

**FOURTH FIVE-YEAR REVIEW REPORT FOR
BARCELONETA LANDFILL SUPERFUND SITE
BARCELONETA, PUERTO RICO**



Prepared by

**U.S. Environmental Protection Agency
Region 2
Guaynabo, Puerto Rico**

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Approved by:

Date:

ERIC WILSON

Digitally signed by ERIC WILSON
Date: 2020.05.22 16:09:36 -04'00'

**Eric Wilson, Acting Director
Superfund and Emergency Management Division**

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
DENR	Department of Environmental and Natural Resources
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager

I. INTRODUCTION

The purpose of a five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment and is functioning as intended by the decision documents. The methods, findings, and conclusions of reviews are documented in the five-year review. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

This is the fourth five-year review for the Barceloneta Landfill site, located in Barceloneta, Puerto Rico. This five-year review was conducted by the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Luis Santos. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 et seq. and 40 CFR 300.430(f)(4)(ii), and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the site file.

The triggering action for this statutory review is the completion date of the previous five-year review. A five-year review is required at this site due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site consists of one operable unit, which is the subject of this five-year review.

Site Background

The Barceloneta Landfill ("the Landfill"), an inactive non-hazardous domestic and industrial waste disposal facility, is located in Barceloneta, Puerto Rico on the north coast of the island, approximately 20 miles due west of San Juan. The Landfill is about 4.5 kilometers south of the Town of Barceloneta in the Florida Afuera Ward. The property which contains the Barceloneta Landfill is approximately 32.6 hectares (80.6 acres) in size and is owned by the Municipality of Barceloneta. The Landfill is surrounded by a tropical forest. The Quebrada Cimarrona, a tributary of the Rio Grande de Manati, is located 0.8 kilometers north of the Landfill. A small residential area of approximately 150 residences in Barrio Bajura Adentro is located approximately one kilometer east of the Landfill. Approximately two kilometers north of the Landfill, in an area with more gentle topographic relief, there are a series of manufacturing facilities. The nearest village is Cruce Magueyes, located approximately two kilometers west north-west of the Landfill. The residences in the area of the Landfill are served by a public water supply system that uses groundwater as a source.

The property contained three surface depressions which were used for waste disposal. These waste disposal areas are known as the northern, southern, and southeastern disposal areas. Each disposal area was located in a depression or "sumidero" (sinkhole) that is surrounded by conical limestone hills referred to as "mogotes." The three waste disposal areas cover about 15 acres. The northern disposal area is separated into two sections by an access road. The southern disposal area was also known as the Superfund disposal area or "El Superfondo." The northern and southern disposal areas were filled and inactive at the time of the 1996 ROD. All three disposal areas are covered by the National Priorities List (NPL) site listing and are addressed by this report.

The Barceloneta Landfill is located in a belt of rugged karst topography that extends along the north coast from 30 kilometers (19 miles) east of San Juan to the west of the island. In the vicinity of the site, this belt is located from about one kilometer south of the coast to about 20 kilometers (12 miles) inland. North (seaward) of this rugged karst region is a belt of relatively flat coastal plain sediments. South (landward), the rugged karst terrain transitions into the central mountainous core of the island. Features of this karst

landscape include numerous sumideros, steep scarp cliffs on the mogotes and adjoining ridges which surround the sumideros, and a lack of surface streams or drainage features associated with individual sumideros.

There are currently no reuse plans for the landfill property. Groundwater in the area of the Site is used as a source of drinking water; however, no potable wells are located in, or threatened by groundwater contamination from the Site, and residents nearby have access to a public water supply.

The property on which the Barceloneta Landfill is located was purchased by the Municipality of Barceloneta during the early 1970s. Preparation of the Site for landfill use began in April 1972, and the landfill operations commenced in August 1973. Reportedly, the Landfill was initially approved to receive both municipal and industrial waste, but was restricted to only municipal waste disposal in 1975. However, disposal of industrial wastes appears to have continued past 1975. Specific dates of active filling in each of the three disposal areas are difficult to determine given the lack of detailed record keeping: The Environmental Quality Board (EQB) has information which indicates that the Landfill (all three disposal areas) was used in the late 1970s for disposal of wastes which contained hazardous substances.

