

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 Broadway
New York, New York 10007-1866

**STATEMENT OF BASIS
FOR
DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
PERMIT MODIFICATION TO DISCHARGE
INTO THE WATERS OF THE UNITED STATES**

NPDES Permit No. PR0023728

Name and Address of Applicant:

Puerto Rico Aqueduct and Sewer Authority (PRASA)
P.O. Box 7066
Barrio Obrero Station
San Juan, Puerto Rico 00916

hereinafter referred to as "the permittee" is authorized to discharge from a facility located at

Bayamón Regional Wastewater Treatment Plant
Road 869 KM 2.9 BO. Palmas
Cataño, Puerto Rico 00926

to receiving waters named:

Atlantic Ocean

Receiving Water Classification: SC

LOCATION OF DISCHARGE

The above named applicant has applied for a National Pollutant Discharge Elimination System (NPDES) permit, to the U.S. Environmental Protection Agency (EPA) to discharge into the designated receiving water. The location of the discharge, Outfall 001, is described by the following U.S.G.S. coordinates:

<u>Outfall</u>	<u>Latitude</u>	<u>Longitude</u>
001	18° 29' 13"	66° 08' 21"

DESCRIPTION OF APPLICANT'S FACILITY AND DISCHARGE

The Bayamón Regional Wastewater Treatment Plant (RWWTP) started operations in May 1983. The facility is owned and operated by the Puerto Rico Aqueduct and Sewer Authority (PRASA). It is located in Barrio Palmas in Cataño, Puerto Rico. The Bayamon RWWTP serves the municipalities of Bayamón, Cataño, parts of Guaynabo, Rio Piedras, Toa Alta and Toa Baja.

The Bayamón RWWTP is designed to treat an average hydraulic loading of 40 million gallons per day (MGD) and a peak hydraulic loading of 68 MGD. Currently, the average daily and maximum flows are approximately 30 MGD and 50 MGD, respectively. The facility's layout includes a pumping station, mechanical bar screen, grit removal mechanism, primary clarifiers, sludge handling facilities and disinfection area. The treated effluent from the Bayamón RWWTP combines with treated effluent from the Puerto Nuevo RWWTP and the Bacardi Corporation's wastewater treatment plant (WWTP). The combined effluent is then discharged approximately 7,365 ft (2,246 m) from the shoreline into the Atlantic Ocean, at a location approximately 3,600 ft (1,097 m) north of Isla de Cabras, at a depth of 141 ft (43 m). The discharge is through a high-rate, Y-shaped diffuser consisting of two (2) legs that are each 1,010 ft (308 m) in length and a constant 84-inch diameter. The west leg of the diffuser has 100 bell-mouthed ports and the east leg of the diffuser has 102 bell-mouthed ports, each at 15 degrees from the horizontal. There are a total of 202 ports. On the west diffuser leg, there are 80 inshore ports that have a diameter of 6 in (15.2 cm), 19 offshore ports that have a diameter of 7 in (17.8 cm), and 1 10-inch (25.4 cm) port. On the east diffuser leg, there are 81 inshore ports that have a diameter of 6 in (15.2 cm), 20 offshore ports that have a diameter of 7 in (17.8 cm), and 1 10-inch port. The ports discharge on alternating sides of the diffuser and are evenly spaced at 10 ft (3.05 m) intervals. The diffuser is currently operated with all 202 ports open. PRASA is proposing to continue discharging through all 202 ports.

The outfall system is owned and operated by the Puerto Rico Aqueduct and Sewer Authority (PRASA) to dispose of treated effluents from the Bayamón and Puerto Nuevo RWWTPs. The Bayamón RWWTP and Puerto Nuevo RWWTP are municipal sewage treatment plants operated by the PRASA and their discharges are regulated by separate NPDES permits. The Atlantic Ocean is classified as SC water in the Puerto Rico Water Quality Standards Regulation (PRWQSR), by the Environmental Quality Board (EQB) of the Commonwealth of Puerto Rico. A detailed description of the type and quantity of pollutants which are to be discharged is listed in the draft Permit.

On September 28, 2011, the U.S. Environmental Protection Agency, Region 2 (EPA) issued a final NPDES permit to the Bayamón Regional Wastewater Treatment Plant located in Cataño, Puerto Rico. The EPA specified that the Permit was to become effective on December 1, 2011.

