

**Screening Study of Surface Soil  
in Selected Baltimore City Parks**

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# Screening Study of Surface Soil in Selected Baltimore City Parks

## 1.0 Scope of Work

The Maryland Department of the Environment (MDE), Land Restoration Program (LRP) prepared this study at the request of the City of Baltimore (City). The study's purpose was to sample surface soils for metals and determine whether any public open spaces or recreational areas immediately adjacent to known LRP sites were potentially impacted by past operational activities or releases of controlled hazardous substances. Figure 1 identifies the LRP sites and adjacent parks evaluated for this study. The LRP sites are also identified in Appendix A. Data from MDE's X-Ray Fluorescence (XRF) lab, as well as confirmation of 60 percent of those samples by the Department of Health and Mental Hygiene Laboratory (DHMH) for selected analytes, has been tabulated and plotted onto Google Earth maps. LRP did not perform data validation for the collected data. Furthermore, the data has not been assessed as part of a formal toxicological evaluation of the potential long-term human health risks at each site as sampling for all environmental media was not conducted.

### 1.1 Executive Summary

Of the 11 parks sampled, only four contaminants, arsenic, chromium, lead and vanadium, were identified in soil samples at concentrations in excess of the Region III risk-based concentrations (RBCs) for industrial or residential soil. Middle Branch Park at Waterview Avenue and Frank Bocek Park had exceedances of EPA's residential soil standards for vanadium (at 87.7 mg/kg) and chromium (at 268 mg/kg), respectively. The analytical data identified arsenic concentrations are in exceedance of their residential RBC (0.43 mg/kg) in almost all instances.

The LRP recommends that additional sampling be conducted at the Middle Branch

Park at Cherry Hill to determine whether any additional action should be taken. The analytical data from the samples collected at the Middle Branch Park at Dickman Street identified the presence of arsenic at concentrations ranging from 24 mg/kg to 195 mg/kg. However, this property is no longer a park and is being addressed through MDE's Voluntary Cleanup Program (VCP) by the Center for Aquatic Life Conservation.

It is important to emphasize that this report represents a site screening assessment of surface soils for select metals and that the data in this report has not undergone third-party validation. As the analytical data is only intended for screening purposes, no formal comprehensive risk assessment has been prepared. MDE did not evaluate other pathways, such as subsurface soils or groundwater at the selected sites.

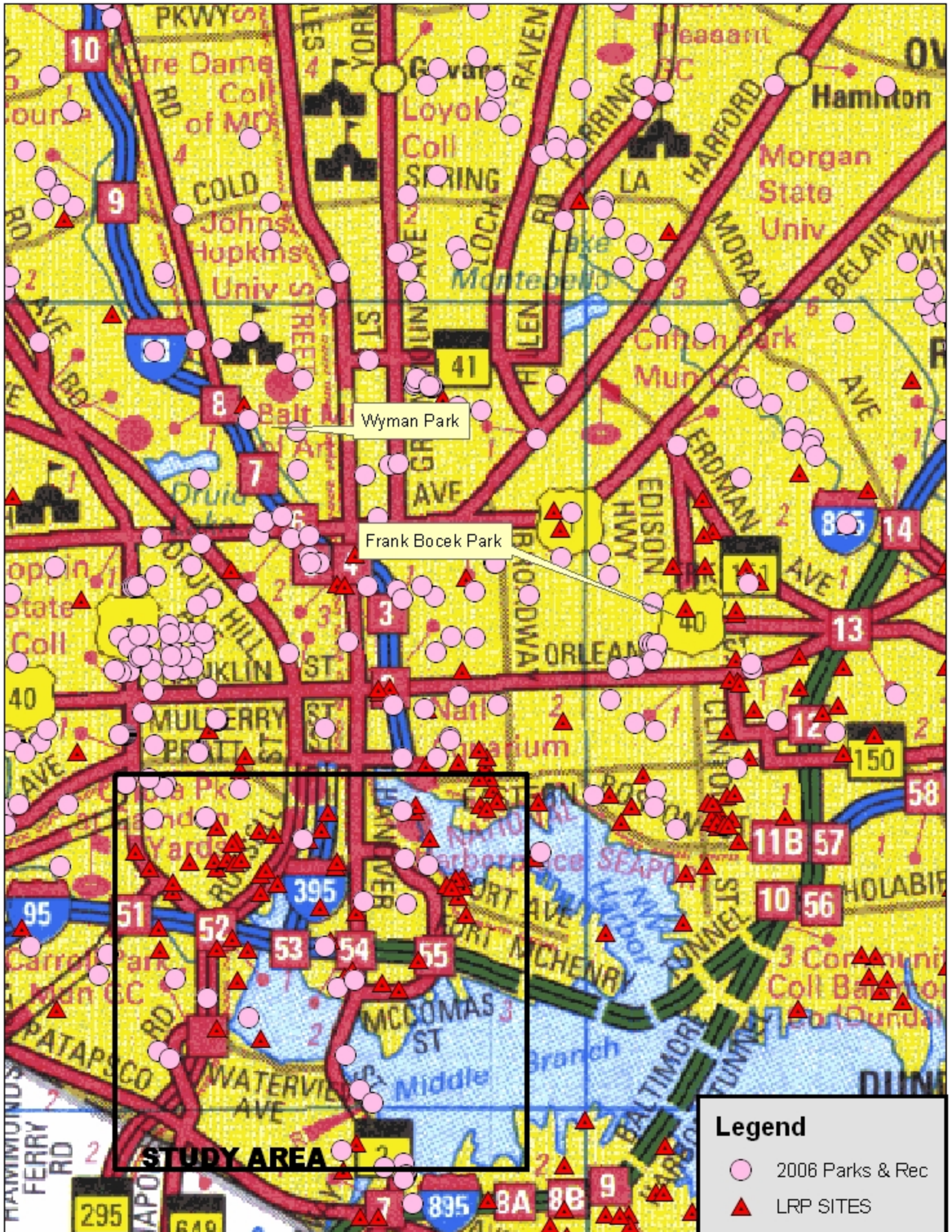
## 2.0 Background and Sampling Rationale