The site was proposed for inclusion on the NPL in December 1982, and was subsequently approved and listed as an NPL site in September 1983. In 1984, a Remedial Action Master Plan (RAMP) was prepared by an EPA contractor for the Site. Based on the RAMP, a Remedial Investigation and Feasibility Study (RI/FS) Work Plan was developed. In September 1990, a Consent Order was signed in which ten settling defendants agreed to perform the RI/FS for the site. Pursuant to the Work Plan, sampling of subsurface soils, ground water and surface water was completed. The first phase of the RI, was completed in 1992 and the second phase of the RI field work was completed in January 1994. A final RI report was received by EPA in March 1995 and a streamlined Risk Assessment was completed in May 1995. An abbreviated Final FS was conducted in accordance with EPA's Presumptive Remedy guidance and was received by EPA in September 1995.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Barceloneta Landfill Site		
EPA ID: PRD980509129		
Region: 2	State: PR	City/County: Barceloneta
SITE STATUS		
NPL Status: Deleted		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA <i>[If "Other Federal Agency", enter Agency name]:</i> Click here to enter text.		

Author name (Federal or State Project Manager): Luis E. Santos
Author affiliation: EPA
Review period: 9/30/2016 - 5/29/2020
Date of site inspection: 11/4/2019
Type of review: Statutory
Review number: 4
Triggering action date: 9/17/2015
Due date (<i>five years after triggering action date</i>): 9/17/2020

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

EPA's Streamlined Risk Assessment evaluated any potential adverse effects to human health from exposure to chemical contamination present in the vicinity of the Site groundwater. The reasonable maximum human exposure was used. The results indicated that the levels of contaminants present in the groundwater pose a relatively low long-term threat to human health. However, if no action is taken with respect to the Landfill, the continued release of contaminants into groundwater could potentially result in a greater risk at some point in the future. Therefore, based on the results of the abbreviated Risk Assessment, EPA has determined that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment. An ecological risk assessment was not conducted as part of the RI/FS.

Response Actions

Remedy Selection

On July 5, 1996, EPA issued a Record of Decision (ROD) for the site. The ROD selected the following remedial action objectives for the site:

- To prevent direct contact with waste material;
- To reduce or eliminate the potential for the Landfill disposal areas to release hazardous substances to groundwater;
- To reduce or eliminate the potential for migration of hazardous substances to groundwater downgradient of the Landfill;
- To prevent the migration of and control Landfill gas; and
- To minimize any potential future impacts of hazardous substances that may migrate into environmental media.

The selected remedy included:

- Installing a low-permeability cover system for the three Landfill cells meeting the requirements of RCRA Subtitle D and Puerto Rico's Regulations Governing Landfill Closure.

- Conducting long-term groundwater and surface water monitoring to evaluate the effectiveness of the cover system. It is anticipated that monitoring will be conducted on a quarterly basis for the first year, semi-annually for the next four years, and then annually.
- Regrading the site and installing storm water management improvements at the site to reduce infiltration of storm water into the Landfill and reduce leachate generation. Monitoring will include the eight existing monitoring wells. Initially, the wells will be sampled for a broad parameter list. The list has been developed based on constituents detected above MCLs in the Remedial Investigation and on the requirements of the RCRA Subtitle D and Puerto Rico's Regulation Governing Landfill Closure. After the first five years, the parameter list would be reviewed and those parameters not detected above standards would be omitted. The exact long-term groundwater monitoring program will be further defined in the remedial design (RD).
- Conducting a landfill gas survey during predesign to determine the necessity of a landfill gas collection system. The appropriate type of system, if necessary, will be determining during RD.
- Implementing a long-term operation and maintenance program for the cover system which will include inspection of the system and provision for repair.
- Recommending, to appropriate authorities that institutional controls be established. Institutional controls are recommended in order to protect the integrity of the landfill cover system and to reduce potential exposure to landfill contents. The institutional controls will include recommending that zoning restrictions be established for the Site to limit future land use and that a deed restriction be established to limit future land and groundwater use.
- Installing a perimeter fence with signs to restrict access.
- Reevaluating site conditions at least once every five years to determine if a modification of the selected remedy is necessary.

