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Puchack Well Field

Camden, New Jersey
CERCLIS #NJD981084767

Site Exposure Potential

The Puchack Well Field hazardous waste site consists of six public water supply wells that are owned and operated by the city of Camden, New Jersey. The well field is located northeast of the city of Camden in Pennsauken Township, Camden County (Figure 1). The northernmost well, P1, is about 0.8 km from the Delaware River. One of the seven original wells, P4, was destroyed when the Betsy Ross Bridge was built (U.S. EPA 1997a).

Delaware River tributaries nearest to the site are Pennsauken Creek, 1.3 km to the north, and the Cooper River, 5.7 km to the south. Puchack Creek, immediately north of the well field, is a channelized stream that carries excess water from the public water supply distribution system during non-storm conditions (Nicholson personal communication 1998).

Contamination with trichloroethylene, 1,2-dichlororethane, tetrachloroethylene, and chromium (including hexavalent) was first documented in the early 1970s, resulting in the closure of all Puchack wells, except P1. In 1996, the New Jersey Department of Environmental Protection (NJDEP) collected groundwater from the wells for analysis of VOCs and trace metals. Results indicated contamination with mercury, copper and silver, in addition to the contamina-

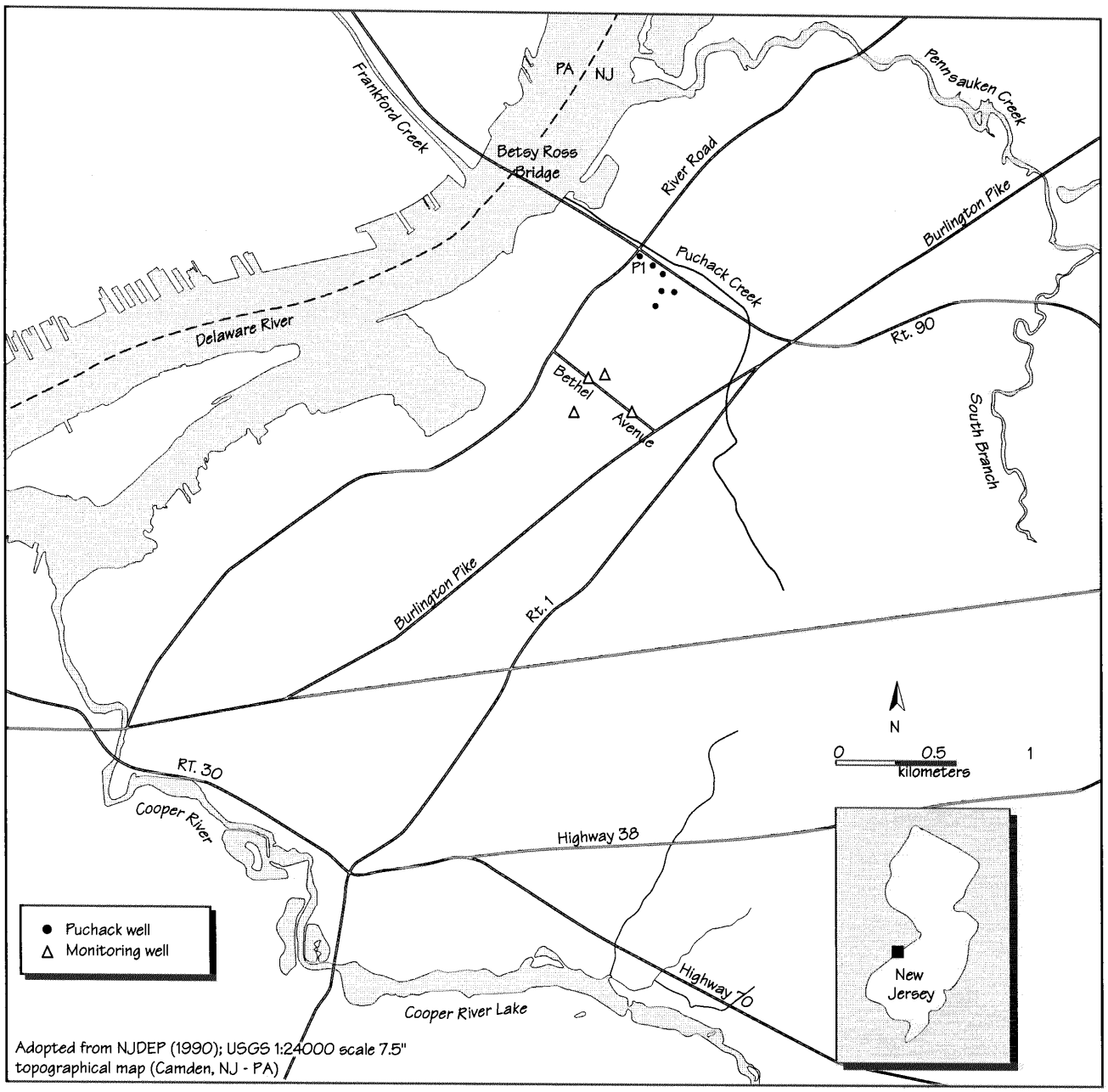

Figure 1. Location of the Puchack Well Field site in Pennsauken Township, Camden County, New Jersey.

tion with VOCs and chromium identified twenty years earlier.