The study was initiated in response to concerns that certain parks in the area of the former Allied Chemical plant or other public open space and recreational areas may be impacted by historic releases of contamination from adjoining LRP sites.

Therefore, all parks within approximately a 1.5-mile radius of Allied Chemical were selected, as shown on Figure 1, and listed below:

- Middle Branch Park (at Waterview Avenue)
- Middle Branch Park (at Cherry Hill)
- Wegworth Park
- Leone Riverside Park
- Cherry Hill Splash Park
- Garrett Park
- Carroll Park

Figure 1 - Study Area and Outlying Parks



## Screening Study of Surface Soil in Selected Baltimore City Parks

- Federal Hill Park
- Latrobe Park
- Ferry Bar Park

These parks are located in Baltimore City, and encompass an area south of Pratt Street, east of the intersection of I-95 and Washington Boulevard, north of Frankfur Avenue, and west of the Fort McHenry Tunnel. The area is a mixture of industrial, residential, and commercial properties, with major thruways for roads and railroad tracks.

### 2.1 Description of Neighboring Use Assessment Study Area

As part of a neighboring use assessment initiative, two additional parks, Frank Bocek Park and Wyman Park, were selected based on their proximity to LRP sites, which include Brownfields, Voluntary Cleanup, State Superfund sites, and CERCLIS sites, or EPA's list of potential hazardous waste sites located immediately adjacent to public open spaces in Baltimore City. LRP combined a geographic information system (GIS) data layer identifying public parks and recreational open space provided by Baltimore City with its own data layer identifying LRP sites in Baltimore. LRP also queried the State Department of Assessment and Taxation (SDAT) database to locate public open space that was not otherwise identified in the other data layers. Using the combined GIS data, LRP identified 32 LRP sites located immediately adjacent to public open space and conducted a file review to determine what hazardous substances were discovered on the specific LRP site<sup>1</sup>. If the contaminants of concern have the potential for airborne mobility, LRP designated the adjacent public open space as an area for additional assessment due to potential airborne deposition.

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<sup>1</sup> See Appendix A for a list of the LRP sites.

Of the 32 LRP sites identified in the process described above, three LRP sites (Monument Street Landfill, Armco, and the Kirk-Steiff Silver) were found to have had a potential for air deposition of contaminants during their periods of operation on adjacent public open space. Frank Bocek and Wyman Parks were the closest parks to these sites

Surface soil sampling was conducted at the parks since that medium was considered the most likely to be impacted. Once the parks were selected, state personnel collected 10 samples from each park. In most cases, a duplicate sample was also collected and submitted to accompany the samples back to MDE's XRF lab. Sample locations were generally chosen in random open areas as well as in areas where a high frequency of contact with park users was expected, but away from possible sources of arsenic (i.e., treated-wood park benches). Soil sampling was conducted from May 3, 2007 to July 24, 2007.

### 3.0 Laboratory Analysis

The MDE's XRF lab analyzes for priority pollutant metals plus vanadium, titanium, manganese, and barium. The XRF is an instrument that is generally used for screening purposes and the XRF data has not been validated. Analytical parameters requested for confirmation from DHMH included arsenic, vanadium, chromium, and lead. In the case of Wyman and Frank Bocek Parks, silver analysis was also requested due to their proximity to a former silver jewelry manufacturer. At DHMH, the soil samples were digested and prepared using EPA Method 3050B (SW-846). The digestates were analyzed on an inductively coupled plasma-atomic emissions spectrometer (ICP-AES) according to EPA Method 200.7. All standards, reagents, QC samples and calibration curves were prepared and performed as specified in both aforementioned EPA methods.