Status of Implementation

On September 30, 1997, a Consent Decree (CD) memorialized a settlement whereby ten parties that had been identified as potentially responsible parties (PRPs) agreed to implement the remedy selected in the ROD. The PRPs hired M&S Ingenieria y Ciencia Asociados, who prepared remedial design plans and specifications that EPA approved on September 17, 1999. On December 16, 1999, EPA approved the Remedial Action Work Plan and the PRPs proposed M&S Ingenieria y Ciencia Asociados as their remedial action contractor.

EPA approved early Remedial Actions that were initiated prior to the final approval of the Remedial Design Report. These activities included the excavation and stockpiling of clay and the excavation and relocation of waste from a discovered waste area. They were initiated on September 7, 1999. On-site construction of the remedial action started in January 24, 2000 and was completed on August 30, 2000.

The Site property consists mainly of forested areas which provide a habitat for various plant insect and animal species. In order to protect the landfill cap, trees will not be allowed to grow on the capped area. However, grasses will be permitted to grow, and it is expected that the Landfill areas will be comparable to the surrounding ecology. On October 3, 2011 was deleted from the NPL.

Table 1: Summary of Planned and/or Implemented Institutional Controls					
Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Parcel(s) Impacted	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil/Groundwater (GW)	Yes	Deed of Imposition of Restrictions of Use	Landfill Site 20 Acres, Located Florida Afuera Ward	No use and/or excavation of Soil; GW shall not be withdrawn or extracted for any use.	February 22, 2010

Systems Operations/Operation & Maintenance

Post-construction operation and maintenance (O&M) activities are being implemented as described in the Operation and Maintenance and Post-Remedial Monitoring Manual (the “O&M Plan”) approved by EPA. The landfill has site-wide groundwater monitoring. The groundwater monitoring program was developed during the RD phase. The system includes the eight existing monitoring wells. Groundwater sampling was conducted quarterly for the first year, semi-annually for the next four years, and currently is conducted annually as part of the 30-year O&M period. Initially, the wells were sampled for a broad parameter list developed based on constituents detected above Maximum Contaminant Levels (MCLs) in the RI, RCRA Subtitle D requirements, and Puerto Rico's Regulation Governing Landfill Closure. This initial list of parameters included:

- Volatile Organic Compounds (VOCs) of Concern (only 1,1-dichloroethane was detected above MCLs during the RI. However, a more conservative approach that included the complete EPA Method Scan for volatile organic compounds was implemented).
- Site Metals of Concern include mercury, chromium, manganese and nickel. These were detected above MCLs during the RI.
- Chloride
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- pH (field measurement)
- Specific Conductivity (field measurement)

The O&M Plan, dated March 28, 2000, and approved by EPA, establishes the criteria used to reevaluate and modify the number of wells and list of parameters sampled.

According to the criteria in the O&M Plan, on September 2004, groundwater monitoring was reduced to five of the original eight wells and to the following parameters: mercury; chromium; manganese; and nickel. These five wells are currently sampled annually.

Based on recommendations in the 2010 five-year review, on October 2012, all eight monitoring wells were sampled for the full suite of contaminants and parameters identified in the remedial design. The results of the 2012 full well/parameter sampling event confirmed that groundwater sampling could take place annually, sampling and analysis for iron and aluminum could be discontinued and the 2000 O&M plan was sufficient, as MW-2, MW-3 and MW-5 were shown to not be impacted by site-related contamination.

Now, consistent with the, September 2000 O&M Plan five monitoring wells (MW-1, MW-4, MW-6, MW-7 and MW-8) are being sampled on an annual basis. Groundwater samples are analyzed for the following parameters: TSS; TDS; manganese; mercury; nickel; aluminum; chromium; and iron.

III. PROGRESS SINCE THE LAST REVIEW

The previous five-year review was signed on September 17, 2015. The 2015 five-year review concluded that:

Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Protective	The remedy at the Barceloneta Landfill currently protects human health and the environment.

No issues were identified as part of this FYR.

The fall 2017 groundwater sampling event was delayed until March 2018 due to the impact of Hurricane Maria. To avoid potential hurricanes affecting the schedule during the fall months, the annual sampling event was moved to spring.

IV. FIVE-YEAR REVIEW PROCESS

Administrative Components

The five-year review team included Luis Santos (EPA-RPM), Kathryn Flynn, (EPA-Hydrologist), Julie McPherson (EPA-Human Health Risk Assessor), and Brenda Reyes (EPA-Community Involvement Coordinator). This is a PRP-lead site.

