

SAIR

WOODARD & CURRAN
ENVIRONMENTAL SERVICES

September 15, 1995

Mr. David Price
Chief of Facility Management
National Park Service/North Atlantic Region
15 State Street
Boston, MA 02109

RE: Evaluation of Potential for Imminent Hazard Conditions at the Saugus Iron Works
Historical Site

Dear David:

This letter report is written to provide the National Park Service with an evaluation of whether an Imminent Hazard occurs at the Saugus Iron Works Historic Site. The evaluation includes the following:

- Review the soil analytical results previously sampled, and
- Based on the data review, a determination whether an Imminent Hazard occurs and Immediate Response Actions are appropriate for the site.

Data Review

Three soil borings (identified as borings L, C, and R) were sampled in the marsh area adjacent to the Saugus River (Figure 1). Soil samples were taken from each boring at the ground surface, 0.5 feet, 1.5 feet, 3.0 feet, and 5.0 feet, and the 15 soil samples were analyzed for volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), 13 priority pollutant metals (PPMs), pesticides, and polychlorinated biphenyls (PCBs). The laboratory results indicate that pesticides, and PCBs were not reported above detection limits, and that several VOCs (chloromethane, dibromochloromethane, and methylene chloride) were reported at concentrations below 7 µg/kg.

Laboratory results for both PPM-13 and PAHs indicate that the subsurface soils have detectable concentrations of these metal and organic compounds. The laboratory results and MCP reportable concentrations/cleanup levels developed for S-1 soils for both PPM-13 and PAHs are shown in Table 1. As shown in Table 1, PAHs are detected in all three soil borings, typically in the upper 1.5 feet of the boring. The PAHs include a suite of compounds of which a subset is believed to be carcinogenic. The carcinogenic PAHs (cPAHs) include benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. Carcinogenic PAHs are detected in top 0.5 feet in all three soil borings at concentrations (705 µg/kg to 4,320 µg/kg) that exceed MCP S-1 soil reportable concentration/cleanup standards (700 µg/kg) for the cPAHs. PAHs are not observed below 1.5 feet, except in the five-foot sample of the R-boring where the non-carcinogen, benzo(g,h,i)perylene (1,630 µg/kg), was reported. This concentration is well below the MCP reportable concentration/cleanup standard for S-1 soils established for benzo(g,h,i)perylene (30,000 µg/kg).

From General File Drawer

PPM-13 metals were detected in all 15 soil samples. The metals reported above detection limits include cadmium, chromium, copper, nickel, lead, zinc, arsenic, beryllium, and mercury. The metals reported above detection limits are shown in Table 1. Also included in Table 1 are the MCP reportable concentration/cleanup standards developed for S-1 soils (MCP exceedences are in bold) and average values of metals in the Eastern United States compiled by the United States Geologic Survey (USGS). Similar to the PAHs, the metals have the highest concentrations in the upper 0.5 feet. In all three soil borings the total metal concentration decreases with depth, with the most pronounced decrease occurring in the upper 1.5 feet of soil. The elevated metal concentrations in the upper soils is also emphasized in the USGS average soil concentrations. The shallow soils above 1.5 feet typically exceed the USGS average soils values, while the deeper soils are at or below the USGS values. Likewise, MCP exceedences are also observed in the shallow soils. Lead (464 mg/kg) and arsenic (30.2) exceed the MCP reportable concentration/cleanup standard in the 0.5 foot sample in the L-boring, while nickel (1,530 mg/kg) and arsenic (39.1 mg/kg) in the surface sample and arsenic (43.6 mg/kg) in the 5 foot sample exceed the MCP levels in the C-boring. The only other metal exceedences occur in the R-boring and include lead at 0.5 feet (376 mg/kg) and 5 feet (469 mg/kg), arsenic at 3.0 feet (40.6 mg/kg), and beryllium (1.11 mg/kg) in the surface sample.

