initiatives, and identified areas for improvement. Observations and recommendations included in these sections consider the results of the condition assessments presented in Section 3 and how the observed O&M practices have varied (where applicable) from the 2008 and 2009 CERs.

## 4.2 Operations

One recurring finding in the facility inspections is the need for facility-specific O&M plans or manuals for treatment plants. O&M manuals normally consist of written policies and SOPs for process equipment, such as pumps, sand filters, and other treatment processes. The O&M manuals at many of the small WTPs were written solely for the operation of their renovated sand filters. The SOPs at the WTPs deal mostly with procedures for analyzing process control samples for various parameters in the lab, not with equipment or treatment processes.

In general, the inspected large dams had O&M plans or manuals, but in some cases they needed to be updated. Even though the majority of the WTPs and WWTPs had O&M plans or manuals available, these were written by the equipment provider at the time the plant was designed or built. It is industry practice to review and, if needed, update O&M plans on an annual basis. In addition, it is industry practice to have an independent O&M manual or O&M plan in addition to manuals provided by equipment manufacturers. An O&M plan is a core management tool used for an effective operations strategy and serves as a basis for managing the entire operation of a facility.

Regarding WPSs and WWPSs, the common finding was that, with the exception of the operator log book, PRASA does not keep documentation locally at each pump station facility. Most information for pump stations, when available, is maintained at the regional or area operations service center. Industry practice is to keep a certain minimum level of information present at the pump stations, including, but not limited to, a copy of the O&M manual, emergency procedures, relevant safety information (e.g., confined space procedures), vendor manuals and copies of as-built drawings.

In order to address its need for improved O&M manuals, SOPs, and plans of operation for its WTPs and WWTPs, PRASA is planning to develop standardized O&M manuals by type of plant, and later customizing these to each specific plant. This effort will be implemented in all WWTPs as part of the Process Control System program required by the 2006 Consent Decree, and will be expanded to include WTPs. The standardized manuals will be developed taking into consideration USEPA guidelines. This initiative is programmed for completion beyond FY2010.

Currently, PRASA is requiring that project scopes for all plants undergoing rehabilitation include the preparation or updating of the plant's O&M manual, in accordance with regulatory guidelines.

## 4.3 Maintenance

PRASA acknowledges the need to implement standardized processes for prioritizing and scheduling preventive, corrective and routine maintenance activities. Currently, preventive maintenance is only formally conducted at a number of facilities (on track with what has been required by the 2006 Consent Decree). Most of the plant operators described a verbal process of reporting unscheduled (corrective) maintenance (e.g., malfunctions, equipment failures, etc.) to their supervisor. Once notified, the supervisor, in turn, begins the process of generating a work order request, and/or passes it along to the regional maintenance manager. After a written work order is generated, it then goes through a process of approval to authorize the repair (depending on cost amount of request and nature of the work). While effective communication using mobile phones was observed between many of the field staff and supervisors, the lack of formalized systems and procedures leaves prioritization, approvals, and the actual maintenance up to the efficiency of the individuals completing the informal approval process.

Furthermore, the mechanisms available to the supervisors by which maintenance activities are carried out vary significantly between Operational Areas and across Regions. These non-standardized processes may hinder long-term efficient and effective maintenance. For example, some areas rely on PRASA mechanics and electricians to perform maintenance; while others rely on outside contractors and/or a combination of both. The process for implementing maintenance then becomes heavily vested on the supervisor's approach and memory; and when a supervisor leaves, the maintenance history is lost or needs to be recreated.

During facility inspections, MPPR/Malcolm Pirnie found that many equipment units throughout the water and wastewater systems were out of service for an indefinite period of time, indicating a critical need for an effective maintenance program. Some of the units have been out of service for months; some for years. While the root causes for maintenance issues observed were not independently verified, operations staff cited a combination of factors that have contributed to the long-term outstanding maintenance issues including:

- Inadequate funding for maintenance.
- Low spending caps at the plant level.
- A slow bureaucratic process in processing written work orders.
- Supplier and vendor issues, including but not limited to availability and locality (some are located as far away as Canada).

Costs for repairs were generally not available at the plants, unless there was a regional or Operational Area supervisor located at that plant who was involved in the budget appropriations process.

With the exception of several large WTPs and WWTPs, PRASA's plant maintenance personnel work out of regionally-managed offices or shops. These regional maintenance centers service pump stations and plants, an approach that provides some economies of scale since many of the WTPs and WWTPs are small facilities where it would not be cost effective to have dedicated maintenance personnel. However, there are facilities that are large and complex enough to require dedicated maintenance personnel to operate reliably. For example, the Ponce Nueva WTP (a 20-MGD facility) would qualify as a large plant and has a number of outstanding maintenance tasks that confirms the need for on-site maintenance staff. In some cases, the improvements in the maintenance problems at each one of these facilities could help improve their compliance record, which at times is hindered by this lack of on-site maintenance.

Many of the larger WWTPs (i.e. capacities above 5 MGD) had a dedicated maintenance staff. During the inspections, MPPR/Malcolm Pirnie noted that, in many Operational Areas, maintenance personnel with electro-mechanical skills were in high demand and short supply. Subcontractors were used to fill these skill gaps and various other maintenance needs. For example, routine maintenance on pump stations was often conducted by PRASA staff; however, for maintenance in confined space areas, or for pump or motor repairs, outside contractors are often utilized.

### 4.3.1 Integrated Preventive Maintenance Program (IPMP) Progress

The 2006 Consent Decree requires that PRASA implement a comprehensive integrated preventive maintenance program, the IPMP, to ensure the proper operation and maintenance of its plants and other critical facilities, including WWPSs. Through the IPMP, PRASA is establishing a plan to enable programmed and continuous maintenance to plants, pump stations, vehicles, and equipment to provide for more reliable service, improve client satisfaction, and achieve long-term operational cost savings through preservation of assets. PRASA is currently financing the program through its CIP. In FY2010, PRASA's cash expenditures for the provisions of preventive maintenance amounted to approximately $31M. PRASA plans to spend an additional $37M in the next three fiscal years to complete the development and implementation of the program. In FY2014 and beyond, the associated costs of preventive maintenance will be included in PRASA's annual O&M budget as a regular operational expense.

Currently, PRASA is integrating the following five initiatives of the IPMP:

- New purchasing and logistic processes to provide the appropriate services and materials at the proper time and in an efficient manner.
- Development of the required skills within the organization to support all processes.
- Development of infrastructure standards for new facilities including equipment, and information technology tools for remote monitoring and control.
- Development of detailed maintenance work plans with specific schedules and tasks.

- Provision of the equipment, tools and necessary infrastructure to carry on the new tasks and roles.

Some of the major benefits that PRASA has identified from the implementation of the IPMP include:

- Improvement in asset useful life, resulting in an improvement in reliability of service and reducing the need for future capital programs and maintenance expenses.
- More efficient maintenance processes by expediting work order processes and allowing planning of work plans in advance (e.g. route planning).
- Improvement in inventory management resulting in a reduction of inventory waste, efficient access to replacement availability information and better procurement terms.
- Standardization of equipment in facilities, reducing inventory costs, unnecessary equipment training, and increasing economies of scale in equipment procurement.
- Reduction of equipment downtime and costly repairs.

In March of 2007, PRASA began using the SAP system (SAP PM) as the application software to support its O&M and asset management process. This software is regionally managed and centrally monitored. PRASA continues utilizing the SAP system in the five Regions and, as of June 30, 2010, has integrated 25 WTPs, 60 WWTPs, one well (Maunabo) and 200 WWPSs into the IPMP. Additionally, in March 2009 PRASA completed the integration of SAP-ISU as its platform for customers, billings, and collections database and customer (commercial) services.

PRASA also started implementing, as part of the IPMP, several initiatives described below:

- Organizational Structure – This initiative seeks to relocate personnel from other departments (i.e., operations to maintenance department) and allocate them, as needed, in the different areas covered by the IPMP. In the event that additional personnel are needed, PRASA projects contracting external contractors to help in the implementation of the IPMP. The relocated as well as the existing IPMP personnel are in the process of being trained to comply with all the safety and compliance requirements of the Occupational Safety and Health Administration (OSHA).
- Communications Plan – As part of this initiative, PRASA has prepared different communication tools that help deliver the information on the extent of, and the accomplishments of the IPMP to PRASA's employees and customers. Among these tools are: preparation of nine editions of an IPMP newsletter that is delivered to the entire PRASA staff; visits to the WTPs that are in the IPMP; presentations to PRASA's personnel on the processes of the program that apply at each one of the facilities; and delivery of seminars in each Region to present the general concepts of the program.
- Logistics and Purchasing – Initiative includes the reduction and consolidation of warehouses to comply with the Logistics and Purchasing Department's plan to reduce costs.

PRASA is also planning to complete the phased implementation of the continuous monitoring project in all of the WTPs. The first two phases of the continuous monitoring project were completed and validated by April 30, 2010. Approximately 54% of the facilities included in the third phase had been completed, at the end of FY2010. The remaining facilities are scheduled to be completed and validated by March 15, 2011.

As additional facilities are integrated into the IPMP, PRASA must continue to monitor and assess the program's costs and benefits. As preventive maintenance increases, corrective maintenance should decrease. Using its SAP system, PRASA should employ sound accounting practices to monitor the costs of the program, not only on a regional and operational area level, but also by facility.

## 4.4 Staffing

Nearly all the WTPs operate 24 hours per day, seven days per week. There is usually only one operator per shift. Some of the plants have an on-site extra or "stand-by" operator while other plants share an "at-large" operator to fill in for absences and vacations. Occasionally staffing problems arise when absences and vacations coincide. Other plants have a "celador" (or circuit rider) which is a maintenance person who checks the pumps and other major equipment at pump stations, wells, and tanks. Sometimes these circuit riders stand in for operators, though they are usually not certified operators. Several of the plants have operator vacancies which have not been filled.

The majority of WWTPs are staffed with one shift and several plants have two shifts. There are only a few WWTPs with 24-hours-per-day staffing. A critical issue with the WWTPs that are not staffed 24 hours per day is that there is limited telemetry at most of the plants to notify the operator if there is a serious problem such as a chlorine alarm, loss of pumping, power loss or serious electrical problem (e.g., blower malfunction), etc. These limited telemetry installations at the WWTPs are currently being addressed under the IPMP and CIP. Additionally, PRASA is considering the development and implementation of a Plant Automation Program to reduce the dependency on staff. This program consists in the installation of the necessary equipment and the development of the O&M and system protocols necessary to automatically, and remotely, operate a number of WTPs and WWTPs. Additional information on this program is later described.

While a few of the WWPSs have telemetry capacity for a few basic functions, the majority still lack this feature. Typically, the frequency of checks on the wastewater pump station is two, three, five or seven times a week depending on the Operational Area. Thus, there are limited systems in place to monitor the status of these assets between visits. PRASA is, however, in the process of installing telemetry systems throughout a large number of its facilities and the majority of the WWPSs are expected to have telemetry within the next few years (depending on capital funding availability). In addition, the IPMP has been implemented in over 200 WWPSs.

All of the large dams have network connectivity for security and monitoring of reservoir levels. Staffing is usually assigned in combination with adjacent pump stations or WTPs. Dam staffing usually covers a standard 40-hour work week. If weather conditions mandate, full 24-hour staffing is provided for monitoring water levels.

Based on the current total number of employees, it appears that PRASA has sufficient quantity of staff to operate and maintain the System. However, PRASA currently has some staffing needs at individual facilities and within its executive and management teams. Also, given the recent reductions in staff, in FY2010 PRASA decreased its number of field personnel, which include meter readers and buried infrastructure repair crews. As a result, certain PRASA metrics (i.e., percent meters read and effectiveness in repairing leaks and overflows) have fallen.

## 4.5 Training

Training is an important O&M issue that is currently being improved throughout PRASA's operating system. As shown in Table 4-1, PRASA has continued to provide training to its employees. In FY2010, PRASA offered, on average, 21 hours of training per employee; which is less than the 29 hours offered in FY2009, but higher than the training hours offered in FY2006, FY2007, and FY2008. The increase in training during FY2009 and FY2010 has been due to, among other reasons, the establishment of the Training Master Plan that is included under the IPMP and the requirements of the 2006 Consent Decree and the PRDOH Agreement. Based on a comparison to other utilities in the U.S. and Canada, PRASA's recent level of training is near the median for all of the utilities. The benchmarks for training hours per employee are summarized in Table 4-2 below.

**Table 4-1:**
**Training Hours (FY2006-FY2010)**

| Description | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 |
|---|---|---|---|---|---|
| Total Training Hours | 73,411 | 94,357 | 79,042 | 162,330 | 102,830 |
| Average Hours per Employee | 13 | 16 | 14 | 29 | 21 |

**Table 4-2:**
**Training Hours per Employee Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | 31.8 | 16.8 | 12.3 |
| Combined W & WW | 34.9 | 22.5 | 12.7 |
| All Utilities | 31.7 | 20.0 | 11.8 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

In regards to operator training and certification, PRASA continues its plan to provide training to plant operators to prepare them for certification in the operation of treatment plants. As shown in

Table 4-3, as of June 2010, PRASA had 421 WTP operators, of which 346 are licensed operators and 75 are operators in training. For FY2010, the number of WTP operators decreased by 22%. According to PRASA, this reduction could be related to a discrepancy in the data collection process during FY2010 and the data collection process during previous fiscal years, in which an operator that approved the license of a higher category could be counted twice, once in the previous category and once in the new one. Additionally, PRASA had 230 WWTP operators, of which 205 are licensed operators and 25 are operators in training. PRASA increased the number of WWTP licensed operators and, as a result, the number of operators in training reduced from FY2009 to FY2010.

**Table 4-3:**
**Licensed WTP and WWTP Operators by Type**

| WTP Operator Type | 2008 CER | 2009 CER | 2010 CER | Difference 2010 and 2009 |
|---|---|---|---|---|
| Operator License IV | 84 | 145 | 153 | 8 |
| Operator License III | 67 | 120 | 86 | -34 |
| Operator License II | 95 | 138 | 75 | -63 |
| Operator License I | 21 | 41 | 32 | -9 |
| Operators in Training | 279 | 109 | 75 | -34 |
| **Total** | **546** | **553** | **421** | **-132** |
| | | | | |
| **WWTP Operator Type** | **2008 CER** | **2009 CER** | **2010 CER** | **Difference 2010 and 2009** |
| Operator License IV | 38 | 69 | 133 | 64 |
| Operator License III | 8 | 19 | 21 | 2 |
| Operator License II | 21 | 30 | 28 | -2 |
| Operator License I | 0 | 4 | 23 | 19 |
| Operators in Training | 111 | 48 | 25 | -23 |
| **Total** | **178** | **170** | **230** | **60** |

PRASA should continue with its staff training program, and more specifically should offer additional technical training to operators and field personnel. Examples of these trainings include, but are not limited to: chlorine and chemical handling and application, working in confined spaces, and water main and trunk sewer installation practices. These types of trainings provide the tools necessary for PRASA's staff to execute the work in a safe and efficient manner. Additionally, PRASA could consider identifying qualified personnel within its current organization that could be trained to be plant operators in order to fill, as necessary, vacant positions at its WTPs and WWTPs.

## 4.6 Operations and Maintenance Budgets[12]

PRASA's total FY2010 net expenses amounted to $609 million (M). Of this, approximately $75M was related to commercial activities and provision of customer services, including but not limited to: staffing and operation of customer service offices island-wide; meter reading; connection and disconnection services; invoice preparation, printing and distribution; customer service call centers; and water meter purchases, amongst others. In order to calculate the estimated O&M budget allocated for the water and wastewater system, respectively, the cost related to PRASA's commercial activities must be subtracted from the total O&M net expenses. Therefore, the total O&M budget for the water and wastewater systems, combined, is approximately $534M. The following sections provide additional information for both the water and wastewater systems, as well as benchmarking data.

### 4.6.1 Water

PRASA estimates that approximately 70% of its O&M budget is allocated for the water service system. Therefore, for FY2010 the O&M budget allocated for the water system was approximately $374M. This is equivalent to an annual O&M cost per account of $292, which is above the median when compared to other utilities in the U.S. and Canada. The benchmarks for O&M cost per account for water service are presented in Table 4-4.

**Table 4-4:**
**Water O&M Cost per Account Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | $163 | $233 | $319 |
| Combined W & WW | $134 | $247 | $411 |
| All Utilities | $148 | $258 | $374 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

Another metric in which PRASA could be compared with other utilities is O&M cost per million gallons (MG) of treated water processed. PRASA reports that it currently produces approximately 659 MGD of treated water (approximately 240,500 MG annually), resulting in a ratio of O&M cost per MG processed of $1,555 which is also above the median when compared to other utilities in the U.S. and Canada. The benchmarks for O&M cost per MG processed are presented in Table 4-5.

[12] Note: The calculation method used in the 2009 and 2010 CERs differs from the method used in the 2008 CER, as costs related to customer (commercial) services were not included in the calculation of water and wastewater O&M budgets, consistent with AWWA benchmarks.

**Table 4-5:**
**Water O&M Cost per MG Processed Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | $885 | $1,320 | $1,665 |
| Combined W & WW | $863 | $1,431 | $2,089 |
| All Utilities | $942 | $1,459 | $2,114 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

Given the complexity of its water system, higher O&M cost per account or per MG processed in comparison to U.S. utilities is not unexpected. The largest expense categories for the water service system are related to payroll and benefits and electricity costs. PRASA must implement measures to bring its metrics to more comparable results. Internal realignment of priorities and efficiency initiatives may be required to better optimize the use of such budget.

### 4.6.2 Wastewater

PRASA's total FY2010 O&M budget for wastewater services is approximately $160M, which is estimated as 30% of PRASA's total O&M budget. This is equivalent to an annual O&M cost per account of $214, which is about the median when compared to other utilities in the U.S. and Canada. The benchmarks for O&M cost per account for wastewater service are presented in Table 4-6.

**Table 4-6:**
**Wastewater O&M Cost per Account Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | $120 | $209 | $303 |
| Combined W & WW | $114 | $209 | $291 |
| All Utilities | $127 | $213 | $306 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

Another metric in which PRASA could be compared with other utilities is O&M cost per MG of wastewater processed. PRASA reports that it currently treats approximately 225 MGD of wastewater (approximately 82,100 MG annually), resulting in a ratio of O&M cost per MG processed of $1,949 which is about average compared to other utilities in the U.S. and Canada. The benchmarks for O&M cost per MG processed are presented in Table 4-7.

**Table 4-7:**
**Wastewater O&M Cost per MG Processed Utility Benchmarks**

| Utility Category | Top Quartile | Median | Bottom Quartile |
|---|---|---|---|
| Serve > 500,000 | $906 | $1,500 | $1,859 |
| Combined W & WW | $1,200 | $2,022 | $3,044 |
| All Utilities | $1,148 | $2,022 | $2,986 |

Source: Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analyses Report, AWWA (2008).

One reason that could help explain why PRASA's wastewater O&M budget is low compared to its water O&M budget (relative to the benchmark comparisons) is that PRASA has several large primary treatment plants (i.e., all the plants with 301(h) waivers), that account for 61% of PRASA's total wastewater treatment capacity. Secondary treatment plants have significantly more equipment to operate and maintain, which results in higher O&M costs. Similar to the water system O&M budget, the largest expense categories for the wastewater service system are related to payroll and benefits and electricity costs. Although the cost per MG processed is comparable to the U.S. median, PRASA could further optimize the use of such budget, which may require internal realignment of priorities and efficiency initiatives.

## 4.7 Additional Operations and Maintenance Metrics

Since 2004, PRASA has implemented a series of metrics for internally measuring its progress. The metrics have been classified under three primary categories: Departmental, Commercial and Operational. In 2005, the metrics were focused on operational issues such as frequency of sewer overflows and water leaks. Presently, PRASA also focuses on billing and customer service metrics. Table 4-8 summarizes some of PRASA's metrics. As illustrated in the table, PRASA's metrics show that significant improvements have been achieved in the reduction of the clients without water service. However, the percent of actual meter readings has been reduced by approximately 23% from FY2009 to FY2010, mainly due to a reduction in temporary employees, who were responsible of performing the meters readings (temporary employees were the first group of employees to be separated under PRASA's staff reduction plan). The remaining areas have remained near the same results as of the 2008 and 2009 CER.

**Table 4-8:**
**PRASA Operational and Performance Metrics Examples**

| Area | Metric | June 2005 | June 2007 | June 2009 | June 2010 |
|---|---|---|---|---|---|
| Clients without water service | No. of clients without service/ week | 14,483 | 9,459 | 5,189 | 4,632 |
| Generators | % operating | 66% | 98% | 98% | 98% |
| Purchase/Logistics | -Days to process purchase order | 30 | 14 | 10-15 | 10 |
| | -Days to process warehouse reserve | 25 | 9 | 7-10 | 10 |
| | -Inventory turns | N/A | 1.8 | 1.7 | 1.9 |
| | -Value of excess/obsolete inventory | $3.5M | $3.5M | $3.6M | $3.6M |
| Actual meter readings | % Actual Meter Readings | 73% | 87% | 82.5% | 59.0% |
| Customer service | Average telephone call wait time for customers (<5 minutes) | >4 min | 52 sec. | 1:34 min | 2:08 min |

## 4.8 Operations and Maintenance Initiatives and Improvements

PRASA is currently developing and implementing several O&M initiatives to improve and optimize its practices, as are described in the sections below. Additionally, based on MPPR/Malcolm Pirnie's findings, supplemental improvements are listed and described as well.

### 4.8.1 Water Accountability Program: Non-Revenue Water Reduction Program

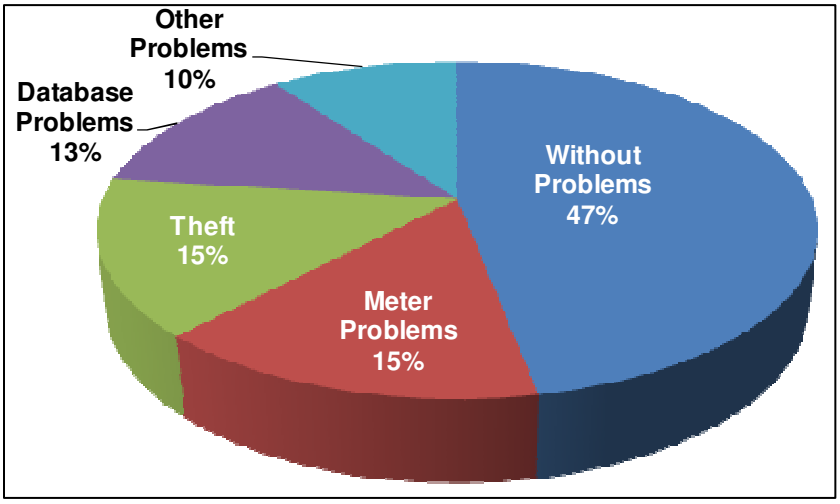
Since FY2008, PRASA has been implementing a series of initiatives that have been designed to reduce its NRW. These initiatives have been integrated into a program named the Non-Revenue Water Reduction Program (NRWRP). The initiatives included under the NRWRP mostly address PRASA's commercial losses including:

- Execution of the "Mega Census" to:
  - Identify clients who are not currently in PRASA's billing system.
  - Identify inactive accounts who are still consuming water.
  - Identify illegal connections to PRASA's water and wastewater systems.
  - Identify incorrect customer tariff classification and service levels.
  - Identify malfunctioning and obsolete meters, and address access difficulties to customer meters.
- Replacement of small and large customer meters according to age and condition.

- Implementation of a proactive collection effort for large customers (top 20,000 receivable accounts) and the aggressive execution of the service disconnection program for non-paying residential customers.
- Proactive collection effort of prior fiscal year receivables generated by certain government clients including municipalities and public corporations.
- Identification of commercial and industrial customers with sprinkler systems that are not registered with PRASA and are not currently paying their corresponding dues.
- Identification of condominium master accounts that are not registered with PRASA.

Field findings of the "Mega Census" initiative have shown that a large percentage of accounts have some sort of problem. Through June 30, 2009, PRASA reports to have visited 258,492 service locations through its Mega Census initiative. Close to 53% of visited service locations had some type of problem ranging from meter function issues (i.e. "stuck" or broken meter or meter box, etc.) to theft, as shown in Figure 4-1. This figure shows that there is a large opportunity for PRASA to obtain additional revenues by identifying, addressing, and resolving such problems.

**Figure 4-1: Mega Census Field Findings Statistics**




In FY2010, PRASA refocused the strategy of the NRWRP considering the program's 2009 results and bringing new initiatives to generate additional revenues. The initiatives addressed in FY2010 include the following:

- Small Meters Replacement
- Large Meters Replacement
- Water Theft
- Service Disconnections
- Collection Efforts
- Sprinklers
- Inactive Accounts
- Condominiums

PRASA has replaced a considerable amount of customer meters in recent years which have resulted in a reduction in the average age of these assets. A meter degradation analysis determined that if meters are changed after 10 years of use, it will result in a higher revenue impact and a higher return of investment. Figure 4-2 shows the number of meter change outs from FY2007 to FY2010 and the total number of meters and their approximate age. Approximately 54% of the water meters installed have less than five years in operation and only 18% have an average age greater than 10 years. As shown in the figure, PRASA increased the rate of meter replacement between FY2007 and FY2010 by 55% and between FY2009 and FY2010 by 11%. In the next year, PRASA will focus on the replacement of meters with 10 years of use or more. PRASA plans to replace approximately 90,000 small meters in FY2011.

**Figure 4-2: Number of Meter Replacements from FY2007 to FY2010 and Total Number of Meters and Approximate Age**

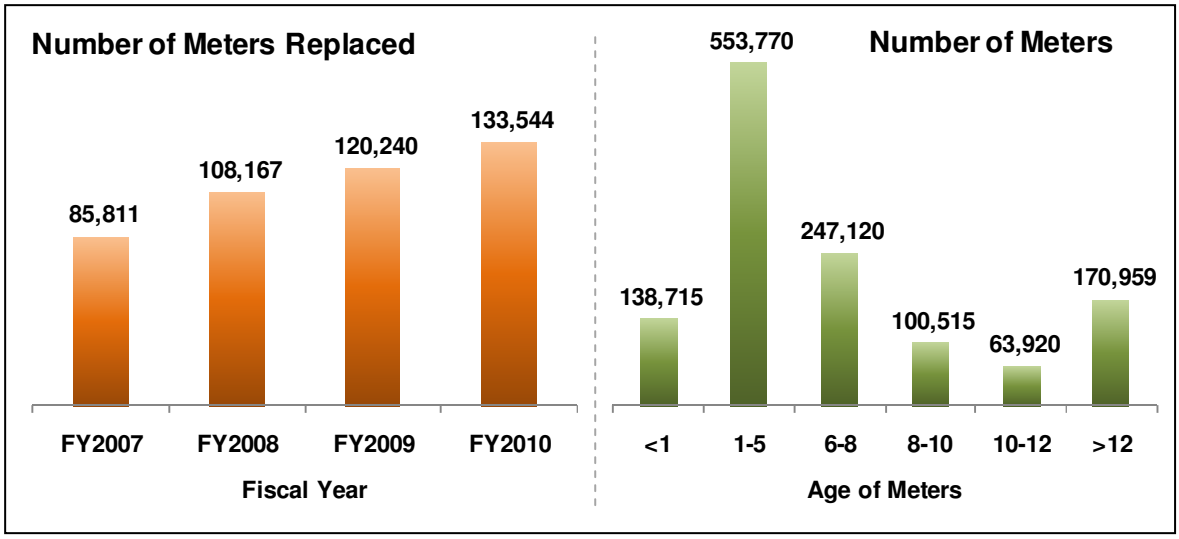
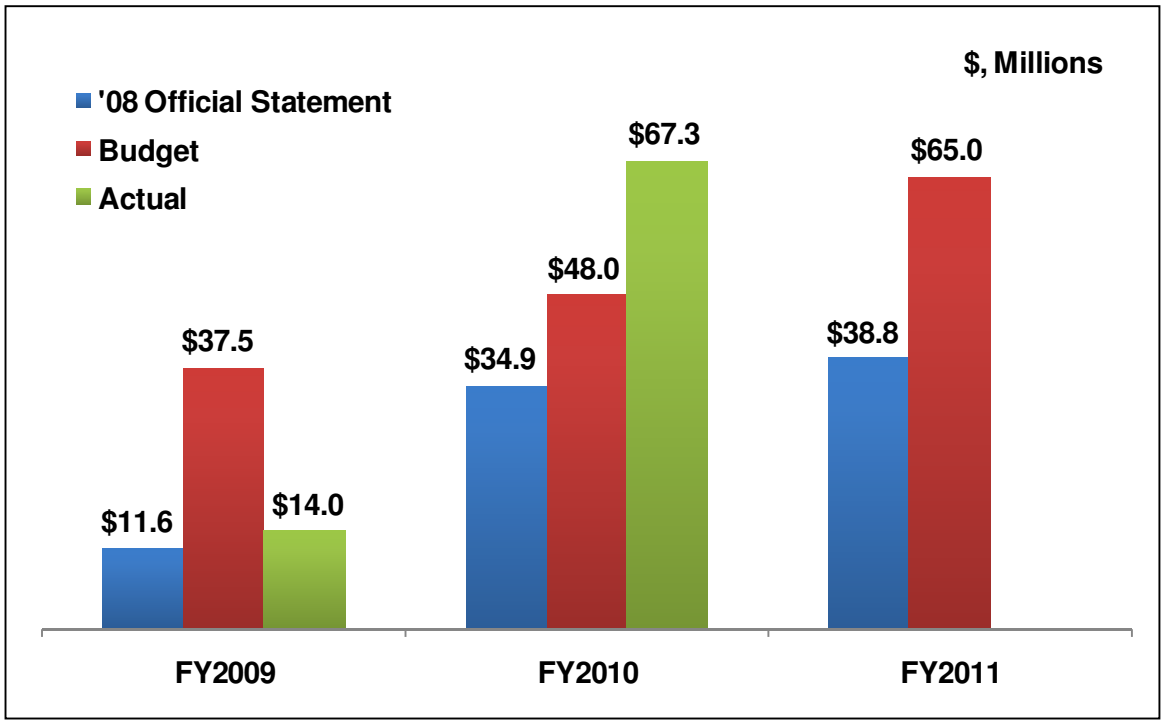



Table 4-9 shows the NRWRP actual and forecasted revenues for FY2010. As shown in the table, the performance of PRASA in these initiatives exceeded the target set at the beginning of the fiscal year by 41%. Figure 4-3 shows the NRWRP projected and actual revenues. In FY2010, the NRWRP initiatives achieved and exceeded PRASA's Official Statement (OS) projections of $34.9M of revenues. The actual revenues of FY2010 were approximately $67.3M. PRASA has estimated that the NRWRP could bring revenues of approximately $65M in FY2011. MPPR/Malcolm Pirnie believes that these NRWRP related initiatives promote the execution of activities that should be part of PRASA's normal course of business, as commercial losses directly affect PRASA's financial capability by increasing operational costs and reducing revenues.