On November 18, 2011, pursuant to 40 CFR §§124.19, PRASA filed a Petition for Review of the Puerto Nuevo RWWTP with the Environmental Appeals Board (EAB), appealing certain conditions included in the Puerto Nuevo RWWTP's Permit. Bacardi filed a Petition for Review for its Permit at or around the same time. In the Petitions for Review submitted by Bacardi and PRASA to the EAB, among other things, the permittees contested the numeric limitation included for whole effluent toxicity, as well as the use of chronic toxicity units (TUC) based on the inverse

of the No Effects Concentration (NOEC) as a unit of determining compliance, in place of the Inhibition Concentration of 25% (IC25) used in the previous permit cycle. PRASA did not file a Petition for Review for the Bayamón RWWTP's permit. Given the fact that the Bayamón RWWTP's permit contains the same condition that EPA has decided to modify in the Bacardi and Puerto Nuevo permits and that the facility discharges from the same outfall as the two facilities for which an appeal was filed, EPA is proposing to withdraw the condition in the Bayamón RWWTP's permit and modify that condition, pursuant to 40 C.F.R. Section 122.62, to conform with the language in the Bacardi and Puerto Nuevo permits. A discussion of these issues which concerns PRASA and the resolution of the issues raised in the appeal is included in this permit modification is discussed below.

EPA is accepting comment solely on the modification of withdrawn conditions, which are explained in this Statement of Basis. With the exception of those conditions that are being withdrawn and that are the subject of this proposed modification, as described below, all terms and conditions of the September 28, 2011 permit became effective on December 1, 2011.

Whole Effluent Toxicity

EPA had included an effluent limitation for Whole Effluent Toxicity (WET) for the combined discharge of the Bacardi, and PRASA Bayamón RWWTP and Puerto Nuevo RWWTP. WET monitoring requirements had also been included for the combined discharge and the discharge 001 from the Bacardi facility. Similar monitoring requirements were incorporated into the NPDES permits for the PRASA Bayamón RWWTP and Puerto Nuevo RWWTP.

Rule 1303.1(I) of PRWQS provides that all waters of Puerto Rico shall not contain any substance at such concentration which, either alone or as result of synergistic effects with other substances is toxic or produces undesirable physiological responses in human, fish or other fauna or flora. This is generally referred to as a narrative water quality criterion "no toxics in toxic amounts". PRWQS do not provide a numeric criterion for toxicity. Since controls on individual pollutants may not always adequately protect water quality, toxicity testing is used to assess and control whole effluent toxicity (WET) which is necessary to reduce or eliminate the toxic impact of the effluent and meet narrative water quality criteria (54 FR 23868, June 2, 1989). NPDES regulations define WET as the whole or aggregate toxic effect of an effluent measured directly by a toxicity test.

Pursuant to the current modified permits, PRASA is required to conduct acute and chronic WET testing on the combined effluent and chronic only WET testing on individual effluent samples from the Bayamón RWWTP, Puerto Nuevo RWWTP, and the Bacardi WWTP. Since 2007, PRASA has conducted four acute WET monitoring events for the combined effluent using the mysid shrimp (*Mysidopsis bahia*) and sheepshead minnow (*Cyprinidon variegates*) and 11 chronic WET monitoring events using these WET test species and the sea urchin (*Arbacia punctulata*). Five of the most recent 11 chronic WET monitoring events also included testing on individual effluent using the sea urchin. Since effluent toxicity is inversely related to the effect concentration (the lower the effect concentration, the higher the toxicity in the effluent), WET test data are typically expressed as toxic units (TUs) to better illustrate the magnitude of potential

toxicity. Rule 1301.1 of PRWQS defines acute TU (TU_a) and chronic TU (TU_c) values as the Lethal Concentration (LC₅₀) of the tested effluent at which 50 percent of the test organisms die, where TU_a = 100 ÷ LC₅₀; and the No Observed Effect Concentration (NOEC), where TU_c = 100 ÷ NOEC, respectively.¹ To assess WET test data, EPA recommends a criterion maximum concentration (CMC) of 0.3 TU_a and criterion continuous concentration (CCC) of 1.0 TU_c be used to ensure aquatic life protection against toxicity in the receiving water. For the purpose of the section 301(h) evaluation, EPA determined the maximum allowable level of effluent toxicity or wasteload allocation (WLA) at the edge of the mixing zone that would still ensure attainment of water quality criteria for toxicity. With consideration of dilution and CMC and CCC values, EPA calculated acute and chronic WLAs of 30.6 TU_a and 102 TU_c, respectively, and then compared the WLAs to effluent WET test data.