Imminent Hazard Evaluation

Comparing the soil results to releases that pose an Imminent Hazard (310 CMR 40.0321(2)b) indicates that arsenic may potentially pose an Imminent Hazard, as arsenic concentrations exceed the 40 mg/kg criteria in soil at the site. All other compounds are below the Imminent Hazard concentration levels. The Imminent Hazard criteria identified in 310 CMR 40.0321(2)b indicates that arsenic detected at concentrations in excess of 40 mg/kg at the ground surface or within a depth of six inches at any location within 500 feet of a residential dwelling, school, playground, recreation area or park, unless access is controlled or prevented, presents an Imminent Hazard. The analytical soil results for the Saugus Iron Works indicate that the 40 mg/kg concentration is exceeded in two borings (C-boring, 43.6 mg/kg and R-boring 40.6 mg/kg), from sampling depths of five feet (C-boring) and three feet (R-boring) below the ground surface. All other arsenic concentrations are below the 40 mg/kg concentration. Arsenic concentrations at the ground surface to 0.5 foot depth range vary between 7.95 mg/kg and 39.1 mg/kg in the three soil borings sampled at the site.

To evaluate potential exposure point concentrations for arsenic, average concentrations of the surface and 0.5 foot samples for the three borings were developed. The exposure point concentration for arsenic in surface soils from the three soil borings is 23.4 mg/kg, while the exposure point concentration for the 0.5 foot-samples is 25 mg/kg. These exposure point concentrations are well below the 40 mg/kg value established for Imminent Hazard criteria and the S-1 reportable concentration (30 mg/kg).

The potential for exposure to the soils is also minimized at the Saugus Iron Works National Historic Site. The marsh area where the soil samples were taken (Figure 1) is not typically accessed as part of the historic site. The various trails and exhibits at the historic site do not include the marsh area, further minimizing the potential for exposure to the arsenic-bearing soils. Although arsenic is present in the surface and near surface soils, the exposure point concentrations do not exceed the reportable concentration/cleanup level for S-1 soils, and an Imminent Hazard condition is not believed to exist at the site. Based on the lack of Imminent Hazard conditions at the site, Immediate Response actions are not warranted at this time.

During the Phase I Initial Site Assessment that will be conducted at the property the potential for Imminent Hazard conditions to occur at the property will be continuously evaluated.

Sincerely,

WOODARD & CURRAN, INC.