Community Notification, Involvement & Site Interviews

On October 1, 2019, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands, including the Barceloneta site. The announcement can be found at the following web address: <https://www.epa.gov/aboutepa/fiscal-year-2020-five-year-reviews>.

Once the FYR is completed, the results will be made available on EPA's webpage for the Site, <http://www.epa.gov/superfund/barceloneta-landfill> and at the Site repositories, which is at the Barceloneta Town Public Library. In addition, efforts will be made to reach out to local public officials to inform them of the results

Document Review

The documents, data and information which were reviewed in completing this five-year review are summarized in Table 3.

Data Review

Pursuant to the ROD, O&M activities include monitoring of the groundwater to detect changes in contaminant concentrations. Currently, five groundwater monitoring wells are sampled and analyzed on an annual basis for manganese, mercury, nickel, aluminum, chromium, iron, TDS, and TSS and the results are compared to the MCLs or Secondary Drinking Water Standards (SDWS) identified in the ROD.

A summary of the Site Groundwater Sampling Results over time are provided in Table 4, attached and the data since 2015 s summarized by each monitoring well below.

MW-1:

Analytical results from MW-1, the upgradient background well, indicate that nickel ranges from ND to 0.155 during this monitoring period, exceeding the MDL of 0.1 milligrams per liter (mg/L) once in 2018 (0.155 mg/L). Iron shows concentrations above the SDWS of 0.3 mg/L from 2016 through 2018. The high was 5.96 mg/ in March 2018 and the low was 0.816 in April 2019. Concentrations of manganese was just above the SDWS value of 0.0235 mg/L at 0.101 mg/L exceeding the MDL of 0.1 milligrams per liter (mg/L) once in 2018. Besides the nickel, iron and manganese exceedances, all other site-related parameters were below their respective MCL or SDWS. (Table 4).

MW-4

The 2015 FYR showed elevated mercury at this well but concentrations were declining. In 2018 and 2019, mercury concentrations were below the MCL. TDS generally declined in this review period, but manganese slightly increased and aluminum and iron were elevated in 2018.

- In 2019, TDS (770 mg/L) is reported above its SDWS of 500 mg/L, similar to the 2018 sampling event result of 740 mg/L.
- Manganese concentration (0.0517 mg/L) is reported lower than the 2018 sampling event (0.0897 mg/L), and below SDWS values during the past eight (8) sampling events (from October 2009 to present), following the 0.0101 mg/l concentration in 2016.
- Mercury (0.00086 mg/L) is reported similar to the 2018 result of 0.00085 mg/L. These concentrations are below the MCL of 0.002 mg/L.
- Nickel (0.0542 mg/L) is higher to the 2018 sampling event (<0.04 mg/L), but still below its MCL values (0.1 mg/L).
- Aluminum was reported Non-detect (<0.2 mg/L), as it has historically been for this well.
- Iron (0.190 mg/L) is reported lower than the 2018 sampling event (2.17 mg/L), and below its SDWS values (0.3 mg/L).
- Chromium (<0.01 mg/L) is reported lower than the 2018 sampling event (0.0688 mg/L), and below its MCL values of 0.1 mg/L. (Table 4).

MW-6

The data from downgradient well MW-6 shows stable concentrations in this period and they are similar

to the previous review period.

- Manganese concentration (0.214 mg/L in this event) is reported lower than the 2018 sampling event (0.442 mg/L), but still above its SDWS (0.05 mg/L) consistently.
- Mercury concentrations were reported at non-detected concentrations similar to the historical results.
- Nickel has historically been observed above its MCL (0.1 mg/L) in this well. A groundwater sample collected from downgradient well MW-6 indicated a result of 0.114 mg/L of Nickel for this sampling event, which is lower than the 2018 reported concentration of 0.255 mg/L and slightly above the MCL value.
- Aluminum concentrations at MW-6 were found at <0.2 mg/L during this event, lower than the 0.204 mg/L results from the 2018, and below its SDWS of between 0.05 and 0.2 mg/L.
- Iron concentrations were again confirmed to be present in this well at 0.63 mg/L, lower than the 2018 result of 3.30 mg/L. These concentrations have been historically above its SDWS of 0.3 mg/L.
- Chromium (<0.01 mg/L) is reported lower than the 2018 sampling event (0.0199 mg/L), and below its MCL values of 0.1 mg/L.

