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Tutu Wellfield

St. Thomas, U.S. Virgin Islands

CERCLIS #VID982272569

Site Exposure Potential

The 44-hectare Tutu Wellfield site, a group of contaminated public supply wells, is located in a mountainous, semi-rural area of east-central St. Thomas, U.S. Virgin Islands. The site skirts Turpentine Run, an intermittent stream that flows south and discharges to Mangrove Lagoon, 4.5 km downstream (Figure 1). This lagoon is hydraulically connected to the Caribbean Sea and, ultimately, the Atlantic Ocean.

In 1987, a strong odor was detected in one of the public supply wells in the area. The Virgin Islands Department of Planning and Natural Resources requested the U.S. Environmental Protection Agency to sample one hundred area wells. VOCs were detected in approximately 60 percent of the wells, and trace elements were detected in approximately 30 percent of the groundwater wells. Petroleum, waste oils, solvent-based auto flushes, degreasers, antifreeze, kerosene, hydraulic fluids, spent PCE, wastes, dry cleaning fluids, ammonium hydroxide and mineral spirits may have been disposed of via catch basins, floor drains, sump holding tanks, leaching pits, evaporation pits, above-ground tanks, and drum storage areas in the area (U.S. EPA undated).

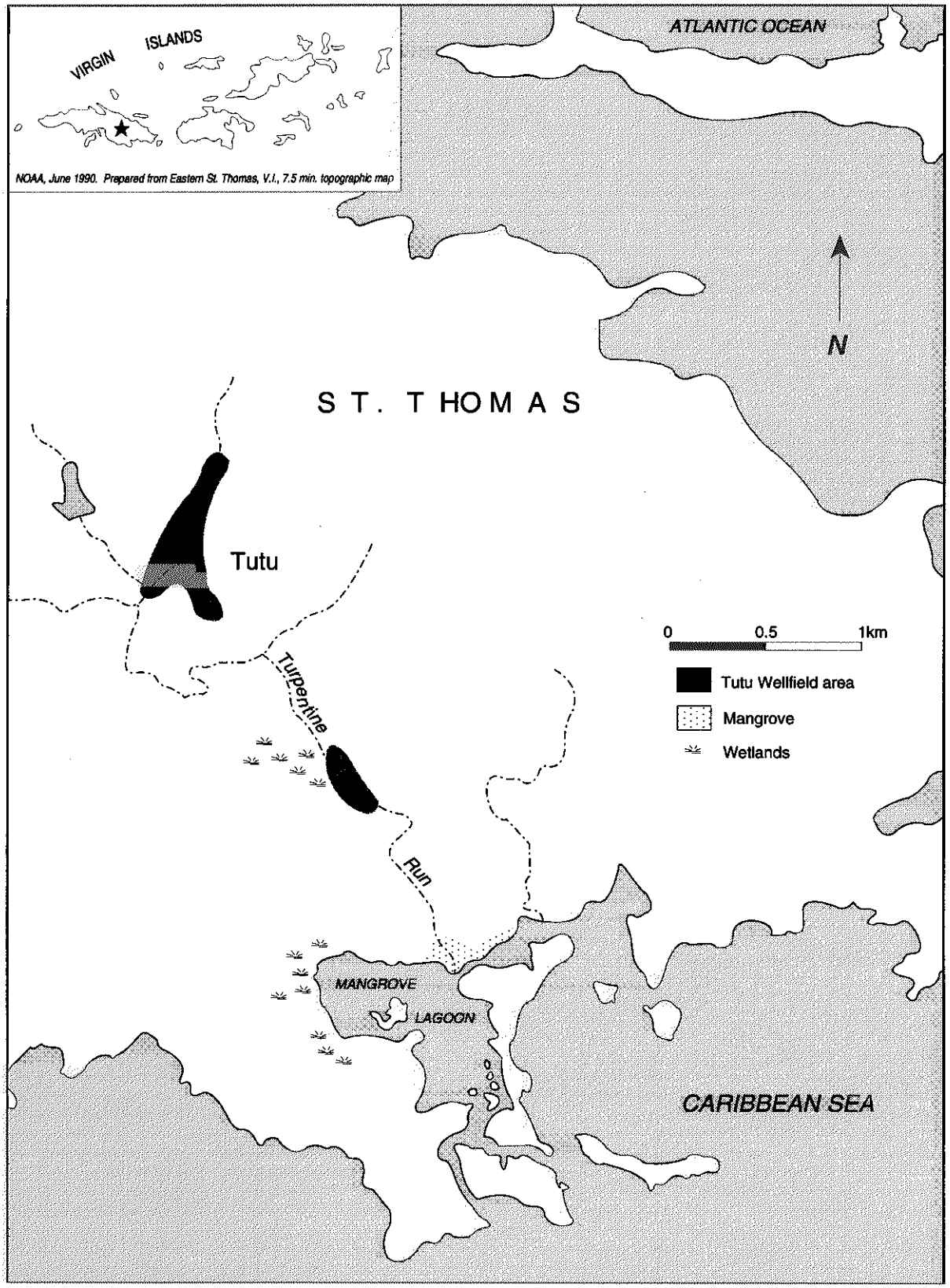

Figure 1. General vicinity of the Tutu Wellfield groundwater sampling sites.

