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Salford Quarry

Lower Salford Township, Pennsylvania
CERCLIS #PAD980693204

Site Exposure Potential

The Salford Quarry site covers about 1.2 ha in Lower Salford Township, Montgomery County, Pennsylvania (Figure 1). The quarry is excavated into the side of a hill about 100 m east of the West Branch Skippack Creek, which joins the mainstem Skippack Creek about 1 km downstream (Figure 2). Perkiomen Creek receives flow from Skippack Creek approximately 13 km downstream from the site and then flows an additional 4 km to the Schuylkill River (Figure 2). The Schuylkill River extends another 45 km to tidal portions of the lower Delaware River, which flows into the Atlantic Ocean approximately 160 km farther downstream.

The site was a shale quarry in the early 1900s. In the 1950s, the quarry was used to dispose of two to five truckloads per day of industrial, commercial, and residential wastes from the Ludwig & Son waste disposal business. In 1963, American Olean Tile (AOT) purchased the quarry to landfill waste from its Lansdale, Pennsylvania plant, and began accumulating waste sludges on-site in two 10,000-gallon fuel oil storage tanks (ENVIRON 1990). In 1973, AOT started bringing most of their lead-containing slurries to the quarry. During this time, an undetermined amount of fly ash cinders from a coal-fired power plant also were disposed at the site (Brown et al. 1992). AOT stopped using the quarry for waste

