
Vega Baja Solid Waste Disposal

Rio Abajo Ward, Puerto Rico

EPA Facility ID: PRD980512669

Basin: Cibuco-Guajataca

HUC: 21010002

Executive Summary

The Vega Baja Solid Waste Disposal property is a former municipal landfill located in Rio Abajo Ward, Puerto Rico approximately one km (0.6 mi) west of the Rio Indio. Soil and sediment samples at the site had elevated concentrations of several trace elements. NOAA trust resources including several species of amphidromous fish and shrimp and the catadromous American eel use the Rio Indio and the Rio Cibuco. There has not been enough sampling downgradient of the site to determine the extent of contaminant migration towards NOAA trust habitats.

Site Background

The Vega Baja Solid Waste Disposal (VBSWD) site occupies six hectares (15 acres) in Rio Abajo Ward, Puerto Rico, approximately one km (0.6 mi) west of the Rio Indio. About 2.7 km (1.7 mi) downstream of the site the Rio Indio meets the Rio Cibuco, which flows nearly seven km (4.3 mi) to the Boca del Cibuco (Figure 1).

From 1948 to 1979 the VBSWD property was the site of an unlined, open-burning municipal landfill used for disposal of institutional, commercial, industrial, and domestic waste (Weston 1998). An estimated 850,000 m³ (1.1 million yd³) of solid waste were placed in the landfill over the 31-year period of operation. Roughly 14,000 kg (30,000 lb) per year of siliceous dust, was landfilled. This is the only documented chemical disposed at the site (Soto 1995). Solid waste disposal activities were discontinued in 1979 without covering or capping the landfill (Budroe 1999). There are now approximately 206 homes across 11 acres of the former VBSWD.

An Expanded Site Inspection and a Hazard Ranking System Package were prepared for the VBSWD site in June 1997 and February 1999, respectively (Soto 1997; Budroe 1999). The U.S. Environmental Protection Agency placed the VBSWD site on the National Priorities List on July 7, 1999 (USEPA 1999b).

Groundwater and surface water runoff provide the primary pathways for the transport of contaminants off the VBSWD property. The site is located in an area characterized by karst topography formed by limestone bedrock. Karst topography can lead to fast groundwater flow and little dissolution of contaminants over a large distance. Depth to groundwater in the area of the site ranges from 0.3 to 37 m (one to 120 ft) below ground surface (bgs) (Budroe 1999). Groundwater generally flows north from the area around the site toward the Atlantic Ocean. An open drainage ditch, which runs through the middle of the VBSWD site and connects to the Rio Indio, is the sole stormwater collection system for the residences in this area (Soto 1997).