The site overlies two aquifers: the Turpentine Run Basin Alluvium (shallow) and the Water Island and Louisenhoj Formations (deep). The shallow aquifer is 6 to 21 m deep, with the deep bedrock aquifer located directly below. Groundwater samples were collected from the deep aquifer at depths between 24 and 68 m during four monitoring periods (September 1990, May and September 1991, and January 1992). Groundwater generally flows south throughout the Turpentine Run basin. Discharge to Turpentine Run is the primary pathway by which site-related contaminants can migrate to NOAA trust habitats (NUS 1991).

NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface water and associated bottom substrates of Mangrove Lagoon (Boulon 1990; Beets personal communication 1992). Turpentine Run serves as a drainage corridor for eastern St. Thomas and receives various inputs of municipal effluent. Turpentine Run discharges to the northwestern corner of the inner lagoon. Turpentine Run is approximately 1 m wide and 0.3 m deep and is dominated by blue algae. Dissolved oxygen levels are reportedly very low, but no data were available (Beets personal communication 1992). No NOAA trust resources are known to use Turpentine Run because of the severely degraded water conditions.

Mangrove Lagoon is subdivided into three areas known as the inner, middle, and outer lagoons and is bordered by a small fringe of red mangrove (*Rhizopora*). Bottom substrate in the lagoons is composed mainly of carbonate silt, mud, and sand, with varying amounts of organic detritus, peat, and siliceous skeletons derived from diatom algae and sponges. Aquatic vegetation is predominantly turtle grasses (*Thalassia*) and algae (Beets personal communication 1992).

The habitats of the inner lagoon are severely degraded from approximately 1.7 million l of "treated" sewage effluent that are discharged into the inner lagoon each day (Boulon 1990). An undetermined amount of contaminated leachate originating from the St. Thomas Municipal Landfill is also considered likely to accumulate in the inner lagoon via Turpentine Run (Boulon 1990; Beets personal communication 1992).

Surface waters of the inner and middle portions of Mangrove Lagoon are productive and are known to provide nursery and adult habitat for numerous Caribbean reef fish (Table 1). Reef fish in the lagoons use the inshore fringing reef of the outer portion of Mangrove Lagoon for spawning habitat (Beets personal communication 1992). Grunt (*Pomadasyidae*) and parrotfish (*Scaridae*) are the most abundant species in the Mangrove Lagoon system. Other species found in considerable numbers in the lagoon include schoolmaster (*Lutjanus apodus*) and sea bream (*Archosargus rhomboidalis*). Larger species frequently observed in the lagoons include great barracuda (*Sphyaena barracuda*) and yellowtail snapper (*Ocyurus chrysurus*). Great barracuda are abundant in the