**Table 4-9:**
**FY2010 NRWRP Results in Thousands**

| Revenues ($, Thousands) | FY2010 Budget Forecast | FY2010 Preliminary Results | % Achieved | FY2011 Forecast |
|---|---|---|---|---|
| Small Meters | $17,025 | $10,358 | 65% | $23,370 |
| Degradation | (7,000) | (7,000) | 100% | (7,000) |
| Large Meters | 3,685 | 2,812 | 76% | 6,950 |
| Census | 48 | - | 0% | - |
| Theft | 10,563 | 11,142 | 105% | 8,568 |
| Sprinklers | 3,395 | 3,683 | 108% | 2,376 |
| Collection Efforts | 2,000 | 3,675 | 184% | 2,500 |
| Inactive Accounts | 3,600 | 1,475 | 41% | - |
| Rate Category Correction | 698 | 456 | 65% | 1,558 |
| Disconnections | 9,600 | 34,666 | 361% | 20,387 |
| Condominiums | 3,056 | 5,306 | 174% | 4,074 |
| Other | 1,656 | 757 | 46% | 2,217 |
| **Total Revenues** | **$48,325** | **$67,330** | **141%** | **$65,000** |

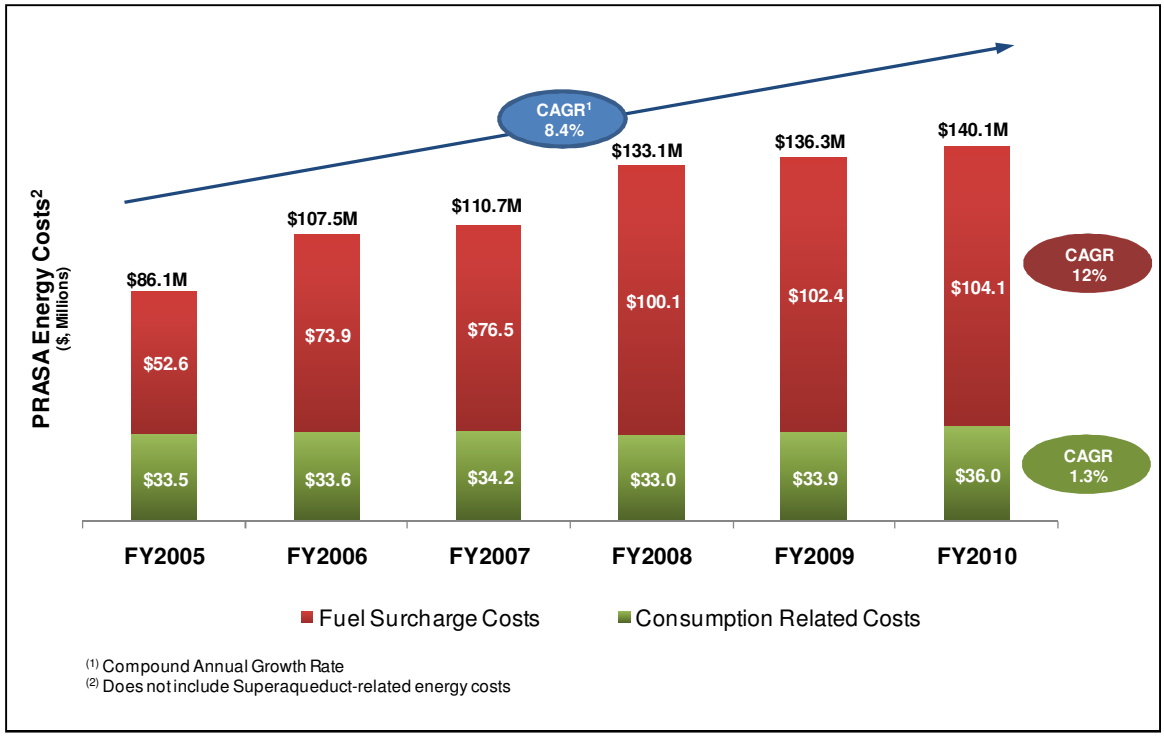
**Figure 4-3: NRWRP Projected and Actual Revenues**



### 4.8.2 Comprehensive Energy Management Program

PRASA's energy costs have increased in the last six fiscal years at an average rate of 8.4% per year as shown in Figure 4-4. PRASA's energy cost is the second largest cost behind payroll and make up 22% of its total operational costs. In order to reduce these costs, PRASA is currently undertaking two separate procurement processes to engage the private sector in investing in energy related projects, discussed below.

**Figure 4-4: PRASA's Energy Costs**




(1) Compound Annual Growth Rate
(2) Does not include Superaqueduct-related energy costs

#### 4.8.2.1 Demand Side Projects through Energy Performance Contracts

PRASA is currently procuring the services and investments from private sector firms interested in entering Energy Performance Contracts (EPCs) designed to reduce energy consumption at PRASA's facilities. The objective of this initiative to have Energy Service Companies (also referred to as ESCOs) perform assessments and invest their own capital to install equipment and implement activities designed to reduce energy consumption. These ESCOs will be paid with a portion of the realized savings for a determined period, until they receive the agreed level of compensation in their EPCs. PRASA has selected 17 companies as eligible to submit EPC proposals. PRASA developed and issued four different Requests for Proposals (RFPs) to the selected companies for: buildings, plants, ancillary facilities (i.e., pump stations), and the North Coast Superaqueduct System. A total of 15 proposals were received and evaluated. PRASA is currently in the process of developing contract documents to commence negotiations with selected proponents.

There are two important benefits for PRASA in employing this type of performance contract. First, PRASA's operations benefit from improvements made with private capital and as such it does not have to place additional burden to its CIP. Second, the EPCs are structured so that payments to ESCOs are only made by realizing measured and verifiable savings, placing most of the risk with the ESCOs and aligning the desired outcomes of both parties. On the other hand, the positive financial impact of this initiative for PRASA is limited by the fact that savings are shared with the ESCOs until they have recovered their investment and earned their agreed returns.

#### 4.8.2.2 Supply Side Projects through Power Purchase Agreements

PRASA is also undertaking a parallel process in which it is procuring companies who are interested in proving independent energy supply services through Power Purchase Agreements (PPAs). The objective is to secure one or more PPAs for lower energy unit costs per kilowatt-hour (kWh) than what PRASA currently pays PREPA. PRASA developed and issued an RFP for these services and received 19 proposals in response. Some of these proposals are currently being evaluated by PRASA and others are in contract negotiations. The proposals that are currently in contract negotiations are the following:

- Waste to Energy (WTE): Proposed WTE facilities at nine municipal WWTPs. Initial phase will convert sludge produced at WWTPs into bio-gas, considered a renewable power source, for generation of electrical power. PRASA's goal is to purchase power at a cost 50% lower than PREPA's current power price. Investment from private sector for initial facility is approximately $20M. Initial facility is planned to begin operation during 2012.
- Wind Power: Proposed wind turbine generator at several WTPs and WWTPs. Total potential capacity of up to 9.75 megawatts (MW). Power generated at each facility will be used within the facility. It is expected that power will be purchased at a cost approximately 30% lower than PREPA's current power cost. Private sector investment is approximately $8M. Wind turbines are planned to begin operation during 2012.
- Hydroelectrical Generation: Proposed rehabilitation of the Carraízo Dam hydroelectrical generators. The facility will have an initial capacity (phase I) of 1.2 MW, with potential expansion of up to 3.6 MW. All power generated will be used for the Sergio Cuevas Water WTP Raw Water Pump Station located at the Carraízo Dam. It is expected that power will be purchased at a cost approximately 25% lower than PREPA's current power cost. Private sector investment is approximately $2.8M for phase I of the project. Facility is planned to begin operation during 2012.
- Liquefied Natural Gas (LNG): Proposed LNG Power Plant at the North Coast Superaqueduct System Raw Water Pump Station. The facility will have an initial capacity of 8 MW (phase I) for direct use at the Raw Water Pump Station and a future expansion of 24 MW (phase II) for use at remote facilities through wheeling regulations. It is expected that power will be purchased at a cost 25% lower than PREPA's current power cost. Private sector investment is currently under evaluation. Facility is planned to begin operation by 2012.

If successfully implemented, these supply side initiatives should be able to provide larger savings to PRASA than the demand side initiative. However, it must be noted that supply side projects, in general, take longer to complete than demand side projects. This is because permitting for and building new plants and facilities for the provision of alternate energy (e.g., wind or solar energy facilities) usually take significantly longer than replacing equipment in existing facilities. Therefore, it is unlikely that PRASA will see any substantial savings from this initiative before FY2013. Another item that affects the implementation of certain projects that require the use of PREPA's grid is the wheeling regulation that will establish the real costs that PREPA will charge to the independent energy suppliers to use its grid. As of June 30, 2010, PREPA was yet to publish a wheeling regulation.

Assuming that the wheeling regulation is implemented in FY2011, and that both procurement processes are completed according to schedule, MPPR/Malcolm Pirnie believes that these initiatives should benefit PRASA with some moderate savings starting as early as FY2012 for the demand–side initiatives. According to the proposed implementation plan, annual savings to be obtained from this program are anticipated to be $2M in FY2012 and growing to $13M in FY2014, based on selected proposals and PRASA's revised savings projected during the contract negotiation phase. Additionally, the realized savings will greatly depend on the level of participation of the private sector and the willingness of PREPA to facilitate the process of integrating independent electricity generators into their system.

### 4.8.3 Treatment Plant Automation Program

PRASA is currently executing the first phase of a program to install the necessary equipment and develop the O&M and system protocols, to automatically, and remotely, operate a number of its WTPs and WWTPs. The project scope includes the procurement and installation of automation control equipment (capital investment is estimated at approximately $400,000 per facility). The program goals and benefits are the following:

- Automate a total of 157 facilities (127 WTPs and 30 WWTPs) by FY2012. The program's initial focus is to automate the 127 WTPs and then focus the program on the 30 WWTPs.
- Develop and implement a technology-based organization (clusters) to support the automation program and maximize the benefits.
- Align the goals and objectives of the IPMP, Telemetry, and CMMS programs.

PRASA has retained a consultant to help with the development and implementation of this initiative. Also, PRASA is currently in negotiations with the PRDOH to obtain their concurrence to this change in WTP operation. At the end of FY2010, the status of the program is the following:

- Completing the pilot in three WTPs in the East Region.
- Procurement for 12 WTPs is underway with six plants about to start construction.

- Technical teams completed the assessment of 105 WTPs and started design phase.
- Program now includes the automation of the North Coast Superaqueduct WTP.
- Program planning completed and with implementation plan ready.

According to PRASA's proposed implementation plan, annual savings to be obtained from this program are $8M in FY2012 and growing to $23M in FY2014. MPPR/Malcolm Pirnie has met with PRASA and its consultant and has reviewed the supporting assumptions for these projected savings. The majority of the potential savings from this initiative is through staff reductions at the automated facilities. Although the potential savings are reasonable, the achievement of these savings projections will depend on the successful and timely execution of the initiative.

### 4.8.4 Chemical Management and Procurement Program

As part of its logistics and purchasing controls initiative, PRASA has implemented a chemical management and procurement program which includes:

- Use of alternative products and process control changes.
- More training for employees for the correct use of chemicals.
- Closing and consolidation of smaller, less efficient facilities wherever/whenever possible.

In FY2007, PRASA initiated a procurement process to secure new chemical (polymers and coagulants) providers. Subsequently, PRASA commenced studies at select facilities, first performing jar test sampling and followed by a live trial with four selected companies. Three of these companies were deemed qualified. PRASA divided the implementation of this effort in three phases. Phase I is currently being implemented and include four WTPs located in the Metro Region. Phase II includes nine WTPs that represent the hydrological basins of 60 WTPs. Phase III includes nine additional WTPs that represent the hydrological basins of the remaining 60 WTPs. For the lasts two phases, RFPs are currently being prepared. Phases II and III are expected to be completed by the fourth quarter of FY2011. The Superaqueduct WTP and the facilities that operate with micro filtration process were not included in this program.

Additionally, PRASA is planning a chemical optimization program in 45 WTPs to control chemical use, and hence reduce O&M costs. The program initiated in FY2010. Based on the results of this program, PRASA's Compliance Department will increase the number of facilities to be addressed. Savings for FY2010 were approximately $2M. Costs related to this optimization program were included in PRASA's O&M budget.

### 4.8.5 Implementation of Advanced Technologies for the Reduction of NRW (PPP Project)

As reported in the 2009 CER, MPPR/Malcolm Pirnie performed an evaluation of PRASA's commercial services, which included its accounting and billing procedures. The results of such evaluation indicate that there is significant room for improvement regarding the performance of

PRASA's commercial services. This situation is negatively affecting PRASA's finances as a significant amount of revenue is unbilled and uncollected.

As a result of these findings, PRASA requested that MPPR/Malcolm Pirnie assess the feasibility of entering into Public-Private Partnerships (PPP) with one or more contractors to improve its meter reading infrastructure, and commercial practices and services as a whole. As part of this assessment, MPPR/Malcolm Pirnie researched what other utilities have done around the world as it relates to engaging the private sector in this operational scope. The main findings highlight that multiple utilities around the world have retained the services of private firms to help them reduce its volume of NRW and provide more effective commercial services.

PRASA's proposed project was selected by the PPP Authority as a potential project for a PPP and was included in the PPP Authority's inventory of projects. In FY2010, the Desirability and Convenience Study and the Request for Qualifications for PRASA's PPP Project were prepared and published by the PPP Authority.[13] The procurement process and contracting is planned to be completed in FY2012.

The anticipated impact on net cash flow to PRASA cannot be accurately estimated at this time as the project scope and payment terms are in development. However, MPPR/Malcolm Pirnie estimates that the potential annual net cash flow impact of these operational improvements, including potential benefits for additional service revenues, a reduced uncollectible rate and lower costs, could be in the range from $50M to $125M. The achievement of additional net revenue will depend on the scope and timing of the initiative.

### 4.8.6 Other Initiatives and Programs

PRASA completed the production meters project which consists of the installation of water meters at points of distribution in WTPs. Currently PRASA is successfully metering 80% of the water produced in its WTPs. Findings have shown that the metered volume is in line with the values PRASA estimated prior to project implementation. Therefore, the theory that a large part of its NRW was due to poor metering in WTPs and overestimation of water delivered was invalidated. PRASA is currently exploring alternatives to address its commercial activities shortcomings and is focusing on issues such as:

- Technology advancements (includes expansion of AMR pilot project and development of District Metered Areas).
- Reading and billing accuracy.
- Collections program.

[13] The *Public-Private Partnership Act* (the ACT) was approved on June 8, 2009. The Act created the PPP Authority as a public corporation of the Commonwealth affiliated to the Government Development Bank for Puerto Rico. Additional information related to Puerto Rico's PPP Program can be found on the PPP Authority's website http://www.p3.gov.pr.

- Expanding its customer base (includes incorporation of non-paying users).
- Overall customer satisfaction.

Additionally, Regions continue to explore, test, and implement other programs to help improve O&M of the facilities and the System, while at the same time reducing associated costs. For example, the five Regions have entered into agreements with the Department of Corrections and Rehabilitation of Puerto Rico to contract minimum security prisoners to perform grounds up-keeping and maintenance. In the five Regions, the continuous implementation and use of telemetry systems in the water storage tanks have helped reduce the number of tank overflows and improve the distribution system. Also, PRASA began collaborating with several municipalities for the replacement of asphalt after R&R works are performed: PRASA provides the asphalt and the municipality provides the personnel and executes the re-pavement.

## 4.9 Conclusions

PRASA's O&M practices are adequate. One recurring finding in the facility inspections is the need for facility-specific O&M plans or manuals for treatment plants. Also, there is an identified need of standardized process for prioritizing, scheduling, and executing preventive, corrective and routine maintenance activities.

Currently, PRASA's operational and cost metrics are generally unfavorable compared to the median values for utilities in the U.S., which is not a surprising result considering the size and complexity of the System; PRASA's high staffing levels, which translate into high payroll and benefits costs; and high electricity costs.

PRASA's staff has been significantly reduced in recent years and this has affected PRASA's meter reading performance metrics and effectiveness in addressing leaks and overflows. PRASA could benefit from a utility-wide organizational assessment to better identify areas with staffing needs and surpluses, respectively.

Finally, benchmark comparisons show that PRASA has areas that could be improved and that represent large opportunities with regards to the reduction of its NRW and increasing its billings and collections. PRASA continues to develop and implement operational initiatives with the ultimate goal of improving and optimizing its operations.

# 5 Capital Improvement Program and Regulatory Compliance Status

## 5.1 Introduction

PRASA is implementing a CIP to improve its water and wastewater infrastructure. The purpose of the CIP is to modernize PRASA's infrastructure, protect public health, safeguard environmental quality, permit continued economic development and help bring PRASA's infrastructure into compliance with all regulatory requirements.

The CIP is a dynamic program that is constantly evolving and undergoing revision as needs and funding are identified, and as projects transition from planning through design, construction and startup. PRASA's CIP has a comprehensive listing of projects and budgets through June 30, 2020. A total of 681 projects are scheduled for implementation between FY2010 and FY2020. As required by PRASA's Board, PRASA's Infrastructure Department must annually submit for it approval an updated five-year CIP plan. Given the magnitude of the CIP, it is understandable that it will continue to evolve over time and the number and budgets of projects is expected to be updated regularly.

As of June 30, 2010, PRASA's CIP includes $1.74 billion (B) in capital expenditures over fiscal years 2010 through 2015, of which approximately $299M correspond to capital expenditures incurred in FY2010. The remaining $1.44B is programmed capital expenditures for the FY2011 through FY2015 five-year CIP. In addition, PRASA has projected capital expenditures for FY2016 through FY2020 at $2.30B. The projects are divided into categories, groups and types. In addition, PRASA has implemented a prioritization system in order to better manage the CIP, given its size and complexity. The individual project cost estimates within the CIP, including the R&R program, have not been independently verified. This section of the report provides:

- an overview of PRASA's CIP (approved by PRASA's Board on March 2010[14]), including summary of the program by project category,
- an assessment of the adequacy of the CIP to address identified system deficiencies and current requirements stipulated in open consent decrees with regulatory agencies, and
- an overview of the potential effects of future regulations on PRASA's System and CIP.

## 5.2 CIP: Project Distribution and Costs

There are 681 projects currently included in the FY2010–FY2020 CIP, with 387 projects that commenced during or prior to FY2010, 195 projects to commence between FY2011 and FY2015,

[14] CIP version used: "PMC & Cash Flow 2009-2030 All Inclusive 02262010 JD V5"

and 99 projects to commence in FY2016 through FY2020. In addition, PRASA has 33 projects programmed beyond FY2020, and 48 projects that have not been associated to a specific fiscal year, for a total of 762 projects included in the CIP. Projects included in the CIP cover major capital improvements identified throughout all five Regions, as well as island-wide initiatives such as technological advancements, telemetry implementations, preventive maintenance, meter replacement, and R&R to the System.

The CIP is developed by PRASA taking into consideration a) current and future infrastructure and operational needs identified from system planning studies, and b) regulatory commitments as stipulated in consent decrees, administrative orders, and other agreements with regulatory agencies. Once the need for a capital improvement project is identified, a project creation form ("Formulario de Alta") is prepared. The form summarizes the project scope, preliminary schedule, and cost estimates, amongst other information. The project is then assigned a CIP project number and added to the CIP, where it is categorized and classified according to PRASA's classification and prioritization system. Periodically, the changes to the CIP are presented to PRASA's Board for their revision and approval.

Total CIP investments per project are calculated taking into consideration the following estimated costs:

- Planning, Studies, and Land Acquisition Costs
- Design Costs
- Construction Costs
- Project Management and Inspection Costs
- Contingencies
- Miscellaneous Cost (includes financing costs, insurance, O&M documents and administrative costs)

The project management and inspection costs are estimated to be 7.5% of the construction cost. Contingencies are estimated to be 10% of the construction cost. Project costs are inflated, on a compound basis, by 3.8% until the construction notice to proceed is executed. These percentages are considered reasonable, since they are based on historic data of completed projects. Also, throughout the development of the planning and design phases of the project, the contingencies are modified as the construction cost estimates are updated. Once the project goes out to bid and the bid is awarded, the amount calculated for contingencies is no longer updated and it remains as part of the assigned funds of the project until it is completed and closed-out. During the construction phase of the projects, contingencies are used to cover change order costs and other costs that may occur, such as additional land acquisition, permitting, or design activities. Through FY2010, PRASA reports that its rate of change order costs to total construction costs is approximately 6%.

PRASA's PMCs assist PRASA in the development, implementation, and evolution of the CIP. PMCs provide support to PRASA in the project development process and actively participate in the planning, design and construction phases. They also manage key tasks that drive CIP project budgets, such as defining project scopes, negotiating consultant contracts for studies and design services, and preparation of project construction cost estimates.

### 5.2.1 Project Classification and Prioritization

CIP projects are classified into mandatory or non-mandatory categories. Mandatory projects are those that are required by law, as stipulated in consent decrees, administrative orders, and agreements with regulatory agencies. There are five CIP categories, listed below in order of importance:

- Mandatory (USEPA, PRDOH, Civil Action, Administrative Orders)
- Non-Mandatory Compliance (Health and Safety)
- Non-Mandatory Quality, Efficiency, Reliability and Redundancy
- Non-Mandatory Growth
- Non-Mandatory Other

Projects are further classified into groups and types of projects, which include:

- Water System (water supply, water distribution, WTP capacity increase and improvements, new WTP, water pump stations, and WTP STSs)
- Wastewater System (wastewater collection, WWTP capacity increase and improvements, new WWTP, wastewater pump stations)
- Preventive Maintenance (includes water and wastewater project types)
- Planning (includes water and wastewater project types)
- Renewal and Replacement (includes water and wastewater project types)
- PAP Projects, or "Proyectos Apremiantes" (initiative implemented in 2004 to address immediate needs for water and wastewater projects)
- Technology (includes information technology project types)
- Meters
- Buildings
- Fleet

Table 5-1 summarizes the complete CIP project distribution by category and group.

**Table 5-1:**
**Number of Capital Projects by Category and Group**

| Category | Group | Number of Projects | | | |
|---|---|---|---|---|---|
| | | FY2010[1] | FY 2011-2015 | FY 2016-2020 | Total |
| Mandatory (Consent Decrees, Administrative Orders, Agreements) | Water System | 74 | 10 | 17 | 101 |
| | Wastewater System | 55 | 10 | 21 | 86 |
| | Preventive Maintenance | 5 | 0 | 0 | 5 |
| | Subtotal | 134 | 20 | 38 | 192 |
| Non-Mandatory Compliance | Water System | 21 | 11 | 2 | 34 |
| | Wastewater System | 70 | 36 | 14 | 120 |
| | Subtotal | 91 | 47 | 16 | 154 |
| Non-Mandatory Quality, Efficiency, Reliability, Redundancy | Water System | 67 | 60 | 14 | 141 |
| | Wastewater System | 17 | 17 | 3 | 37 |
| | Meter Replacement | 5 | 5 | 5 | 15 |
| | Buildings | 1 | 0 | 0 | 1 |
| | Fleet | 4 | 5 | 5 | 14 |
| | PAP Projects | 2 | 0 | 0 | 2 |
| | Planning | 5 | 1 | 0 | 6 |
| | Renewal and Replacement | 4 | 5 | 5 | 14 |
| | Technology | 13 | 0 | 0 | 13 |
| | Subtotal | 118 | 93 | 32 | 243 |
| Non-Mandatory Growth | Water System | 22 | 21 | 9 | 52 |
| | Wastewater System | 6 | 6 | 2 | 14 |
| | Subtotal | 28 | 27 | 11 | 66 |
| Non-Mandatory Other | Water System | 4 | 3 | 0 | 7 |
| | Wastewater System | 2 | 0 | 0 | 2 |
| | Buildings | 6 | 2 | 1 | 9 |
| | Planning | 1 | 0 | 0 | 1 |
| | Technology | 2 | 0 | 0 | 2 |
| | Subtotal | 15 | 5 | 1 | 21 |
| Non-Mandatory Unclassified | Water System | 0 | 1 | 1 | 2 |
| | Wastewater System | 1 | 2 | 0 | 3 |
| | Subtotal | 1 | 3 | 1 | 5 |
| | TOTAL | 387 | 195 | 99 | 681 |

(1) Projects were initiated during or prior to FY2010.

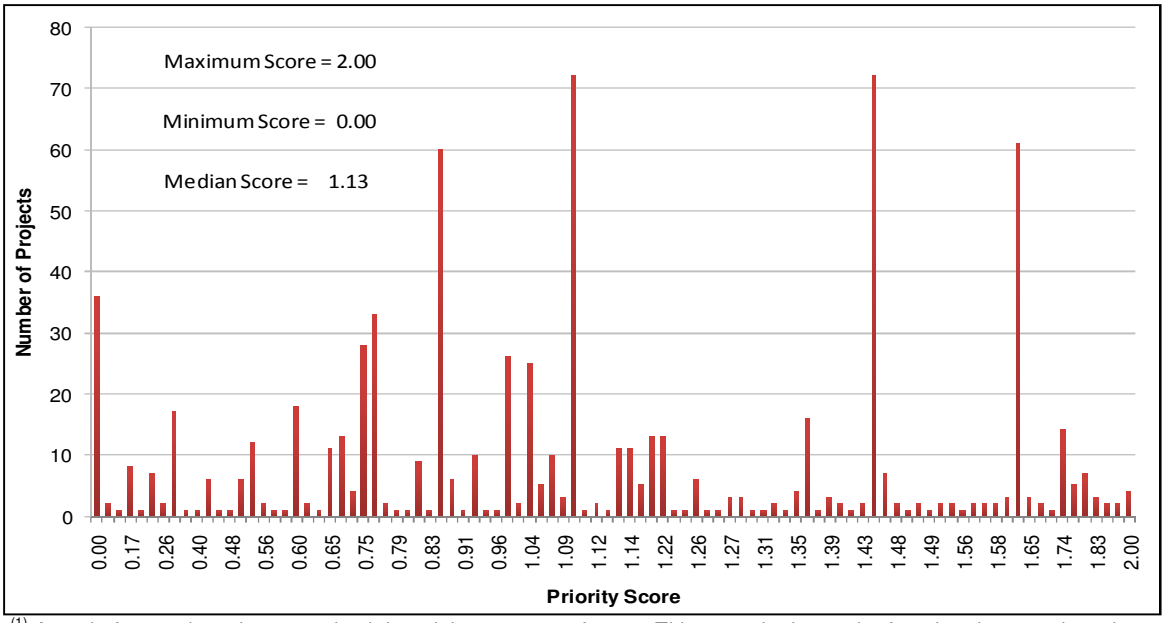
In addition to project classification, CIP projects are ranked according to a prioritization score. This score is the result of the weighted sum of the evaluation criteria adopted in PRASA's Master Plan. Categorizing and prioritizing projects gives PRASA the ability to maintain an organized and dynamic CIP. The criteria and associated weight of importance by which each project is evaluated are:

- Environmental Compliance (35% weight) – Satisfying local and federal environmental regulations, discharge limits, watershed protection, and sludge treatment and handling.

- Quality of Service (22% weight) – Service quality improvements, improvements to existing service areas, service continuity, WTP capacity expansion to meet demand, and treated water storage.
- Operational Efficiency (17% weight) – Reduction of operational costs and physical losses, plant improvements, and instrumentation.
- Reliability and Redundancy (13% weight) – Distribution redundancy to handle peak demand, emergencies and other transient events, raw water storage, transmission redundancy, electrical power redundancy, and intake improvements.
- System Growth (9% weight) – Wastewater service extension, WWTP expansions in to accommodate service extension, and inclusion of Non-PRASA water systems.
- PRASA Management Privilege (4% weight) – Used by PRASA's management to increase priority of a project and break ties, when necessary.

The maximum score a project can receive is two (High Priority), and the minimum is zero (Low Priority). As shown on Figure 5-1, most projects fall between the medium to high priority ranges. Figure 5-1 shows the score distribution throughout all 762 projects included in the CIP.

**Figure 5-1: Project Distribution by Prioritization Score[1]**




(1) A total of 36 projects have received the minimum score of zero. This score is due to the fact that these projects have not yet been classified by PRASA; the CIP table automatically assigns a "0" wherever no score has been assigned. None of the projects that have a "0" score are of highest priority to PRASA.