Until May 1998, the City of Camden continued to pump Well P1 to prevent the contaminated groundwater migrating to other area public supply wells. Water from Well P1 was mixed with potable water from other wells before distribution, or was wasted to the Delaware River via the Puchack Creek channel. The Puchack wells that have been removed from service are all located within an approximately 4.1-hectare area.

In October 1991, NJDEP alerted several facilities of their potential liability for the documented contamination. Investigations of likely contaminant sources continue (EPA 1997a).

The Puchack Well Field is situated in an outcrop area of the Potomac-Raritan-Magothy aquifer system. The sand and gravel aquifer system is subdivided into the upper, middle, and lower aquifers, separated by two confining units composed of mixed silt and clay. The Puchack wells are screened in the lowest aquifer, which is believed to receive recharge from the Delaware River and the middle aquifer. Regional groundwater flow within the lowest aquifer is to the south or southeast under static (non-pumping) conditions. However, groundwater gradients were to the southwest during hydrogeologic investigations (pump tests) at sites northeast of the Puchack well field (NJDEP 1990).

Potential contaminant migration pathways to NOAA trust resources are the discharge of contaminated groundwater into the Delaware River, and the historic discharge of contaminated water into Puchack Creek. The degree to which groundwater may enter the Delaware River under well-pumping and non-pumping conditions has not yet been determined. Although there aren't any monitoring wells between the Puchack Well Field and the river, a study of groundwater flow over the entire region has been initiated (Nicholson personal communication 1998).

Although Puchack Creek is situated directly above the contaminated aquifer, groundwater is not expected to enter the creek because the maximum water table elevation is 20 m deeper than the creek bottom. In addition, the creek is lined with concrete over most of its length (Nicholson personal communication 1998).

NOAA Trust Habitats and Species

The primary habitats of concern to NOAA include the wetlands and mudflats of the Delaware River north and west of the site, the submerged shallow habitat immediately offshore of the river banks, and river habitat upstream and downstream within the tidally influenced region of the river. Most of Puchack Creek has been channelized and lined with concrete, so it no longer provides suitable habitat for trust resources (Nicholson personal communication 1998).

The Delaware River extends approximately 170 km from the head of tide at Trenton, New Jersey, to its confluence with Delaware Bay near Bombay Hook, Delaware. The Puchack Well Field is located approximately 145 river km from Delaware Bay, in the tidally influenced freshwater reach of the river. Several tributaries enter the Delaware River within 3 km upstream of the site. These tributaries, as well as the main river channel, provide resident and seasonal habitat for numerous species of migratory and estuarine fish, including the shortnose sturgeon, a federally listed endangered species. Atlantic sturgeon and American shad, which also use this river reach, are

listed by New Jersey as species of concern (Table 1).

Near Philadelphia and Pennsauken Township, the Delaware River provides important nursery and spawning habitats for American shad, herring, striped bass, and white perch (NOAA 1994; Byrne personal communication 1998). Species of special interest to NOAA because of their commercial importance or abundance in the region are striped bass, American shad, alewife, herring, anchovy, white perch, American eel, and blue crab (Table 1). The two most abundant species in the Delaware River system are blueback herring and bay anchovy, which provide food for larger predators such as striped bass (Byrne personal communication 1998). The shortnose sturgeon, a federally listed endangered species, spawns in the Delaware River approximately 40 river km north of the site, and uses habitat near the site throughout early lifestages (NOAA 1994; Byrne personal communication 1998).

Coastal commercial fisheries for American shad, alewife, herring, and striped bass are subject to National Marine Fisheries Service resource management plans. American shad and striped bass are under special interstate management programs because of declining stocks.

Table 1. NOAA trust species using habitats in the Delaware River near the Puchack Well Field site (NOAA 1994; Byrne 1998).