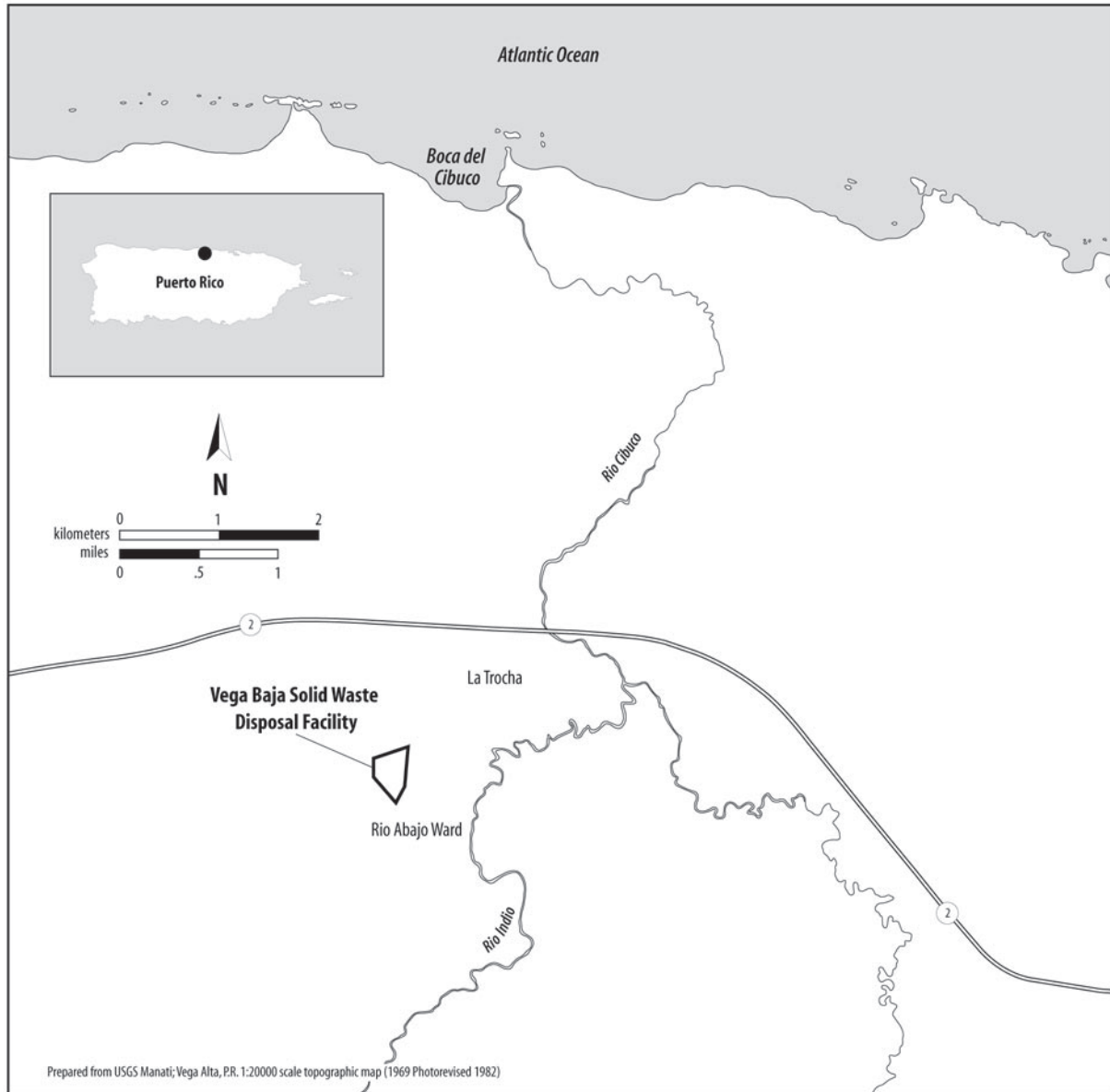


Figure 1. Location of the Vega Baja Solid Waste Disposal facility in Rio Abajo Ward, Puerto Rico.

NOAA Trust Resources

The NOAA trust habitat of concern is Rio Indio, a tributary within the Rio Cibuco basin. The Rio Cibuco watershed is a relatively small river basin covering approximately 257 km² (99 square mi²) above Vega Baja, flowing north from central Puerto Rico to discharge to the Atlantic Ocean (USGS 2000). Most of the fish and invertebrate species within the basin are secondarily derived freshwater species that require a portion of their life cycle in estuarine or marine environments. Both fish and shrimp species exhibit amphidromous life-cycles in which juveniles enter the river, migrating upstream where they reside, mature, and reproduce entirely in fresh water. Eggs or larvae are carried downstream to estuaries where they develop to juvenile stages, whereupon they re-enter

the river. The catadromous American eel also is present in the river. Native amphidromous and catadromous species dominate the freshwater ecosystem of the river, filling many ecological niches from filter- and deposit feeders to top predators. There are no anadromous fish in Rio Indio or Rio Cibuco (Yoshioka 2000). Table 1 lists common amphidromous and catadromous species.

Table 1. NOAA trust resources in the Rio Indio and Rio Cibuco and potential habitat use near the facility (Yoshioka 2000).

Species		Habitat Use			Fisheries
Common Name	Scientific Name	Adult Habitat	Juvenile Nursery	Migratory Corridor	Subsistence/ Recreational Fishery
CATADROMOUS FISH					
American eel	<i>Anguilla rostrata</i>	◆	◆	◆	◆
AMPHIDROMOUS FISH					
Bigmouth sleeper	<i>Gobiomorus dormitor</i>	◆	◆	◆	◆
Fat sleeper	<i>Guavina guavina</i>	◆	◆	◆	
Mountain mullet	<i>Agonostomous monticola</i>			◆	◆
River goby	<i>Awaous tajasica</i>	◆	◆	◆	
Sirajo goby	<i>Sicydium plumieri</i>			◆	◆
AMPHIDROMOUS SHRIMP					
Freshwater prawn	<i>Macrobrachium acanthurus</i>	◆	◆	◆	◆
Freshwater prawn	<i>Macrobrachium carcinus</i>			◆	◆
Freshwater prawn	<i>Macrobrachium crenulatum</i>			◆	
Freshwater prawn	<i>Macrobrachium faustinum</i>			◆	
Freshwater prawn	<i>Macrobrachium heterochirus</i>			◆	◆
Guabara chagara	<i>Atya innocous</i>			◆	◆
Guabara chagara	<i>Atya lanipes</i>			◆	◆
Guabara chagara	<i>Atya scabra</i>			◆	◆
Unnamed shrimp	<i>Jonga serrei</i>	◆	◆	◆	
Unnamed shrimp	<i>Micratya poeyi</i>	◆	◆	◆	
Unnamed shrimp	<i>Potimirrim americana</i>	◆	◆	◆	
Unnamed shrimp	<i>Potimirrim mexicana</i>	◆	◆	◆	
Unnamed shrimp	<i>Xiphocaris elongata</i>	◆	◆	◆	

Several amphidromous, goby-like fish species are present in Rio Indio and Cibuco. The river goby, big-mouth sleeper, and fat sleeper are found in low to mid-reaches of streams and are likely to inhabit stream reaches near the Vega Baja facility. The Sirajo goby most often occupies the upper reaches of streams and likely would migrate through stream reaches near the facility. Similarly, the mountain mullet is an amphidromous fish species that occupies the higher elevations of stream systems and would migrate through areas near the facility. The catadromous American eel spawns in the ocean; progeny migrate to the basin as juveniles and reside in the rivers as adults. Because it is found in the middle to upper reaches of the river, it also may occupy reaches near the facility (Yoshioka 2000).