MW-7

This well is located downgradient. It showed elevated TDS and iron in this period, similar to the previous FYR.

- The TDS (555 mg/L) concentration from downgradient monitoring well MW-7 was found slightly above the SDWS for TDS (500 mg/L), but similar to historical results.
- Manganese concentrations were found at concentrations of 0.0168 mg/L, lower than the 2018 sampling event (0.0203 mg/L) and similar to the 2016 sampling event (<0.01 mg/L). Concentrations in the three (3) previous sampling events were below its SDWS (0.05 mg/L).
- Mercury and Aluminum were observed non-detect during this sampling event, similar to historical results.
- Nickel concentrations were found at Non-Detected (<0.04 mg/L) concentrations, similar to the 2018 sampling event. Nickel concentrations in this well are historically below the MCL of 0.1 mg/L.
- Iron concentrations (1.52 mg/L) shows higher concentrations than the previous 2018 (0.855 mg/L), 2016 (<0.05 mg/L) and 2015 (0.374 mg/L) sampling events results, and above its SDWS of 0.3 mg/L.
- Chromium (0.0441 mg/L) is reported lower than the 2018 sampling event (0.0601 mg/L), and below its MCL values of 0.1 mg/L.

MW-8

MW-8 also showed similar concentrations to the previous FYR. Chromium and iron were elevated in 2016 and 2019 events, and manganese was high in 2019.

- The TDS (380 mg/L) concentration from downgradient monitoring well MW-8 was found below the SDWS for TDS (500 mg/L), and similar to historical results.
- Manganese concentrations were found at concentrations of 0.0626 mg/L, higher than the 2018 sampling event (<0.01 mg/L) and the 2016 sampling event (0.0105 mg/L). Concentrations during this sampling event were slightly above its SDWS of 0.05 mg/L.

- Mercury, Nickel and Aluminum were observed non-detect during this sampling event, similar to historical results.
- Iron concentrations (1.24 mg/L) shows higher concentrations than the previous 2018 sampling event (0.229 mg/L), 2016 (0.487 mg/L) and 2015 (0.116 mg/L) sampling events results, and above its SWDS of 0.3 mg/L.
- Chromium (0.117 mg/L) is reported higher than the 2018 sampling event (0.082 mg/L), and slightly above its MCL values of 0.1 mg/L.

Overall, the groundwater data showed stable or declining concentrations during this review period. The elevated nickel at MW-6 appears to be limited to that well, and the mercury at MW-4 has declined below the MCL. At the downgradient wells MW-7, iron is the only metal above the SDWS. Downgradient well MW-8 has chromium slightly above the standard, but the concentration has declined significantly since 2012. The direction of groundwater flow continues to the north and was not significantly changed by recharge from Hurricane Maria.

Site Inspection

The inspection of the site was conducted on November 4, 2019. In attendance were Luis Santos, EPA; and Guillermo Hernandez, CDM Contractor. During the site inspection, EPA confirmed that the cap over the three disposal areas has been maintained in a manner consistent with the ROD and the final design documents. The activities presented in the O&M Plan are conducted as required by EPA and EQB.

The access controls and restrictions were implemented in the form of fences, locked gate and signs around the site and were all in good repair. The signs indicating that the landfill is a Superfund site were located in both languages (Spanish and English). This action prevents entry to the site. The caps were intact and did not show any signs of erosion.

Interviews

No interviews were conducted for this review. The Municipality of Barceloneta and EQB were involved in the five-year review process.

V. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The remedy selected in the 1996 ROD included: (1) installing a low-permeability cover system for the three landfill cells meeting the requirements of the RCRA Subtitle D and Puerto Rico's Regulations Governing Landfill Closure; (2) regrading the site and installing storm water management improvements at the site to reduce infiltration of storm water into the landfill and reduce leachate generation; (3) conducting long-term groundwater and surface water monitoring to evaluate the effectiveness of the cover system; (4) conducting a landfill gas survey during predesign to determine the necessity of a landfill gas collection system; (5) implementing an O&M program to inspect the cover system and repair, if necessary; and, (6) implementing institutional controls to protect the integrity of the landfill and install fence to restrict access.