## Screening Study of Surface Soil in Selected Baltimore City Parks

### 3.1 Collection of Screening Samples for XRF Analysis

State personnel collected surface soil samples by removing or digging below the sod where present, in order to access the soil below it. The latitude and longitude coordinates were recorded at each location. Soil was collected into whirlpacks and brought to MDE's XRF lab. The MDE analyst took a small portion of the sample out of the whirlpack bag for preparation for XRF analysis.

### 3.2 Collection of Samples for DHMH Laboratory Analysis

Once the XRF analysis was complete, samples were selected for laboratory confirmation at DHMH laboratory. Samples chosen for DHMH confirmation were selected based on their XRF concentrations of arsenic: two low, two high, and two

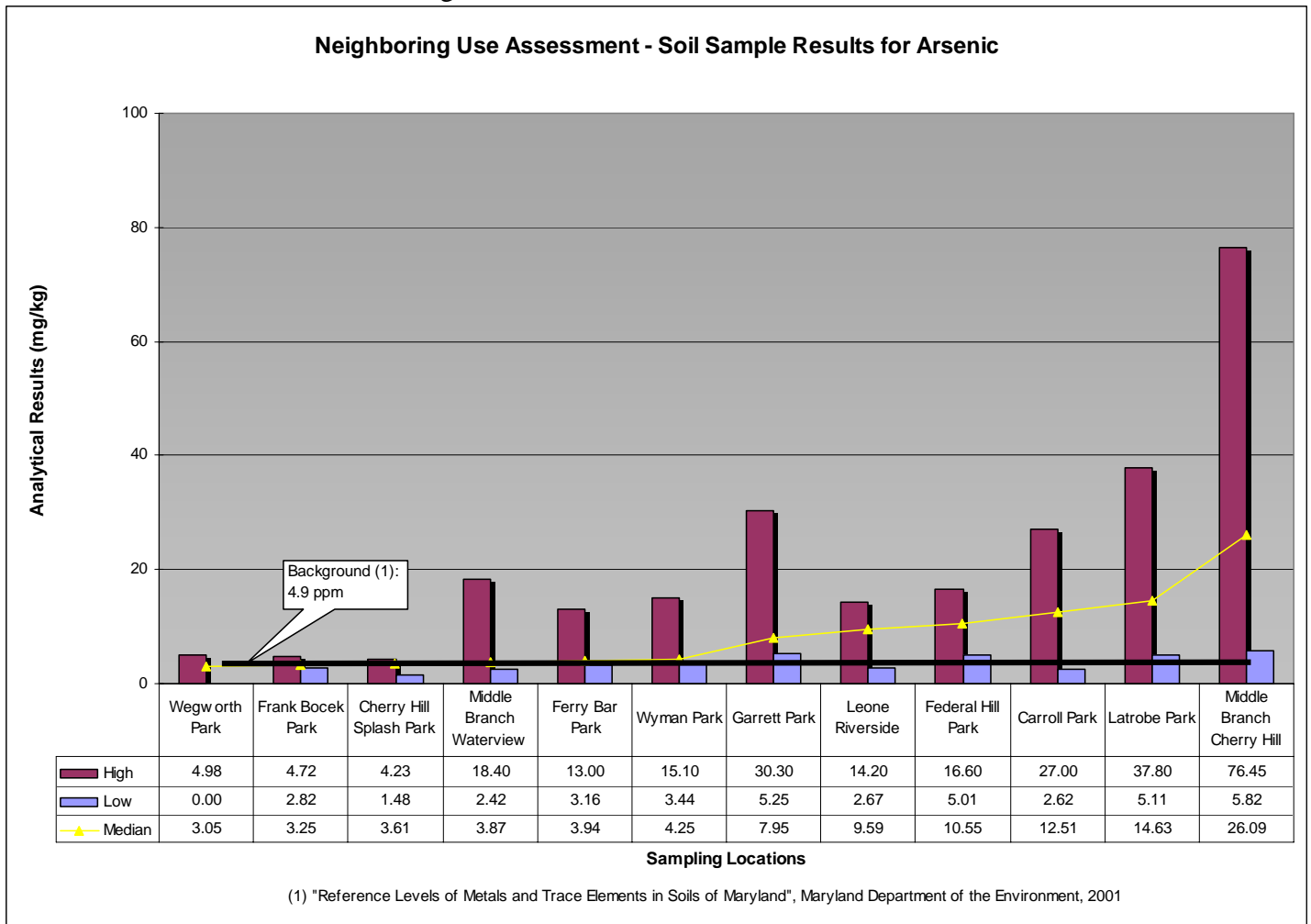
intermediate concentration samples, and delivered to the DHMH lab for analysis.

### 3.3 Discussion of Results

Comparison of the XRF results with the DHMH results showed good relative correlation. Since the XRF is a screening tool and the DHMH analysis was performed with a more precise instrument, only the DHMH results are discussed herein.