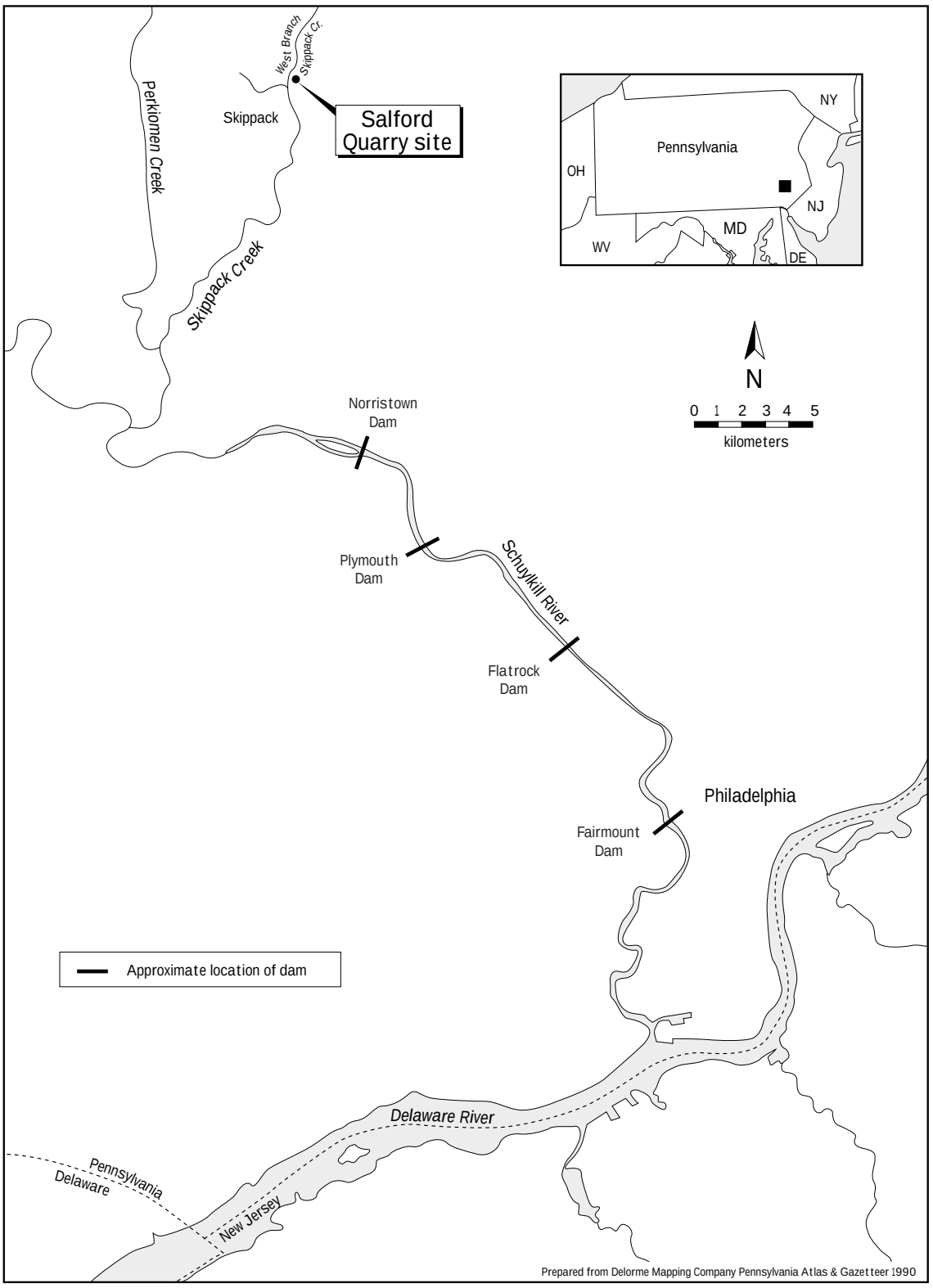

Figure 1. Location of Salford Quarry site in lower Salford Township, Pennsylvania.