Of the 30 chronic WET tests conducted on the combined effluent since 2007, 30 percent (or 10 tests) resulted in TU_c values that exceeded the 102 TU_c WLA. All of these tests were conducted on the sea urchin and 60 percent of them were conducted in May 2007. When compared to the permit limitation of 1.00 percent effluent or 100 TU_c derived from the IC₂₅, or the inhibition concentration at which a 25 percent effect occurs, no chronic toxicity is demonstrated. Based on the NOEC pursuant to PRWQS, since these tests were conducted on the combined effluent it is difficult to distinguish whether effluent from one facility or all was contributing to toxicity in these tests. In 2009, PRASA and the Bacardi Corporation began conducting chronic WET testing on individual samples of effluent from each facility in addition to the combined effluent. Between 2009 and 2011, five chronic WET tests using the sea urchin were conducted and results showed no toxicity observed in terms of the NOEC for the combined effluent but showed repeated toxicity in effluent samples from the Bacardi RWWTP. This may suggest that toxicity demonstrated in tests of combined effluent prior to 2009 may be attributed to effluent from the Bacardi WWTP. Nevertheless, nine WET monitoring events have been conducted since May 2007 and only one has demonstrated chronic toxicity on the combined effluent. Also no acute or chronic toxicity has been observed in effluent from the Bayamón RWWTP and only one effluent sample from the Puerto Nuevo RWWTP showed chronic toxicity.

Based on review of WET data, in accordance with 40 CFR 122.44(d)(v), EPA has determined that the combined discharge will cause, has the reasonable potential to cause, or contributes to an excursion above the narrative criterion for chronic toxicity and has proposed effluent limitation for the combined discharge. With consideration of dilution, utilizing the calculation procedures in the EPA Guidance *Technical Support Document for Water Quality-Based Toxics Control* (March 1991), EPA included a maximum daily effluent limitation of 83.32 TU_c (or 1.2% effluent) for chronic toxicity in the draft modified permits for the Bayamón RWWTP, Puerto Nuevo RWWTP, and Bacardi WWTP. The calculation of this limitation is included as Attachment I.

In addition to the limitation, EPA had included other toxicity testing requirements on the individual effluents from these three facilities, as these effluents combine prior to discharge. The toxicity observed in the effluent may be the result of toxicity in one or more of the discharges, or it may be the result of synergistic effects that occur when the effluents combine prior to discharge.

¹ The NOEC is the highest tested effluent concentration (in percent effluent) that does not cause an adverse effect on the test organism (i.e., the highest effluent concentration at which the values for the observed responses are not statistically different from the control).

The contemporaneous testing on each of the effluents from these facilities will provide an indication as to the source of any toxicity observed in the combined discharge.

In the 2011 permits, EPA had also required that all three dischargers develop plans for a toxicity reduction evaluation (TRE) within the first six months of the permit term. The three dischargers may coordinate and develop one plan to meet the permit requirement in each NPDES permit. Violation of the limitation for chronic toxicity using the combined discharge would trigger accelerated monitoring of both the combined discharge and solely the Bacardi effluent (PRASA would be required to test their individual effluents for the Bayamon and Puerto Nuevo facilities in addition to the combined discharge as well) for twelve weeks. During the accelerated testing period an additional violation of the limitation on the combined discharge would require these three permittees to activate their TRE workplans, and implement their strategy to identify and abate the source of toxicity.

As a result of conversations during the ADR process, EPA agreed to modify the permit to allow a three-year compliance schedule, during which time an interim limitation, based on existing effluent quality (EEQ) results would be applied. This decision was based on the inclusion of a more stringent limitation, and the variability of NOEC results observed by Bacardi and PRASA for the *Arbacia punctulata* chronic fertilization test. The final effluent limitation will remain the number calculated by EPA in the 2011 permit, and will remain in terms of chronic toxicity units as defined using the inverse of the NOEC endpoint. It was explained during the ADR process that the number was calculated using EPA guidance to ensure that the discharge would not cause or contribute to a violation of the standard at the edge of the mixing zone, which is not a straight application of the dilution ratio, but a statistical calculation that accounts for variability in effluent, dilution, and ambient conditions. The retention of the NOEC endpoint was explained as required by the definition of chronic toxicity units in the definitions section of the Puerto Rico Water Quality Standards Regulation. However, the interim limitation is an EEQ number, which was calculated using IC25 results, such that the calculated number is a consistent projection of the 95th percentile result of toxicity results over the last five years. The EEQ Calculation is included as Attachment II.

During the timeframe of the interim limitation, the permittee will be required to develop a TRE workplan, which will be triggered by any exceedance of the final permit limitation of 83.32 TUc.