The soil concentrations were compared to EPA Region III RBCs, using both industrial and residential screening concentrations. Neither set of screening concentration is directly applicable to a residential facility, but it can be assumed that these screening concentrations represent a range of reasonably protective comparisons.

A single soil sample each at Middle Branch



## Screening Study of Surface Soil in Selected Baltimore City Parks

Park at Waterview Avenue and Frank Bocek Park exceeded EPA's residential soil standards for vanadium (at 87.7 mg/kg) and chromium (at 268 mg/kg), respectively. The analytical data identified arsenic concentrations are in exceedance of their residential RBC (0.43 mg/kg) in almost all instances.

### 3.4 Findings and Recommendations

The LRP screening study did identify certain locations in the Middle Branch Cherry Hill Park where the presence of arsenic in the surface soils appeared to be above and beyond the normal levels found in areas where pesticides and herbicides have been applied as products. LRP recommends that the City of Baltimore perform additional surface soil investigation of these areas to determine whether further action is necessary.

## Appendix A

### Land Restoration Program Sites Evaluated for Neighboring Use Assessment Initiative



**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

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**Sites to Be Sampled**

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Site Name: Kirk-Steiff Silver Building  
Address: 800 Wyman Park Dr.  
Media of Concern: Soil  
Contaminant of Concern: Metals, PAHs, TPH  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: Wyman Park,  
Adjacent Open Space to be Sampled? Yes  
Comments: Operational history included baghouse to collect air emissions from manufacturing operation

Site Name: Monument Street LF  
Address: Monument St. & Edison Hwy  
Media of Concern: No File on Shelf  
Contaminant of Concern:  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: Frank C. Bocek,  
Adjacent Open Space to be Sampled? Yes  
Comments: Landfill is directly across Edison Hwy from the FCB Park.

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

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**Other Sites Under Consideration For Sampling**

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Site Name: Fort Holabird Crime Records Center  
Address: (Federal Facility)  
Media of Concern: GW  
Contaminant of Concern: VOCs from UST?  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: Fort Holabird Park  
Adjacent Open Space to be Sampled?  
Comments: Need to consult with Fed. Fac.

Site Name: Hawkins Point Landfill  
Address: (RCRA Facility)  
Media of Concern: Soil, GW  
Contaminant of Concern: Chrome Tailings  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: Fort Armistead Park  
Adjacent Open Space to be Sampled?  
Comments: Need to consult with HWP.

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

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**Other Sites Considered For Sampling**

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Site Name:	WATERVIEW PROPERTY
Address:	3100 Waterview Ave.
Media of Concern:	
Contaminant of Concern:	
Adjacent Public Open Space?	Yes
Name of Adjacent Open Space:	MIDDLE BRANCH PARK,
Adjacent Open Space to be Sampled?	No
Comments:	Already sampled
Site Name:	Montgomery Park Business Center
Address:	1800 Washington Blvd.
Media of Concern:	Soil, GW
Contaminant of Concern:	TPH and Metals
Adjacent Public Open Space?	Yes
Name of Adjacent Open Space:	Carroll Park, 1500 Washington Blvd
Adjacent Open Space to be Sampled?	No
Comments:	Site has been capped.
Site Name:	REEDBIRD LANDFILL
Address:	Potee St. and Reedbird Ave.
Media of Concern:	
Contaminant of Concern:	
Adjacent Public Open Space?	Yes
Name of Adjacent Open Space:	CHERRYHILL PARK, 201 Reedbird Ave
Adjacent Open Space to be Sampled?	No
Comments:	Already sampled

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

**Other Sites Considered For Sampling (continued)**

Site Name: BALTIMORE CITY SOLID WASTE FACILITY  
 Address: 701 REEDBIRD AVE  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: CHERRYHILL PARK, 201 Reedbird Ave  
 Adjacent Open Space to be Sampled? No  
 Comments: Already sampled

Site Name: American Visionary Art Museum  
 Address: 820 Key Highway  
 Media of Concern: Soil  
 Contaminant of Concern: As, Hg, Pb, SVOCs  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: Federal Hill Park, 300 N Warren Ave.  
 Adjacent Open Space to be Sampled? No  
 Comments: Unpaved park areas higher elevation than AVAM.

Site Name: RITZ CARLTON  
 Address: 801 KEYHIGHWAY  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? No  
 Name of Adjacent Open Space: FEDERAL HILL PARK,  
 Adjacent Open Space to be Sampled? No  
 Comments:

Site Name: ALLIED CHEMICAL - AG PLT  
 Address: 2000 Race Street  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? No  
 Name of Adjacent Open Space: SWANN PARK,  
 Adjacent Open Space to be Sampled? No  
 Comments: Already sampled

Site Name: DPW/MIDDLE BRANCH PARK  
 Address: 101 W. Cromwell St.  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: MIDDLE BRANCH PARK,  
 Adjacent Open Space to be Sampled? No  
 Comments: Already sampled

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

**Other Sites Considered For Sampling (continued)**

Site Name: Bloede Manufacturing  
 Address: 700 Block of Caton Ave.  
 Media of Concern: Soil, SW  
 Contaminant of Concern: Metals, PAHs, Pesticides  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: --, --  
 Adjacent Open Space to be Sampled? No  
 Comments: Site not adjoined by parks or residences.