Table 1. Marine species that regularly or intermittently use the Mangrove Lagoon and associated mangrove habitats near the site.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground[1]	Nursery Ground	Adult Forage	Comm.	Recr.
Sergeant major	*Abudefduf saxatilis*	♦	♦	♦		
Ocean surgeon	*Acanthurus bahianus*	♦	♦	♦		
Doctorfish	*Acanthurus chirurgus*	♦	♦	♦		
Blue tang	*Acanthurus coeruleus*	♦	♦	♦		
Bonefish	*Albula vulpes*		♦	♦		♦
Redspotted hawkfish	*Amblycirrhitus pinos*	♦	♦	♦		
Sea bream	*Archosargus rhomboidalis*	♦	♦	♦		
Porkfish	*Anisotremus virginicus*	♦	♦	♦		
Hardhead silversides	*Atherinomorous stipes*	♦	♦	♦		
Frillfin goby	*Bathygobius soporator*	♦	♦	♦		
Jolthead porgy	*Calamus bajonado*	♦	♦	♦		
Sharpnose puffer	*Canthigaster rostrata*	♦	♦	♦		
Yellow jack	*Caranx bartholomaei*		♦	♦		
Blue runner	*Caranx crysos*		♦	♦		
Bar jack	*Caranx ruber*		♦	♦		
Snook	*Centropomas undecimalis*	♦	♦	♦		♦
Foureye butterfish	*Chaetodon capistratus*	♦	♦	♦		
Bridled goby	*Coryphopterus glaucofraenum*	♦	♦	♦		
Spotfin mojarra	*Eucinostomus argenteus*	♦	♦	♦		
Green moray	*Gymnothorax funebris*	♦	♦	♦		
Grunt	*Haemulon* spp.	♦	♦	♦		
Slippery dick	*Halichoeres bivittatus*	♦	♦	♦		
Longjaw squirrelfish	*Holocentrus ascensionis*	♦	♦	♦		
Grouper	*Hypoplectrus* spp.	♦	♦	♦	♦	
Dwarf herring	*Jenkinsia lamprotaenia*	♦	♦	♦		
Schoolmaster	*Lutjanus apodus*	♦	♦	♦	♦	
Gray snapper	*Lutjanus griseus*		♦	♦	♦	
Dog snapper	*Lutjanus jocu*		♦	♦	♦	
Lane snapper	*Lutjanus synagris*		♦	♦	♦	
Tarpon	*Megalops atlanticus*		♦	♦		♦
Yellowtail damselfish	*Microspathodon chrysurus*	♦	♦	♦		
Yellowtail snapper	*Ocyurus chrysurus*		♦	♦	♦	
Gray angelfish	*Pomacanthus arcuatus*	♦	♦	♦		
French angelfish	*Pomacanthus paru*	♦	♦	♦		
Parrotfish	*Scaridae* spp.	♦	♦	♦		
Striped parrotfish	*Scarus croicensis*	♦	♦	♦		
Princess parrotfish	*Scarus taeniopterus*	♦	♦	♦		
Redtail parrotfish	*Sparisoma chrysopterum*	♦	♦	♦		
Bucktooth parrotfish	*Sparisoma radians*	♦	♦	♦		
Great barracuda	*Sphyaena barracuda*		♦	♦		
Bluehead	*Thalassoma bifasciatum*	♦	♦	♦		

[1] Spawning occurs within the inshore fringing reef of outer Mangrove Lagoon.

lagoons from April to May (Boulon 1990). No data were available for invertebrate species.

Snapper (*Lutjanidae*), the only commercial fishery in the area, are commercially fished outside Mangrove Lagoon, which, with its surrounding surface water, supports a popular sport fishery

for bonefish (*Albula vulpes*), tarpon (*Megalops atlantica*), and snook (*Centropomas undecimalis*). There are currently no landing restrictions, nor health advisories for the consumption of fish in the area (Beets personal communication 1992).

Site-Related Contamination

Investigations have focused on groundwater sampling. Samples collected in September 1990 were analyzed for trace elements and organic compounds. All subsequent samples were analyzed only for organic compounds. Minimal soil samples have been collected and analyzed for organic compounds. No off-site surface water, sediment, or biota sampling has been conducted.

No organic compounds were detected in any of the groundwater samples at concentrations exceeding chronic freshwater or marine AWQC by a factor of ten (U.S. EPA 1986). Five trace elements were measured infrequently in groundwater at concentrations exceeding screening criteria. Cadmium, lead, and silver concentrations exceeded their respective freshwater screening criteria. However, the measured concentrations of silver were qualified in the data report as estimated concentrations (Geraghty & Miller 1991). Copper and nickel concentrations exceeded the marine AWQC in several samples, but did not exceed the screening criteria for freshwater (Table 2).

Table 2. Maximum trace element concentrations (µg/l) in groundwater at the Tutu Wellfield site compared to chronic AWQC[1].

	Groundwater	AWQC[2]	
		freshwater	marine
Trace Elements			
Cadmium	11	1.1+	9.3
Copper	59	12+	2.9
Lead	33	3.2+	8.5
Nickel	95	160+	8.3
Silver	18	.12	.92

1: Ten times the AWQC is used for screening purposes to account for dilution in surface water.
2: Ambient water quality criteria for the protection of aquatic organisms. Chronic criteria presented (U.S. EPA 1986).
+: Hardness-dependent criteria (100 mg/l $CaCO_3$ used)

Summary

Numerous hazardous wastes were disposed of at this site in a manner that could permit them to enter the main drainage system of the area via surface runoff or groundwater discharge. This drainage system empties into Mangrove Lagoon, an important habitat for NOAA trust resources in the area. Elevated levels of organics and metals have been detected in groundwater near the site, and it is of some concern to NOAA that these groundwater contaminants, as well as other site-related contaminants, could migrate to Mangrove Lagoon via the drainage system.

References

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