ATTACHMENT I CALCULATION OF FINAL PERMIT LIMIT

Calculation of Waste Load Allocation (WLA)

The WLA is used to determine the level of effluent concentration that will comply with water quality standards in receiving waters. Using the information available for dilution, WLAs were calculated for WET using the complete mix equation, which simplifies to

$$WLA = C_r \times \text{Dilution Ratio}$$

where C_r = the water quality criterion concentration. In Puerto Rico, a criterion continuous concentration of 1.0 TU_c, and a criterion maximum concentration (CMC) of 0.3 TU_a is used as the numeric interpretation of the water quality standard for toxicity.

Using a critical initial dilution (CID) ratio of 102:1, the chronic WLA would be

$$WLA_c = C_r \times 102 = 1.0 \times 102 = 102.0 \text{ TU}_c$$

$$WLA_a = 0.3 \times 102 = 30.6 \text{ TU}_a$$

$$WLA_{a,c} = WLA_a \times ACR = 30.6 \times 10 = 306 \text{ TU}_{a,c}$$

Calculate Long-term Averages (LTAs).

To calculate the long term average (LTA):

$$LTA = WLA \times e^{[0.05\sigma^2 - z\sigma]}$$

$$LTA_{a,c} = 306 \times 0.321 = 98.23 \text{ TU where:}$$

0.321 is the acute WLA multiplier for $C_v = 0.6$ at the 99th percentile (from Table 5-1, pg. 102 of the TSD)

$$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$$

$$LTA_c = 102 \times 0.527 = 53.75 \text{ where:}$$

0.527 is the chronic WLA multiplier at the 99th percentile (from Table 5-1, pg. 102 of the TSD)

Select the minimum LTA.

The LTA based on the chronic WLA is more limiting and will be used to develop permit limits.

Limit Calculation:

Using the 95th percentile and monthly sampling, the effluent limit is calculated as:

$$LTA \times e^{\frac{[z\sigma - 0.5\sigma^2]}{n}} \text{ where } e^{\frac{[z\sigma - 0.5\sigma^2]}{n}} = \text{AML LTA multiplier}$$

$z = 1.645$ for the 95th percentile occurrence probability for the AML is recommended

n = number of samples/month (the TSD recommends that a minimum n of 4 be used, even if monitoring is less frequent).

From Table 5-2, on pg. 102 of the TSD, for $Cv = 0.6$ and $n=4$,

$$AML = 53.75 \times 1.55 = \mathbf{83.32 \text{ TUc}}$$

**ATTACHMENT II: Calculation of Interim Limit based on Existing Effluent Quality
Arbacia Punctulata Results for Combined Bacardi PRASA Discharge**

	IC25	100/IC25	Natural Log
February-2006	7.25	13.8	2.6242
March-2006	7.31	13.7	2.6159
April-2006	5	20.0	2.9957
September-2006	1.68	59.5	4.0864
November-2006	1.7	58.8	4.0745
November-2006	4	25.0	3.2189
April-2007	3.09	32.4	3.4770
April-2007	2.12	47.2	3.8538
April-2007	4.47	22.4	3.1078
May-2007	4.92	20.3	3.0119
May-2007	14.8	6.8	1.9105
May-2007	14.4	6.9	1.9379
May-2007	4.88	20.5	3.0200
May-2007	3.01	33.2	3.5032
May-2007	5.23	19.1	2.9508
May/June 2007	5.91	16.9	2.8285
September-2008	4.15	24.1	3.1821
December-2008	5.57	18.0	2.8878
February-2009	13.5	7.4	2.0025
June-2009	9.51	10.5	2.3528
August-2009	4.34	23.0	3.1373
November-2009	4.31	23.2	3.1442
March-2010	4.68	21.4	3.0619
May-2010	13.96	7.2	1.9690
September-2010	12.9	7.8	2.0479
November-2010	13.4	7.5	2.0099
March-2011	13.9	7.2	1.9733
May-2011	5.3	19.0	2.9469

Maximum daily limit = $\exp[\mu_y + 2.326 \sigma_y]$
Average monthly limit = $\exp[\mu_n + 1.645 \sigma_n]$
 μ_y = estimated mean of the lognormally transformed measurements
 σ_y = standard deviation
 μ_n = n-day monthly average - where n = 2 or 1 depending on monitoring frequency
 σ_n = standard deviation

99th percentile
77.4846

E(X)
21.3571
V(X)
154.6258
Sn^2
0.1566
Un
2.9831

Inverse

1.29

95th percentile
37.8646