Site Name: Cold Spring Lane LF  
 Address: 2221 W. Coldspring Ln.  
 Media of Concern: Soil, Sediment  
 Contaminant of Concern: Metals, PAHs  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: Cylburn Park, --  
 Adjacent Open Space to be Sampled? No  
 Comments: Landfill surrounds Cylburn Park.

Site Name: CLIPPER INDUSTRIAL PARK  
 Address: 3500 Clipper Road  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? No  
 Name of Adjacent Open Space: DRUID HILL PARK,  
 Adjacent Open Space to be Sampled? No  
 Comments:

Site Name: BOWLEYS LANE LANDFILL  
 Address: 6101 BOWLEY LANE  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? No  
 Name of Adjacent Open Space: HERRING RUN PARK,  
 Adjacent Open Space to be Sampled? No  
 Comments: Area already under investigation

Site Name: Lower Herring Run Park  
 Address: End of Aldricks Way  
 Media of Concern: Soil, Sediment  
 Contaminant of Concern: S: As, Pb, B(a)P, Sed: fluorathene  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: Herring Run Park & Armistead Gardens, --  
 Adjacent Open Space to be Sampled? No  
 Comments: Adjoins Herring Run Park & Armistead Gardens neighborhood.

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

**Other Sites Considered For Sampling (continued)**

Site Name: Hutton Landfill E&W  
 Address: 4825-4835 Windsor Mill Road  
 Media of Concern: Soil, SW, Sediment  
 Contaminant of Concern: As, Be, Fe, Mn  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: Leakin Park,  
 Adjacent Open Space to be Sampled? No  
 Comments: Site located in the park, adjacent to outdoor education center.

Site Name: American Shot & Lead Co.  
 Address: 701 E. Fayette St.  
 Media of Concern: Soil  
 Contaminant of Concern: Lead  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: --, --  
 Adjacent Open Space to be Sampled? No  
 Comments: Small park. Placed on FIS. Entire site excavated in 1968-69.

Site Name: Proctor & Gamble Soap Manufacturing  
 Address: 1422 Nicholson Street  
 Media of Concern:  
 Contaminant of Concern:  
 Adjacent Public Open Space? No  
 Name of Adjacent Open Space: 900 HULL STREET,  
 Adjacent Open Space to be Sampled? No  
 Comments:

Site Name: 3800 E. Biddle St.  
 Address: --  
 Media of Concern: Soil, GW  
 Contaminant of Concern: Soil: As, Pb, B(a)P; GW: Pb, Hg  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: School? Not shown on ADC Map., 1401 E. Biddle St.?  
 Adjacent Open Space to be Sampled? No  
 Comments:

Site Name: 3800 E. Biddle St.  
 Address: --  
 Media of Concern: Soil, GW  
 Contaminant of Concern: Soil: As, Pb, B(a)P; GW: Pb, Hg  
 Adjacent Public Open Space? Yes  
 Name of Adjacent Open Space: Park? Not shown on ADC Map., 1050 N. Caroline St.?  
 Adjacent Open Space to be Sampled? No  
 Comments:

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

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**Other Sites Considered For Sampling (continued)**

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Site Name:	FORT MCHENRYSHIPYRD
Address:	
Media of Concern:	
Contaminant of Concern:	
Adjacent Public Open Space?	No
Name of Adjacent Open Space:	CONSTELLATION PLAZA,
Adjacent Open Space to be Sampled?	No
Comments:	
Site Name:	KANE & LOMBARD DRUM SITE
Address:	6200 E. Pratt St.
Media of Concern:	
Contaminant of Concern:	
Adjacent Public Open Space?	No
Name of Adjacent Open Space:	JOSEPH LEE PARK,
Adjacent Open Space to be Sampled?	No
Comments:	
Site Name:	KANE & LOMBARD DRUM SITE
Address:	100 Kane St.
Media of Concern:	
Contaminant of Concern:	
Adjacent Public Open Space?	No
Name of Adjacent Open Space:	PATTERSON HS,
Adjacent Open Space to be Sampled?	No
Comments:	
Site Name:	MARTIN MARIETTA
Address:	1401 Fillmore St.
Media of Concern:	Produced paste inks, etc.
Contaminant of Concern:	Oils, glycols, kerosene
Adjacent Public Open Space?	Yes
Name of Adjacent Open Space:	COLDSTREAM PARK ES & MS,
Adjacent Open Space to be Sampled?	No
Comments:	Site evaluated and issued NFA by MDE and EPA
Site Name:	Maryland White Lead Works
Address:	1215 E. Fort St.
Media of Concern:	No File on Shelf
Contaminant of Concern:	
Adjacent Public Open Space?	Yes
Name of Adjacent Open Space:	1215 E. Fort Ave.,
Adjacent Open Space to be Sampled?	No
Comments:	Site evaluated and issued NFA by MDE and EPA