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
Alewife	*Alosa pseudoharengus*	♦	♦	♦		♦
American eel	*Anguilla rostrata*			♦	♦	♦
American shad*	*Alosa sapidissima*	♦	♦	♦		♦
Atlantic sturgeon*	*Acipenser oxyrhynchus*		♦	♦		
Blueback herring	*Alosa aestivalis*	♦	♦	♦		♦
Shortnose sturgeon**	*Acipenser brevirostrum*		♦	♦		
Striped bass	*Morone saxatilis*	♦	♦	♦		♦
MARINE/ESTUARINE SPECIES						
Atlantic menhaden	*Brevoortia tyrannus*		♦	♦		
Bay anchovy	*Anchoa mitchilli*		♦	♦		
Hogchoker	*Trinectes maculatus*		♦	♦		
Striped killifish	*Fundulus majalis*	♦	♦	♦		
White perch	*Morone americana*	♦	♦	♦		♦
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*	♦	♦	♦	♦	♦

*New Jersey species of concern
**federally endangered

There are recreational fisheries for most of the species found in the river, including striped bass, American shad, herring, white perch, hogchoker, American eel, and blue crab. White perch is the fish most commonly caught and eaten by sport fishermen in the Delaware River estuary (Byrne personal communication 1998). A fish consumption advisory based on excessive mercury contamination is in place for largemouth bass and chain pickerel in the Delaware River. In addition, the New Jersey Department of Environmental Protection (NJDEP) prohibits the sale of, and recommends against any consumption of fish, shellfish, or crustaceans from Pennsauken Creek, the Cooper River, and Cooper River Lake because of contamination in the edible tissues of these resources. (U.S. EPA 1997b; NJDEP 1998).

Site-Related Contamination

Data on site-related contamination were obtained from the Hazard Ranking System (HRS) evaluation (U.S. EPA 1997a), which reported results from NJDEP sampling in 1996 and briefly reviewed results from previous investigations. According to the HRS evaluation, chromium is the primary contaminant of concern at the site. However, copper, mercury, and silver also have been measured at concentrations ten times or more greater than the freshwater chronic AWQC (Table 2). Volatile organic compounds were found at concentrations that exceed drinking water criteria, but the reported concentrations do

Table 2. Comparison of freshwater chronic AWQC to maximum contaminant concentrations found in groundwater at the Puchack Well Field site during the 1996 NJDEP investigation.

	Groundwater (µg/L)		
	Monitoring wells south of well field	Puchack Well Field	AWQC[a] (µg/L)
Trace Elements			
Cadmium	2.1	0.4	1.1
Chromium	9,530	4,180[b]	11
Copper	23.9	183	12
Mercury	1.1	2.0[c]	0.012
Silver	1.6	1.3 U	0.12
Zinc	215	38.4	110

a: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented and hardness assumed at 100 mg/L calcium carbonate (EPA 1993).
b: From sample collected 10/23/89 (NJDEP 1990); measured as hexavalent chromium.
c: From sample collected 12/13/85 (NJDEP 1990).
U: Estimated concentration, less than sample quantitation limit.

not exceed applicable AWQC. Groundwater samples were analyzed only for VOCs, trace metals, and cyanide.

The 1996 investigation found maximum trace element concentrations (with the exception of copper) in monitoring wells south of the site, not in the Puchack wells (Table 2). All samples contained chromium at concentrations exceeding the freshwater chronic AWQC, and the maximum total chromium concentration was 860 times greater than the AWQC. Mercury concentrations were up to 100 times greater than the AWQC; silver and copper concentrations were up to ten times greater than the AWQC.

Summary

The Puchack Well Field, located less than a kilometer east of the Delaware River, used water from one of the most productive aquifers in New Jersey. The Delaware River near the site contains several anadromous and marine/estuarine species of concern to NOAA, including the shortnose sturgeon, a federally listed endangered species. Atlantic sturgeon and American shad, which are species of special concern to New Jersey, also are found near the site. Groundwater samples from every well near the site have had total chromium concentrations much greater than AWQC. Mercury, copper, and silver concentrations in groundwater also have been reported an order of magnitude, or more, greater than the AWQC.

References

Byrne, D., Fisheries Biologist, New Jersey Department of Environmental Protection, Division of Marine Fisheries, Trenton, New Jersey, personal communication, January 26, 1998.

NOAA. 1994. Aquatic Ecological Risk Assessment for Metal Bank of America/Cottman Avenue NPL Site, Final Draft. Philadelphia: U.S. Environmental Protection Agency.

New Jersey Department of Environmental Protection (NJDEP). 1990. Puchack, Morris and Delair well fields. Pennsauken Township, Camden County. Ground-water pollution assessment audit. Camden, New Jersey: Bureau of Ground-water Pollution Assessment, Ground-water Quality Management Element, Division of Water Resources, New Jersey Department of Environmental Protection.

New Jersey Department of Environmental Protection (NJDEP). 1998. Summary of Rules and Management Information, *New Jersey Fish & Wildlife Digest*, Vol. 11, No. 1, pp. 21-23, May 1998.

Nicholson, B., Hydrologist, United States Geological Survey, Trenton, New Jersey, personal communication, January 5, 1998.

U.S. Environmental Protection Agency. 1997a. Hazard Ranking System documentation package. Puchack Well Field. Pennsauken Township, Camden County, New Jersey. Document Control No. START-02-F-00913. Washington, D.C.: EPA, Region 3.

U.S. Environmental Protection Agency. 1997b. Listing of fish and wildlife advisories - 1996. 823-C-97-004. Washington, D.C.: Office of Science and Technology.