Melville P. Dickenson, III, Ph.D., LSP
Senior Project Manager

Attachments

cc.
file

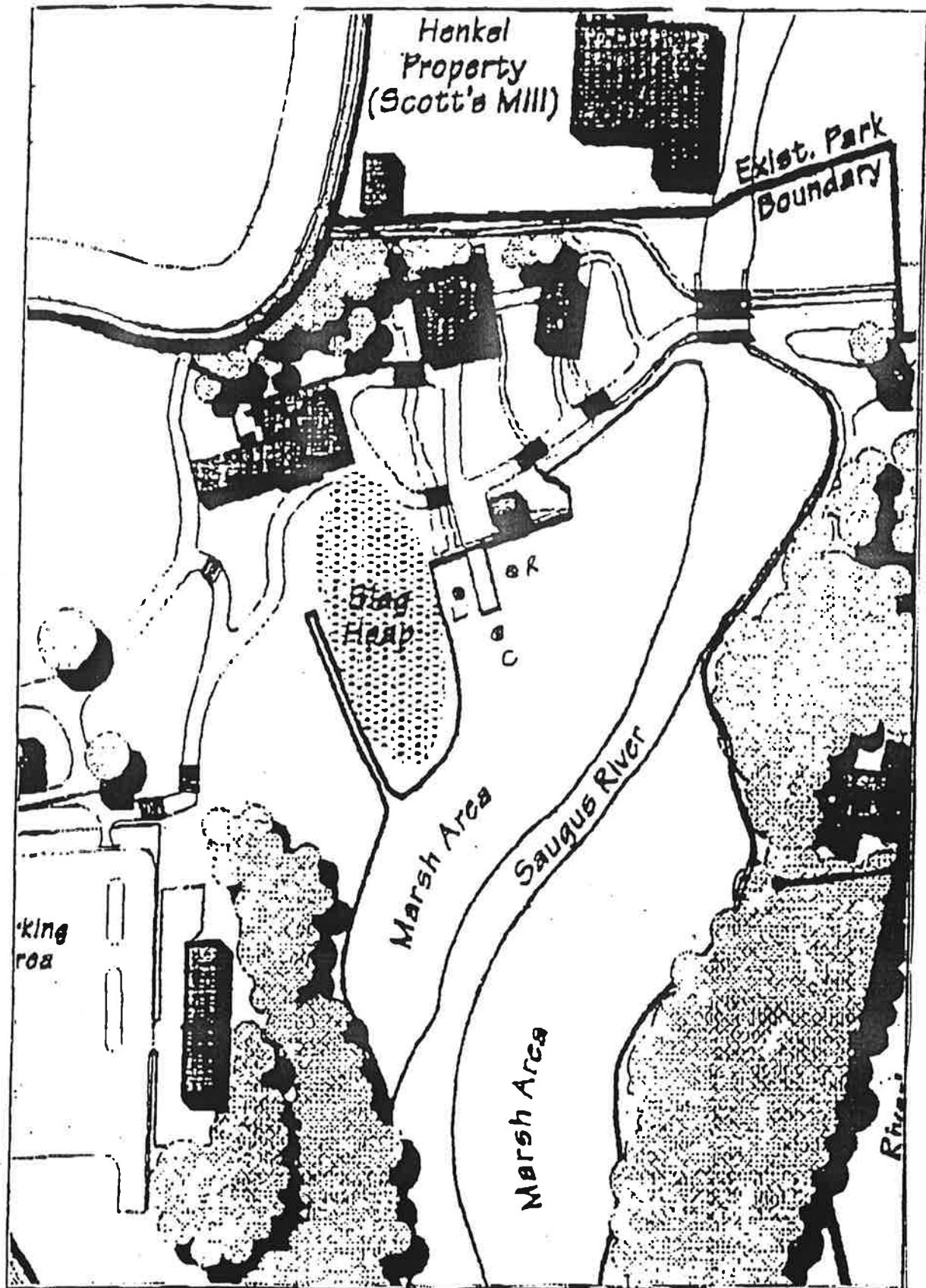


FIGURE 1

SOIL BORING LOCATIONS

Saugus Iron Works

National Historic Site *Sept 19, 1995*

Table 1
PAHs and Metals in Soils
Saugus Iron Works

Sample/Depth		PAHs (µg/kg)		Metals (mg/kg)			
			S-1		S-1	USGS	
19201L (0')	Y ✓	Benzo(a)anthracene	1520	700	Cd	5.09	30 NA
	Y ✓	Benzo(b)fluoranthene	1340	700	Cr	78.7	1,000 33
	Y ✓	Dibenz(a,h,)anthracene	3380	700	Cu	58.2	NA 13
	ND ✓	Benzo(g,h,i)perylene	1020	100,000	Ni	91	300 11
					Pb	266	300 14
					Zn	265	2,500 40
					As	23.2	30 4.8
19202L (.5')	BD				Cd	ND	30 NA
					Cr	50.6	1,000 33
					Cu	32.9	NA 13
					Ni	44.5	300 11
					Pb	46.4	300 14
					Zn	114	2,500 40
					As	30.2	30 4.8
19203L (1.5')	No ✓	Benzo(g,h,i)perylene	1050	30,000	Cd	ND	30 NA
					Cr	20.9	1,000 33
					Cu	8.67	NA 13
					Ni	28.3	300 11
					Pb	42.8	300 14
					Zn	28.6	2,500 40
					As	24.6	30 4.8
19204L (3')	BD				Cd	ND	30 NA
					Cr	18.4	1,000 33
					Cu	6.2	NA 13
					Ni	24	300 11
					Pb	59.2	300 14
					Zn	25.3	2,500 40
					As	24.8	30 4.8
19205L (5')	BD				Cd	ND	30 NA
					Cr	19.9	1,000 33
					Cu	6.09	NA 13
					Ni	22.5	300 11
					Pb	59.1	300 14
					Zn	20.1	2,500 40
					As	28.4	30 4.8
		Chloromethane - 4.9 ppb					
		Dibromochloromethane - 2.2 ppb					