**Neighboring Uses Assessment Initiative  
List of Adjacent Open Space Properties**

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**Other Sites Considered For Sampling (continued)**

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Site Name: Ainsworth Paint  
Address: 3200 E. Biddle Street  
Media of Concern: No File on Shelf  
Contaminant of Concern: Drums of chemicals, ASTs and USTs  
Adjacent Public Open Space? No  
Name of Adjacent Open Space:  
Adjacent Open Space to be Sampled? No  
Comments: Drummed chemicals, ASTs and USTs removed from site.

Site Name: PARKER METALS/AMERICAN CHEMMATE  
Address: 1044 Ledenhall St.  
Media of Concern: Subsurface soil, gw  
Contaminant of Concern: PCE, BTEX, metals,  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: SCHOOL/150 W. WEST ST.,  
Adjacent Open Space to be Sampled? No  
Comments: No onsite risk, issued NFRD

Site Name: Seton Business Park  
Address: Metro Drive  
Media of Concern: Soil, Sediment  
Contaminant of Concern: Metals, PAHs, PCBs  
Adjacent Public Open Space? No  
Name of Adjacent Open Space:  
Adjacent Open Space to be Sampled? No  
Comments: No parks shown in vicinity of site on ADC map.

Site Name: Ackerman & Baines  
Address: 4215 Erdman Ave.  
Media of Concern: Soil  
Contaminant of Concern: As, Hg, Pb; As  
Adjacent Public Open Space? Yes  
Name of Adjacent Open Space: Archbishop Curley HS,  
Adjacent Open Space to be Sampled? No  
Comments: Property capped



## Appendix B

### Data Tables and Google Earth Maps Showing Arsenic Concentrations

Carroll Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Carroll Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		CAP-1		CAP-2		CAP-3		CAP-4		CAP-5		CAP-6		CAP-7		CAP-8		CAP-9*		CAP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	23.3	17.1	0.9	2.62	36.4	NA	26.3	NA	41.6	27	18.7	NA	13	7.92	14.9	7.16	4.1 7.4	NA	36	22.1
Vanadium	1000	78	80	26	66.1	34.9	135.3	NA	67.7	NA	157.7	43	122.3	NA	71.5	32	133.7	38.4	142.6 145.9	NA	230.4	71
Thallium			9.5	NA	3.9	NA	8.6	NA	ND	NA	3.5	NA	ND	NA	ND	NA	3.7	NA	ND 7.3	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA
Chromium	3100	230	115.5	25.7	136.2	47.9	129.8	NA	186.6	NA	138.3	40.2	101.5	NA	148.7	36.5	66.5	35.9	37.4 37.6	NA	238.6	63.7
Manganese			239.1	NA	750.6	NA	288.3	NA	280.5	NA	370.8	NA	343.4	NA	446	NA	958	NA	383.5 411.7	NA	1368	NA
Nickel			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	85.8	NA
Copper			41.6	NA	86.4	NA	50.3	NA	62.2	NA	76	NA	52.7	NA	92.7	NA	53.7	NA	14.4 17.1	NA	110.1	NA
Zinc			154.4	NA	2628.4	NA	139.5	NA	128.9	NA	177.5	NA	180.8	NA	203.4	NA	134.5	NA	56.9 49.6	NA	363.9	NA
Selenium			ND	NA	ND	NA	0.4	NA	ND	NA	ND	NA	ND	NA	1.9	NA	2.9	NA	1.1 ND	NA	ND	NA
Silver	5100	390	1	NA	6.4	NA	1.9	NA	ND	NA	0.3	NA	2.9	NA	0.7	NA	ND	NA	ND 1.3	NA	ND	NA
Cadmium			1.3	NA	7.8	NA	ND	NA	3	NA	ND	NA	4	NA	0.5	NA	ND	NA	0.3 ND	NA	1.1	NA
Antimony			6.4	NA	ND	NA	2.2	NA	1.6	NA	1.1	NA	0.9	NA	3.6	NA	12.2	NA	ND 3.9	NA	2	NA
Barium			210.9	NA	1180.9	NA	267.3	NA	246.7	NA	263.3	NA	373.2	NA	364.3	NA	360.8	NA	847.6 1047.8	NA	265.5	NA
Lead	--	--	219.5	123	354.2	243	187.4	NA	193.5	NA	225.1	214	210.4	NA	241.6	159	81.8	47.2	21.5 21.1	NA	302.5	224
Mercury			5.9	NA	ND	NA	ND	NA	12.4	NA	3.8	NA	11.1	NA	ND	NA	ND	NA	ND ND	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Cherry Hill Splash Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample CHS-5, results are as follows: XRF / XRF DUP / DHMH.