### 5.2.2 FY2010 CIP

PRASA incurred $299M of capital expenditures in FY2010, which included $144M for projects classified as mandatory. During FY2010, PRASA managed 387 capital projects that commenced during or prior to FY2010.

### 5.2.3 CIP Programming: FY2011-2015

The CIP budget for FY2011 through FY2015 is $1.44B and includes $502M for mandatory projects, as shown in Table 5-2. Figure 5-2 shows the total capital expenditures by category for FY2010 through FY2015. Table 5-3 includes the project distribution and capital expenditure by group and type classification for FY2010 through FY2015.

**Table 5-2:**
**Capital Improvement Program FY2010-2020 by Category ($, Millions)**

| Project Category | Fiscal Year Ending June 30, | | | | | | Total[1] | Total[1] |
|---|---|---|---|---|---|---|---|---|
| | 2010 (Actual) | 2011 | 2012 | 2013 | 2014 | 2015 | 2011-2015 | 2016-2020 |
| Mandatory (Consent Decrees, Administrative Orders, Agreements) | $144.3 | $141.3 | $123.1 | $66.3 | $69.8 | $102.0 | $502.4 | $1,060.1 |
| Non-Mandatory Compliance | $60.4 | $46.9 | $40.6 | $22.4 | $27.3 | $45.5 | $182.6 | $393.1 |
| Non-Mandatory Quality, Efficiency, Reliability & Redundancy | $80.9 | $145.8 | $184.0 | $103.9 | $92.2 | $109.9 | $635.9 | $696.4 |
| Non-Mandatory Growth | $5.4 | $16.0 | $21.9 | $10.2 | $9.6 | $23.4 | $81.1 | $124.9 |
| Non-Mandatory Other | $7.9 | $8.6 | $7.1 | $1.7 | $0.6 | $4.1 | $22.1 | $22.2 |
| Non-Mandatory Unclassified | $0.3 | $2.7 | $5.3 | $3.6 | $0.0 | $0.0 | $11.7 | $0.9 |
| **TOTAL** | **$299.2** | **$361.3** | **$382.0** | **$208.0** | **$199.5** | **$285.0** | **$1,435.7** | **$2,297.6** |

(1) Numbers may not add due to rounding.

**Figure 5-2: FY2010-FY2015 Total Capital Expenditures by Project Category ($, Millions)**

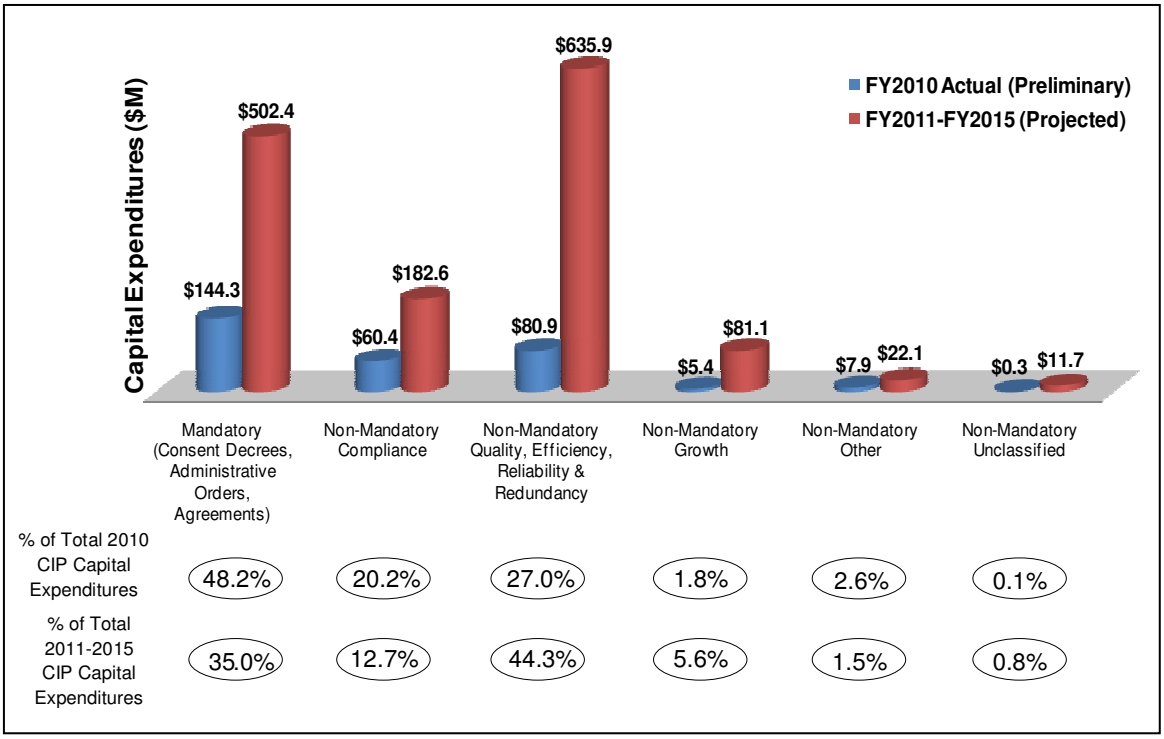


**Table 5-3:**
## Capital Improvement Program 2010-2020 by Project Type ($, Millions)

| Category Type[1] | Sub-Category | Fiscal Year | | | | | | Total[2] | Total[2] |
|---|---|---|---|---|---|---|---|---|---|
| | | 2010 (Actual) | 2011 | 2012 | 2013 | 2014 | 2015 | 2011-2015 | 2016-2020 |
| Water System | Water Supply | $0.8 | $4.0 | $7.6 | $10.3 | $11.7 | $10.2 | $43.8 | $230.5 |
| | Water Treatment Plant STS | $0.0 | $0.0 | $0.0 | $0.0 | $0.0 | $1.5 | $1.5 | $12.5 |
| | Water Pump Stations | $0.5 | $1.4 | $2.0 | $2.9 | $2.2 | $0.2 | $8.7 | $16.6 |
| | WTP Capacity Increase | $7.2 | $2.0 | $0.4 | $0.0 | $1.1 | $4.2 | $7.7 | $76.4 |
| | WTP Improvements | $14.2 | $25.1 | $38.7 | $20.0 | $15.8 | $20.8 | $120.4 | $135.0 |
| | WTP New | $25.7 | $30.4 | $26.1 | $3.5 | $10.6 | $18.6 | $89.2 | $58.9 |
| | Water Distribution | $33.8 | $45.2 | $37.7 | $9.4 | $5.6 | $23.1 | $121.0 | $178.4 |
| | SUBTOTAL | $82.3 | $108.0 | $112.4 | $46.2 | $47.0 | $78.7 | $392.3 | $708.2 |
| | | | | | | | | | |
| Wastewater System | Wastewater Pump Stations | $6.3 | $8.3 | $13.9 | $5.6 | $1.8 | $3.3 | $32.9 | $7.3 |
| | WWTP Capacity Increase | $31.6 | $13.4 | $7.4 | $11.9 | $31.7 | $57.9 | $122.2 | $280.2 |
| | WWTP Improvements | $4.6 | $7.3 | $8.1 | $4.4 | $2.7 | $5.5 | $28.1 | $93.1 |
| | WWTP New | $2.7 | $5.3 | $8.0 | $2.2 | $0.0 | $0.0 | $15.5 | $186.5 |
| | Wastewater Collection | $72.3 | $68.4 | $78.7 | $55.1 | $37.6 | $46.8 | $286.6 | $486.2 |
| | SUBTOTAL | $117.5 | $102.7 | $116.1 | $79.3 | $73.8 | $113.5 | $485.3 | $1,053.2 |
| | | | | | | | | | |
| Meters | Water Meters | $30.0 | $36.8 | $16.5 | $9.9 | $14.2 | $18.9 | $96.3 | $97.4 |
| Buildings | Buildings | $5.6 | $3.3 | $2.8 | $0.9 | $0.0 | $3.4 | $10.4 | $22.2 |
| Fleet | Fleet | $5.7 | $2.9 | $3.6 | $5.7 | $8.1 | $12.4 | $32.7 | $64.9 |
| Planning | Water & Wastewater | $6.7 | $42.2 | $87.1 | $14.0 | $0.0 | $0.0 | $143.3 | $0.0 |
| Preventive Maintenance | Water & Wastewater | $31.1 | $33.1 | $3.8 | $0.0 | $0.0 | $0.0 | $36.9 | $0.0 |
| Renewal and Replacement | Water & Wastewater | $9.4 | $30.1 | $38.5 | $51.7 | $56.4 | $58.0 | $234.8 | $351.7 |
| Technology | Water & Wastewater | $10.8 | $2.2 | $1.1 | $0.3 | $0.0 | $0.0 | $3.6 | $0.0 |
| | SUBTOTAL | $99.4 | $150.7 | $153.5 | $82.5 | $78.7 | $92.7 | $558.1 | $536.2 |
| TOTAL[2] | | $299.2 | $361.3 | $382.0 | $208.0 | $199.5 | $285.0 | $1,435.7 | $2,297.6 |

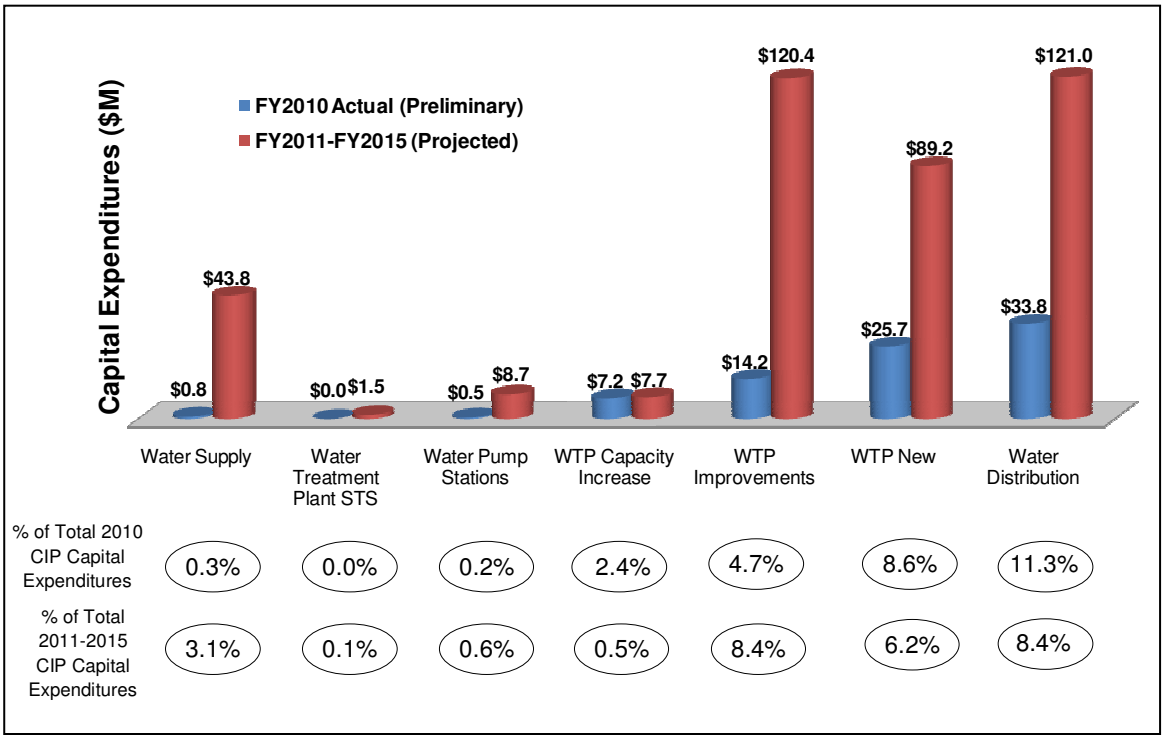
(1) Urgent projects (PAP) included in the 2008 and 2009 CERs were completed and no additional capital investments are planned under this project category type. PAP projects were developed as part of an initiative included in PRASA's CIP prior to FY2005. The PAP projects investments included in previous fiscal years were the remnants of that initiative.

(2) Numbers may not add due to rounding.

### 5.2.3.1 Water System Projects

The water system projects include projects to improve compliance, new WTPs, new reservoirs and upgrades to water distribution systems. Total capital expenditures in water system projects for FY2011–FY2015 are estimated at approximately $392M, of which approximately $213M is allocated for projects classified as mandatory. Figure 5-3 shows the FY2011–FY2015 CIP expenditures for water system projects, alongside the FY2010 expenditures.

**Figure 5-3: Water System Capital Expenditures by Project Type ($, Millions)**



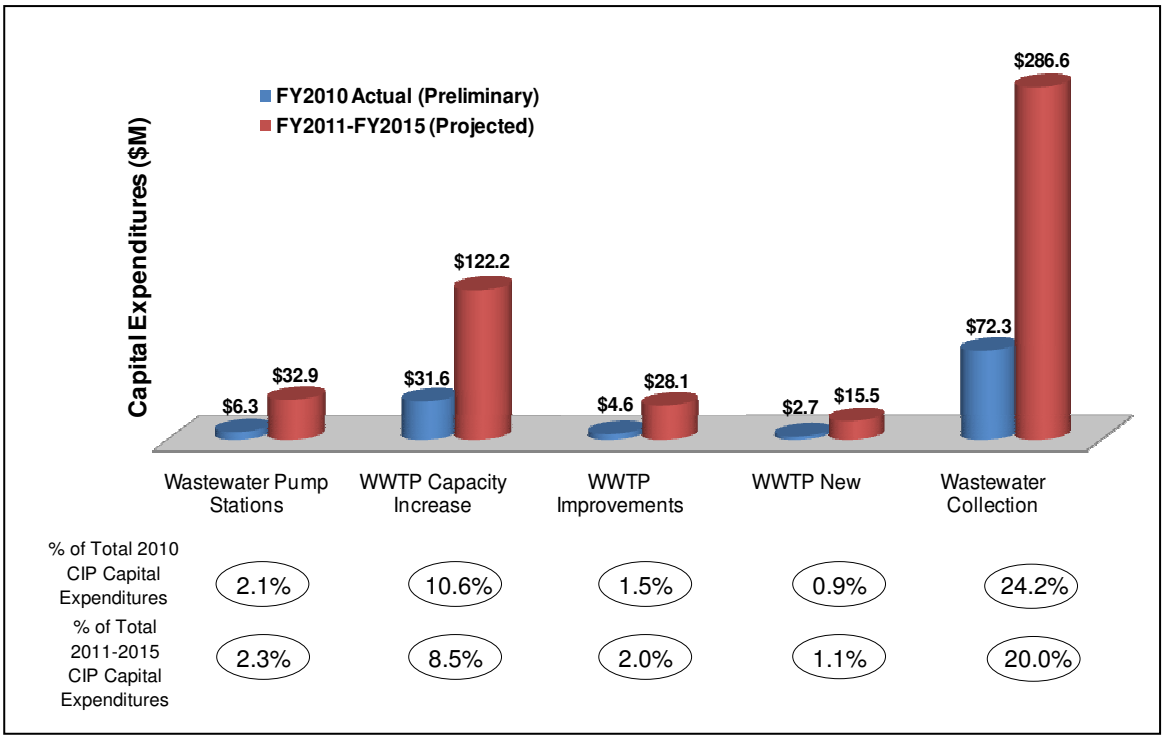

### 5.2.3.2 Wastewater System Projects

The wastewater system projects include projects to improve compliance, new WWTPs, and upgrades to wastewater collection systems. Total capital expenditures in wastewater system projects for FY2011–FY2015 are estimated at $485M, of which approximately $252M is allocated for projects classified as mandatory. Figure 5-4 shows the FY2011–FY2015 capital expenditures for wastewater system projects, alongside the FY2010 expenditures.

### 5.2.3.2 Wastewater System Projects

The wastewater system projects include projects to improve compliance, new WWTPs, and upgrades to wastewater collection systems. Total capital expenditures in wastewater system projects for FY2011–FY2015 are estimated at $485M, of which approximately $252M is allocated for projects classified as mandatory. Figure 5-4 shows the FY2011–FY2015 capital expenditures for wastewater system projects, alongside the FY2010 expenditures, and the percentage of the total System-wide capital expenditures each project type represents with respect to each period.

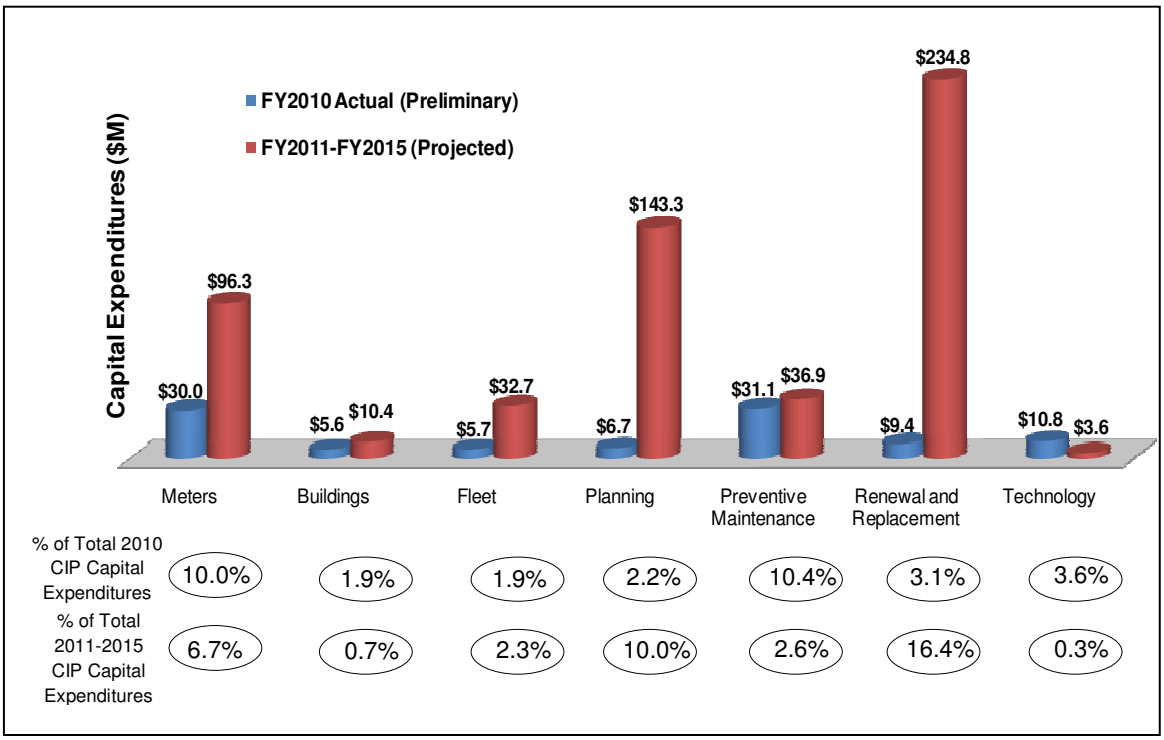
**Figure 5-4: Wastewater System Capital Expenditures by Project Type ($, Millions)**




### 5.2.3.3 Other Projects: Operational, Planning, Renovation and Technology

Total capital expenditures for all other capital projects are estimated at approximately $558M for FY2011–FY2015. These projects address preventive maintenance, planning, R&R, meter replacements, office and building improvements, fleet upgrades, and technology improvements. Figure 5-5 shows the FY2011–FY2015 projected capital expenditures for the above mentioned project categories. Preventive maintenance projects, which ensure the proper O&M of the plants and other critical facilities, are categorized as mandatory-driven, with an estimated FY2011–FY2015 capital expenditure of $37M. Also, within the R&R projects, although not formally categorized as mandatory, there are projects that are required by consent decrees.

**Figure 5-5: Other Projects Capital Expenditures by Project Type ($, Millions)**




### 5.2.4 CIP Programming: FY2016-2020 and Beyond

Of the total 762 projects included in the CIP, there are 99 projects programmed for development and implementation between FY2016 and FY2020. PRASA estimates capital expenditures for this period will be $2.30B. Mandatory-driven projects account for $1.06B of these capital expenditures. Beyond FY2020, PRASA currently has an additional 33 projects programmed for development and implementation on or after FY2020, of which a number are mandatory. Finally, there are 48 projects that have not been associated to a specific fiscal year.

## 5.3 Comparison of CIP with Regulatory Requirements

The CIP projects were compared with existing consent decrees and agreements that PRASA has entered into with regulating agencies in order to determine the adequacy of the identified projects in the CIP with regulatory requirements. These are:

1. PRASA II: 1995 Consent Decree, United States v. PRASA and Commonwealth of Puerto Rico, Civil Action No. 92-1511 (SEC) – Construction of eight STSs and compliance actions on potable water treatment facilities.
2. PRASA III: 2000 Consent Decree, United States v. PRASA, et al., Civil Action No. 00-2554 – Addresses alleged violations of the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

3. PRASA IV: 2003 Consent Decree, United States v. PRASA, Commonwealth of Puerto Rico, and Compañía de Aguas de Puerto Rico, Inc., Civil Action No. 01-1709 (JAF) – Addresses violations to the Section 301 and 402 of the CWA and regulations and PRASA's NPDES permits with regard to certain of PRASA's wastewater pump stations
4. 2006 Wastewater Consent Decree, United States v. PRASA and Commonwealth of Puerto Rico, Civil Action No. 06-1624 (SEC) – Addresses violations to the Section 301 and 402 of the CWA and regulations promulgated there under, and PRASA's NPDES permits with regard to PRASA's WWTPs.
5. Puerto Rico Department of Health 2007 Drinking Water Settlement Agreement Civil Action KPE 2006-0858[15]– Addresses non-compliance and alleged violations with the Puerto Rico Potable Water Purity Protection Law, as amended ("Ley para Proteger la Pureza de las Aguas Potables de Puerto Rico, Ley Num 5 de 21 de Julio de 1977, según enmendada"), the SDWA and applicable regulations, and the General Environmental Health Regulation ("Reglamento General de Salud Ambiental, Reglamento Núm. 6090 de 4 de febrero de 2000").
6. USEPA STS Consent Decree, United States v. PRASA and Commonwealth of Puerto Rico – Addresses alleged violations to the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA), specifically to the National Primary Drinking Water Regulations (NPDWRs).

The following sections provide a summary update of the compliance status for each regulatory enforcement action listed above. Such analysis includes compliance status and CIP adequacy in addressing compliance with the requirements.

### 5.3.1 PRASA II: 1995 Consent Decree, Civil Action No. 92-1511 (SEC)

Although the STSs required by PRASA II have been constructed, the STSs are not operating in compliance with their NPDES permit limits. Therefore, size and treatment process assessments should be made at the eight STSs that were constructed in order to determine the cause of the violations of NPDES final effluent limits and develop corrective measures, or determine the need for additional capital improvements to bring the STSs into compliance. These facilities have been included in the list of facilities to be addressed in the STS Consent Decree; as such, PRASA II has been closed.

### 5.3.2 PRASA III: 2000 Consent Decree, Civil Action No. 00-2554

Although the 23 STSs required by PRASA III have been constructed, 20 of the STSs are not operating in compliance with their NPDES permit limits. Therefore, size and treatment process assessments may be required at these 20 STSs in order to determine the cause of the violations of NPDES final effluent limits and develop corrective measures to bring the STSs into compliance. The Fajardo WTP ceased water distribution on September 22, 2008 and reported the last

[15] In 2008 CER and PRASA's Official Statement, it was referred to as 2006 Drinking Water Settlement Agreement. Year has been updated to reflect date Settlement Agreement was signed: March 15, 2007. Subsequently, the Settlement Agreement was amended on June 16, 2008.

discharge on October 28, 2008. This treatment plant was not included in the 20 STSs that are not in compliance with the NPDES permit limits. These facilities have been included in the list of facilities to be addressed in the STS Consent Decree; as such PRASA III has been closed.

### 5.3.3 PRASA IV: 2003 Consent Decree, Civil Action No. 01-1709 (JAF)

On June 2, 2010, PRASA submitted to the USEPA the Quarterly Compliance Report No. 21 that covers the period from January 1 to April 30, 2010. A summary of the requirements and status is included in Table 5-4. Under PRASA IV, 111 WWPSs were selected by PRASA and approved by the USEPA to undergo rehabilitation improvements. As of the date of the report, all 111 WWPS projects were completed.

Additional assessments of the WWPSs may be required to determine the cause of the unanticipated bypasses associated with the pump stations, and in turn reduce the frequency of violations for which PRASA self-assessed penalties. Additional capital improvements may be required to further reduce the frequency of bypasses at these facilities.

**Table 5-4:**
**PRASA IV Requirements and Compliance Progress Status**

| Requirement | Requirement Reference | Status |
|---|---|---|
| 1. Payment of a civil penalty in the amount of one million dollars ($1,000,000) to the United States. | Section V, Paragraph 8 | Civil penalty was paid on July 22, 2003. |
| 2. Submit a detailed list of remedial actions to be performed at the agreed upon pump stations (referred to as Group A in PRASA IV) and a proposed schedule for completion to the USEPA for approval. | Section VI, Paragraph 11 | On April 29, 2004 a final list of the Group A pump stations, comprised of 111 wastewater pump stations, was approved by the USEPA and remedial actions were to be completed in three terms ending on January 2005, November 2005 and November 2006; an extension was requested by PRASA as a result of the strike by its major union, pushing back the deadlines to May 2005, March 2006 and March 2007 respectively; all 111 wastewater pump station remedial action projects have been completed. |
| 3. Submit Operation and Maintenance Plan (OMP) to the USEPA for approval. | Section VII, Paragraph 12 | OMP was submitted in 2003 to the USEPA, which in turn evaluated it and submitted comments to PRASA; further modifications were discussed and approved by the USEPA in subsequent meetings; OMP is currently being implemented in a phased approach. Phase I (40 WWPS) was completed by December 31, 2008. Phase II (160 WWPS) was completed by December 31, 2009. Phase III (446 WWPS) is currently being implemented, and is expected to be completed by December 31, 2010. |

| Requirement | Requirement Reference | Status |
|---|---|---|
| 4. Submit to USEPA for approval a Spill Response and Cleanup Plan (SRCP) that specifies actions to be taken by PRASA for unanticipated bypasses from any pump station facility. | Section VIII, Paragraph 17 | The SRCP manual was submitted to the USEPA, which in turn evaluated it and submitted comments to PRASA; the SRCP was later approved, once it was translated to English. During the months of July through October 2007 and the summer of 2008, several SRCP refresher sessions were offered to approximately 150 PRASA employees of every level. These sessions covered all aspects of the utility's SRCP. PRASA has scheduled to update the SRCP during FY2011. |
| 5. Develop, fund, and implement projects to improve drinking water quality of selected non-PRASA systems that fail to comply with applicable local and federal regulations for public drinking water supplies as a Supplemental Environmental Project (SEP). | Section XIX and Appendix E | PRASA selected the El Chichón, Villa Blanca and Lajitas communities for implementation of the SEP. A scope of work was submitted on May 11, 2007 for evaluation and comments. The construction of these SEPs began during July 2007 and was completed in FY2010. The start-up of the system is pending for the disinfections of the pipelines and the distribution tanks, and the connection to the existing distribution pipelines, since the community does not want to be connected to the system. |

### 5.3.4 2006 Consent Decree, Civil Action No. 06-1624 (SEC) (or Mega Consent Decree)

On June 1, 2010, PRASA submitted to the USEPA the Quarterly Progress Report No.12, covering the period from March 1, 2010 through May 31, 2010. A summary of the requirements and status is included in Table 5-5. The 2006 Consent Decree specifies that PRASA shall implement system-wide remedial measures at all WWTPs owned/operated by PRASA. These remedial actions were identified for the selected facilities; and will be completed in three phases, consisting of short and mid-term remedial actions, and long term capital improvement projects. The long term projects, in turn, are divided into three terms varying by completion dates. Table 5-6 includes a breakdown of the projects by term and current status of remedial measures and CIP projects.