Sample/Depth		PAHs (ppb)			Metals (ppm)			
				S-1		S-1	USGS	
19201C	(0') ✓	Benzo(k)fluoranthene	705	700	Cd	35.2	30	NA
	✓	Dibenz(a,h,)anthracene	1550	700	Cr	903	1,000	33
	NO ✓	Benzo(g,h,i)perylene	735	100,000	Cu	159	NA	13
					Ni	1530	300	11
					Pb	251	300	14
					Zn	93.8	2,500	40
					As	39.1	30	4.8
19202C	(.5') ✓	Benzo(b)fluoranthene	751	700	Cd	ND	30	NA
	✓	Dibenz(a,h,)anthracene	1810	700	Cr	35.4	1,000	33
		Methylene Chloride - 6.3 ppb			Cu	21.4	NA	13
					Ni	49	300	11
					Pb	269	300	14
					Zn	70.2	2,500	40
					As	24.8	30	4.8
19203C	(1.5')	BD			Cd	ND	30	NA
					Cr	24.6	1,000	33
					Cu	6.38	NA	13
					Ni	26.1	300	11
					Pb	34.2	300	14
					Zn	18.7	2,500	40
					As	17.3	30	4.8
19204C	(3')	BD			Cd	ND	30	NA
					Cr	25.1	1,000	33
					Cu	6.89	NA	13
					Ni	31.2	300	11
					Pb	50.2	300	14
					Zn	23	2,500	40
					As	22.4	30	4.8
19205C	(5')	BD			Cd	ND	30	NA
					Cr	29.9	1,000	33
					Cu	7.08	NA	13
					Ni	28.9	300	11
					Pb	93.4	300	14
					Zn	23.2	2,500	40
					As	43.6	30	4.8

Sample/Depth		PAHs (ppb)		Metals (ppm)			
			S-1		S-1	USGS	
19201R (0')	Y✓	Benzo(b)fluoranthene	3310	700	Cd	5.76	30 NA
	Y✓	Benzo(k)fluoranthene	1760	700	Cr	(89.2)	1,000 33
	Y✓	Benzo(a)pyrene	3060	700	Cu	(113)	NA 13
	Y✓	Dibenz(a,h,)anthracene	5840	700	Ni	(128)	300 11
19202R (.5')					Pb	(144)	300 14
					Zn	(483)	2,500 40
					As	(7.95)	30 4.8
					Be	(1.11)	0.4 0.55
					Hg	(1.38)	10 0.81
	Y✓	Pyrene	1070	500,000	Cd	3.72	30 NA
	Y✓	Benzo(b)fluoranthene	2260	700	Cr	(64.1)	1,000 33
19203R (1.5')	Y✓	Benzo(a)pyrene	1160	700	Cu	(67.1)	NA 13
	Y✓	Indeno(1,2,3-cd)pyrene	1680	700	Ni	(72.9)	300 11
	Y✓	Dibenz(a,h,)anthracene	4320	700	Pb	(376)	300 14
	NO✓	Benzo(g,h,i)perylene	1180	100,000	Zn	(331)	2,500 40
					As	(20)	30 4.8
19204R (3')	Y✓	Phenanthrene	496	700,000	Cd	ND	30 NA
	Y✓	Fluoranthene	500	600,000	Cr	(56.4)	1,000 33
	Y✓	Pyrene	505	500,000	Cu	9.14	NA 13
	NO✓	Benzo(g,h,i)perylene	535	100,000	Ni	(32.8)	300 11
					Pb	(89.2)	300 14
19205R (5')					Zn	(57.5)	2,500 40
					As	(30)	30 4.8
19204R (3')	BD				Cd	ND	30 NA
					Cr	23	1,000 33
					Cu	9.01	NA 13
					Ni	(30)	300 11
					Pb	(137)	300 14
					Zn	32.3	2,500 40
					As	(40.6)	30 4.8
19205R (5')	NA✓	Benzo(g,h,i)perylene	1630	100,000	Cd	ND	30 NA
					Cr	24.5	1,000 33
					Cu	7.13	NA 13
					Ni	(24.5)	300 11
					Pb	(469)	300 14
					Zn	36.1	2,500 40
					As	(28.9)	30 4.8