## Cherry Hill Splash Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		CHS-1		CHS-2		CHS-3		CHS-4		CHS-5*		CHS-6		CHS-7		CHS-8		CHS-9		CHS-10		
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	
Arsenic	1.9	0.43	4.7	NA	7	3.66	4.4	3.55	10.3	3.83	8.7 12.6	1.49	ND	1.48	12.8	4.23	10.4	NA	ND	NA	NA	10.9	NA
Vanadium	1000	78	72.6	NA	94.7	26.6	103.6	29.3	113.5	35.2	121.5 74.0	47.2	42.6	17.4	77.6	40.6	63.3	NA	104.2	NA	240.2	NA	
Thallium			ND	NA	ND	NA	2.6	NA	4.9	NA	4.0 ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	
Chromium	3100	230	58.6	NA	59.2	20.5	61.3	20.3	143	38.3	69.7 74.8	34.5	35.2	8.7	80.4	21.1	66	NA	165	NA	113.4	NA	
Manganese			164.6	NA	152.4	NA	227.1	NA	279.3	NA	260.9 289.1	NA	100.6	NA	147.3	NA	1020.4	NA	428.9	NA	737.4	NA	
Nickel			66	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	15.7	NA	24.8	NA	32.3	NA	ND	NA	
Copper			17.9	NA	33.4	NA	16.2	NA	55.7	NA	38.2 40.7	NA	19.4	NA	39.3	NA	55.7	NA	58.7	NA	63.9	NA	
Zinc			230.6	NA	123.8	NA	68.2	NA	193.3	NA	68.7 70.9	NA	37	NA	90.1	NA	70.5	NA	117.4	NA	801.4	NA	
Selenium			ND	NA	0.5	NA	0.3	NA	ND	NA	0.2 0.4	NA	2.3	NA	ND	NA	ND	NA	ND	NA	ND	NA	
Silver	5100	390	ND	NA	0.8	NA	ND	NA	3.3	NA	ND 2.5	NA	ND	NA	0.8	NA	1.6	NA	3.3	NA	ND	NA	
Cadmium			0.9	NA	0.7	NA	1.4	NA	1.1	NA	0.8 ND	NA	1.4	NA	0.5	NA	ND	NA	1.3	NA	ND	NA	
Antimony			3.7	NA	3.3	NA	1.9	NA	12.3	NA	ND 13.6	NA	4.7	NA	2	NA	8.2	NA	ND	NA	6.2	NA	
Barium			274.4	NA	239.6	NA	191.5	NA	154.9	NA	647.4 704.3	NA	93.5	NA	303.1	NA	124.3	NA	253.1	NA	289.8	NA	
Lead	--	--	37.4	NA	27	17.8	32.6	18.6	139.1	94.8	36.5 23.3	29.3	13.1	<12.5	86	66.3	44.7	NA	127.7	NA	118.3	NA	
Mercury			ND	NA	ND	NA	4.2	NA	ND	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Federal Hill Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample FHP-5, results are as follows: XRF / XRF DUP / DHMH.

## Federal Hill Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		FHP-1		FHP-2		FHP-3		FHP-4		FHP-5*		FHP-6		FHP-7		FHP-8		FHP-9		FHP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	36.9	16.6	13.3	NA	11.4	5.01	8.2	9.69	16.9 18.3	5.86	15.4	13.8	11.8	NA	13.2	NA	21	11.4	ND	NA
Vanadium	1000	78	82.3	43.1	82.5	NA	165.6	34.1	93.3	36.2	111.0 83.3	32.4	186.2	50.8	111.1	NA	132	NA	109.6	38.9	21.1	NA
Thallium			ND	NA	ND	NA	ND	NA	ND	NA	ND 2.6	NA	ND	NA	ND	NA	ND	NA	ND	NA	2	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	237	63.6	127.1	NA	110.8	37.4	242.2	52.6	190.4 147.3	38.4	243.8	69.2	165.8	NA	142	NA	184.5	49	4.8	NA
Manganese			533.4	NA	663.6	NA	715	NA	366.8	NA	278.8 286.2	NA	433.4	NA	804	NA	362.8	NA	515.9	NA	9.9	NA
Nickel			ND	NA	ND	NA	ND	NA	ND	NA	ND 18.4	NA	ND	NA	ND	NA	ND	NA	ND	NA	2.5	NA
Copper			89.6	NA	36	NA	45.3	NA	91.5	NA	49.9 70.0	NA	85.6	NA	72.5	NA	45.9	NA	71.6	NA	2.2	NA
Zinc			250.3	NA	148.6	NA	136.5	NA	302.1	NA	122.0 114.5	NA	183.9	NA	169.5	NA	113.2	NA	223.5	NA	14.2	NA
Selenium			0.2	NA	2	NA	0.1	NA	2.8	NA	0.6 ND	NA	2.6	NA	ND	NA	ND	NA	ND	NA	ND	NA
Silver	5100	390	ND	NA	1.9	NA	4.4	NA	0.3	NA	3.2 ND	NA	ND	NA	3.1	NA	ND	NA	3.5	NA	2.4	NA
Cadmium			1.4	NA	1.5	NA	ND	NA	1.7	NA	ND ND	NA	0.1	NA	0.6	NA	1	NA	2.7	NA	0.2	NA
Antimony			7.2	NA	3.3	NA	1.2	NA	10	NA	2.0 ND	NA	8.5	NA	6.8	NA	ND	NA	ND	NA	12.4	NA
Barium			449.1	NA	347	NA	399.2	NA	334.8	NA	311.5 278.3	NA	475.5	NA	411.4	NA	346.2	NA	335.5	NA	130.8	NA
Lead	--	--	342.2	285	189.2	NA	90.8	59.8	252.6	202	162.2 136.6	129	214.3	184	146.9	NA	113.3	NA	253	230	10.5	NA
Mercury			ND	NA	ND	NA	ND	NA	7.4	NA	6.7 ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	2.2	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Ferry Bar Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).