**Table 5-5:**
**2006 Consent Decree Requirements and Compliance Progress Status**

| Requirement | Requirement Reference | Status |
|---|---|---|
| 1. Progress report on probation and plea agreement special conditions and compliance with terms and conditions of the 2006 Consent Decree. | Civil Action | At present time, PRASA is in compliance with all terms and conditions of the 2006 Consent Decree. |

| Requirement | Requirement Reference | Status |
|---|---|---|
| 2. Implementation of system-wide remedial measures at WWTPs owned and/or operated by PRASA included in the 2006 Consent Decree appendices A, B, C, and D. | Section V, and Appendix A, B, C, and D | See Table 5-6 of this report: 2006 Consent Decree Remedial Measures and CIP Project Status Table. |
| 3. Comply with the respective interim limitations and monitoring asset forth for each of the WWTPs in Appendix E of the 2006 Consent Decree, as specified for that parameter in the respective NPDES permit for each facility, and submit results of each sample on the facility's Discharge Monitoring Report (DMR). | Section VI, Paragraph 11 and Appendix E | Effective June 1, 2006, the interim discharge limits are active in all PRASA WWTPs. PRASA is complying with the DMRs submittal of each of the facilities included in Appendix E of the Consent Decree, and exceedances are being notified to the USEPA. |
| 4. Develop and implement an Integrate Preventive Maintenance Program (IPMP). | Section VII | On October 31. 2007 PRASA's submitted to USEPA the IPMP and implementation schedule. This report was approved by PRASA on November 14, 2007. In the organizational structure, a training tool was developed to track employee's training history and compliance, and first training was performed on June 2010. The communication plan and integrated program were implemented in the 60 WWTPs. Periodic follow-up visits are performed in each facility to verify compliance with maintenance procedures. PRASA continues using SAP PM (Plant Management) in all the WWTPs. The equipment inventory was received and validated and is in process of being uploaded to SAP PM. In the Purchasing and Logistic Department, PRASA consolidated the five regional warehouses in two distribution warehouses. |
| 5. Submit for evaluation and approval, no later than October 1, 2006, a Spill Response and Cleanup Plan (SRCP) that specifies actions to be taken by PRASA for SSOs from all facilities owned and/or operated by PRASA. | Section VIII | The SRCP was approved by the USEPA on October 19, 2007. PRASA is working in several initiatives, in order to reduce the SSOs, this includes the creation of pretreatment programs, training for employees and the development of SOPs for the cleanup, response, mitigation and repair of sewage spills. Sewage personnel at PRASA developed SOPs for cleanup, response, mitigation and repair. Final revision was submitted on June 29, 2009 for USEPA revision and approval. |
| 6. Develop and implement a Sanitary Sewer System Evaluation Plan (SSEP1) and a Sanitary Sewer System Repair Plan | Section IX and Appendix H | A progress report was submitted for the implementation of these plans. The evaluation and repair is divided |

| Requirement | Requirement Reference | Status |
|---|---|---|
| (SSSRP1) for the Aguadilla, Bayamón, Isabela, Juncos, La Parguera, San Sebastian New, and Unibón Morovis facilities. | | in two phases; first phase will work with the seven most critical sanitary sewer systems and the second phase includes the remaining sanitary sewer systems. The first phase is currently under development. The Bayamón, La Parguera, Unibón, Juncos, and San Sebastian SSSEP1 were submitted on January 14, 2009 to the USEPA. Isabela and Aguadilla SSSEP1 were submitted on March 20, 2009. Unibón SSSRP1 was submitted to USEPA on May 1, 2009. Toa Alta SSSEP1 and SSSRP1 were submitted on April 29, 2009. Island-wide SSSEP1 was submitted on June 3, 2009. PRASA is in negotiations with USEPA, regarding the implementation of the repair plans. |
| 7. Monitoring and management of wastewater treatment capacities. | Section X | No changes to PRASA's sewer connections policy are proposed. Monthly average permitted flows of the facilities owned and/or operated by PRASA were submitted. On November 27, 2007, PRASA implemented ban on new sewer connections at the Bayamón RWWTP, also rehabilitated the Rabúa pump station, allowing the Bayamon RWWTP to comply with NPDES permit limit for flow parameter. Furthermore, on July 22, 2008 USEPA terminated the new sewer connections ban of the Patillas WWTP. |
| 8. PRASA shall pay $1,000,000 within 30 days of entry of the Consent Decree to the United States as a civil penalty. | Section XII, Paragraph 39 | PRASA complied and paid the civil penalty in compliance with the requirement of the Consent Decree on February 6, 2007. |
| 9. PRASA shall pay to the United States stipulated penalties for the violations listed in the 2006 Consent Decree for each wastewater treatment facility owned and/or operated by PRASA. | Section XIII | No stipulated penalty was assessed for failing to complete specified works for each facility. PRASA deposited the amount of $457,300 in an escrow account that covers stipulated penalties listed in the Consent Decree during the period of January to December 2009. |
| 10. Eligibility of removal and reincorporation of facilities from stipulated penalties provisions in the 2006 Consent Decree. | Section XIV and XV | No facilities were removed or reincorporated. |
| 11. Develop, fund, and implement a Supplemental Environmental Project (SEP). | Section 84(a) | An Escrow Account and deposits have been made as set forth in PRASA V. As of June 01, 2008, the |

| Requirement | Requirement Reference | Status |
|---|---|---|
| | | fourth and last deposit was completed. The Naranjito La Plata Community was selected by PRASA and approved by the USEPA on December 15, 2006. The scope of work (SOW) of the project was submitted to USEPA for evaluation and approval on June 2007, and was approved by USEPA on September 7, 2007. As of January 2009, the 30% design has been completed. The construction of this project is scheduled to be substantially completed by June 2013. PRASA is coordinating a meeting with USEPA to discuss the schedule and scope of work of this project. |

**Table 5-6:**
**2006 Consent Decree Remedial Measures and CIP Project Status**

| Term | Total Projects | Status |
|---|---|---|
| Short (6 months)[1] | 32 | All 32 remedial measures have been completed. |
| Mid (12-24 months)[1] | 49 | 27 measures have been completed and USEPA granted an extension for another one. The remaining measures are in progress. |
| CIP Long Term 1 ending June 1, 2008 (3) June 1, 2010 (4) June 1, 2011 (13) | 20 | Completed - 11 projects<br>Construction - 8 projects<br>Bidding - 0 projects<br>Design - 1 project |
| CIP Long Term 2 ending June 1, 2016 | 24 | Six projects are in the construction phase and one project has been completed. Remaining projects are currently in planning, study phases or being evaluated under PRASA's 2010 Master Plan. |
| CIP Long Term 3 ending June 1, 2021 | 19 | Design development completed for one project. Additionally, one project is in the construction phase. Remaining projects are scheduled to commence planning activities beyond FY2014. |

(1) It refers to implementation completion date, measured from the date of PRASA and USEPA entered into agreement in the 2006 Consent Decree.

The projects included in the CIP were reviewed to determine how adequately the CIP addresses the 2006 Consent Decree requirements. In summary:

- Short-Term measures have all been completed (see Table 5-6).
- Mid-Term measures are in progress as indicated in Table 5-6. All deadlines have been met to date.

- All 20 projects included in Long-Term 1 are on schedule to meet compliance with the 2006 Consent Decree requirements and currently have projects programmed in the five-year CIP. Eleven projects have been completed to date, ahead of schedule.
- All 24 Long-Term 2 projects have identified CIP projects within the 10 year CIP. However, not all project scopes have been finalized given that planning efforts for some of these projects are scheduled to commence between FY2011 and FY2012. This is reasonable since the 2006 Consent Decree requires they are placed in operation by June 1, 2016, which allows for enough time to complete the projects. PRASA classified these projects as mandatory; therefore, it is assumed that the projects scopes will be developed to comply with the 2006 Consent Decree.
- All 19 Long-Term 3 projects have CIP projects within the 10 year CIP program. However, not all project scopes have been finalized given that planning efforts for some of these projects are scheduled to commence between FY2014 and FY2018. This is reasonable since the 2006 Consent Decree requires they are placed in operation by June 1, 2021, which allows for enough time to complete the project. PRASA classified these projects as mandatory; therefore it is assumed that the projects scopes will be developed to comply with the 2006 Consent Decree.

Upon review of this information, the CIP adequately addresses the requirements of the 2006 Consent Decree. PRASA has indicated that project scopes will be defined to address the 2006 Consent Decree requirements, thus bringing these facilities into compliance. PRASA's compliance with the 2006 Consent Decree requirements during FY2010 and improved communication with the USEPA, re-affirm PRASA's commitment to its operational objectives. PRASA has set aggressive project completion schedules to meet compliance. Projects shall be advanced or postponed as funding is identified. It is PRASA's intention to implement all mandatory projects in a fast-track basis to reduce and minimize violations, improve the O&M and reliability of the system, and comply with the consent decree.

### 5.3.5 Puerto Rico Department of Health 2007 Settlement Agreement Civil Action KPE 2006-0858 (904)

In 2007, PRASA and the Government of Puerto Rico (Puerto Rico Department of Health, or PRDOH) entered into a Settlement Agreement Civil Action KPE 2006-0858 (PRDOH Agreement), which addresses a total of 132 potable water systems (including 112 WTPs).

PRASA must comply with the following requirements, in accordance with the PRDOH Agreement:

- Provide a Progress Report in a quarterly basis where a compliance statement of the decree is detailed.
- Develop and implement an operational and preventive maintenance program, currently in the development phase, which program shall include continuous monitoring programs for water

systems. The continuous monitoring program is to be implemented in three phases for the systems listed in the PRDOH Agreement.

- Comply with stipulated interim mitigation measurements and protocols (i.e. SOPs) for non-compliance systems, as well as preventive measures for intermittent non-compliance systems, for bacteriology, turbidity, nitrates, DBPs, and chemical contaminants.
- Provide and require operator, and supervisors, certification and training.
- Transaction penalty payment of $1,000,000.
- Quarterly penalty payments for Non-compliance.
- Comply with short, mid, and long term remedial measures within the stipulated completion dates, for the water systems addressed.

The PRDOH Agreement was filed on December 2006 and was signed by PRASA and PRDOH on March 15, 2007. Subsequently, on June 16, 2008, the PRDOH Agreement was amended replacing the original in its totality.

### Short-Term Measures

A list of 540 short-term remedial actions was identified to be completed within 12 months of PRASA and PRDOH entering into the PRDOH Agreement. These remedial actions with due date of December 31, 2008, that were pending for a final compliance determination, were evaluated and completed, as per a communication from the PRDOH dated June 23, 2009. Two additional remedial actions were established between PRASA and PRDOH in a meeting held on June 3, 2009. These remedial actions included the Ceiba Sur WTP and Jacanas 2 WPS. A deadline was set for December 2009 to complete both remedial actions. PRASA has indicated that the remedial actions for the Ceiba Sur WTP and the Jacanas 2 WPS were completed.

Most of the short-term actions are operational and/or compliance related, and includes monitoring and studies. The facilities that require capital improvement projects, were not addressed as individual CIP projects, but were addressed under PRASA's R&R program, managed by each Region, for which budgeting was included in the CIP.

### Mid-Term Measures

A total of 115 mid-term remedial actions were identified to be completed by March 14, 2010. Prior to the expiration date, PRASA requested to PRDOH a time extension for those projects that were scheduled to be completed after March 2010. The time extension was approved, with expiration dates of May 28, 2010 and December 1, 2010. The status of those projects is the following:

- A total of 82 remedial actions were completed in the stipulated period.

- Seven remedial actions that had expiration date of March 14, 2010 were completed after this date, resulting in penalties of $65,700, since no time extension was requested on time.
- For five remedial actions, a time extension was requested and the actions were completed before or within the time extension period, resulting in no penalties.
- The remaining 21 remedial actions are scheduled to be completed by December 1, 2010.

### Long-Term Measures

The long-term remedial actions are divided into three terms to be respectively completed in the scheduled time frames. Table 5-7 includes a breakdown of the projects by term and current status of remedial measures and CIP projects.

**Table 5-7:**
**PRDOH Agreement Remedial Measures and CIP Project Status**

| Term | Total Projects | Status |
|---|---|---|
| Term 1: 5 years or no later than December 15, 2011 | 38 | There are 38 projects, of which 28 require capital improvements, as per the PRDOH Agreement project scope description; the other 10 projects require operational and maintenance programs, equipment installation (i.e., valves, meters), evaluations, studies, etc. Three of the 28 projects that require capital improvements will be directly managed by the respective Regions and are to be funded by the renewal and replacement budget. The remaining 25 projects have identified CIP projects with scopes that comply with the requirements stipulated in the PRDOH Agreement. PRASA is currently on schedule with development and implementation of the projects. Eleven of these projects have been completed, and are currently in operation. |
| Term 2: 10 years or no later than December 15, 2016 | 18 | There are 18 projects, of which 17 require capital improvements, as per the PRDOH Agreement project scope description; the other project require operational and maintenance programs, equipment installation (i.e., valves, meters), evaluations, studies, etc. Five of the 17 projects that require capital improvements will be directly managed by the respective Regions and are to be funded by the renewal and replacement budget. The remaining 12 projects have identified CIP projects with scopes that comply with the requirements stipulated in the PRDOH Agreement. |
| Term 3: 15 years or no later than December 15, 2021 | 13 | There are 13 projects and all require capital improvements. All 13 projects have identified CIP projects that cover the requirements stipulated in the PRDOH Agreement. One of these projects was completed and is currently in operation |

Upon review of this information, the CIP adequately addresses the requirements of the PRDOH Agreement. PRASA has set aggressive project completion schedules to meet compliance. Projects will be advanced or postponed as funding is identified.

## Other Non-CIP Requirements

- Continuous Monitoring Program – PRASA has complied with the requirements addressed in the PRDOH Agreement, with the implementation of a continuous monitoring program in all WTPs. The program includes the installation of monitoring equipment for residual chlorine and turbidity. Phase I of the program establishes the implementation of the monitoring system for the facilities with a production greater or equal to 5 MGD and/or that serve more than 100,000 clients. The 11 facilities included in this phase were completed. Phase II establishes the implementation of the program in facilities with a production between 1 to 5 MGD and/or that serve to a population between 10,000 to 100,000 clients. The 52 facilities included in the phase were completed. On April 30, 2010 the validation process of Phase I and II was completed. Phases III establishes the implementation of the program in facilities with a production less than 1 MGD and/or that serves to less than 10,000 clients. This phase is in the process of being implemented: 37 of the 69 facilities included in this phase were already completed. The remaining facilities shall be completed and validated by March 15, 2011, and are on track to comply.

- Optimization Program – Comprehensive Technical Assistance (CTA) evaluations were performed in the 16 facilities included in the optimization program. PRASA is currently in the process of defining the action plans in the 16 facilities according to the requirement of the PRDOH Agreement.

- Integrated Preventive Maintenance Program – As stipulated by the PRDOH Agreement, PRASA is expanding its IPMP program with the purpose to operate and maintain the water systems. An integration pilot plan of 16 WTPs was completed during the first trimester of year 2010 and follow-up is being performed to this facilities. The Standard Operating Procedures (SOPs) are in development and implementation process as required by the Agreement.

- Interim Mitigation Measures – The PRDOH Agreement requires that a general interim measure of mitigation be performed to minimize any possible health risks from the non-compliant system while the remedial measures are being implemented. The mitigation measures are established for turbidity, bacteriology, disinfection byproducts, nitrates and other parameters. Compliance certifications, including the penalties, were delivered regarding these measures. Penalties have been paid entirely on a quarterly basis.

- Training Program and Operator's License – In accordance with the PRDOH Agreement, PRASA submitted to PRDOH a training plan for water system operators and supervisors. Table 5-7 summarizes the training program status as of June 30, 2010. All PRASA's WTPs are supervised or operated by licensed personnel.

**Table 5-8:**
**Status of Training Program**

| Training | Number of Employees to be Trained | Number of Employees Trained | Percent of Trained Employees |
|---|---|---|---|
| PRDOH Agreement (Managers) | 128 | 1139 | 889.8%[1] |
| PRDOH Agreement (Operators) | 667 | 316 | 47.4% |
| Federal and Local Drinking Water Regulations and Laws | 685 | 506 | 73.9% |
| WTPs Operation Practices | 620 | 285 | 45.9% |
| Preparatory Courses for Operator License Exam | 620 | 410 | 66.1% |
| Drainages SOPs | 133 | 133 | 100.0% |
| Wells Disinfection SOPs | 133 | 133 | 100.0% |
| Continue Monitoring Program | 702 | 507 | 72.2% |
| SOPs | 779 | 779 | 100.0% |
| Optimization | 620 | 126 | 20.3% |
| Problem Solution Techniques[2] | 611 | - | - |

(1) PRASA decided to include in this training additional employees that are not necessarily related to the Compliance Department.

(2) This training topic was included as part of the other training topics listed.

### 5.3.6 USEPA STS Consent Decree

PRASA negotiated with USEPA a new consent decree to address non-compliance with NPDES discharges of STSs in WTPs. This new consent decree, in turn, closes PRASA II and PRASA III Consent Decrees, consolidating all STS compliance projects and simplifying both PRASA's management and regulatory agency monitoring. This consent decree was approved in April 2010 and applies to all PRASAs WTPs and three unfiltered plants located at Naguabo, Lares and Las Marías.

PRASA must comply with the following requirements, in accordance with the STS Consent Decree:

- Remedial Measures at Water Treatment Plants – PRASA shall implement remedial measures to address washwater discharges at WTPs owned and operated by PRASA. These remedial measures will be completed in three phases, consisting in short-term remedial measures, mid-term remedial measures and long-term capital improvements

- Interim Effluent Limits – PRASA shall comply with the respective interim limitations set forth for each WTP included in Appendix F and G of the Consent Decree. For each pollutant for which an interim limit is established in Appendix F, PRASA shall monitor for compliance with the same measurement frequency and sample type as specified for that pollutant in the respective NPDES permit for each WTP and shall submit the results of each sample in the monthly Discharge Monitoring Report (DMRs) submitted for each WTP. For those plants without NPDES permit, listed in Appendix G, PRASA shall monitor the effluent as established in the Decree and submit the reports to USEPA in the Triannual Progress Reports.

- IPMP for WTPs – All WTP STSs under this consent decree shall be operated and maintained in accordance with the USEPA-approved IPMP.

- Sludge Treatment Capacity – The capacity of the existing STS shall be evaluated to determine: (1) whether the existing STS has the capacity to adequately treat the WTP washwater discharges to comply with the effluent limitations contained in the WTP's NPDES permit; and (2) to identify the actions PRASA must undertake to ensure that washwaters, are adequately treated including, but not limited to, the construction of additional facilities to adequately treat the sludge and achieve compliance with the respective NPDES permit.

- Training and Additional Requirements for Sludge Treatment Operators – By signing the consent decree PRASA certifies that is has trained its exiting STS operators in the monitoring, recording and reporting requirements of the individual NPDES permits as applicable to the WTPs.

- Alternate Power Units (APUs) for the STSs – PRASA shall provide for APUs for all its STS, except when PRASA informs to USEPA that such APU is not necessary because the respective WTP is not intended to be operational when normal power sources are interrupted, and it is determined by USEPA that it is not necessary.

- Additional Requirements Regarding Installation and Operation of Flow Meter Devices and High Level Indicators – PRASA shall install flow meter devices and high level indicators according to requirements and schedule set forth in the consent decree.

- SOPs for Filter Backwashing and the Washing of Process Treatment Units – PRASA shall have SOPs in place for the filter backwashing of process treatment units at all its WTPs.

- Establishment of a Process Control System – PRASA shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by PRASA to achieve compliance with the conditions of the NPDES permit.

- Monitoring, Records and Reporting Requirements – PRASA shall monitor and sample the washwater discharges from each STS. Such monitoring and sampling shall be completed for all of the effluent limitations established in the respective NPDES permit and for any interim limitations established herein, at the monitoring frequency and sample type specified in the NPDES permit or in the consent decree.

- Standardized Records – PRASA shall standardize all record keeping and reporting procedures for STSs at its WTPs.

- Solids Handling – Once an STS is constructed and operational, all sludge generated due to the STS operation shall be:

a. Disposed of in compliance with the applicable requirements established in 40 CFR Part 257.
b. Transported adequately in such a way that the sludge is not discharged to any water body or soil.

- Remedial Actions for Unfiltered Plants – PRASA shall construct and operate the Maizales WTP for the Cubuy Public Water System (PWS). The construction shall be completed no later than March 1, 2010. Operation of the Maizales WTP and distribution to the Cubuy PWS shall commence no later than March 25, 2010.

- Interim Measures for Unfiltered Plants – Until PRASA ceases to provide unfiltered water from the Cubuy PWS, PRASA shall comply with the interim measures set forth in the consent decree.

- New Plants – Any new PRASA WTP that begins operation after the date of lodging of the consent decree shall include an STS with sufficient capacity to manage washwater discharges and respective APUs.

- Civil Penalty – PRASA shall pay $1,024,427.00 as a civil penalty within thirty (30) days of enactment of the STS Consent Decree.

- Stipulated Penalties – PRASA shall be liable to pay to the U.S., automatically and without notice or demand (except where indicated otherwise), stipulated penalties in the amounts set forth in the STS Consent Decree for specific violations.

## 5.4 Future Regulations

The CIP was reviewed for adequacy to comply with future regulations that could impact compliance limits for PRASA's water and wastewater facilities. Although plant-specific changes to effluent permit limits may change from time to time, due to site-specific issues, there are no identified future regulations anticipated to require additional capital improvements to the WWTPs beyond those future effluent limits identified in the consent decrees. Anticipated future regulations for PWSs at the time of this report writing include:

- Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR).
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2 ESWTR).
- Groundwater Rule (GWR).
- Future contaminants of concern based on current scientific knowledge.

Likely concerns for PRASA pertaining to each regulation are discussed in the following subsections.

A final determination of the CIP adequacy for addressing compliance problems at PWSs cannot be made at this time based on the available compliance information at the time of the preparation of this report. However, there are 346 projects programmed over the next ten years that will address compliance issues for water and wastewater systems, of which 135 will address water system compliance issues, including WTPs. Of these, 116 are programmed for implementation by FY2015. It is expected that PRASA, along with its PMCs and other external consultants, will address any future, impending regulations when defining project scopes.

PWSs that are complying with current regulations may or may not be able to comply with future regulations. In general, PWSs will require both continual preventive and corrective maintenance of existing treatment facilities in order to comply with all regulations, both current and future. In all likelihood, the current programming and expected investments will be impacted by the effects of future regulations.

### 5.4.1 Stage 2 Disinfection and Disinfection Byproducts Rule

In January 2006, USEPA published the final Stage 2 DBP Rule. Stage 2 DBPR is one part of the Stage 2 Microbial and Disinfection Byproducts Rules (M-DBP). The Stage 2 M-DBP Rules are interrelated regulations that address risk from microbial pathogens and DBPs. The LT2 ESWTR, described later in this section, addresses microbial issues. Stage 2 M-DBP Rules are the final phases in the M-DBP rulemaking strategy affirmed by Congress as part of the 1996 Amendments to the SDWA.

The goal of the rule is to reduce cancer and reproductive and developmental health risks from DBPs in drinking water. The rule strengthens public health protection by strengthening total trihalomethane (TTHM) and haloacetic acid (HAA) compliance monitoring. The rule applies to all community water systems (CWSs) and non-transient water systems.

The largest difference between Stage 2 and the Stage 1 DBPR is that Stage 2 DBPR compliance will be determined by locational running annual averages (LRAA) for each sample point in the distribution system, rather than a running annual average (RAA) of all sample points for the whole system. To determine compliance, new distribution system monitoring points must be determined through approved sampling programs, or waivers. Sampling for Stage 2 begins on April 1, 2012 for large systems (>100,000 customers) through October 1, 2014 for very small systems (<10,000 customers).

#### 5.4.1.1 Likely Effects of Stage 2 DBPR on PRASA

Compliance data from records provided by PRASA for 2006 show that 34.1% of PWSs have DBPs greater than the 64 parts per billion (ppb) for TTHMs or 48 ppb for HAAs. While the maximum contaminant levels (MCLs) for TTHMs and HAAs are 80 ppb and 60 ppb respectively, 64 ppb and 48 ppb were used because they represent 80% of the MCL. As a general rule of thumb, if a PWS is within 80% of the MCL for DBPs, it is in danger of violating Stage 1 DBPR and should be considered as a likely violator of Stage 2 DBPR. This data suggests that 34% of the

PWSs are likely to be affected by Stage 2 DBPR. The following are the likely effects of the Stage 2 DBPR on some PRASA drinking water systems:

- Changes in the management of the distribution system to minimize residence times hence reduce the formation of DBPs.
- Movement of the point(s) of chlorine addition without compromising overall disinfection efficacy (additional disinfectants may be needed)
- Optimizing organics removal through the treatment process – through additional treatment or enhanced coagulation/softening measures
- Use of alternative disinfectants

It is important to note that these measures have varying degrees of costs. Some measures are not capital intensive, and the costs are mainly associated with administrative and operational changes, while others, such as new solids removal systems for sedimentation basins or expanded solids treatment systems for greater quantities of coagulants (to reduce organics), will require capital expenditures.

### 5.4.2 Long Term 2 Enhanced Surface Water Treatment Rule

The LT2 ESWTR was published in January 2006. The purpose of this rule is to improve public health protection through the control of microbial contaminants by focusing on systems with higher *Cryptosporidium* risk. In general, the rule requires all PWSs that use surface water or ground water under the direct influence of surface water to monitor their source water, calculate an average *Cryptosporidium* concentration, and use that data to determine if and the extent their source is vulnerable to *Cryptosporidium* contamination. Based on the results of the monitoring, the Rule may require systems to install additional treatment to specifically address *Cryptosporidium* occurrence.

A major provision of the rule requires that filtered and unfiltered systems conduct source water monitoring for *Cryptosporidium*. Filtered systems achieving 5.5 log (99.9993% removal) of treatment and unfiltered systems achieving at least 3 log (99.9% removal) of treatment for *Cryptosporidium* are not required to conduct source water monitoring. Systems that have previously collected *Cryptosporidium* monitoring data may be able to grandfather their historical data if they meet certain requirements.

Based on the results of the monitoring data, systems will be classified into one of four bins that will determine how much additional treatment will be required to provide the desired level of microbial protection. Depending on the bin assignment, systems will require either no additional treatment or up to 3 log (99.9% removal) additional *Cryptosporidium* removal. Treatment options will be selected from the "microbial toolbox" – a list of approved alternatives that provide assigned levels of Cryptosporidium inactivation credit.

Uncovered finished water reservoirs either must be covered or have their discharges treated to achieve inactivation and/or removal of at least 4-log for viruses, 3-log for Giardia, and 2-log for *Cryptosporidium*.

Compliance schedules are based on population served. Systems must comply with additional treatment requirements as follows:

- >100,000 customers by March 31, 2012.
- > 50,000 to 99,999 customers by September 30, 2012.
- > 10,000 to 49,999 customers by September 30, 2013.
- < 10,000 customers by September 30, 2014.

#### 5.4.2.1 Likely Effects of LT2 ESWTR on PRASA

Efforts to prepare this report revealed that 15% of WTPs (a total of 19 out of 127) have experienced turbidity violations from January to December 2009. In comparison to the 2009 CER, a decrease in this percent from 24% to 15% was observed. Plants struggling to meet turbidity compliance will certainly continue to struggle under the more stringent LT2 requirements for *Cryptosporidium*. If any of the struggling plants have significant occurrences of *Cryptosporidium* (which must be determined by required monitoring), they will most likely require additional removal of pathogens and more stringent treatment. In all likelihood, plants struggling with turbidity removal will require capital projects to continue to meet more stringent regulations. Some PRASA projects that are currently under development or are being implemented include provisions to comply with this future regulation, including projects at Hatillo-Camuy, Sanamuerto and Enrique Ortega WTPs. Moreover, PRASA has established policy for new WTPs to be designed for an effluent turbidity level of 0.1 NTU although the current regulatory limit is 0.3 NTU.

Once the results of source water monitoring have been tabulated for each WTP, and Bin Classifications (level of additional treatment required) made, this can be used to determine the appropriate compliance strategy for each WTP. Plants will complete this source monitoring between 2009 and 2012.

### 5.4.3 Ground Water Rule

The purpose of the GWR, published November 8, 2006, is to provide increased protection against microbial pathogens in PWSs that use ground water sources. All PWSs that serve ground water, including those that blend with surface water, must comply with the rule. The GWR includes the following requirements:

- Sanitary surveys are required for all ground water systems. The initial sanitary survey for each Community Water System (CWS) must be conducted by December 31, 2012 and for

non-community water systems by December 31, 2014. Surveys must be repeated depending on system size and treatment capabilities.

- Triggered Source Water Monitoring is required for systems that have total coliform-positive samples in the distribution system and do not treat to at least 4-log inactivation/removal of viruses prior to the first customer.

PRDOH can make exceptions to triggered source water monitoring if it determines the routine Total Coliform Rule sample contamination was caused by a deficiency in the distribution system.

- Source Water Assessment Monitoring may be required by PRDOH. Samples positive for fecal indicators will require public notification.
- Hydrogeologic Assessments may be conducted by PRDOH to determine if sources are sensitive to contamination. Systems are required to provide any existing information that may facilitate PRDOH's assessment.
- Corrective Action is required if a system has a significant deficiency, as identified by PRDOH, or detects a fecal indicator in source water samples.

Water systems must report the completion of the corrective action, failure to meet disinfection or treatment performance, and exceptions to triggered source water monitoring.

#### 5.4.3.1 Likely Effects of the GWR on PRASA

The GWR has two primary requirements: completing sanitary surveys and triggered source water monitoring. Because systems will not be completing their own surveys, PRASA will need to work closely with PRDOH and provide it with all the necessary information to complete the sanitary surveys. The rule also requires source water monitoring. It is important to note that the rule gives PRDOH many enforcement options. Hence, PRASA and PRDOH can work together to determine how to implement the rule.

### 5.4.4 Future Contaminants of Concern

The Safe Water Drinking Act requires the USEPA to conduct research into the occurrence and health effects of new and emerging contaminants. The following identifies contaminants that may be regulated in the future:

- **Endocrine Disrupting Compounds.** A rapidly increasing number of man-made chemicals, or their breakdown products, are known to be capable of interfering with the human endocrine system. Such chemicals are called endocrine disrupting compounds (EDCs). Implicated chemicals include industrial chemicals such as PCBs, as well as a wide variety of pesticides, including herbicides, fungicides, nematocides, and insecticides. Potential health effects of exposure to EDCs include adverse reproductive outcomes, birth defects, breast cancer, developmental disabilities, endometriosis, thyroid problems and testicular cancer.