The landfill cap and gas venting system has been constructed on the site. Both engineered remedies are maintained and monitored by the PRPs' contractor and results reviewed by EPA. The systems are functioning as intended.

A review of the groundwater monitoring data indicates that contamination is not increasing across the site. Concentration trends of nickel, mercury, and chromium, which have shown levels above the MCL since the onset of groundwater monitoring in 2002, are decreasing. The remedy is effective in reducing the migration of contamination to groundwater. The surface water monitoring requirement in the ROD is no longer being implemented. This is due to the fact that surface water conditions have changed in the area and there are no longer permanent surface water features on site.

The Municipality of Barceloneta has implemented the institutional controls at the site. The Institutional Controls include a Deed Restriction on the use of the soil and groundwater in the future. The necessary zoning restrictions and deed restriction are in place. These controls were placed on the Barceloneta Landfill Deed on October 3, 2011.

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

At this time, the remedial action objectives continue to be valid. These objectives have been met and verified by the installation of a low-permeability cover system, long-term groundwater monitoring, and the establishment of institutional controls. Since the last five-year review, there are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedy. The cap is intact and contaminated material is not available for contact. Groundwater contamination is localized within the site property. In addition, because ingestion of drinking water is not occurring, nor is it expected to occur in the next five years, this pathway is currently incomplete.

In order to account for changes in the baseline human health risk assessment process, during this five-year review, the maximum detected concentrations of the parameters identified during the 2015 - 2019 sampling events were compared to MCLs. The results indicate that the concentrations of chromium exceeded the MCL in MW-1 (a background well) and MW- 4. The monitoring wells currently in the O&M program will continue to be sampled for the analytes that exceed their respective MCLs.

The remedy has eliminated surface soil exposure to ecological receptors by the installation of a low permeability cover system. Sampling conducted at the Ojo de Guillo Spring (over 3,100 feet from the site) during the RI indicated that only iron was elevated. Based on the data from the long-term groundwater monitoring, low level metals were detected in the downgradient wells. The Rio Grande de Manatí (river) and the Cano Tiburones (wetlands) are beyond this area at approximately 1.7 miles from the site. Therefore, it appears unlikely that the low-level detections in groundwater would impact these surface water bodies. Consequently, the exposure assumptions remain appropriate and thus the remedy remains protective of ecological resources.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

No, there is no information that calls into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

None.

VII. PROTECTIVENESS STATEMENT

Issues/Recommendations		
OU(s) without Issues/Recommendations Identified in the Five-Year Review:		
None		

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU1	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable)</i>
<i>Protectiveness Statement:</i> The remedy for OU1 is protective of human health and the environment		
Sitewide Protectiveness Statement		
<i>Protectiveness Determination:</i> Protective		<i>Addendum Due Date (if applicable):</i>
<i>Protectiveness Statement:</i> The remedy for Barceloneta Landfill is protective of human health and the environment.		

VIII. NEXT REVIEW

The next FYR report for the site will be completed five years from the date of this review.

Table 1: Chronology of Site Events	
Event	Date(s)
Initial discovery of problem or contamination	
Pre-NPL responses	NA
Final NPL listing	07/01/1983
Removal actions	NA
Remedial Investigation/Feasibility Study complete	
ROD signature	07/05/1996
ROD Amendments or ESDs signature dates	--
Enforcement documents (CD, AOC, Unilateral Administrative Order)	09/28/1990
Consent Decree Civil Action No. 98-1013 JAF	09/30/1997
Remedial design start	
Remedial design complete	09/30/1997
Superfund State Contract, Cooperative Agreement, or Federal Facility Agreement signature	
On-site remedial action construction start	01/24/2000
RA Construction completion	03/2001
Construction completion date	08/30/2000
Final Close-out Report (if applicable)	08/08/2011
Deletion from NPL (if applicable)	10/03/2011
First Previous five-year reviews	08/11/2005
Second Previous five-year reviews	08/30/2010
Third Five-Year Review	09/30/2015
Current Five-Year Review	05/30/2020