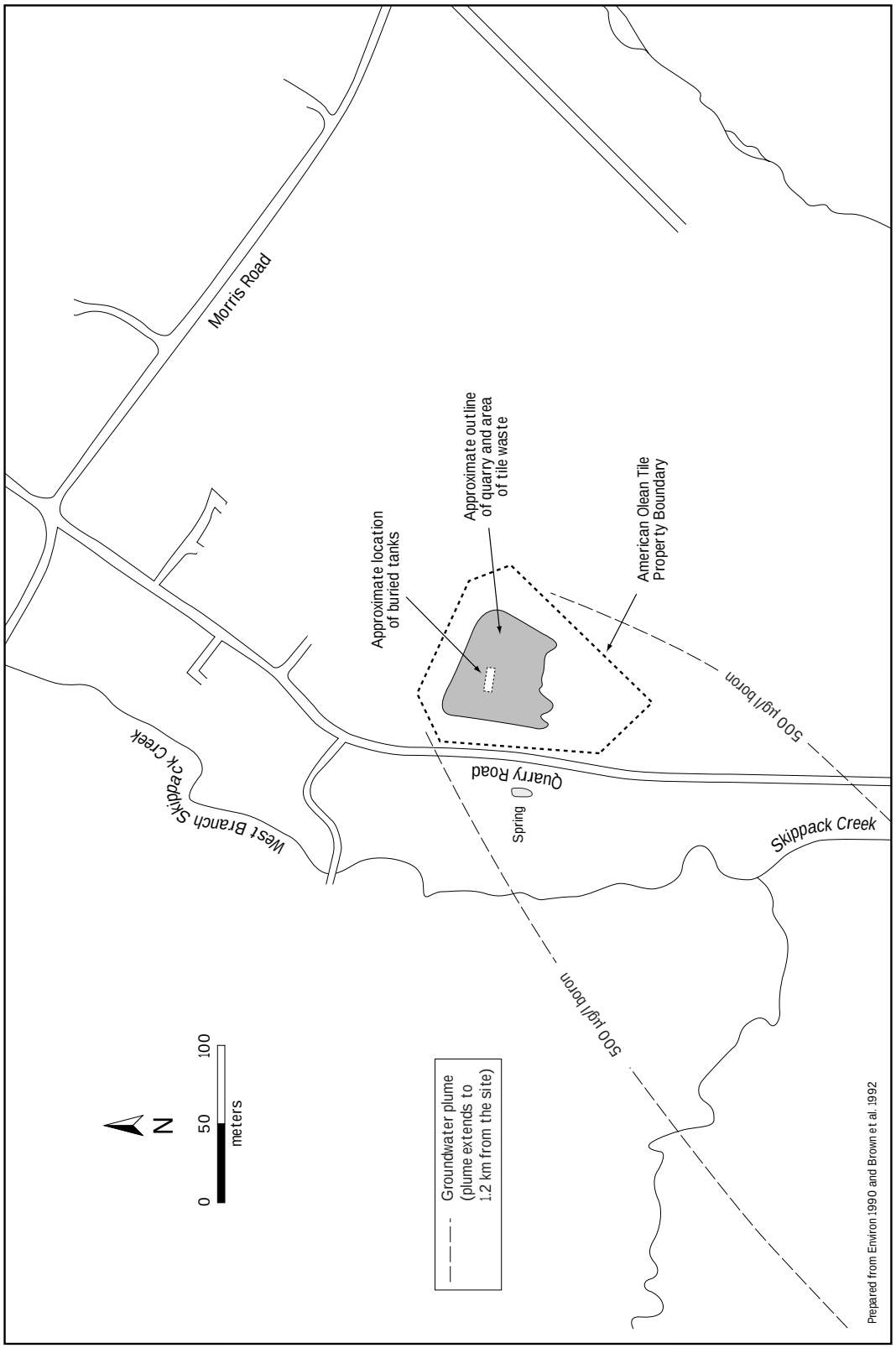

Figure 2. Detail of Salford Quarry site.

disposal in about 1980, and reported that about 6,500 tons of waste had been discarded at the site (Brown et al. 1992). In 1982, a clay cap was installed to reduce infiltration.

Wastes brought to the site include glaze wash-up sludge, settling pond sediment, and fired and unfired scrap tiles. These wastes contain trace elements and boron oxides (ENVIRON 1990; Brown et al. 1992).

Groundwater is the primary pathway of contaminant transport from the site to NOAA resources and associated habitats. Soils around the quarry are generally 0.6 to 1.8 m deep. Soils are underlain by the Brunswick Formation, which consists of shale, siltstone, and mudstone. The Lockatong Formation underlies the Brunswick Formation, and has a similar lithology and structure. The two formations are hydraulically connected, but groundwater within the two formations is restricted to secondary openings such as joints and fractures. As a result, water-bearing properties may vary greatly across the formations. At the site, hydraulic gradients of 0.01 to 0.03 (vertical / horizontal) to the southwest (Brown et al. 1992) indicate that groundwater flows toward the West Branch of Skippack Creek. Groundwater migration in the Brunswick and Lockatong formations is estimated at 0.003 to 0.55 m / day.

There is no surface water pathway from the site to the West Branch Skippack Creek. A small, standing-water body observed 30 m east of the West Branch may actually be a partially dried-up stream channel (Figure 2; ENVIRON 1990).

NOAA Trust Habitats and Species

The primary habitats of concern to NOAA are the surface waters, bottom substrates, and associated riparian zones of the Skippack Creek drainage and Schuylkill River. The Skippack Creek drainage is composed of the West Branch of Skippack Creek, the mainstem Skippack Creek, and Perkiomen Creek.

The West Branch of Skippack Creek is a small stream, averaging about 4.6 m wide and less than 1.5 m deep. The mainstem is a considerably wider stream, generally between 17 and 20 m wide and between 0.5 and 2 m deep. Both streams have moderate gradients with typical riffle-pool habitats. Gravel substrates dominate the riffles with finer sands and silts in pool environments. The streams have both warm and coldwater resident fish assemblages; the mainstem is fairly diverse with trout, largemouth bass, smallmouth bass, and panfish populations. Perkiomen Creek near the confluence with Skippack Creek is a lower-gradient warmwater stream approximately 30 m wide and 2.5 m deep (Kaufmann 1997a).

The only NOAA trust resource now in the Skippack Creek drainage is American eel. Eel have been documented in Perkiomen and the mainstem Skippack Creek. They have not been documented in the West Branch, but do have access to the smaller stream. There are no other NOAA trust resources found in the two streams because of impassable dams below the confluence

of Skippack Creek and the Schuylkill River (Kaufmann 1997a).

The Schuylkill River near the Skippack Creek drainage is a large, low-gradient stream, generally about 100 m wide and 1 to 2 m deep. Substrates are predominantly gravel and cobble in riffles, and finer sands and silts in pool environments. Although its upper portions are classified as a scenic river, the Schuylkill receives considerable amounts of agricultural runoff and wastewater, and is generally considered to have low water quality. There are heavy aquatic plant beds throughout the river, with the dominant species being the non-indigenous and nuisance Eurasian milfoil (Kaufmann 1992; Arnold 1993; Kaufmann 1997b).