- **Pharmaceuticals and Personal Care Products.** Pharmaceuticals and personal care products (PPCPs) refers to a very diverse collection of thousands of chemical substances, including prescription and over-the-counter drugs (e.g., aspirin and antibiotics), fragrances, cosmetics, sun-screen agents, diagnostic agents, nutraceuticals, biopharmaceuticals, and many others. The PPCP residues in treated wastewater effluent (or run off or directly discharged raw sewage) can then enter the environment. PPCPs are considered emerging contaminants because detection of the chemicals in the environment has occurred over the last 10 years.
- **NDMA.** N-nitrosodimethylamine (NDMA) occurrence in drinking water may result from industrial groundwater contamination (rocket fuel), from the chlorination of cationic polymers, from the use of ion exchange resins, and as a chloramination byproduct. NDMA has also been found in wastewater influent from industrial sources (carbamate users, etc.) and is formed during the chlorination of secondary effluent at WWTPs.
- **Chromium (VI).** Chromium (VI) may cause cancer in laboratory animals but the evidence of carcinogenicity via ingestion is not compelling. Total chromium (sum of Cr(III) and Cr(VI)) is regulated by USEPA with an MCL of 0.1 mg/L, but no specific limit has been set for Cr(VI). The National Toxicology Program has been conducting toxicity studies on Cr(VI) and this data will be used for future regulation development.
- **Perchlorate.** Perchlorate is both a naturally occurring and man-made chemical that originates in the environment from the solid salts of ammonium, potassium, or sodium perchlorate. Perchlorate has been used as a rocket fuel propellant and has been found in numerous drinking water sources. Perchlorate has an adverse effect on the thyroid gland and body metabolism and can persist for many decades under typical groundwater and surface water conditions because of its resistance to react with other available constituents.
- **Algal Toxins.** In the last decade, harmful algae and their toxins have continued to threaten public and natural resources health and to impact local economies. From a public health standpoint, four human illnesses are associated with toxic algal blooms and consumption of toxin-contaminated shellfish in the U.S.: paralytic, neurotoxic, amnesic, and diarrheic shellfish poisoning.

#### 5.4.4.1 Likely Effects of the Future Contaminants on PRASA

Based on available information, no determinations could be made to determine the likely impact on PRASA due to potential regulations from candidate future contaminants. Treatment for emerging contaminants varies greatly depending upon the nature of the contaminant. However, several of the above contaminants require advanced treatment technologies to be used as effective measures for mitigation. Some of the possible technologies available are:

- Carbon – Granular Activated Carbon has been shown to be an effective barrier for naturally occurring organic matter in some cases as well as has adsorptive capacity to remove certain pharmaceuticals and endocrine disruptors.

- NF/RO – In order to remove the most persistent contaminants, high pressure filtration methods are necessary to mitigate contamination. This comes at a high cost to the public utility.
- UV – Ultraviolet radiation is being used throughout the industry to address concerns with DBP formation and cryptosporidium inactivation. Evidence suggests that UV radiation may play a role in helping to address some emerging contaminates as well.
- AOP – Advanced Oxidation Processes can be used with or without UV radiation to aggressively treat total organic carbon (TOC) and initial evidence suggests AOP may be used to treat some contaminates of concern.

## 5.5 Identified CIP Needs

As a result of the condition assessment and CIP review completed by MPPR/Malcolm Pirnie for the 2009 CER, additional capital project needs beyond those already included in the CIP were identified for plant facilities. Also, MPPR/Malcolm Pirnie prepared conceptual cost estimates (total investment) of the potential costs associated with the implementation of these projects. Tables 5-9 provides a summary of the status and actions undertaken by PRASA related to the CIP needs indicated in the 2009 CER. As shown in Table 5-9, facilities with CIP needs related to STS projects have been included in PRASA's STS Consent Decree and will be addressed through the CIP or R&R program. The remaining facilities included in Table 5-9 have a CIP or an R&R project already identified for improvements. No additional CIP needs at plant facilities were identified for this CER.

MPPR/Malcolm Pirnie also identified additional budgetary needs for PRASA's ancillary facilities (i.e. wells, tanks and pump stations) estimated based on the following assumptions:

1. Assumed facilities with unacceptable or poor ratings under the Equipment/Maintenance category require an upgrade.
2. Assumed the same percentage of ancillary facilities used in 2009 CER with unacceptable or poor ratings applies to both inspected and non-inspected assets.
3. Assumed $10,000 per well facility, $15,000 per tank facility[16] and $25,000 per pump station facilities as the budgetary estimates for the complete cost of the required improvements.

Table 5-10 provides an updated estimated number of potential ancillary facilities that could require additional improvements, and a summary of the status and actions undertaken by PRASA related to the recommendations included in the 2009 CER. Number values for locations that could require improvements have been updated to reflect the most recent condition assessment

[16] Value updated from 2009 CER to better reflect estimated costs of improvements at water storage tank facilities.

inspection results, described in detail in Section 4. These identified additional budgetary needs are not in addition to those recommended in the 2009 CER.

While many of these improvements could be addressed out of the existing R&R budget within the CIP, the comparison of condition ratings between the past two inspections has indicated that the R&R budget in the CIP is adequate only to maintain status quo and not make substantial progress towards the improvements needed for these assets. PRASA should evaluate the historical breakdown of its R&R budget and re-evaluate its budget moving forward to assure proper condition of the assets for reliable operation and to preserve their value.

The implementation period for the improvements listed in Table 5-10 is recommended to be three years; however, considering the negotiated implementation schedules of the consent decrees and agreements with regulatory agencies and given that PRASA is in the process of finalizing its updated Master Plan, it is expected that these recommended needs will be further analyzed by PRASA and ultimately prioritized and scheduled utilizing the methodology prescribed in the Master Plan. Nevertheless, PRASA has expressed that it is committed to further investigating its facility needs and addressing these as part of its CIP and R&R program.

Buried infrastructure was not inspected as part of the preparation of this CER; however PRASA's operational metrics for occurrence and duration of leaks and overflows and its current NRW levels indicate a growing need for increased budgeting for assessment and rehabilitation of its water distribution and wastewater collection systems. The CIP budgets for these systems may be insufficient and should, therefore, be analyzed in detail.

**Table 5-9:**
## Additional CIP Needs at Plant Facilities

| Facility | Identified Need | Status / Actions |
|---|---|---|
| Rocha WTP | Construction of a sludge treatment system (STS). | Facility has been included in the STS Consent Decree. Rocha WTP will be eliminated. |
| Ceiba Sur | Superpulsator rehabilitation; can be used as pre-settlers. | PRASA has rehabilitated the superpulsator and has reduced the solids loading to the filters. |
| Caguas Norte WTP | Rehabilitation of the STS, new emergency generator unit, rehabilitation of two of the six filter units, one additional pump for the raw water pump station for redundancy, one additional pump for transfer water to the filters. | PRASA began planning efforts for improvements at the Caguas Norte WTP in February of 2010. Construction is projected to commence in January of 2011 and completed by December of 2012. Total project investment is estimated at $6.5M. |
| Canóvanas WTP | Rehabilitation of the STS, filter rehabilitation, roof of drying beds and emergency generator at raw water pump station. | Facility has been included in the STS Consent Decree. The following improvements are programmed: Install cover (roof) over sludge drying beds; If necessary replace drying beds floor tiles and gates. Will be funded through the R&R program. |
| Cidra WTP | Controls and telemetry system. Safety issues for old WTP. | PRASA has noted these recommendations and will address through Plant Automation Program. |
| Quebrada Honda WTP | Provide redundancy to the microfiltration system, new emergency generator. | PRASA has noted these recommendations and will analyze as part of its planning efforts. |
| Tanamá WTP | Construction of a STS. | Project has been included in the STS Consent Decree. Tanamá WTP will be eliminated. |
| Villalba WTP | Construction of a STS. | Project has been included in the STS Consent Decree. A new STS system will be constructed. |
| Guajataca WTP | Rehabilitation of a STS. | Facility has been included in STS Consent. The following improvements are programmed: Construction and/or rehabilitation of sampling point or south chamber, installation and/or reparation of flow meter, installation and/or reparation of flow meter, high level indicators, and/or dechlorinator. |
| Ponce Vieja WTP | Compliance improvements to meet the TOC removal, CFE turbidity, THM and HAA parameters. | PRASA has noted these recommendations and will analyze as part of its planning efforts. |
| Aguas Buenas WWTP | Package plant rehabilitation. | PRASA has noted these recommendations and will analyze as part of its planning efforts. |

**Table 5-10:**
## Additional Budgetary Needs at Ancillary Facilities

| Facility | Identified Need | Estimated Investment Cost (updated) | Status / Actions |
|---|---|---|---|
| Wells | Various improvements at 38 locations[1] | $0.4M | PRASA is currently in the process of reviewing all inspection forms for the facilities inspected in 2009 and 2010. PRASA's planning team will, in turn, develop an action plan to address improvement needs at its ancillary facilities through its R&R program. |
| Water Pump Stations | Various improvements at 153 locations[1] | $3.8M | PRASA is currently in the process of reviewing all inspection forms for the facilities inspected in 2009 and 2010. PRASA's planning team will, in turn, develop an action plan to address improvement needs at its ancillary facilities through its R&R program. |
| Water Storage Tanks | Various improvements at 793 locations[1] | $11.9M | PRASA is currently in the process of reviewing all inspection forms for the facilities inspected in 2009 and 2010. PRASA's planning team will, in turn, develop an action plan to address improvement needs at its ancillary facilities through its R&R program. |
| Wastewater Pump Stations | Various improvements at 98 locations[1] | $2.5M | PRASA is currently in the process of reviewing all inspection forms for the facilities inspected in 2009 and 2010. PRASA's planning team will, in turn, develop an action plan to address improvement needs at its ancillary facilities through its R&R program. |
| | **Total** | **$18.6M[2]** | |

(1) Estimated number of locations that could require additional improvements has varied from those recommended in 2009 CER based on the inspection results presented in this CER and in accordance with the assumptions described in this section.
(2) Value increased as a result in the increase of PRASA's total assets, described in Section 3.

## 5.6 Master Plan Updating

In 2003, while PRASA was still operated and managed by a private contractor, PRASA develop a water and wastewater Master Plan for the period of 2002–2027. At the time, it was recommended that PRASA's Master Plan be revised and updated every five years. As most of the construction related to the first phase of PRASA's extensive CIP was completed during FY2010 and with its Master Plan update analysis overdue, PRASA is looking to continue with the related planning activities in order to address its current and future infrastructure needs. In February 2009, MPPR/Malcolm Pirnie was contracted to aid PRASA in the preparation of an updated Water and Wastewater Infrastructure Master Plan for the period of 2010–2030. The 2010–2030 Master Plan will allow PRASA to review in detail and update the existing CIP, and it will provide a clear roadmap for the implementation of its future investments in water and wastewater infrastructure over the next 20 years.

The main objective of the 2010–2030 Master Plan is to execute a comprehensive analysis of PRASA's major infrastructure needs and develop a list of projects and actions that addresses such needs in the form of an updated CIP that optimizes the use of PRASA's resources and ensures financial feasibility. The major needs being addressed in the 2010–2030 Master Plan include:

- **Environmental Compliance and Protection:** to protect the sustainability of the water supply and disposal resources and comply with the environmental requirements and commitments (USEPA, PRDOH, etc.) to ascertain this protection.

- **Reliability of Service:** to provide plans to improve water and wastewater services to existing areas with inadequate service, and explore alternatives to extend PRASA's service network (i.e., conversion of non-PRASA water systems).

- **Service Area Expansion:** to ensure that all necessary infrastructures to address forecasted future growth for all client types (residential, commercial, industrial and governmental) is planned for the relevant service areas.

- **Economic Sustainability:** to provide an updated CIP spending plan and schedule that will allow the implementation of the recommended list of projects and actions for a horizon of twenty years (until year 2030).

- **Non-Revenue Water:** to integrate the insights and recommendations of the NRWRP with the Master Plan analysis and its resulting list of projects.

The Master Plan development was divided into seven tasks that are described as follows:

- Task 1 – Master Plan Work Plan Development: Development of the work plan that will serve as a detailed guide to follow during the execution of the Master Plan. The work plan will determine specific details such as: sources of information, guidelines, standards, design

criteria, analysis and procedures, and a detailed schedule of activities. This task was completed and delivered to PRASA in July 2009.

- Task 2 – Service Area Assessment: The objective of this task is to define all water and wastewater client service areas, as well as assessing the existing condition of the PRASA water and wastewater systems. This task was completed and delivered to PRASA in September 2009.

- Task 3 – Identification of Service Area Infrastructure Needs: The objective of this task is to identify current and future needs for each service area. This task was completed and delivered to PRASA in February 2010. Assuming that no water loss control measures are implemented, it was estimated that by year 2030, if the CIP is not implemented properly and/or new infrastructure projects are not developed to supply the water demand, PRASA could have an island-wide water production deficit at average and maximum daily demand of approximately 88 MGD and 286 MGD, respectively. However, if water loss control measures are implemented, PRASA could have an island-wide water production surplus of 5 MGD at average daily demand and a deficit of 160 MGD at maximum daily demand.

- Task 4 – Service Area Project Development: During this task feasible solutions to the needs identified in Task 3 were evaluated. Based on the proposed solutions, projects will be developed under a subsequent task. This task was completed and delivered to PRASA in July 2010. It was estimated that PRASA will need a capital investment of approximately $3.9B over the next 20 years, to supply the water deficit at maximum daily demand by year 2030 assuming water loss control measures are implemented.

- Task 5 – CIP Development: The objective of this task is to facilitate and provide PRASA with a comprehensive list of capital improvement projects to be implemented over the next 20 years. This task is currently under development.

- Task 6 – Master Plan Report Preparation: This task will document the findings, conclusions, and recommendations of the previous tasks. It is scheduled to begin once Task 5 is completed.

- Task 7 – CIP Planner and Modeling Application: MPPR/MPI will develop a custom CIP modeling application that will allow PRASA to work with different scenarios for its proposed CIP in the future. It is scheduled to begin once Task 5 is completed.

The 2010–2030 Master Plan will be completed during FY2011.

## 5.7 Conclusions

With the possible exception of buried infrastructure improvements as noted above, PRASA's CIP addresses the general needs of the System and complies with PRASA's commitments with

regulatory agencies. The CIP includes projects that cover a broad array of current and future needs, as identified by PRASA and as required by consent decrees. The CIP includes funding for R&R projects and the IPMP, both essential to maintaining and preserving the utility assets. Additional capital project needs beyond those already included in the CIP are listed in Table 5-8. The operational metrics of leaks and overflows and the current NRW levels indicates that the budget for buried infrastructure may be insufficient. Therefore, PRASA should analyze its budget in detail to determine additional buried infrastructure budgetary needs.

PRASA's classification and prioritization process allows for an organized and systematic management of the CIP. Projects are not only classified by category, group and type, but are also ranked according to a prioritization score which allows PRASA to easily identify priority projects as the CIP evolves. By categorizing and prioritizing the projects in the CIP, PRASA is able to keep track of mandatory-driven projects versus the non-mandatory, and make adjustments as projects move from planning through start-up. Periodic revisions to PRASA's Master Plan also give PRASA the opportunity to validate the CIP and guide future changes to the CIP to meet PRASA's needs. Based on the CIP evaluation, PRASA has an adequate CIP implementation program.

PRASA will need to perform additional assessments and implement operational changes or additional capital improvements to bring non-compliant facilities, which include WTPs, WWTPs, STSs, amongst others, into compliance. Review of PRASA's CIP showed that all of the WTPs and WWTPs that were considered unacceptable in terms of compliance currently have CIP projects identified to either rehabilitate or close the facility, thus addressing existing compliance problems. Furthermore, PRASA's FY2010 record of compliance with the 2006 Consent Decree and PRDOH Agreement requirements and the noticeable transformation in communications with regulatory agencies (i.e. USEPA and PRDOH) further supports PRASA's ongoing commitment to bring its System into compliance. PRASA recently entered into a new STS Consent Decree with USEPA to address STS compliance issues in WTPs.

The full impact of future regulations on the water treatment and supply system are not known at this time. In some cases, future regulations are expected to require minor process changes and in other cases major capital improvements, such as construction of new treatment processes. In general, the existing CIP does not include projects intended solely to address future regulations. However, PRASA is implementing some improvement projects with consideration for compliance with LT2 ESWTR. To further assist with compliance of future regulations, PRASA has established a policy for new WTPs to be designed for an effluent turbidity level of 0.1 NTU although the current regulatory limit is 0.3 NTU. Presently, regulatory agencies, PRASA's PMCs, and other consultants actively participate in the project planning and design phases, providing support to PRASA in the project development process, overseeing compliance with consent decrees, and searching for innovative solutions to comply with current, and when applicable, future regulations. As the impact of future regulations becomes more defined, could be possible

to assign specifics budgets to those needs and perform CIP modifications to adequately accommodate the resulting needs.

PRASA expects to have an updated 20-year Water and Wastewater Infrastructure Master Plan by the end of FY2011. The 2010–2030 Master Plan will allow PRASA to review in detail and update the existing CIP, and it will provide a clear roadmap for the implementation of its future investments in water and wastewater infrastructure over the next 20 years. CIP needs identified through the CER effort will be addressed and incorporated in PRASA's 2010–2030 Master Plan.

# 6 Insurance Program

## 6.1 Introduction

Section 7.08 of the MAT establishes that "[PRASA] shall employ an Insurance Consultant to review the insurance program of the Authority from time to time (but not less frequently than biennially). If the insurance Consultant makes recommendations for the increase of any coverage PRASA shall increase or cause to be increased such coverage in accordance with such recommendations, subject to a good faith determination of PRASA that such recommendations in whole or in part are in its best interest."

MPPR/Malcolm Pirnie issued an RFP for insurance consulting services to address said requirement and AON Risk Services of Puerto Rico, Inc. (AON) was selected to review PRASA's current insurance coverage and determine its adequacy considering the type and value of PRASA's fixed assets. AON also provided a professional opinion on the appropriateness of such coverage and recommendations related to PRASA's insurance coverage, as detailed in the following sections. AON has submitted to MPPR/Malcolm Pirnie an update to its 2009 report which summarizes its findings, opinion and recommendations of PRASA's insurance program as of June 30, 2010. In turn, MPPR/Malcolm Pirnie has submitted this report to PRASA. The data, opinions, and comments included in this section have been extracted from AON's 2010 report. All references to specific insurance policies not defined in detail in this section shall take the meaning included in PRASA's insurance policies and detailed in AON's report.

## 6.2 Risk Management

Risk is exposure to loss. It is the chance of something happening that will lead to a loss or an undesirable outcome and it is measured in terms of consequences and likelihood. Risk management is an effective process that is directed towards management of risks and hazards in order to produce a desired set of results.

The treatment of risk takes the following forms:

- Loss Control:
  - Elimination or reduction of risk by physical, technical or mechanical means, loss prevention techniques, loss prevention engineering.
- Contractual transfer:
  - Hold harmless agreements, indemnity agreements in contracts with suppliers, contractors, service providers, customer agreements.
- Transfer of risk through insurance:
  - Self-insurance.

- Insurance policies and coverage available from insurance companies.
- Insurance products/programs available from government (FEMA) and State (Commonwealth of Puerto Rico) (Workers' Compensation, Health/Medical).

### 6.2.1 PRASA Insurance Department

The risk management function is an integral part of the management function. Within PRASA, risk identification and treatment is performed by all departments at all levels in conformity with local and federal regulations (including OSHA regulations). Risk management is applied through the employment of independent engineering and consulting firms in planning, design and construction and in the implementation of excellence in practices and processes. Furthermore, new construction is carried out in accordance with applicable building codes and regulations. In FY2010 PRASA's full time Insurance and Risk Manager retired. The Executive Director of Finance currently oversees PRASA's Insurance Department.

### 6.2.2 Identification of Risk

The risks affecting PRASA can be broadly categorized as follows:

1. Risks to property, facilities, and physical assets from natural and human element causes.
2. Financial risks arising from damage to, or loss of, physical assets, such as loss of income, interruption of operations and an increase in operating expenses to continue operations.
3. Theft of owned and non-owned property- theft of water production.
4. Liability risks, including suits from third parties for injury or loss of property, fines/penalties, injuries caused by vehicles or properties, advertising injury, liable slander, false arrest/detainment and injuries occurring on premises.
5. Pollution liability claims and fines.
6. Public authority/errors and omissions liability, which is liability arising from financial loss incurred by other that does not result in physical injury to persons or property.
7. Reputation Risk which includes incidents, events or human actions which seriously damage the image and reputation of the organization.
8. Epidemic or pandemic that causes wide-spread injury or sickness to PRASA employees.
9. Kidnap, ransom, extortion risks.

## 6.3 Assessment of Insurance Program

This section of the report provides AON's summary and recommendations with respect to PRASA's insurance policies currently in force.

### 6.3.1 Property Insurance

PRASA's property is insured by a policy issued by Chartis Insurance Company (Chartis). Two other insurance companies and the "London Market" are shown on the Chartis policy as "subscribers." This means they have agreed to bear a portion of each loss.

Coverage is written on an "all risks" basis. The policy insures real and business personal property, impounded water, dams, and underground piping. Coverage is included for the Superaqueduct. Except for flood and earthquake, the property policy provides a $150M limit in excess of a $25M retention and in excess of other specific policy deductibles. A $100M business income sublimit and a $50M extra expense sublimit are included in the $150M limit. The combined flood and earthquake limit is $300M per occurrence, with no aggregate limit.

Contingent business income coverage is also included, subject to a sublimit of $35M. This provides coverage for the additional cost PRASA might incur should it be necessary to purchase chemicals and other supplies from alternative sources should a primary supplier or a major PRASA customer suffer property damage of the type covered by PRASA's policy.

Flood and earthquake deductibles are the sum of the $25M retention and a $3M flood deductible and a 5% earthquake deductible. The earthquake deductible is subject to a $7.5M maximum plus the $25M retention. The $25M retention does not apply to boiler and machinery or electronic data processing losses.

#### 6.3.1.1 Recommendations

The following recommendations were made by AON regarding PRASA's property insurance policy:

1. **Review the property limit and complete a Probable Maximum Loss (PML) Study.** There are two facilities which, based on the 2006 End Book Value computations provided by MPPR/Malcolm Pirnie, have a replacement cost of over $200M each. These are the Toa Vaca Dam ($203.6M) and the Puerto Nuevo WWTP ($206.8M).

   The property values for the Toa Vaca Dam and the Puerto Nuevo WWTP plant listed above are not current and may or may not reflect the maximum potential loss that could arise from a single event, such as a flood or earthquake.

   PRASA indicates to have reported property values to insurers of $10.9B for the current policy period. To identify PRASA's potential exposure, a PML study was recommended in AON's 2008 report. PRASA has indicated that a PML study was concluded on June 2010.

2. **Consider revising the flood definition.** The flood definition says "Flood is defined as a rising and overflowing of a body of water onto normally dry land." This definition could be interpreted to limit flood coverage for a WWTP facility where the treatment ponds are not normally dry land. In the event of a large flood loss to such a facility, an insurer could argue

the damage was not caused by a flood as defined in the policy. To avoid potential claim disputes, AON recommends eliminating the phrase "normally dry" and revising the flood definition to apply to the rush of water flowing over and/or onto land.

3. **Consider terrorism coverage on renewal.** Endorsement 6 excludes war and terrorism loss. Dams represent a potential terrorism target, especially if there is a potential for severe property damage or injury below a dam that would generate media attention. PRASA should consider obtaining terrorism coverage on renewal.

### 6.3.2 Crime

PRASA maintains a crime policy providing the coverage and limits shown in Table 6-1. Coverage is provided by Chartis.

**Table 6-1:**
**Crime Policy Coverages and Limits**

| Coverage | Limit | Deductible |
|---|---|---|
| Employee Dishonesty | $1 million | $10,000 |
| Loss Inside Premises | $500,000 | $10,000 |
| Loss Outside Premises | $500,000 | $10,000 |
| Counterfeit currency and Money Orders | $500,000 | $10,000 |
| Depositors Forgery | $500,000 | $10,000 |
| Computer Fraud and Funds Transfer Fraud | $500,000 | $10,000 |
| Incoming Check Forgery | $500,000 | $10,000 |
| ERISA Extension | $500,000 | $0 |
| Policy Aggregate | $1 million | Not Applicable |
| Extortion Threats to Persons | $100,000 | $10,000 |

#### 6.3.2.1 Recommendations

The following recommendation was made by AON regarding PRASA's crime policy:

1. **Consider eliminating the exclusion for the Treasurer.** Exclusion D, d in the Public Employee Dishonesty Coverage form excludes loss caused by a treasurer. AON recommends that PRASA ask Chartis to remove this exclusion. Many insurers will remove this exclusion at no or little cost.

### 6.3.3 General Liability

PRASA maintains commercial general liability coverage through Triple S Propiedad, Inc. (Triple S) with the limits shown in Table 6-2. Aggregate limits have been amended to apply per location or per project. A $100,000 deductible applies to each occurrence.

**Table 6-2:**
**General Liability Coverages and Limits**

| Coverage | Limit |
|---|---|
| General Liability – Per Occurrence | $1 million |
| General Liability – General Aggregate | $2 million |
| Personal and Advertising Injury | $1 million |
| Products/ Completed Operations | $2 million |
| Employer's Stop-Gap | $1 million |
| Employee Benefit Liability | $1 million |

#### 6.3.3.1 Recommendations

The following recommendation was made by AON regarding PRASA's general liability policy:

1. **Obtain watercraft liability insurance.** PRASA has indicated that it owns a few boats, which are used from time to time in its operations. PRASA's general liability policy excludes liability arising from the use of owned watercraft. To cover this exposure, AON recommends that PRASA purchase watercraft liability or protection and indemnity insurance.

   PRASA's umbrella policy also excludes owned watercraft over 26 feet in length. Thus, it will cover liability claims arising out of boats 26 feet and under, but coverage is subject to a $1M self-insured retention.

### 6.3.4 Automobile Liability

PRASA maintains automobile liability coverage through Triple S for:

- Any automobile with a $1M per accident limit.
- Garage liability coverage for any automobile with a $1M per accident limit and a $3M aggregate limit for garage operations.

A $2 million limit covers physical damage to owned automobiles for any one event caused by fire, lightning, windstorm, earthquake, hail or flood, subject to a $50,000 deductible.

Subject to deductibles of $250 for comprehensive coverage and $500 for collision, garage keeper's legal liability is provided at a $1M limit per location for non-owned automobiles in the insured's care. Trailer interchange coverage is also provided for non-owned trailers, subject to limits of $35,000 for tank and refrigerated trailers, $20,000 for non-refrigerated and van units, and $15,000 for other trailers.

### 6.3.5 Umbrella and Excess Liability

PRASA maintains a primary umbrella policy which provides a $20M limit excess of the primary general, automobile and employer's liability policies. The umbrella is otherwise subject to a $1M

self-insured retention (SIR) for bodily injury, property damage and personal and advertising injury losses not covered by the primary insurance. Coverage is provided through Triple S.

PRASA also maintains an excess liability policy providing a $40M limit in excess of the $20M umbrella limit described in the preceding paragraph. Coverage is also provided through Triple S.

#### 6.3.5.1 Recommendations

The following recommendation was made by AON regarding PRASA's umbrella and excess liability policy:

1. **Complete review of the downstream liability exposure for PRASA's dams.** The failure of a PRASA dam could potentially cause a very large liability loss, especially if there are residential communities located below a dam. The question of PRASA's exposure to liability from destruction of a dam was raised during the interviews. PRASA indicated that it is in the process of assessing this exposure.

### 6.3.6 Directors and Officers Liability

PRASA maintains one primary and two excess layers of directors & officers (D&O) liability insurance. The D&O carriers and limits are shown in Table 6-3.

**Table 6-3:**
**Directors and Officers Liability**

| Insurer | Limit |
|---|---|
| XL Specialty Ins. Co. (Primary) | $10 million |
| ACE Ins. Co. (First Layer) | $10 million excess of $10 million |
| American International Ins. Co. of Puerto Rico (Second Layer) | $10 million excess of $20 million |
| Total D&O Limit | $30 million |

The primary layer of D&O insurance is subject to a $100,000 retention for claims against indemnified persons or a claim against PRASA alleging a breach of duty involving securities issued by PRASA.

### 6.3.7 Employment Practices Liability

PRASA maintains primary and excess employment practices liability (EPL) policies providing total limits of $10M in the aggregate annually for employee claims alleging wrongful termination, discrimination, sexual harassment, retaliation or other violation of an employee's civil rights. A $100,000 retention applies to each claim. Primary coverage is provided through ACE Insurance Company (ACE). Excess EPL coverage is through Liberty Mutual Insurance Company.

### 6.3.8 Professional Liability

PRASA maintains a primary professional liability policy through ACE and an excess professional liability policy through Universal Insurance Company (Universal). Together these policies

provide a $25M per claim limit and a $50M annual aggregate limit, subject to a $250,000 per claim deductible. Claims and defense costs are both included within the limits and serve to reduce the deductible.

Both policies are written on a claims-made basis covering claims made during the policy period if the occurrence giving rise to the claim occurred after the policy's September 21, 2004 retroactive date. Coverage applies to professional construction management services, contract management and administration, design, engineering, consulting, and inspection and testing services.

#### 6.3.8.1 Recommendations

The following recommendations were made by AON regarding PRASA's ACE professional liability policy:

1. **Try to Amend Professional Exclusion Z.** Exclusion Z in Endorsement EO-0002, excludes loss "alleging, based upon, arising out of, or attributable to the Insured's ownership, rental, leasing, operation, maintenance, use or repair of any real or personal property, including property damage to owned, occupied, rented or leased by or to the Insured." This exclusion might be interpreted to exclude injury or damage caused by an error or omission in a repair or renovation designed by PRASA.

   If, for example, PRASA prepares engineering designs for repairing a PRASA owned dam and the dam later collapsed due to a design error, this exclusion could be alleged to exclude resulting injury or damage. AON recommends removing the reference to "repair" in the exclusion, and clarifying that the exclusion does not apply to any design work performed by or on behalf of PRASA.