Table 2: Remediation Goals for Groundwater (all concentrations in µg/L) From the OU1 ROD		
Contaminants of Concern	National Primary Drinking Water Standards (Federal MCLs)	Secondary Drinking Water Standard (SDWS)
Mercury	0.002	-----
Chromium	0.1	-----
Manganese	NONE	0.05
Nickel	0.1	NONE
Aluminum,	50 to 200	50 to 200
Iron	300	300
1,1Dichloro-ethyle	7	-----

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	Submittal Date
Headquarter Concurrence on the Barceloneta Landfill Superfund Site Notice of Intent to Delete (Letter)	08/08/2011
Federal Register / Vol. 76, No. 160 / Thursday, August 18, 2011 / Rules and Regulations	08/18/2011
Groundwater Monitoring Report, March 2018., by TrueLand Construction	06/12/2018
Groundwater Monitoring Report, April 2019, by TrueLand Construction	07/15/2019
Third Five-Year Review Report	09/17/2015
October/November 2016 Landfill Inspection Report	11/10/2016
Quarterly Inspection Report 2017, Third (3rd) Quarter, Inspection Date: November 4, 2017, by TrueLand Construction	11/06/2017
Quarterly Inspection Report 2018, (2nd) Quarter, Inspection Date: June 26, 2018, by TrueLand Construction	06/29/2018
Quarterly Inspection Report 2018, Third(3rd) Quarter, Inspection Date: September 26, 2018, by TrueLand Construction	09/28/2018
Quarterly Inspection Report 2018, Fourth (4th) Quarter, Inspection Date: January 11, 2019, by TrueLand Construction	01/14/2019
Quarterly Inspection Report 2019, First (1st) Quarter, Inspection Date: April 10, 2019, by TrueLand Construction	03/09/2019
Quarterly Inspection Report 2019, Second (2nd) Quarter, Inspection Date: June 28, 2019, by TrueLand Construction	07/08/2019

Table 4 Groundwater Sampling Results

		TSS	TDS	Manganese	Mercury	Nickel	Aluminum	Iron	Chromium
Location	Sample Date	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
MW-1	Nov-15	ND	325	ND	ND	ND	ND	0.0564	ND
	Nov-16	4.0	350	0.0318	ND	0.0495	ND	2.34	0.506
	Mar-18	15.0	320	0.101	ND	0.155	ND	5.96	1.58
	April-19	6.0	285	0.0235	ND	ND	ND	0.816	0.0725
MW-4	Nov-15	7.0	1090	0.0451	0.0063	0.0813	ND	0.223	0.0288
	Nov-16	ND	1200	0.0102	0.0064	ND	ND	ND	ND
	Mar-18	21	740	0.0897	0.00085	ND	1.32	2.17	0.0688
	April-19	4.0	770	0.0517	0.00086	0.0542	ND	0.190	ND
MW-6	Nov-15	13.0	390	0.418	ND	0.255	0.413	3.20	0.0162
	Nov-16	24.0	370	0.203	ND	0.314	0.338	6.48	0.0341
	Mar.-18	5.0	300	0.442	ND	0.255	0.204	3.30	0.0199
	April-19	5.0	330	0.214	ND	0.114	ND	0.63	ND
MW-7	Nov-15	9.0	710	0.0153	ND	0.0544	ND	0.374	0.0229
	Nov-16	ND	670	ND	ND	ND	ND	ND	ND
	Mar.-18	ND	630	0.0203	ND	ND	ND	0.855	0.0601
	April-19	5.0	555	0.0168	ND	ND	ND	1.52	0.0441

MW-8	Nov-15	ND	465	ND	N D	ND	ND	0.11 6	0.022 6
	Nov-16	ND	500	0.01 05	N D	ND	ND	0.48 7	0.160
	Mar.-18	ND	290	ND	N D	ND	ND	0.22 9	0.082
	April-19	16	380	0.06 26	N D	ND	ND	1.24	0.117

Notes:

Bold - Values above MCL or SDWS
 NT - Sample not Collected
 ND - Non-Detected / Below Reporting Limit
 mg/L - milligrams per liters

MCL - Maximum Contamination Level
 SDWS - Secondary Drinking Water Standard
 PQL - Practical Quantitation Limit
 RL - Reporting Limit

Attachment 1: Figure: Site Wells Location