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Several amphidromous shrimp species are found in Rio Indio and Rio Cibuco, including a number of moderate- to large-sized freshwater prawns in the genus *Macrobrachium*. *Macrobrachium acanthurus* is a lower-reach species that occupies habitats in the region of the facility whereas *M. carcinus* and *M. heterochirus* occupy the upper reaches of the river. The species *M. faustinum* is uncommon in Puerto Rican streams but may occur in the area. Some moderate-sized freshwater shrimp in the genus *Atya* are also common amphidromous residents, but generally occupy the upper reaches of the river. Several small shrimp species, including *Micratya poeyi*, *Xiphocaris elongata*, *Potimirrim americana*, *P. mexicana*, and *Jonga serrei*, occupy the lower reaches of the river and are more likely to be present near the facility (Yoshioka 2000).

Recreational or subsistence fisheries occur in Rio Indio for the larger *Macrobrachium* prawns, *Atya* shrimp, eel, mountain mullet, big-mouth sleeper, and sirajo goby. Much of these fisheries occur in the upper watershed where these species primarily reside, but some collection may occur downstream of the site (Yoshioka 2000).

Site-Related Contamination

Contaminants have been detected at the site in groundwater, sediment, and soil at concentrations greatly exceeding screening guidelines. As part of a Site Inspection completed in January 1995 for the VBSDW property the Puerto Rico Environmental Quality Board (PREQB) collected six soil samples, five sediment samples, and three groundwater samples from various locations on the property and the Rio Indio (Soto 1995). In June 1996 PREQB and the U.S. Environmental Protection Agency conducted an Expanded Site Inspection that included the collection of 132 soil samples and 37 groundwater samples (Soto 1997). The Region II Superfund Technical Assessment and Response Team collected seven groundwater samples from wells located near the site (Weston 1998).

The primary contaminants of concern to NOAA at the VBSDW site are trace elements. Table 2 summarizes maximum concentrations found during site investigations and lists appropriate screening guidelines.

Elevated concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were all found in soil samples collected at the site. The maximum lead concentration (26,000 mg/kg) in soil exceeds screening guidelines by three orders of magnitude (Soto 1997). Concentrations of copper (3,600 mg/kg), cadmium (21 mg/kg), and silver (20 mg/kg) also exceed screening guidelines by orders of magnitude (Soto 1997).

Contaminants in groundwater samples collected from the site did not exceed AWQC screening guidelines by more than an order of magnitude.

Concentrations of copper (66 mg/kg), chromium (40 mg/kg), and nickel (31 mg/kg) were found to exceed screening guidelines in a Rio Indio sediment sample. The sediment sample containing the maximum lead concentration (72 mg/kg) was collected from the drainage ditch that passes through the middle of the site (Soto 1995).

Table 2. Maximum concentrations of contaminants of concern at the Vega Baja Solid Waste Disposal Site (Soto 1995, 1997; Weston 1998).

Contaminants	Soil (mg/kg)		Water (µg/L)		Sediment (mg/kg)	
	Soils	Mean U.S. ^a	Ground-water	AWQC ^b	Sediment	TEL ^c
TRACE ELEMENTS						
Arsenic	28	5.2	2.4	150	5.2	5.9
Cadmium	21	0.06	3.4	2.2 ^d	ND	0.596
Chromium	210	37	ND	11	40	37.3
Copper	3,600	17	34	9 ^d	66	35.7
Lead	26,000	16	ND	2.5 ^d	72	35
Mercury	1.7	0.058	0.11	0.77	0.53	0.174
Nickel	290	13	ND	52 ^d	31	18
Silver	20	0.05	ND	0.12	ND	1.0 ^e
Zinc	3,900	48	ND	120 ^d	51	123.1

ND Not detected; detection limit not available.

NA Screening guidelines not available.

a Shacklette and Boerngen (1984), except for cadmium and silver which represent mean concentrations in the earth's crust from Lindsay (1979).

b National Recommended Water Quality Criteria (USEPA 1999a). Freshwater chronic criteria presented.

c TEL; Threshold Effects Level; Freshwater sediment value. Concentration below which adverse effects were rarely observed (geometric mean of the 15 percent concentration in the effects data set) as compiled by Smith et al. (1996).

d Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of CaCO₃ 100 mg/L.

e TEL not available; marine Effects Range-Low (ERL) presented. ERL represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1995)

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