Four dams on the Schuylkill River downstream of the Skippack Creek drainage prevent anadromous fish from migrating into this reach of the river. The Norristown, Plymouth, Flatrock, and Fairmount dams are respectively located 10, 16, 24, and 36 km downstream of Skippack Creek drainage. A fish passage has been added to the Fairmount Dam. Fish passage construction on the remaining three dams has been delayed by legal and financial complexities, but is planned to begin by the year 2000. Dam restoration would allow alewife and blueback herring to use the Skippack Creek drainage to spawn. American shad also would increase their range, but probably would not migrate beyond the Schuylkill River because of their preference for large streams (Kaufmann 1997a).

A fish consumption advisory is now in effect for the Schuylkill River because of high concentrations of PCBs, chlordane, and DDT. This advisory does not affect the Skippack Creek drainage, and the mainstem of Skippack Creek is managed as a recreational trout fishery.

Site-Related Contamination

The Remedial Investigation Site Operations Plan presents results from sampling conducted by NUS in 1983 and by ENVIRON in 1989 (ENVIRON 1990). These data are compared to NOAA screening guidelines in Table 1. Reported sample analyses indicate that boron and other inorganic substances are the contaminants of concern to NOAA.

In 1983, the highest measured boron concentration in groundwater was 374,000 µg/L (NUS 1986, as cited in ENVIRON 1990). In 1989, the maximum boron concentration in groundwater was 241,000 µg/L. A groundwater plume contaminated with boron extends from the quarry approximately 1.2 km southwest from the site and may be 120 to 300 m wide (Figure 2; Brown et al. 1992). The extent of this plume is consistent with the probable range of hydraulic characteristics at the site area (Brown et al. 1992). No other inorganic substances were detected in groundwater at concentrations greater than ten times their respective AWQCs.

Table 1. Maximum concentrations of contaminants of concern to NOAA detected in groundwater, surface water, and sediment during investigations at the Salford Quarry site compared to NOAA screening guidelines.

	Water (µg/L)				Sediment (mg/kg)		
Trace elements	Groundwater	Spring Water	Creek Surface Water	Freshwater Chronic AWQC[a]	Spring Sediment	Creek Sediment	ERL[b]
Arsenic	12[c]	ND	ND	190	6[d]	12[d]	8.2
Boron	374,000[d]	139,000[d]	480[c]	NA	53[d]	ND	NA
Cadmium	ND	ND	ND	1.1[+]	2.2[d]	0.3[d]	1.2
Lead	16[c]	4[c]	6[d]	3.2[+]	120[d]	26[d]	46.7
Zinc	344[d]	43[d]	36[d]	110[+]	380[d]	81[d]	150

NA: Not available.
ND: Not detected; detection limits not available.
a: U.S. EPA 1993.
b: Effects range-low (Long and MacDonald 1995).
c: ENVIRON 1990.
d: NUS 1986 as cited in ENVIRON 1990.
+: Hardness-dependent criteria: 100 mg/L $CaCO_3$ assumed.

Water collected from the spring west of the quarry contained concentrations of boron as high as 139,000 µg/L. An AWQC for boron has not been developed. However, data collected by Birge and Black (1977, as cited in Eisler 1990) indicate that concentrations ranging from 1 to 100 µg/L may cause a reduction in the reproductive potential of rainbow trout, and concentrations greater than 200 µg/L may impair the survival of other fish species. Maximum boron concentrations in the creek and spring were 480 µg/L in surface water and 53 mg/kg in sediment. There are no ERLs or similar sediment screening guidelines for boron in sediment. Other contaminants that exceeded NOAA screening guidelines are lead in surface water and arsenic in sediment.

Summary

From 1963 to about 1980, wastes from a tile manufacturing company were discarded into Salford Quarry, about 100 m east of the Skippack Creek West Branch. Data indicate that trace elements, particularly boron, have migrated through the groundwater to the West Branch at concentrations that may pose a threat to NOAA trust resources. American eel is now the only trust species using the Skippack Creek drainage. However, if fish passage facilities are opened on the Schuylkill River, alewife and blueback herring may use Skippack Creek and its tributaries for spawning.

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