2. **Request deletion of exclusion DD, Mechanical Electrical Failure.** Exclusion DD in Endorsement EO-0002, excludes loss "based on or arising out of any mechanical or electrical failure, breakdown or defect of any hardware." For example, this exclusion can be interpreted to exclude injury and damage resulting from the failure of equipment specified by PRASA in its designs for a pumping station. If the pumping station failure resulted in a back surge of sewage or water, it could injure persons or property. If the failure resulted in a lack of water needed to attack an uncontrolled fire, again the resulting injury or damage could be alleged to arise from a PRASA's design error. PRASA should request the deletion of this exclusion.

### 6.3.9 Pollution Legal Liability

PRASA maintains a pollution legal liability policy through Liberty Mutual Insurance Company (Liberty) providing per occurrence limits and deductibles shown in Table 6-4. The policy applies a $10M annual aggregate limit to all coverage.

The policy is written on a claims-made basis and covers claims made during the policy term if the occurrence giving rise to the claim occurred after the policy's July 1, 2002 retroactive date. The policy specifically excludes sewage back up events.

**Table 6-4:**
**Pollution Legal Liability Limits and Deductibles**

| Coverage | Per Occurrence Limit | Deductible |
|---|---|---|
| Pollution Clean Up at or Arising from Scheduled Sites | $5 million | $250,000 |
| Bodily Injury and Property Damage | $5 million | $250,000 |
| Bodily Injury, Property Damage and Pollution Clean Up from Cargo Transported by Automobile | $5 million | $50,000 |
| Bodily Injury, Property Damage and Clean Up at Specified Non-Owned Disposal Sites | $5 million | $250,000 |

#### 6.3.9.1 Recommendations

The following recommendations were made by AON regarding PRASA's pollution legal liability policy:

1. **Confirm there is no need for pollution clean-up for overseas shipments.** PRASA's pollution liability policy includes coverage for clean-up of pollutants spilled from a covered auto and covers obligations to clean up pollution at scheduled sites in which pollutants are disposed.

   The disposal sites scheduled in PRASA's policy include three sites on the U. S. mainland (Cycle Chem, Inc in New Jersey; Ensco Inc in Arizona; and Trans Cycle Industries in Alabama) and one site in Puerto Rico (BFI Industrial Landfill in Ponce). PRASA's pollution liability policy does not cover pollution clean-up at sea. PRASA has advised us it makes no off-island shipments of pollutants. If this situation changes, PRASA should consider obtaining pollution coverage for any ocean transit it might undertake.

2. **Consider adding underground storage tank coverage.** At the time of AON's review and interviews with PRASA personnel, PRASA was unable to confirm if it has underground storage tanks (USTs) used to store pollutants (such as fuel, chemicals or waste) in any of its facilities. PRASA's commercial general liability policy has a Total Pollution Exclusion Endorsement which excludes all pollution liability claims, including the USTs.

   The pollution policy excludes loss arising from an "Underground Storage Tank System," which is defined broadly as a tank or tanks operated by the insured at a location designated on the policy which has at least ten percent of its volume beneath the surface of the ground. Technically, this excludes pollution liability coverage for any tank if the tank meets the above definition, no matter what the tank may contain, unless the UST coverage endorsement has

been added to the pollution policy. The UST endorsement is not on the current pollution policy. If PRASA identifies a UST pollution exposure, PRASA should consider adding UST coverage to insure bodily injury, property damage and clean up arising from an underground storage tank leak.

### 6.3.10 Cyber Liability

PRASA does not currently purchase cyber liability insurance. PRASA has indicated that the website allows for on-line customer payment of water and sewer bills. To the extent customer account information and customer payment information is maintained by PRASA's computer system, such customer information is potentially at risk if an accomplished computer hacker were able to access customer's personal information.

#### 6.3.10.1 Recommendations

The following recommendation was made by AON regarding PRASA's cyber liability policy:

1. **Consider cyber liability coverage.** PRASA should consider cyber liability coverage to insure liability arising from potential allegations such as PRASA failed to adequately secure customer data and the associated identification theft costs needed to repair customer credit.

### 6.3.11 Heliport Liability

PRASA owns and maintains a helipad on the roof of its main building. PRASA has indicated that the helipad is rarely or never used. If there is a potential for emergency use of the helipad, or possible future use, AON recommends that PRASA obtain liability coverage for this exposure. Coverage is now excluded from other liability policies.

### 6.3.12 Business Travel and Accident

PRASA maintains travel and accident insurance on its personnel while traveling on business. Life Insurance Company of North America is the insurer. Coverage is provided at a limit of $500,000 per incident and $2M in the aggregate annually.

## 6.4 Owner Controlled Insurance Program

PRASA maintains an Owner Controlled Insurance Program (OCIP) for its multi-year CIP. In addition to covering PRASA, the OCIP is designed to insure enrolled contractors, subcontractors and design professionals working on the CIP. The OCIP is not open to suppliers, site security firms, vendors, truck and delivery personnel or other parties which are not directly involved in construction.

The OCIP program provides builder's risk, general liability, umbrella and excess liability, and pollution liability insurance. Each of these coverages is discussed below.

### 6.4.1 Builder's Risk

PRASA maintains a builder's risk policy as part of its OCIP program. Chartis is the insurer. Coverage applies to all risks of direct physical loss, except as excluded by the policy. Coverage applies to scheduled projects under $50M in contract value. The policy provides a $100M per occurrence and annual aggregate limit, including the perils of flood and earthquake, and subject to various sub limits which are detailed in AON's report.

The All Other Perils deductible is $20,000. There are additional deductibles for some losses, which range from $100,000 to $250,000, with percentage deductibles of 2% for flood and named windstorm, and 5% for earthquake. All percentage deductibles are subject to a minimum deductible of $100,000.

#### 6.4.1.1 Recommendations

The following recommendations were made by AON regarding PRASA's OCIP builder's risk policy:

1. **Define Existing Surrounding Property.** A deductible of $250,000 applies with respect to "Existing Surrounding Property". While the term is capitalized, indicating it is a defined term, the policy does not include a definition.

2. **Consider revising the flood definition.** The flood definition describes flood, in part, as "A general and temporary condition of complete inundation of normally dry land areas..." The reference to "normally dry land areas" could be interpreted to exclude damage to holding or treatment ponds or similar property located in a water treatment facility, as those facilities are not a normally dry land areas. PRASA should request that the definition eliminate the word "dry" and simply refer to the inundation of land areas.

3. **Consider amending Endorsement 1 to include coverage for wet works**. AON understands that PRASA's OCIP operations will include some wet work. Endorsement 1, age 20 of the builder's risk policy lists "Wet Works" among the "Excluded Works". To cover wet works associated with the OCIP operations, AON recommends that PRASA ask Chartis to amend the endorsement to cover wet works.

4. **Amend Endorsement number 1 to include coverage for underground works.** Underground works are already listed in the base policy, in the Excluded Property section, item I. This section says the exclusion does not apply to works in laying pipelines and constructing of underground sewer collector systems.

5. **Endorsement 1 (page 20) adds all underground works to the list of "Excluded Works."** PRASA should consider removing "underground works" from this list on page 20 so coverage is provided for laying pipelines and construction of underground sewer collector systems.

6. **Consider amending exclusion R.** Exclusions R, 1 and R, 2 exclude any loss based on the failure of the internet or any software. If security camera systems do use the internet or specialized software to view activity at OCIP sites, PRASA should consider amending this exclusion to cover property loss arising from a system failure.

### 6.4.2 General Liability

The OCIP general liability policy is provided by ACE and includes the limits shown in Table 6-5.

**Table 6-5:**
**OCIP General Liability Coverages and Limits**

| Coverage | Limit |
|---|---|
| General Liability – Per Occurrence | $2 million |
| General liability – General Aggregate | $4 million |
| Personal and Advertising Injury | $2 million |
| Products/ Completed Operations - Aggregate | $4 million |

The OCIP general liability policy is renewable annually each February 1 during the project period stated in the policy. This project period stated in the policy is February 1, 2010 to February 1, 2013. The $4M products/completed operations aggregate applies for each annual policy period during the three year project period and for each of five years beyond the end of the project period (i.e., through February 1, 2018). The policy includes a deductible endorsement, but does not specify the deductible amount in the endorsement or in the policy declarations.

#### 6.4.2.1 Recommendations

The following recommendation was made by AON regarding PRASA's OCIP general liability policy:

1. **Delete the deductible endorsement.** A deductible endorsement (Form CG 03 00 01 96) is attached to the policy and says if the deductible schedule in the endorsement is blank, the information in the policy declarations pages shall apply. The deductible endorsement does not show a deductible amount. The declarations pages also do not show any deductible. AON understands that no deductible is to apply to the primary OCIP general liability policy. AON recommends deleting the deductible endorsement to avoid confusion in the event of a substantial claim.

### 6.4.3 Umbrella Liability

The OCIP umbrella liability policy is provided by ACE. Except for employer's liability, the policy provides a limit of $25M per occurrence subject to a $50M annual policy aggregate, in excess of the primary OCIP general liability limits. The umbrella policy includes an employer's liability limit of $3M per occurrence $6M annual aggregate, in excess of the $2M employer's liability limit in the underlying general liability policy.

### 6.4.4 Excess Liability

The excess liability policy is issued by Chartis. It applies in excess of the OCIP umbrella policy. The excess policy limits are $25M per occurrence, $50M annual policy aggregate. This provides total umbrella and excess liability limits of $50M per occurrence, $100M annual aggregate.

#### 6.4.4.1 Recommendations

The following recommendation was made by AON regarding PRASA's OCIP excess liability policy:

1. **Amend the Contractor's Limitation Endorsement.** The last paragraph of The Contractor's Limitation Endorsement (endorsement no. 212) says, "It is further agreed that this policy does not apply to any liability for personal injury or property damage arising out of: …2. Any project insured under a "Wrap-Up" or similar rating plan". This limitation appears to exclude the coverage intended by the OCIP insurance program. AON recommends that PRASA ask the insurer to amend the last paragraph of the endorsement to add, "unless such liability is covered by valid and collectable underlying insurance described in the Schedule of Insurance."

### 6.4.5 Pollution Liability

OCIP pollution liability insurance is provided by Chartis. Coverage applies on a "claims-made" basis. The policy provides a $25M limit each loss and annual aggregate, and covers PRASA and OCIP contractor participants for pollution arising from contractor operations at scheduled projects. Coverage does not apply to PRASA's activities. Scheduled projects which are started during the policy period are covered for claims made up to four years after the policy expiration date. Defense costs and other claim expense erode the aggregate limit.

### 6.4.6 Conclusions

In the opinion of AON, the insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. AON has provided several recommendations to PRASA's insurance program. Particularly, PRASA should address the following key recommendations:

1. Review of the adequacy of the property insurance limit.
2. Complete a Probable Maximum Loss study to assist in the evaluation of the property insurance limit.
3. Review the downstream liability exposure for PRASA's dams.
4. Consider adding underground storage tank coverage to the pollution liability policy.

The OCIP covering PRASA's exposures to risks of accidental property and liability losses arising from construction activities provides reasonable coverage. AON has provided several

recommendations to PRASA's OCIP. Particularly, PRASA should address the following key recommendations:

1. Revise Endorsement 1 on the builder's risk policy to include coverage for underground property.
2. Remove the Wrap Up exclusion in the Contractor's Limitation Endorsement contained in the excess liability policy.

# 7 System Assets and Financial Analysis

## 7.1 Introduction

In accordance with Section 7.07(e) of the MAT, MPPR/Malcolm Pirnie hereby provides a statement of the estimated cost of all additions made to the Systems and of all the retirements of property made in FY2010. Also, in accordance with Section 7.07(f) of the MAT, MPPR/Malcolm Pirnie evaluated PRASA's financial forecast and assessed the appropriateness of rates and charges.

## 7.2 System Assets

### 7.2.1 Additions and Deletions of System Assets

Table 7-1 shows that, as of June 30, 2010, PRASA reported an estimated total book value of fixed assets of approximately $5,469M, which represents an increase of $1,069M (24%) over the FY2009's reported value of fixed assets. Additionally, PRASA reported it had approximately $1,616M of assets that are currently under construction or as "Work in Process", which represents an increase of approximately $24M (2%) than reported in FY2009. As such, total fixed assets increased by approximately $1,092M (18%) over FY2009's reported value. This increase is primarily attributable to a $933.4M capital assets transfer from the Puerto Rico Infrastructure Financing Authority (PRIFA). Table 7-2 provides a summary of the assets that have been added to and deleted from the System in FY2010.

**Table 7-1:**
**Fixed Assets Summary through June 30, 2010**
**(in Thousands)**

| | Original Cost | Accumulated Depreciation | Book Value |
|---|---|---|---|
| Fixed Assets | $8,111 | ($2,642) | $5,469 |
| Work in Process | 1,616 | - | 1,616 |
| Total Fixed Assets | $9,727 | ($2,642) | $7,085 |

**Table 7-2:**
**Fixed Assets Additions and Deletions FY2010**
**(in Thousands)**

| | Deletions to Work in Process | Equipment Write-Offs | Additions to Work in Process | Additions to Plants in Service |
|---|---|---|---|---|
| **FY2010** | $17,461 | $937 | $338,582 | $1,226,218 |

## 7.3 Financial Analysis

PRASA's 2008 MAT with bondholders contains specific Debt Service Coverage (DSC) requirements that must be met. The Rate Covenant requirements which PRASA must meet include the following:

- Net Revenues shall be sufficient in each fiscal year to be at least equal to 120% of the annual debt service with respect to the senior indebtedness for such fiscal year.
- Net Revenues shall be sufficient in each fiscal year to be at least equal to 110% of the annual debt service with respect to the senior indebtedness and the senior subordinate indebtedness for such fiscal year.
- Net Revenues shall be sufficient in each fiscal year to pay:
  - annual debt service on Indebtedness;
  - the amounts, if any, necessary to be deposited in any Senior Debt Service Reserve Account, Senior Subordinate Debt Service Reserve Account or Subordinate Debt Service Reserve Account to restore the respective amounts on deposit therein to the amount of the applicable Debt Service Reserve requirement;
  - the amount, if any, necessary to be deposited in the Operating Reserve Fund to maintain the balance therein at the Operating Reserve Fund requirement;
  - the amount, if any, necessary to be deposited in the Capital Improvement Fund as specified in the annual budget;
  - the amount, if any, necessary to be deposited into the Commonwealth Payments Fund for the Commonwealth Guaranteed Indebtedness and/or Commonwealth Supported Obligations; and
  - the amount, if any, necessary to be deposited into the Rate Stabilization Account of the Surplus Fund in accordance with the annual budget for such fiscal year.

As defined and summarized from the MAT, net revenues is the difference between Revenues (including new installation fee revenues) and Current Expenses. Current Expenses are the reasonable and necessary expenses, calculated on an accrual basis, to maintain, repair and operate the System, excluding non-cash reserves or expenses, e.g., depreciation expense. Indebtedness is defined as Bonds, Other System Indebtedness, Commonwealth Guaranteed Indebtedness (CGI) and Commonwealth Supported Obligations (CSO), collectively.

The DSC requirements of the Rate Covenant vary by the seniority of the debt and are summarized in Table 7-3. Also, should PRASA decide to issue additional debt in any given year of the FY2011 through FY2014 forecast period, Additional Bonds Test (ABT) requirements would also have to be met. The ABT is a measure of whether or not DSC will still be met after the issuance of additional debt. Where two DSC values are shown for the ABT on Table 7-3, the first value is

the minimum for net revenues divided by existing and proposed debt service (at the specific lien level). The second value is the minimum for net revenues divided by existing and proposed debt service (regardless of lien level) plus specified reserve fund deposits.

**Table 7-3:**
**Trust Agreement Treatment of Existing and Proposed Debt**

| Lien Level | Debt Secured | DSC for Additional Bonds Test[1] | DSC for Covenant Test[1] | In Default if not Paid? |
|---|---|---|---|---|
| Senior | 2008 Senior Bonds | 1.20 / 1.00 | 1.20 | Yes |
| Senior Subordinate | Bank Term Loan | 1.10 / 1.00 | 1.10 | Yes |
| Subordinate | Not applicable currently | 1.00 | 1.00 | Yes |
| Below Subordinate | Commonwealth Guaranteed Indebtedness | N/A | 1.00 | No |
| Below Subordinate | Commonwealth Supported Obligations | N/A | 1.00 | No |

(1) Two tests apply to future debt. The first test is net revenues divided by existing and proposed debt service (at the existing lien level); the second test is net revenues divided by existing and proposed debt service (regardless of lien level) plus specified Reserve Fund deposits.

### 7.3.1 FY2010 Results

Table 7-4 summarizes PRASA's FY2010 financial results, as compared to the FY2010 financial projection included in the OS. As shown, PRASA's financial results deviated from OS projections as a result of PRASA's inability to generate sufficient revenues due to lower than expected growth in customer accounts, a reduction in average water consumption per account, and the fact that no rate adjustment/increase was implemented. Additionally, PRASA experienced a higher rate of uncollectible accounts and higher electric power costs.

Current local economic conditions and unemployment rates continue to negatively impact PRASA's budget for revenues, growth, and uncollectibles. Also, housing development and general construction in Puerto Rico continued to decline as first reported in the 2009 CER, thus reducing the amount of revenues collected by PRASA for new house and project connections, recorded under its Special Assessments revenue category.

PRASA's electricity costs were much higher than projected in the OS. Although PRASA incorporated moderate annual increases in the Forecast of electricity costs to account for inflation, these were not sufficient to cover the FY2010 costs. O&M costs of the Superaqueduct Service Contract were slightly higher, as electricity costs are passed through to PRASA by the contract operator. However, it is important to note that PRASA continued to reduce some of its operational costs, achieving reductions in all other expense categories, with significant recorded reductions in the payroll and related expense category.

**Table 7-4:**
**FY2010 Financial Results Compared to Official Statement Projections**
**(in Thousands)**

| | | FY 2010 OS Projection Base Case | FY2010 PRELIMINARY RESULTS | $ VARIANCE | % VARIANCE |
|---|---|---|---|---|---|
| 1 | **REVENUES** | | | | |
| 2 | Base Fee and Service Charges | $775,000 | $740,993 | ($34,007) | -4% |
| 3 | Average Annual Growth/(Decrease) | 23,483 | - | (23,483) | -100% |
| 4 | Rate Increases | - | - | - | - |
| 5 | Rate Adjustments | 35,576 | - | (35,576) | -100% |
| 6 | General Fund Special Contribution | - | 27,240 | 27,240 | 100% |
| 7 | Operational Initiatives (Includes NRWRP & PPP Project) | 34,875 | 67,330 | 32,455 | 93% |
| 8 | Collections Lag and Uncollectibles Reserve | (51,875) | (100,147) | (48,272) | 93% |
| 9 | Actual Collections Adjustment/Reimbursements Prior Years | - | 72,543 | 72,543 | 100% |
| 10 | Subsidy (PAN/TANF) | (3,993) | (3,533) | 460 | -12% |
| 11 | Subsidy to Public Housing (Includes recommended subsidy reduction) | - | (7,000) | (7,000) | -100% |
| 12 | Other Income | 13,000 | 7,692 | (5,308) | -41% |
| 13 | Special Assessments | 20,000 | 6,502 | (13,498) | -67% |
| 14 | Interest Income | 6,209 | - | (6,209) | -100% |
| 15 | **Total Operating Revenues, Net** | **$852,275** | **$811,620** | **($40,655)** | **-5%** |
| 16 | | | | | |
| 17 | **OPERATING EXPENSES** | | | | |
| 18 | Payroll and Benefits (Includes staff reductions through attrition) | $346,138 | $299,948 | ($46,190) | -13% |
| 19 | Electricity | 119,343 | 140,131 | 20,788 | 17% |
| 20 | Chemicals | 30,292 | 26,264 | (4,028) | -13% |
| 21 | Superaqueduct Fee | 22,354 | 22,800 | 446 | 2% |
| 22 | Insurance | 14,618 | 9,443 | (5,175) | -35% |
| 23 | Other Expenses | 158,766 | 152,801 | (5,965) | -4% |
| 24 | Operational Initiatives (PPP Project) | - | - | - | - |
| 25 | Capitalized Operating Expenses | (44,948) | (42,340) | 2,608 | -6% |
| 26 | **Total Operating Expenses, Net** | **$646,563** | **$609,047** | **($37,516)** | **-6%** |
| 27 | | | | | |
| 28 | **OTHER FINANCING SOURCES** | | | | |
| 29 | Surplus Funds & Non-Cash Adjustments | - | - | - | - |
| 30 | Other Sources of Fund ($150M Facility) | - | - | - | - |
| 31 | | | | | |
| 32 | **TOTAL NET REVENUES AVAILABLE FOR DEBT SERVICE** | **$205,712** | **$202,573** | **($3,139)** | **-2%** |
| 33 | | | | | |
| 34 | **TOTAL DEBT SERVICE (Includes CSO)** | **$201,717** | **$192,307** | **($9,410)** | **-5%** |
| 35 | | | | | |
| 36 | **ENDING BALANCE AFTER DEBT SERVICE** | **$3,995** | **$10,266** | **$6,271** | **157%** |

*Numbers may not add up due to rounding.

### 7.3.1.1 FY2010 Debt Service Coverage

In FY2010, the Government Development Bank of Puerto Rico (GDB) supported PRASA by making a special contribution using Central Government Funds which helped PRASA meet its debt service obligations, as shown in Table 7-5.

**Table 7-5:**
**FY2010 Debt Service Coverage Calculation**

| Type of Debt | Debt Service ($, Thousands)[1] | Debt Service Coverage |
|---|---|---|
| **Senior Debt** Coverage Required = 1.20 | $68,756 | 2.95 |
| **Senior Subordinate Debt** Coverage Required = 1.10 | 10,751 | 2.55 |
| **Subordinate Debt** Coverage Required = 1.00 | - | 2.55 |
| **Commonwealth Guaranteed Indebtedness** Coverage Required = 1.00 | 85,561 | 1.23 |
| **Commonwealth Supported Obligations** Coverage Required = 1.00 | 27,240 | 1.05 |
| **TOTAL DEBT SERVICE[1]** | **$192,307** | |

(1)Numbers may not add up due to rounding.

### 7.3.2 FY2011 – FY2014 Forecast: PRASA's Base Case

MPPR/Malcolm Pirnie reviewed the revenues provided by PRASA for the FY2011 through FY2014 PRASA's Base Case forecast period (the Forecast or the forecast period) shown in Exhibit 1. In both the 2008 and 2009 CERs a five-year forecast period projection was included. At the time of preparation of this CER, PRASA was in the process of updating its financial projections past FY2014; hence, only a four-year projection has been reviewed and presented in this CER. Each of the major revenue categories of the Forecast is described in this subsection along with a description of how PRASA's Base Case was developed. Additionally, MPPR/Malcolm Pirnie has prepared a sensitivity analysis of PRASA's Forecast (the MPPR/Malcolm Pirnie-prepared Alternate Case forecast.) The objective of the sensitivity analysis is to demonstrate the impact that more conservative assumptions will have on PRASA's projections.

The Forecast presents PRASA's estimate of the expected results of operations and DSC for the forecast period. Thus, the Forecast reflects PRASA's judgment, based upon present circumstances, as to the most likely set of conditions and course of action. However, there will usually be differences between forecasted and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material. MPPR/Malcolm Pirnie has no responsibility for updating this CER for changes that occur beyond June 30, 2010.

#### 7.3.2.1 Revenues

As defined in the MAT:

> *"**Revenues**" shall mean all moneys received by or on behalf of the Authority (PRASA), including (i) the moneys derived by or on behalf of the Authority from the sale of water produced, treated or distributed by, or the collection, transmission, treatment or disposal of sewage by the Systems, (ii) any proceeds of use and occupancy insurance on the Systems or any part thereof, (iii) except as provided in the following sentence, any income from the investments made under this Agreement, (iv) except as provided in the following sentence, any governmental grants or appropriations available to pay Current*

*Expenses of the Authority, including grants or appropriations received by the Authority and specifically made for the payments of principal of and interest on obligations of the Authority or for reimbursing the Authority for such payments, (v) any special assessments, including assessments in the nature of impact fees, (vi) amounts, if any, paid from the Rate Stabilization Account into the Deposit Fund in any Fiscal Year minus the amounts, if any, paid from the Deposit Fund into the Rate Stabilization Account during the same Fiscal Year; and (vii) regularly scheduled payments received under any Qualified Swap or Hedge Agreement during such period. In no event shall Revenues include (i) income from the investment of moneys on deposit to the credit of the Construction Fund, proceeds of insurance (except use and occupancy insurance) or condemnation awards (which are required to be deposited directly to the credit of the Capital Improvement Fund), (ii) proceeds of sales of property constituting a part of the Systems (which are required to be deposited directly to the credit of the Capital Improvement Fund), (iii) any amounts received from the Commonwealth of Puerto Rico on account of Commonwealth Guaranteed Indebtedness (which is required to be deposited directly in the Commonwealth Payments Fund) or Commonwealth Supported Obligations (which is required to be deposited in the Commonwealth Payments Fund), (iv) the proceeds of Bonds or other Indebtedness and (v) any termination or similar payment under any interest rate swap or similar hedge agreement received by the Authority (which are required to be deposited directly to the credit of the Capital Improvement Fund).*

PRASA's revenue projections, on a cash basis, and their respective assumptions are discussed below:

1. Base Fee and Service Charges (Exhibit 1, line 2) – PRASA's single largest source of revenue is from the monthly base charge and volume rate for service. PRASA implemented a two-phase rate increase effective October 10, 2005 and July 1, 2006. Resolution No. 2167 (the Resolution) was approved on October 6, 2005 by PRASA's Board of Directors after recommendation by PRASA's Executive President and the Board's Revenue Committee. The Resolution included provisions for future increases as outlined below:

   a) Rates for water and sewer service are not allowed to be increased prior to July 1, 2009 (FY2010);

   b) Increases after July 1, 2009 will be calculated according to a specified formula (Coefficient of Annual Adjustment [CAA] described below);

   c) Beginning July 1, 2009, there is a cap or limit on future annual increases of 4.5% and a limit on the cumulative increase of 25%;

   d) If PRASA requires an increase in excess of 4.5% in any single year, or once the 25% cumulative limit is reached, PRASA must follow the formal approval process for requesting a rate increase.

Increases implemented after July 1, 2009 are limited by the calculation of the CAA described in the Resolution. There are three steps to determining the CAA as follows:

STEP 1 – Calculate the Coefficient of Deficiency (CD) for the applicable year:

$$CD = \frac{\text{Operating Expenses and Debt Service}}{\text{Operating Revenues}}$$

STEP 2 – Calculate the Annual Base Coefficient (CAB) for the Base Year:

$$CAB = \frac{\text{Operating Expenses and Debt Service (FY2007)}}{\text{Operating Revenues (FY2007)}}$$

STEP 3 – Calculate the CAA:

$$CAA = CD/CAB$$

If the CD for any year is greater than the CAB from FY2007, i.e., CD is greater than CAB, then the rates can be increased by the lesser of the CAA less one (CAA-1) or 4.5% until the 25% cumulative maximum is reached.

In addition to the change in rates, PRASA converted from bimonthly to monthly billing in October of 2005 using estimated readings. Beginning in October of 2007, PRASA began using actual versus prior estimated meter readings to bill customers: readings are performed every two months and the recorded consumption for a two-month period is divided by two before calculating monthly billing charges.

PRASA's forecast projections include service revenues of $754M, approximately $13M more than the FY2010 $741M results. FY2010 results were approximately 2% lower than FY2009 actual results. Declines in service revenues are due in part to a reduction in demand for utility services and current economic conditions.

PRASA has experienced a modest growth in its total number of customer accounts averaging approximately 0.67% per year from FY2004 to FY2010, as shown in Table 7-6 below.[17] However, in its forecast period, PRASA has made a conservative assumption of zero percent (0%) customer growth rate in each fiscal year (Exhibit 1, line 3).

[17] Compound Annual Growth Rate (CAGR) of number of accounts for FY2004 through FY2010.

**Table 7-6:**
## Customer Accounts FY2004 – FY2010

| Fiscal Year | Customer Class | | | | |
|---|---|---|---|---|---|
| | Residential | Commercial | Industrial | Government | Total |
| FY 2004 | 1,145,963 | 67,375 | 1,528 | 11,033 | 1,225,899 |
| FY 2005 | 1,161,350 | 68,093 | 1,533 | 11,584 | 1,242,560 |
| FY 2006 | 1,173,040 | 68,396 | 1,526 | 11,688 | 1,254,650 |
| FY 2007 | 1,178,677 | 67,560 | 1,472 | 11,706 | 1,259,415 |
| FY 2008 | 1,181,366 | 63,004 | 1,447 | 11,519 | 1,257,336 |
| FY 2009 | 1,184,661 | 61,657 | 1,280 | 11,290 | 1,258,888 |
| FY 2010 | 1,204,636 | 62,938 | 1,237 | 10,946 | 1,279,757 |
| **CAGR 2004-2010[1]** | **0.84%** | **-1.13%** | **-3.46%** | **-0.13%** | **0.72%** |

(1) CAGR = Compound Annual Growth Rate

Total consumption in FY2010 decreased less than 1% compared to FY2009, as shown in Table 7-7. This reduction in consumption along with an increase in the total number of customers represents a decrease in the average billed consumption per account of approximately 2%, presented in Table 7-8. It should be noted that, as a result of the difficult economic conditions on the island, industrial consumption is declining at a much higher rate than other customer classes. In general, the reduction in consumption per account is one of the primary reasons for the FY2010 decline in service revenues when compared to FY2009.

**Table 7-7:**
## Average Monthly Billed Consumption by Class FY2009 – FY2010
**(1,000 Cubic Meters)**

| Fiscal Year | Customer Class | | | | |
|---|---|---|---|---|---|
| | Residential | Commercial | Industrial | Government | Total |
| FY 2009 | 20,267 | 3,475 | 1,126 | 2,652 | 27,520 |
| FY 2010 | 20,554 | 3,152 | 869 | 2,738 | 27,313 |
| **% Difference** | **1.41%** | **-9.29%** | **-22.82%** | **3.26%** | **-0.75%** |

**Table 7-8:**
## Average Monthly Consumption per Account FY2009 – FY2010
**(Cubic Meters)**

| Fiscal Year | Customer Class | | | | |
|---|---|---|---|---|---|
| | Residential | Commercial | Industrial | Government | Total |
| FY 2009 | 17.11 | 56.36 | 879.95 | 234.86 | 21.86 |
| FY 2010 | 17.06 | 50.08 | 702.51 | 250.14 | 21.34 |
| **% Difference** | **-0.29%** | **-11.14%** | **-20.16%** | **6.51%** | **-2.38%** |

Given the FY2010 results for service revenues, MPPR/Malcolm Pirnie believes the $754M forecast period projections for service revenues is aggressive. MPPR/Malcolm Pirnie suggests using a more conservative assumption of $741M in the Alternate Case over the

forecast period. Continued strain on the economy could cause further decline in the consumption patterns of PRASA customers, resulting in lower than projected revenues. Hence, FY2011 year-to-date (YTD) results should be closely monitored and projections for subsequent fiscal years shall be adjusted accordingly.

2. Rate Increases (Exhibit 1, line 4), Rate Adjustments (Exhibit 1, line 5), General Fund Special Contribution / Other Sources of Funds (Exhibit 1, line 6) – Currently, PRASA is not including any rate increases or rate adjustments in its Forecast. PRASA has included in its Forecast a General Fund Special Contribution / Other Sources of Funds revenue category (Exhibit 1, line 6).

   For FY2011, PRASA received a special assignment of $105M from the Central Government General Fund. However, it is important to note these contributions are a one-time occurrence to assist PRASA in paying operating expenses and/or debt service to help avoid a rate increase in times of economic hardship.

   For FY2012 through FY2014, PRASA has projected approximately $150M to $160M in additional revenues in each fiscal year from Other Sources of Funds (Exhibit 1, line 6), which are yet to be identified. These other sources may include, but are not limited to, additional General Fund Special Contributions. Since future special assignments from the Central Government General Fund are unknown and uncertain at this time, MPPR/Malcolm Pirnie believes that PRASA's assumption of having no rate increase and adjustments during the forecast period is aggressive. As such, MPPR/Malcolm Pirnie has included in the Alternate Case the rate adjustments and increases that, in its opinion, would need to be implemented in FY2012 through FY2014 and has assumed that no revenues from the General Fund Special Contribution / Other Sources of Funds would be available.

3. Operational Initiatives (Exhibit 1, line 7) – PRASA is projecting additional revenue from the implementation of various operational initiatives as shown on Exhibit 1. The NRWRP (also referred to as the revenue optimization program) is the most significant (in terms of additional revenue potential) of these initiatives in FY2010 and FY2011. In FY2010 PRASA surpassed the $34.9M of operational initiative revenues projected in the OS by almost double that amount. Starting in FY2012, PRASA has projected that the PPP Project will replace the NRWRP, as the activities performed in the NRWRP have been included in the scope of services of the PPP Project. As discussed in Section 4.8.5, under the PPP Project, PRASA aims to partner with the private sector to technologically transform PRASA's meter reading system and its commercial services in order to reduce commercial losses; an effort that PRASA has been addressing under the NRWRP. The PPP Project seeks to reduce the number of non-paying customers, theft, erroneous billing, and marginal or inaccurate meter performance; all of which adversely affect PRASA's ability to maximize revenues. As presently configured, the PPP Project has the potential to increase PRASA's revenues by as much as $140M annually.

MPPR/Malcolm Pirnie is encouraged by the FY2009 and FY2010 Operational Initiative results, and believes PRASA has a strong commitment to its operational initiatives and to achieving the goals outlined for each initiative. It is reasonable to expect that the projected incremental revenues resulting from the Operational Initiatives in general, are attainable over the forecast period. Nonetheless, PRASA's assumption for the incremental revenues from Operational Initiatives relies on the effective and timely implementation of these initiatives and, in particular, of the implementation of the PPP Project as presently planned and described in Section 4.8.5.

4. Collections Lag and Uncollectibles Reserve (Exhibit 1, line 8) – PRASA's Base Case revenues include an adjustment for uncollectible accounts to get to the actual cash collection. Prior to the recent rate increases, uncollectible accounts were approximately 4% of all billings. Approximately 14% of these uncollectible are from the Government; the remaining uncollectible (86%) are from residential customers. In FY2007, the uncollectible level increased to 6.7%, which may have surged due to the rate increases, the change in rate structure, and/or the change to monthly billing. Subsequently, in FY2009, the rate of billings not collected during the year increased to 16%, which may have surged due to local economic conditions and the recent rise in unemployment. However, in FY2010 PRASA's rate of billings not collected during the year decreased from the 16% recorded in FY2009 to 9.2%; a value consistent with its FY2010 budget. This decrease can be attributed, in part, to PRASA's FY2010 increased effort to disconnect non-paying customers. PRASA is projecting a collection reserve of approximately 11.5% over the forecast period. This percentage is slightly lower than the FY2008 to FY2010 three-year average of 12.46%, but considering the current economic environment and the high unemployment rate in Puerto Rico[18], MPPR/Malcolm Pirnie cautions that the rate for uncollectible accounts could increase. MPPR/Malcolm Pirnie finds the Forecast projection aggressive and, as such, has increased the uncollectible accounts percentage to 14% over the forecast period in the Alternate Case. MPPR/Malcolm Pirnie considers an uncollectible accounts percentage of 14% a more conservative estimate; one more closely aligned or consistent with the current economic conditions.

5. Reimbursements from Prior Years (Exhibit 1, line 9) – PRASA has projected it will not collect any of its aging uncollectible government accounts from prior years over the forecast period. Given recent history, this seems to be an overly conservative budgeting assumption – the historical three-year average annual government accounts collection amount is $19M; collections totaled $32.9M in FY2010, $22.4M in FY2009 and $4M in FY2008. In FY2010 PRASA received $39.6M from pending reimbursements from SRF and PRIFA.

[18] Based on the United States Bureau of Labor Statistics unemployment rate as of August 2010 the rate in Puerto Rico was 16.3% while the US average was 9.6%. Source: www. stats.bls.gov/

MPPR/Malcolm Pirnie finds the projection conservative for FY2011. As such, the prior year budget amount for FY2011 has been increased to $19M in the Alternate Case. However, for FY2012-FY2014, PRASA's projection seems reasonable given that, starting in FY2012, any collection from prior years will be done through the PPP Project operational initiative and have, therefore, been accounted for under the operational initiatives revenue category (Exhibit 1, line 6.)

6. Subsidy (Exhibit 1, lines 10 and 11) – PRASA's Forecast includes a reduction in revenues to reflect the subsidy offered to customers who qualify for the Programa de Asistencia Nutricional (PAN Program) or residents under the Programa de Asistencia Temporal para Familias Necesitadas (TANF Program). The subsidy, approved in October of 2005 by PRASA's Board of Directors, provides a 35% base charge discount to PAN or TANF-eligible customers, i.e., qualifying seniors over 65 years of age, disabled persons, and families in need of temporary assistance.

   PRASA has calculated the full impact of this subsidy to be approximately $17M annually if all eligible customers apply for and meet the qualification criteria (estimated at 210,000 customers). However, PRASA does not expect all 210,000 eligible customers to apply for the subsidy and therefore does not forecast the subsidy to reach the $17M level. For the last three fiscal years this subsidy has totaled approximately $3.2M per year. The Forecast assumes the level of the subsidy at $3.6M in FY2011 and to increase at a rate of 10% per year over the balance of the forecast period; from $3.6M in FY2011 to $4.8M in FY2014.

   Also, in August of 2009 Puerto Rico's Legislative Assembly approved Act 69 which includes a partial subsidy for water and wastewater consumption costs for residents of public housing projects. PRASA originally projected that this new subsidy program could cost approximately $16.2M in additional subsidy assistance offered to PRASA customers who qualify (estimated based on a full-year participation of the eligible customers). In FY2010 this subsidy totaled $7M; the implementation of the program did not occur for the entire 12-month period. PRASA is projecting that in FY2011 it will grant approximately $12M in assistance to qualified customers based on a full program year. For FY2012 through FY2014, PRASA projects subsidies to increase at a rate of approximately 3% per year.

   While it is difficult to predict the impact that any new subsidy will have on PRASA's revenues, recent history has shown that subsidy participation is usually low. Hence, MPPR/Malcolm Pirnie believes that PRASA's subsidy estimate over the Forecast is reasonable but should be re-assessed on an annual basis in case participation is higher than expected.

7. Other Income (Exhibit 1, line 12) – PRASA receives revenue from other services including: theft penalties, reconnections, sale of water for construction, bulk water sales, and monthly fixed fees for sprinkler systems and private fire hydrants. Fines account for approximately

$6.6M, bulk water sales are projected at $0.4M, other miscellaneous revenues at $2.8M and interest income at $75,000 (all values represent annual amounts). Many of these fees were increased on July 1, 2006 at the same time as the increase in base charges and volume rates for service. Revenues from other services and sales are projected at approximately $8M in each fiscal year of the Forecast. PRASA's projections, which are based on audited results from previous fiscal years, are conservative and seem reasonable.

8. Special Assessments (Exhibit 1, line 13) – PRASA collects revenues from new service installations. This fee is collected from developers and applies to new water and sewer connections to the System. The current fees are $500 each for water and sewer connections ($1,000 total per unit). Special Assessments depend on the fees paid by developers of new projects and it is expected that the current economic situation will continue to impact the local new housing market during the next few years. PRASA has projected $7M in FY2011 and $10.5M per year, for special assessments in FY2012, FY2013 and FY2014. However, PRASA generated $6.5M in FY2010, half the amount generated in FY2008. This three-year downward trend is consistent with the current economic situation and its impact on the local housing market. The $7M projection for special assessments, although lower than the most recent three-year average of $10.8M, is approximately $0.5M higher than the FY2010 results. This revenue source is exclusively dependent upon economic conditions and could be lower than the FY2010 level if the recession continues. PRASA's projections for the forecast period, which are based on audited results from previous fiscal years, are conservative and seem reasonable.

9. Interest Income (Exhibit 1, line 15) – The interest income projections assume a 0.75% annual interest earnings rate and an average cash balance of $10M. PRASA is projecting zero additional revenue from interest income. MPPR/Malcolm Pirnie believes this to be a reasonable and conservative assumption for the Forecast.

### 7.3.2.2 Expenses

As defined in the MAT:

> *"**Current Expenses**" shall mean the reasonable and necessary current expenses, incurred by the Authority in the ordinary course of business, calculated on an accrual basis, of maintaining, repairing and operating the properties constituting the Systems or causing said maintenance, repair and operation, which expenses shall exclude depreciation, reserves for allowances for doubtful accounts and other non-cash reserves or expenses. Notwithstanding any accounting treatment to the contrary, the amount of any termination or similar payment under any interest rate swap or similar hedge agreement shall, if payable by the Authority, not be taken into account in computing Current Expenses to the extent the same is paid by or on behalf of the Authority from the proceeds of any Indebtedness.*

PRASA's expenses projections, in accrual basis, and their respective assumptions are discussed below:

1. Payroll and Benefits (Exhibit 1, line 18) – PRASA has projected payroll and benefits expenses of $270.6M for FY2011. The projection for FY2011 represents a 9.1% decrease from the FY2010 results of $299.9M, established prior to the capitalization of project overhead costs. PRASA implemented a personnel reduction of 547 employees in FY2010 following a reduction of 266 employees in FY2009. These reductions were achieved mainly through an incentivized retirement program and permanent reduction in positions for temporary employees.

   The Forecast reductions correspond to the savings expected from the planned net staff reductions listed in Table 7-9. PRASA is assuming average savings of approximately $40,000 per each Full Time Equivalent (FTE) position eliminated; a conservative assumption considering that the FY2010 average salary per FTE was close to $50,000. Projected reductions included in Exhibit 1 are based on FY2009's base of payroll expenses of $318.6M.

**Table 7-9:**
**Projected Employee Headcount Reductions**

| Fiscal Year[1] | Projected Annual Net Staff Reductions[2] |
|---|---|
| 2011 | 250 |
| 2012 | 1,123 |
| 2013 | 234 |
| 2014 | 50 |
| **Total** | **1,657** |

(1) PRASA had a staff of approximately 5,575 at the beginning of FY2010 and 5,001 at the beginning of FY2011. Average saving per employee is calculated at $40,000 for a 12 month period.
(2) Net staff reduction = Staff reduced – new staff hired

PRASA is expecting to achieve these reductions through a variety of program/initiatives including: staff attrition, plants automation, possible early retirement programs, freezing vacant positions, and reclassifying positions, amongst others. PRASA is also budgeting additional reductions in overtime costs of $3.5M in FY2011, $5M in FY2012, and $6M in both FY2013 and FY2014.

Given the number of initiatives that PRASA is implementing to achieve greater operating efficiencies, it is expected that there will be workforce reductions. However, how quickly PRASA will be able to achieve these reductions is not yet known. As such, the magnitude of the potential savings via such programs is not yet available. Therefore, MPPR/Malcolm Pirnie has included in its Alternate Case a more conservative staff reduction plan that assumes a slower and lower staff reduction rate than forecasted by PRASA as shown in Table 7-10. The reduction in overtime costs is reasonable based on the cost controls and reduction initiative implemented by PRASA in the last few years and that are to continue throughout the Forecast.

**Table 7-10:**
**Alternate Case Projected Employee Headcount Reductions**

| Fiscal Year | Alternate Case Projected Annual Net Staff Reductions[1] |
|---|---|
| 2011 | 100 |
| 2012 | 240 |
| 2013 | 400 |
| 2014 | 417 |
| **Total** | **1,157** |

(1) Net staff reduction = Staff reduced – new staff hired.

2. Electricity (Exhibit 1, line 19) – PRASA has projected an electric power expense of $138M for FY2011, $132M for FY2012, $129M for FY2013 and $123M for FY2014. The amount projected for FY2011 represents a 1.5% decrease from FY2010 results. The FY2011 projection is based on an expectation that oil market prices experienced between July 2009 and June 2010 (an average of $69.73 per barrel of oil) will continue throughout FY2011, and PRASA will implement energy conservation measures in selected facilities as planned through its Comprehensive Energy Management Program.

   The average price per barrel of oil for the last six months of FY2010 (January 2010 to June 2010) was $75.61. This average was 18% higher than the average of the last six months of FY2009 (January 2009 to June 2009) which was $63. Due to this increase, PRASA's average monthly cost of electric power for the last six months of FY2010 was $12.2M, compared to $9.8M in the same period for FY2009. PRASA is projecting average monthly costs of electric power for FY2011 of $11.5M, lower than the results during the last six months of FY2010. The average prices per barrel of oil during the 1st, 2nd, 3rd and 4th quarters of 2010 were $60, $68, $76 and $75, respectively. Results through June 30, 2010 demonstrate PRASA's electric power budget metrics have not been met. Electric costs as of June 30, 2010 are $20.3M above budget, which represents a 17% deviation.

   PREPA, in conjunction with the GDB, headlined the Puerto Rico Credit Conference in February 2010.[19] One of the most pertinent messages of the conference was the need to reduce energy cost and simultaneously protect the environment. Strategies used to achieve these objectives are listed below:

   - Reduce operating expenses
   - Increase efficiency
   - Minimize energy theft
   - Develop a proper fuel mix diversification
   - Add renewable energy
   - Maximize use of advance technology

[19] "Puerto Rico Electric Power Authority – Company Overview and Project Development"

Although the average price for a barrel of oil has increased from FY2009 to FY2010, implementation of the above strategies are expected to contribute to the lowering of electricity costs. PREPA's executive director Miguel Cordero publicly reiterated that fuel diversity, efficient operation of the system, and a reduction in operating costs will enable PREPA to lower energy costs in Puerto Rico[20].

PRASA also has continued working on its Comprehensive Energy Management Program to implement demand side EPCs and supply side PPAs with suppliers other than PREPA. Results from EPC and PPA efforts, although originally scheduled to take effect in FY2011, are not expected until FY2012, at the earliest. Extended negotiations with selected proponents and PREPA's delay in the definition of wheeling rates have contributed to the delays in the implementation schedule for selected projects.

Even if energy consumption at PRASA's facilities is reduced as planned, if oil price increases continue at high rates throughout FY2011, PRASA's projections for energy costs could be compromised. PRASA projections do not include a contingency to address increases in energy costs resulting from global increases in oil prices. However, the actions set out by PREPA (summarized above) can ultimately result in lower energy costs. The fuel diversification plan has the potential to produce the largest impact in terms of energy savings. PREPA projects that units 5 and 6 of the Central South Coast will be converted to natural gas by the end of 2010, and units 1 through 4 will be replaced by a combined cycle facility by the end of 2012.

Given the uncertainty of potential diversification of project completion, strategies established to achieve specific energy and cost reduction objectives, and the YTD results of PRASA's electric power expenditures, MPPR/Malcolm Pirnie finds the projections aggressive and, as such, has increased the electricity budget in the Alternate Case over the forecast period using a more conservative scenario which assumes a cost for oil of $85 per barrel for FY2011 and with 5% increases annually to account for inflation, and projected savings due to the Comprehensive Energy Management Program of $6M in FY2012, $10M in FY2013, and $13M in FY2014.

3. Chemicals (Exhibit 1, line 20) – PRASA has projected $27.7M for chemical expenses in FY2011 and is forecasting annual 1% increases in each year of the Forecast thereafter. The FY2011 projection represents an increase of approximately 5% compared to PRASA's results for FY2010 of $26.2M. Chemical costs are usually affected by inflation and worldwide demand as they are mostly commodities. PRASA plans to continue its proactive chemical management program to maintain chemical consumption and cost levels similar to or below FY2010. As of June 30, 2010, results for chemical costs show PRASA was 8% lower than the

[20] In an article posted on July 16, 2010 by Primerahora.com.

FY2010 budget amount for chemical costs. However, the annual rate of increase from FY2012 through FY2014 is premised on the success of the following initiatives:

- Use of alternative products and process control changes.
- More training for employees for the correct use of chemicals.
- The closing and consolidation of smaller, less efficient facilities.
- Expected results from current chemicals procurement process (discussed in Section 4).

Although PRASA is committed to proactively continuing its chemical management and procurement program to maintain chemical consumption and cost levels similar or below to those of FY2010 and it has included in its projections a 1% annual adjustment to account for inflation, MPPR/Malcolm Pirnie believe this percentage to be aggressive. As such, the annual adjustment has been increased to 3% in the Alternate Case, which is a more conservative assumption.

4. Superaqueduct Service Contract (Exhibit 1, line 21) – PRASA is forecasting a 5% increase from FY2010 to FY2011 for expenses associated with the operation of the Superaqueduct. Thereafter, PRASA is forecasting annual increases of 1% for expenses associated with the operation of the Superaqueduct. The Superaqueduct facilities are managed and operated by Thames-Dick Superaqueduct Partners (Thames-Dick) under contract with PRASA. The facilities include the following:

   - A 100 MGD water treatment plant located in the North Region.
   - A transmission line from the plant to the municipality of Bayamón (Metro Region).
   - Several points of connection to the Superaqueduct, including tanks, pumping stations, and other assets.

   PRASA's contract with Thames-Dick includes an annual fixed fee component (approximately one-third of the annual expense) and pass-through cost, with caps in certain instances, for such O&M expense items as power and fuel, chemicals, and insurance. In September of 2006, PRASA issued a notice of renewal effective through September of 2013. PRASA has the option of terminating the agreement without cause on the third anniversary of the extension (September 2011), provided prior notice is given to Thames-Dick at least 30 days prior to the termination date. Thames-Dick continues to operate the Superaqueduct under the contract terms provided in certain change orders dated March 1, 2004. PRASA plans to enter into contract negotiations with Thames-Dick in FY2011.

   The Thames-Dick contract with PRASA and the corresponding payment provisions are consistent with generally accepted industry practices. However, because Superaqueduct electricity costs are entirely passed through to PRASA it is important to note that this Forecast could be negatively impacted if oil prices in the future increase, resulting in

increases of electricity costs. Also, the Metro Region Executive Director has indicated that sometime between FY2011 and FY2012 the Superaqueduct sludge lagoons will have to be cleaned, a costs that has not been considered in the Forecast. Hence, MPPR/Malcolm Pirnie believes that the 1% annual increase is aggressive. As such, the annual adjustment has been increased to 3% in the Alternate Case, which is a more conservative assumption.

5. Insurance (Exhibit 1, line 22) – Between FY2006 and FY2007, insurance expenses increased 35%. Between FY2007 and FY2008, PRASA's insurance expenses decreased 5%. However, between FY2008 and FY2009 these expenses increased once again by 32%. The increase experienced in FY2009 was driven mainly by PRASA's restructuring of its insurance program which consisted of adjusting its insurance coverage, deductibles, and other applicable components. Results for insurance expenses in FY2010 were approximately $9.4M, or 27% lower than the budgeted amount. PRASA continues to work with its insurance brokers to reduce/maintain its insurance costs, while sustaining adequate and acceptable levels of coverage. PRASA has projected $12.3M for insurance expenses in FY2011, $12.6M in FY2012, and a 3% annual rate increase in each fiscal year thereafter. These Forecast projections seem reasonable.

6. Other Expenses (Exhibit 1, lines 23) –As of June 30, 2010 these expenses were $152.8M, a 3% decrease compared to the FY2010 budget amount. Overall, the Other Expenses budget over the forecast period includes decreases in FY2011 through FY2013 as shown in Table 7-11. These decreases are mainly due to the reduction in costs related to maintenance and repair activities. PRASA reduced some of these Other Expenses from what was budgeted and from the previous year actual results, including: professional services, security, treatment of residuals and rentals.

**Table 7-11:**
**Other Expenses Assumptions**
**(in Thousands)**

| | FY2010 (Budgeted) | FY2010 (Results) | FY2011 | FY2012 | FY2013 | FY2014 |
|---|---|---|---|---|---|---|
| Other Expenses | $158,275 | $152,801 | $150,616 | $142,609 | $136,587 | $140,685 |
| % Difference | - | -3.5% | -1.4% | -5.3% | -4.2% | 3.0% |

Although projected reductions in Other Expenses categories such as maintenance and repair, material and supplies, contingencies and fines, water transport, and chemical and bacterial analysis seem to be slightly aggressive, MPPR/Malcolm Pirnie finds these projections reasonable when compared to actual results in previous years. The monitoring of results should continue.

PRASA continues its plan to reduce the NRWRP budget from the $16M included in FY2010 to zero ($0) by FY2013. This projected reduction combined with the 3% cost increase in other categories of other expenses cause an overall reduction of 1% in FY2011, 5% in

FY2012, and 4% in FY2013. Since costs associated with the NRWRP are expected to decrease as the program progresses, these projected reductions are reasonable. Since no further cost reductions are projected for the NRWRP in FY2014, PRASA's projections show a slight increase in its other expenses category in this fiscal year, as shown below. These projections also seem reasonable since all categories are being increased by a reasonable 3% adjustment factor. Given PRASA's achieved cost reductions in the last two fiscal years, the number of other expenses that are at contract or fixed prices, and the savings anticipated from System improvements, it is reasonable to expect that PRASA will be able to hold these projections.

7. Operational Initiatives (Exhibit 1, line 24) – PRASA has included a new expense item in the Forecast for the operational costs of the PPP Project. PRASA is projecting these costs to range from $80M in FY2012 up to $89M in FY2014. These costs have been obtained from the financial model projections of the PPP Project developed in part by PRASA's consultant (MPPR/Malcolm Pirnie). The PPP Project's financial model uses as a base PRASA's current costs to provide commercial services and includes certain assumptions related to staffing, O&M, contractor's profit margin, etc. Assuming the PPP Project is implemented as described in Section 4.8.5, PRASA's Forecast is reasonable. However, upon completion of the PPP Project procurement process, PRASA should revise its Forecast projections to include the costs as negotiated and included in the PPP Project's contract terms.

8. Capitalized Expenses (Exhibit 1, line 25) – PRASA projects 5% of Operational Expenses will be capitalized every year (shown as a reduction to projected expenses in Exhibit 1). Capitalized expenses include payroll and indirect costs associated with development and implementation of the CIP, renewal and replacement and major planned repairs of fixed assets which may be combined with implementation of the CIP, and allocation of staff expenses associated with construction management and oversight of the CIP. This capitalization rate is approximately 1.5% lower than the rate used in previous years (6.5%) based on more conservative PRASA-revised estimates. In FY2010, PRASA's capitalization rate was revised from 7% to 6% (values rounded) by PRASA's consultant in the 2009 report update of its 2007 Asset Capitalization Report. Hence, PRASA's projection is conservative. MPPR/Malcolm Pirnie has not reviewed this estimation in detail and, as such, is not providing an opinion. The capitalization percent may change from year-to-year depending on the organizational structure and volume of capital improvements. Given the level of the CIP and the support provided by an external consultant's report for the current capitalization figure, the Forecast of a 5% capitalization rate is reasonable.

### 7.3.3 Consultant's Forecast Adjustments

MPPR/Malcolm Pirnie's Alternate Case, included as Exhibit 2, incorporates the following adjustments to the Forecast prepared by PRASA in order to provide a sensitive analysis of PRASA's projections using more conservative assumptions:

1. Decrease in Base Fee and Service Charges (Service Revenues) in FY2011 through FY2014 (Exhibit 2, line 2) – The Alternate Case assumes $741M in revenues generated from the Base Fees and Service Charges in each fiscal year. This Alternate Case is based on FY2010 actual results.

2. Implementation of Rate Increase and Rate Adjustments, and Decreased General Fund Special Contribution / Other Sources of Funds (Exhibit 2, lines 3, 4 and 5) – In PRASA's OS, both Management's (PRASA's) Base Case and the Alternate Case Scenarios included rate increases to be implemented starting in FY2010, as shown in Table 7-11. Because no increase was implemented in FY2010, and no increase has been budget by PRASA in FY2011, the calculated revenue increase for FY2012 is higher than those originally projected in both scenarios. The Alternate Case assumes zero General Fund Special Contributions over the forecast period. It includes revenue increases as detailed in Table 7-12.

**Table 7-12:**
**Annual Percent Increase in Revenues from Rates**

| Fiscal Year | Official Statement Management Base Case | 2008 Official Statement Alternate Case | Updated Revenue Increase Projection |
|---|---|---|---|
| 2010 | 4.5% | 11.0% | - |
| 2011 | 4.5% | 4.5% | - |
| 2012 | 4.5% | 4.5% | 32.0% |
| 2013 | 4.5% | 6.0% | 4.5% |
| 2014 | 4.5% | 4.5% | - |

3. Increase Reserve for Uncollectible Accounts (Exhibit 2, line 8) – The Alternate Case assumes an increase of two percentage points from the 12% included in PRASA's FY2011 Annual Budget up to 14% of Service Revenues over the forecast period.

4. Increase in Reimbursements from Prior Years (Exhibit 2, line 9) – The Alternate Case assumes an increase of $19M in reimbursement, or collections, from prior years in FY2011. This Alternate Case is based on the three-year average for FY2008, FY2009, and FY2010, of $19M per year.

5. Increase in Payroll and Benefits Costs (Exhibit 2, line 18) – The Alternate Case assumes an increase in each fiscal year based on the employee headcount reductions listed in Table 7-13.

**Table 7-13:**
**Alternate Case Projected Employee Headcount Reductions**

| Fiscal Year | PRASA Projected Annual Net Staff Reductions[1] | Alternate Case Projected Annual Net Staff Reductions | Increase in Alternate Case Payroll and Related Cost Projections[2] |
|---|---|---|---|
| 2011 | 250 | 100 | $4.5M |
| 2012 | 1,123 | 240 | $51.5M |
| 2013 | 234 | 400 | $52.0M |
| 2014 | 50 | 417 | $36.1M |
| **Total** | **1,657** | **1,157** | **-** |

(1) Net staff reduction = Staff reduced – new staff hired.
(2) Calculated as the difference between PRASA's Payroll and Benefits costs forecast and Alternate Case Payroll and Benefits costs.

6. Increased Electric Power Allowance (Exhibit 2, line 19) – The Alternate Case assumes a $7M increase in electric power costs in FY2011. It also includes a 5% adjustment factor to account for inflation in each fiscal year thereafter. It includes the same PRASA projected savings to be achieved from the Comprehensive Energy Management Program. This case represents a more conservative scenario which assumes a cost for oil of $85 per barrel for FY2011.

7. Increase in Chemical Expenses (Exhibit 2, line 20) – The Alternate Case assumes a 3% annual adjustment factor, each year, starting on FY2012. This is a 2% increase over PRASA's Forecast assumption of 1%.

8. Increase in Superaqueduct Fee (Exhibit 2, line 21) – The Alternate Case assumes a 3% annual adjustment factor, each year, starting on FY2012. This is a 2% increase over PRASA's Forecast assumption of 1%.

9. Increase in Capitalized Expenses (Exhibit 2, line 25) – As a result of the increase in expenses previously discussed, the calculated Capitalized Expenses included in the Alternate Case should also be adjusted.

### 7.3.4 Forecast Projected Debt Service Coverage

Table 7-14 summarizes the projected DSC over the forecast period for PRASA's Base Case Forecast (included as Exhibit 1). Based on the anticipated debt service obligations over the forecast period, PRASA would meet its DSC requirements. This is contingent upon PRASA being able to secure the General Fund Special Contributions, continuing with the implementation of its operational initiatives, reducing its staffing levels, and controlling its operational expenses as projected.

**Table 7-14:**
**FY2010 – FY2014 Debt Service Coverage Calculation**
**PRASA's Base Case**

| Debt Service Level | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
|---|---|---|---|---|---|
| **Senior Debt** Coverage Required = 1.20 | 2.95 | 1.83 | 1.90 | 1.42 | 1.45 |
| **Senior Subordinate Debt** Coverage Required = 1.10 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Subordinate Debt** Coverage Required = 1.00 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Commonwealth Guaranteed Indebtedness** Coverage Required = 1.00 | 1.23 | 1.14 | 1.12 | 1.06 | 1.08 |
| **Commonwealth Supported Obligations** Coverage Required = 1.00 | 1.05 | 1.01 | 1.01 | 1.02 | 1.02 |

Table 7-15 summarizes the projected DSC for the Forecast including the Forecast adjustments recommended by MPPR/Malcolm Pirnie, or the Alternate Case (included as Exhibit 2). Based on the anticipated debt service obligations over the forecast period, PRASA would meet its DSC requirements in each fiscal year of the Forecast, with the exception of FY2011 where net revenues available for debt service could fall short by approximately $9.6M. For FY2012 through FY2014, meeting the DSC requirements is contingent upon PRASA implementing the Rate Increases and Rate Adjustments included in the Alternate Case Forecast, and continuing with the implementation of its operational initiatives, reducing its staffing levels, and controlling its operational expenses as planned and projected.

**Table 7-15:**
**FY2010 – FY2014 Debt Service Coverage Calculation**
**Consultant's Alternate Case**

| Debt Service Level | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
|---|---|---|---|---|---|
| **Senior Debt** Coverage Required = 1.20 | 2.95 | 1.74 | 1.91 | 1.41 | 1.48 |
| **Senior Subordinate Debt** Coverage Required = 1.10 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Subordinate Debt** Coverage Required = 1.00 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Commonwealth Guaranteed Indebtedness** Coverage Required = 1.00 | 1.23 | 1.08 | 1.13 | 1.05 | 1.11 |
| **Commonwealth Supported Obligations** Coverage Required = 1.00 | 1.05 | 0.96 | 1.02 | 1.01 | 1.05 |

## 7.4 Operating Reserve Fund

In accordance with the MAT, an Operating Reserve Fund must be established in the amount of $150M until March 1, 2013, and thereafter:

(i) if there is a line of credit on deposit in the reserve fund, the reserve shall mean for the term of line of credit an amount equal to at least ninety (90) days of current expenses

determined on the first day of the fiscal year in which such line of credit is delivered or renewed as set forth in the annual budget for such fiscal year; or

(ii) if the reserve fund is funded from revenues, the reserve shall mean an amount equal to not less than ninety (90) days of current expenses determined annually based on the current expenses relating to the fiscal year of such calculation as set forth in the annual budget for such fiscal year.

PRASA has established a line of credit on deposit to maintain the Operating Reserve Fund to be in compliance with the MAT requirements.

## 7.5 Capital Improvement Fund

In accordance with the MAT, a Capital Improvement Fund must be established and funded for each fiscal year, in an amount equal to the greater of:

(i) the amount set forth in the annual budget for such fiscal year, and

(ii) the amount recommended by the Consulting Engineer.

Equal monthly deposits over the fiscal year must be deposited to the Fund to make the balance of the Fund equal to the requirement. In addition, the following must also be credited to the Fund:

(i) the proceeds of any condemnation awards,

(ii) proceeds of insurance (other than use and occupancy insurance),

(iii) the proceeds of sales of property constituting a part of the Systems, and

(iv) the proceeds of any termination or similar payment received by PRASA under any interest rate swap or similar hedge agreement.

Given PRASA's current financial situation, PRASA has not included deposits to the Capital Improvement in the FY2011 Annual Budget, nor in the rest of the forecast period. As recommended in PRASA's FY2010 Budget Review, MPPR/Malcolm Pirnie recommends that PRASA develop formal capital financing policies and begin funding the Capital Improvement Fund in accordance with the MAT. Policies would set forth the types of capital projects for which long-term debt would be the preferred funding source, compared to the use of pay-as-you-go or cash financing. Many utilities rely on debt funding for long-lived assets such as water and wastewater treatment plants. For regularly recurring projects such as water distribution and wastewater collection system replacements, a specific amount can be included in rate revenue requirements to produce the cash needed for the annual funding of this type of project or initiative. The annual funding amount could then form the basis for projecting a required balance of the Capital Improvement Fund in the future.

## 7.6 Rate Stabilization Account

In accordance with the MAT, a Rate Stabilization Account, the balance of which is determined in the annual budget, must be established. This account is established within the Surplus Fund which contains any remaining moneys after all the required deposits are made. Equal monthly

deposits over the fiscal year must be deposited to the account to make the balance in the Fund equal to the balance set forth in the annual budget. Given PRASA's current financial situation, PRASA has not projected for a Rate Stabilization Account balance in the Forecast.

## 7.7 Funding of Capital Improvement Program

The CIP developed by PRASA estimates an expenditure of $1.2B from FY2011 through FY2014. In FY2010, PRASA expended $299.2M in CIP, which represents a $54.2M reduction from the CIP Budget projection included in the 2009 CER. Table 7-16 provides a summary of the projected CIP sources and uses of funds for FY2010 and the Forecast.

**Table 7-16:**
**CIP Sources and Uses of Funds**
**(in Thousands)**

| | FY2010 PRELIMINARY RESULTS | FY2011 BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|
| **USES OF FUNDS** | | | | | |
| Repair & Replacement of Fixed Assets | $9,403 | $30,094 | $38,491 | $51,738 | $56,444 |
| CIP Infrastructure Projects | 289,841 | 331,231 | 343,497 | 156,217 | 143,012 |
| **Total Uses** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |
| | | | | | |
| **SOURCES OF FUNDS** | | | | | |
| Federal Funds – Rural Development Bonds / LOC | $20,190 | $12,810 | $12,000 | $12,000 | $12,000 |
| Federal Funds – State Revolving Funds | 34,320 | 35,000 | 35,000 | 35,000 | 35,000 |
| Federal Economic Stimulus – Grants | 14,381 | 30,409 | 16,825 | - | - |
| Federal Economic Stimulus – Loans | 2,701 | 6,705 | 10,446 | 2,100 | - |
| Local Stimulus | 2,147 | 4,271 | 5,016 | 1,002 | - |
| Interim Financing | 225,504 | 272,130 | - | - | - |
| Bond Proceeds (Subsequent Issues) | - | - | 302,701 | 157,854 | 152,456 |
| **Total Sources** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |

Of the sources of funds identified over the five-year forecast period, 77% are projected to come from interim financings and/or bond proceeds; 22% are projected to come from Federal Funds (State Revolving Fund, Rural Development bonds, American Recovery and Reinvestment Act, and other matching sources); and 1% is projected to come from local economic stimulus funds. Given current market conditions and PRASA's fiscal situation, it is possible that the projected future bond issuances will not occur as projected. In such case, PRASA would have to continue

to work with the GDB in order to secure the necessary interim funding to continue its CIP implementation.

## 7.8 Conclusions

The purpose of this section is to provide MPPR/Malcolm Pirnie's conclusions regarding the reasonableness of PRASA's forecasts for the fiscal years from July 1, 2010 through June 30, 2014.

PRASA's Base Case financial forecast includes results from operational initiatives that have been described throughout this report and assumptions regarding the future cost of payroll, electricity and chemicals. The financial forecast also includes certain revenue enhancing and cost reduction initiatives that are currently underway. MPPR/Malcolm Pirnie's conclusions regarding the Base Case and adjustments made to the initiatives for the Alternate Case assume the framework and execution of the operational initiatives will not materially change; any changes could significantly alter the findings contained and presented in this CER.

Compliance with the MAT's Rate Covenant and DSC requirement is contingent upon PRASA obtaining special assignments from the Commonwealth's Central Government General Fund in each fiscal year in the amount of $150M to $160M. In the case that the Central Government is unable to provide said special assignment in any given year, PRASA would have to implement rate increases and adjustments that would generate sufficient revenues to meet its DSC requirements. Assuming that all adjustments presented in the Alternate Case take place, the required rate increase could be as much as 32% in FY2012. PRASA has made a dedicated commitment to implement the initiatives described in this report. However, while PRASA is committed to the initiatives, there is a possibility that the projected results and, more specifically, the timing of those results will not be achieved. This possibility is reflected in MPPR/Malcolm Pirnie's Alternate Case, which includes more conservative assumptions in select revenue and expense categories.

Based on the aforementioned review, MPPR/Malcolm Pirnie has concluded the following with regards to the forecast period:

1. PRASA should continuously monitor the results of its existing operational initiatives and measure its progress.

2. PRASA should also focus on achieving the implementation of all of its planned revenue enhancing and cost reducing initiatives as they have been planned on a timely manner. PRASA's projections greatly depend on the successful implementation of such initiatives.

3. If PRASA cannot secure special assignments from the Central Government General Fund, PRASA should increase its water and sewer service rates to a level that will provide sufficient revenue for it to meet all of its obligations as defined in the MAT, rather than depend on one-

time sources that may or may not be available in the future. Any possible rate increase should follow the basic Bonbright principles considered when the previous rate increases were authorized in October 2005. These principles include: revenue stability and predictability, simplicity and public acceptance, fairness to all customer groups, defensibility, and conservation.[21] Although PRASA can approve an automatic 4.5% rate adjustment as stipulated in the 2005 Rate Resolution, any increase above this amount must follow the due process established in Law #21 of May 1985, Law #170 of August 1988, and corresponding amendments.

4. PRASA should also review its current collections processes and practices to establish effective procedures that can lead to a reduction in the existing rate of uncollectibles. An analysis of key accounts should be completed.

5. PRASA should develop capital financing policies that provide direction and guidance regarding the use of debt and cash funding of its CIP. Based on these policies, PRASA should, begin funding the Capital Improvement Fund and Rate Stabilization Account as per MAT requirements.

[21] James C. Bonbright, Albert L. Danielson, and David R. Kammerschen, *Principles of Public Utility Rates* (Public Utilities Reports Inc.) 2nd ed. 1989.

**EXHIBIT 1**

| | PRASA BASE CASE ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|---|
| 1 | **REVENUES** | | | | | |
| 2 | Base Fee and Service Charges | $740,993 | $754,000 | $754,000 | $754,000 | $754,000 |
| 3 | Average Annual Growth/(Decrease) | - | - | - | - | - |
| 4 | Rate Increases | - | - | - | - | - |
| 5 | Rate Adjustments | - | - | - | - | - |
| 6 | General Fund Special Contribution / Other Sources of Funds | 27,240 | 105,000 | 150,000 | 160,000 | 150,000 |
| 7 | Operational Initiatives (Includes NRWRP & Commercial Contracting) | 67,330 | 65,000 | 68,654 | 85,113 | 119,456 |
| 8 | Collections Lag and Uncollectibles Reserve | (100,147) | (98,280) | (98,719) | (100,694) | (104,815) |
| 9 | Reimbursements from Prior Years | 72,543 | - | - | - | - |
| 10 | Subsidy | (3,533) | (3,630) | (3,993) | (4,392) | (4,832) |
| 11 | Subsidy to Public Housing (Includes recommended subsidy reduction) | (7,000) | (12,000) | (12,360) | (12,731) | (13,113) |
| 12 | Other Income | 7,692 | 10,000 | 8,000 | 8,000 | 8,000 |
| 13 | Special Assessments | 6,502 | 7,000 | 7,500 | 8,000 | 8,500 |
| 14 | Interest Income | - | - | - | - | - |
| 15 | **Total Operating Revenues, Net** | **$811,620** | **$827,090** | **$873,082** | **$897,296** | **$917,196** |
| 16 | | | | | | |
| 17 | **OPERATING EXPENSES** | | | | | |
| 18 | Payroll and Benefits (Includes staff reductions through attrition) | $299,948 | $270,584 | $200,364 | $194,302 | $186,458 |
| 19 | Electric Power | 140,131 | 138,000 | 132,000 | 128,600 | 123,030 |
| 20 | Chemicals | 26,264 | 27,703 | 27,980 | 28,260 | 28,542 |
| 21 | Superaqueduct Service Contract | 22,800 | 24,000 | 24,240 | 24,482 | 24,727 |
| 22 | Insurance | 9,443 | 12,280 | 12,648 | 13,028 | 13,419 |
| 23 | Other Expenses | 152,801 | 150,616 | 142,609 | 136,587 | 140,685 |
| 24 | Operational Initiatives (PPP Project) | - | - | 80,802 | 84,332 | 89,199 |
| 25 | Capitalized Operating Expenses | (42,340) | (37,391) | (31,032) | (30,480) | (30,303) |
| 26 | **Total Operating Expenses, Net** | **$609,047** | **$585,792** | **$589,611** | **$579,111** | **$575,757** |
| 27 | | | | | | |
| 28 | **OTHER FINANCING SOURCES** | | | | | |
| 29 | Surplus Funds & Non-Cash Adjustments | - | - | - | - | - |
| 30 | Other Sources of Fund ($150M Facility) | - | - | - | - | - |
| 31 | | | | | | |
| 32 | **TOTAL NET REVENUES AVAILABLE FOR DEBT SERVICE** | **$202,573** | **$241,298** | **$283,471** | **$318,185** | **$341,439** |
| 33 | | | | | | |
| 34 | **TOTAL DEBT SERVICE (Includes CSO)** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |
| 35 | | | | | | |
| 36 | **TOTAL (DEFICIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$1,726** | **$2,446** | **$5,208** | **$6,163** |
| 37 | **CUMULATIVE (DERCIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$11,992** | **$14,438** | **$19,646** | **$25,809** |

| **DEBT SERVICE COVERAGE** | | | | | |
|---|---|---|---|---|---|
| **Senior** | $68,756 | $132,158 | $149,310 | $223,683 | $236,121 |
| Coverage Required = 1.20 | 2.95 | 1.83 | 1.90 | 1.42 | 1.45 |
| **Senior Subordinated** | $10,751 | $10,853 | $1,309 | - | - |
| Coverage Required = 1.10 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Subordinated** | - | - | - | - | - |
| Coverage Required = 1.00 | 2.55 | 1.69 | 1.88 | 1.42 | 1.45 |
| **Commonwealth Guranteed Indebtedness** | $85,561 | $69,324 | $102,692 | $75,854 | $78,882 |
| Coverage Required = 1.00 | 1.23 | 1.14 | 1.12 | 1.06 | 1.08 |
| **Commonwealth Supported Obligations** | $27,240 | $27,237 | $27,714 | $13,441 | $20,273 |
| Coverage Required = 1.00 | 1.05 | 1.01 | 1.01 | 1.02 | 1.02 |
| **Total Debt Service** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |

*Numbers may not add up due to rounding

**EXHIBIT 1**

| ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|
| **USES OF FUNDS** | | | | | |
| Repair & Replacement of Fixed Assets | $9,403 | $30,094 | $38,491 | $51,738 | $56,444 |
| CIP Infrastructure Projects | 289,841 | 331,231 | 343,497 | 156,217 | 143,012 |
| **Total Uses** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |
| | | | | | |
| **SOURCES OF FUNDS** | | | | | |
| Federal Funds – Rural Development Bonds / LOC | $20,190 | $12,810 | $12,000 | $12,000 | $12,000 |
| Federal Funds – State Revolving Funds | 34,320 | 35,000 | 35,000 | 35,000 | 35,000 |
| Federal Economic Stimulus – Grants | 14,381 | 30,409 | 16,825 | 0 | 0 |
| Federal Economic Stimulus – Loans | 2,701 | 6,705 | 10,446 | 2,100 | 0 |
| Local Stimulus | 2,147 | 4,271 | 5,016 | 1,002 | 0 |
| Interim Financing | 225,504 | 272,130 | 0 | 0 | 0 |
| Bond Proceeds (Subsequent Issues) | 0 | 0 | 302,701 | 157,854 | 152,456 |
| **Total Sources** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |

**EXHIBIT 2**

| | ALTERNATE CASE ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|---|
| 1 | **REVENUES** | | | | | |
| 2 | Base Fee and Service Charges | $740,993 | $741,000 | $741,000 | $974,415 | $1,018,264 |
| 3 | Average Annual Growth/(Decrease) | - | - | - | - | - |
| 4 | Rate Increases | - | - | 200,070 | - | - |
| 5 | Rate Adjustments | - | - | 33,345 | 43,849 | - |
| 6 | General Fund Special Contribution / Other Sources of Funds | 27,240 | 105,000 | - | - | - |
| 7 | Operational Initiatives (Includes NRWRP & Commercial Contracting) | 67,330 | 65,000 | 68,654 | 85,113 | 119,456 |
| 8 | Collections Lag and Uncollectibles Reserve | (100,147) | (104,780) | (103,740) | (136,418) | (142,557) |
| 9 | Reimbursements from Prior Years | 72,543 | 19,000 | - | - | - |
| 10 | Subsidy | (3,533) | (3,630) | (3,993) | (4,392) | (4,832) |
| 11 | Subsidy to Public Housing (Includes recommended subsidy reduction) | (7,000) | (12,000) | (12,360) | (12,731) | (13,113) |
| 12 | Other Income | 7,692 | 10,000 | 8,000 | 8,000 | 8,000 |
| 13 | Special Assessments | 6,502 | 7,000 | 7,500 | 8,000 | 8,500 |
| 14 | Interest Income | - | - | - | - | - |
| 15 | **Total Operating Revenues, Net** | **$811,620** | **$826,590** | **$938,476** | **$965,835** | **$993,718** |
| 16 | | | | | | |
| 17 | **OPERATING EXPENSES** | | | | | |
| 18 | Payroll and Benefits (Includes staff reductions through attrition) | $299,948 | $275,084 | $251,444 | $246,347 | $222,537 |
| 19 | Electric Power | 140,131 | 145,000 | 146,250 | 149,863 | 154,856 |
| 20 | Chemicals | 26,264 | 27,703 | 28,534 | 29,390 | 30,272 |
| 21 | Superaqueduct Service Contract | 22,800 | 24,000 | 24,720 | 25,462 | 26,225 |
| 22 | Insurance | 9,443 | 12,280 | 12,648 | 13,028 | 13,419 |
| 23 | Other Expenses | 152,801 | 150,616 | 142,609 | 136,587 | 140,685 |
| 24 | Operational Initiatives (PPP Project) | - | - | 80,802 | 84,332 | 89,199 |
| 25 | Capitalized Operating Expenses | (42,340) | (38,081) | (34,350) | (34,250) | (33,860) |
| 26 | **Total Operating Expenses, Net** | **$609,047** | **$596,602** | **$652,657** | **$650,757** | **$643,333** |
| 27 | | | | | | |
| 28 | **OTHER FINANCING SOURCES** | | | | | |
| 29 | Surplus Funds & Non-Cash Adjustments | - | - | - | - | - |
| 30 | Other Sources of Fund ($150M Facility) | - | - | - | - | - |
| 31 | | | | | | |
| 32 | **TOTAL NET REVENUES AVAILABLE FOR DEBT SERVICE** | **$202,573** | **$229,988** | **$285,819** | **$315,078** | **$350,385** |
| 33 | | | | | | |
| 34 | **TOTAL DEBT SERVICE (Includes CSO)** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |
| 35 | | | | | | |
| 36 | **TOTAL (DEFICIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **($9,584)** | **$4,794** | **$2,101** | **$15,109** |
| 37 | **CUMULATIVE (DERCIENCY) / SURPLUS - OPERATIONAL FUNDS** | **$10,266** | **$682** | **$5,476** | **$7,577** | **$22,686** |

| **DEBT SERVICE COVERAGE** | | | | | |
|---|---|---|---|---|---|
| **Senior** | $68,756 | $132,158 | $149,310 | $223,683 | $236,121 |
| Coverage Required = 1.20 | 2.95 | 1.74 | 1.91 | 1.41 | 1.48 |
| **Senior Subordinated** | $10,751 | $10,853 | $1,309 | - | - |
| Coverage Required = 1.10 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Subordinated** | - | - | - | - | - |
| Coverage Required = 1.00 | 2.55 | 1.61 | 1.90 | 1.41 | 1.48 |
| **Commonwealth Guranteed Indebtedness** | $85,561 | $69,324 | $102,692 | $75,854 | $78,882 |
| Coverage Required = 1.00 | 1.23 | 1.08 | 1.13 | 1.05 | 1.11 |
| **Commonwealth Supported Obligations** | $27,240 | $27,237 | $27,714 | $13,441 | $20,273 |
| Coverage Required = 1.00 | 1.05 | 0.96 | 1.02 | 1.01 | 1.05 |
| **Total Debt Service** | **$192,307** | **$239,572** | **$281,025** | **$312,977** | **$335,276** |

*Numbers may not add up due to rounding

**EXHIBIT 2**

| ($, Thousands) | FY2010 PRELIMINARY RESULTS | FY2011 ANNUAL BUDGET | FY2012 PROJECTION | FY2013 PROJECTION | FY2014 PROJECTION |
|---|---|---|---|---|---|
| **USES OF FUNDS** | | | | | |
| Repair & Replacement of Fixed Assets | $9,403 | $30,094 | $38,491 | $51,738 | $56,444 |
| CIP Infrastructure Projects | 289,841 | 331,231 | 343,497 | 156,217 | 143,012 |
| **Total Uses** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |
| | | | | | |
| **SOURCES OF FUNDS** | | | | | |
| Federal Funds – Rural Development Bonds / LOC | $20,190 | $12,810 | $12,000 | $12,000 | $12,000 |
| Federal Funds – State Revolving Funds | 34,320 | 35,000 | 35,000 | 35,000 | 35,000 |
| Federal Economic Stimulus – Grants | 14,381 | 30,409 | 16,825 | 0 | 0 |
| Federal Economic Stimulus – Loans | 2,701 | 6,705 | 10,446 | 2,100 | 0 |
| Local Stimulus | 2,147 | 4,271 | 5,016 | 1,002 | 0 |
| Interim Financing | 225,504 | 272,130 | 0 | 0 | 0 |
| Bond Proceeds (Subsequent Issues) | 0 | 0 | 302,701 | 157,854 | 152,456 |
| **Total Sources** | **$299,243** | **$361,325** | **$381,988** | **$207,956** | **$199,456** |

# 8 Conclusions and Recommendations

## 8.1 Considerations and Assumptions

In preparation of this report and the conclusions contained herein, MPPR/Malcolm Pirnie has relied on certain assumptions and information provided by PRASA with respect to the conditions which may exist or events which may occur in the future. MPPR/Malcolm Pirnie believes the information and assumptions are reasonable, but has not independently verified information provided by PRASA and others. To the extent that actual future conditions differ from those assumed herein or provided to us by others, the actual results will vary from those forecast.

In the preparation of this report, MPPR/Malcolm Pirnie has made a number of principal considerations and assumptions (as provided throughout this report); some of the most notable are as follows:

1. MPPR/Malcolm Pirnie has made no determination as to the validity and enforceability of any contracts, agreement, existing law, rule, or regulation applicable to PRASA and its operations. However, for purposes of this report, MPPR/Malcolm Pirnie has assumed that all such contracts, agreements, laws, rules and regulations will be fully enforceable in accordance with their terms.
2. PRASA will generally continue the current policies of employing qualified and competent personnel; properly operating and maintaining the System in accordance with generally accepted industry practices; and of operating the System in a prudent and sound businesslike manner.
3. The proposed CIP reflects the general needs of the System, and the CIP will be largely implemented as planned and reflected in this report.

## 8.2 Conclusions and Recommendations

Set forth below are the principal opinions which MPPR/Malcolm Pirnie has reached regarding the review of PRASA's water and wastewater system. For a complete understanding of the assumptions upon which these opinions are based, this report should be read in its entirety.

1. PRASA's overall staff levels have been historically high compared to industry standards, although some individual facilities and PRASA departments have staffing shortages. Also, as a result of recent staff reductions, PRASA's performance regarding meter readings and effectiveness in repairing leaks and overflows in a timely manner have fallen. As such, PRASA could benefit from a utility-wide organizational assessment to identify staffing needs, and opportunities for staff reductions and position consolidations where surplus staff is identified.

2. Although PRASA's training record since FY2006 has improved considerably, the staff needs additional training to improve effectiveness and increase safe work practices. PRASA recognizes this need and has continued providing a comprehensive training program which provided an average of 21 hours of training per employee in FY2010 compared to an average of 13 hours per employee in FY2006, 16 hours in FY2007, and 14 hours in FY2008. Between FY2009 and FY2010 the training hours were reduced from 29 to 21 hours. With the new facilities automation process and chemical reduction efforts, it is recommended to PRASA to increase or at least maintain the training hours for the next fiscal year. As this program continues, the capabilities and performance of staff working at PRASA is expected to improve over time.

3. The condition of the facilities visited varied from new to those requiring capital upgrades. The condition of most facilities with implemented CIP projects improved from FY2009 to FY2010. However, certain facilities are operating out of compliance with discharge permit limits and drinking water standards. Despite these compliance problems, the facilities are generally producing and delivering potable water and conveying and treating wastewater to a level of competency. PRASA demonstrates a thorough understanding of the System shortcomings and continues to work towards correcting them.

4. PRASA must continue to maintain its commitment for the implementation of the Integrated Preventive Maintenance Plan (IPMP). In addition, PRASA must continue a focused corrective maintenance and R&R program in order to improve fallen metrics, to maintain and improve the condition of the System, and to provide a program for the long-term preservation of the System assets. PRASA has included in its CIP provisions for the continuous implementation of the IPMP. Additionally, PRASA has budgeted, on average, approximately $47M annually from FY2011 through FY2015 for R&R. However, PRASA should evaluate and adjust its R&R budget to improve its performance metrics.

5. PRASA should review its performance metrics and standardize the way these metrics are calculated to facilitate their interpretation and application including, but not limited to, how the data is collected, how it is reported, and how it is used by PRASA management.

6. A review of PRASA's commercial services showed that PRASA has significant opportunities to reduce its current volume of NRW and commercial losses, and to improve its billing procedures and collections. In MPPR/Malcolm Pirnie's opinion, PRASA is losing significant amounts of revenue due to:

   - Water theft
   - Non-optimal collection practices
   - Poor customer billing database management
   - High levels of estimation
   - Reading bi-monthly instead of monthly
   - Malfunctioning and obsolete customer meters

PRASA should review its current collections efforts in order to establish effective and proactive procedures that can lead to a reduction in its uncollectibles. An analysis of key accounts should be completed so that collection efforts target higher value customers.

7. With the possible exception of buried infrastructure improvements, the planned CIP along with the O&M initiatives are generally in alignment with the System needs. No additional CIP needs at plant facilities were identified for this CER, although improvements to ancillary facilities are required. Those improvements could be addressed through PRASA's R&R program, included within the CIP. Hence, an analysis of PRASA's R&R needs and budget is recommended to develop a sound R&R program that will allow PRASA to improve and extend the useful life of its System. Because PRASA has not budgeted contributions to the Capital Improvement Fund, the planned capital improvements for FY2010 ($299M) were paid from the proceeds of Federal funding and Interim Financing Loans. Facilities that underwent upgrades or improvements through the CIP showed overall improvement. Review of PRASA's CIP showed that most of the WTPs and WWTPs that were considered unacceptable in terms of compliance currently have CIP projects identified to either rehabilitate or close the facility, thus addressing existing compliance problems. Once implemented as planned, these initiatives are expected to result in significant improvements in the performance of the System, including substantial advances towards complying with existing regulatory requirements.

8. The full impact of future regulations on the water treatment and supply system are not known at this time. In some cases, future regulations are expected to require minor process changes (such as moving the point of chlorination within a facility) and in other cases major capital improvements, such as construction of new treatment plants. Although, the existing CIP does not include projects specifically to address future regulations, PRASA is making allowances in its new designs to improve capabilities to meet certain future regulations. As the impact of future regulations becomes more defined, PRASA may need to modify its CIP to accommodate resulting needs.

9. PRASA's insurance program has reasonable insurance policies to meet PRASA's insurable risks and exposures. Insured amounts and values are reasonable to meet or exceed industry standards. PRASA has in place a risk management and loss prevention regime that reasonably addresses the pro-active process of avoiding losses and accidents in all its operations in accordance with modern industry standards.

10. Although PRASA's financial Forecast is, for the most part, reasonable, it depends on revenue sources that for FY2012 through FY2014 are yet to be identified. Currently, PRASA's Forecast does not include rate adjustments or rate increases. However, PRASA continues to implement operational initiatives to help improve its financial situation. While PRASA is committed to the initiatives, there is a possibility that the results projected to be achieved and more specifically, the timing of those results, will not be achieved. This possibility is

reflected in the adjustments and recommendations made by MPPR/Malcolm Pirnie in select revenue and expense categories and conclusions presented herein. In the event that PRASA is unable to secure future special assignments from the Central Government General Fund or generate sufficient revenues to meet their operational and debt service obligation in FY2012 through FY2014, in FY2012 PRASA would have to increase its rates by as much as 32%.

Respectfully Submitted,

**MP ENGINEERS OF PUERTO RICO, P.S.C.**

/s/ Guillermo Marxuach, P.E.
President

Autoridad de Acueductos y Alcantarillados
GOBIERNO DE PUERTO RICO

# Puerto Rico Aqueduct and Sewer Authority

MP ENGINEERS of PUERTO RICO and its subcontractor MALCOLM PIRNIE