## Ferry Bar Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		FBP-1		FBP-2		FBP-3		FBP-4		FBP-5		FBP-6		FBP-7		FBP-8*		FBP-9		FBP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	19.5	3.16	14.2	NA	56.9	13	ND	3.55	24	NA	24.4	6.6	34.9	4.33	ND 15.2	NA	10.8	NA	3.8	3.35
Vanadium	1000	78	94.9	35.5	70.7	NA	169.4	68.6	161.4	41.7	128	NA	198.6	37.9	225	54.2	82.6 103.6	NA	194.7	NA	105	44.4
Thallium			4.3	NA	ND	NA	ND	NA	ND	NA	15.9	NA	ND	NA	ND	NA	2.6 ND	NA	ND	NA	1.9	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA
Chromium	3100	230	128	29	259	NA	2328.5	44	180.7	36.2	7154	NA	7234.5	63.7	5613.4	45.5	66.2 90.9	NA	362.7	NA	109.9	34.6
Manganese			907.9	NA	877.8	NA	4607.1	NA	778.6	NA	1592.3	NA	1850.3	NA	1670.8	NA	199.4 211.1	NA	1072.6	NA	877.7	NA
Nickel			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA
Copper			66.3	NA	180.8	NA	242.5	NA	46.4	NA	1260.8	NA	1771.8	NA	783.9	NA	21.3 24.0	NA	93.2	NA	46	NA
Zinc			163	NA	446.7	NA	1660.6	NA	124.3	NA	1086.8	NA	1526.7	NA	687.2	NA	47.6 63.2	NA	314.2	NA	124.7	NA
Selenium			ND	NA	0.7	NA	6.4	NA	1.2	NA	ND	NA	ND	NA	ND	NA	0.2 ND	NA	0.6	NA	ND	NA
Silver	5100	390	ND	NA	ND	NA	3.5	NA	ND	NA	3.2	NA	ND	NA	ND	NA	2.5 ND	NA	2.9	NA	0.8	NA
Cadmium			ND	NA	1.8	NA	ND	NA	ND	NA	7.5	NA	4.4	NA	2.9	NA	ND ND	NA	1.2	NA	ND	NA
Antimony			ND	NA	2.9	NA	19.1	NA	10.3	NA	16	NA	13.2	NA	3.3	NA	ND ND	NA	ND	NA	ND	NA
Barium			733.8	NA	530.4	NA	440.3	NA	1400.4	NA	298.2	NA	295.3	NA	315.5	NA	351.2 385.5	NA	811.4	NA	1463.3	NA
Lead	--	--	34.4	24.6	218.8	NA	465.9	256.1	51.1	23.8	288.6	NA	329.8	241.4	162.3	151.6	47.5 42.0	NA	122.4	NA	53.5	26.2
Mercury			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	8.7 ND	NA	ND	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Frank Bocek Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Frank Bocek Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		FRP-1		FRP-2		FRP-3		FRP-4		FRP-5		FRP-6		FRP-7		FRP-8		FRP-9		FRP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	ND	3.28	10.2	4.72	ND	NA	ND	NA	6.1	3.21	3.9	3.28	5	2.82	6.2	NA	ND	NA	4.7	2.99
Vanadium	1000	78	45.2	30.9	85.5	36.7	96.3	NA	126.4	NA	95.1	30.7	68	29	134.9	44.8	152.4	NA	133.5	NA	142.8	44.9
Thallium			ND	NA	8.8	NA	ND	NA	ND	NA	ND	NA	1.8	NA	ND	NA	ND	NA	3.1	NA	3.6	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	182.8	84.5	158.2	56.4	169.8	NA	245.6	NA	281.2	70.3	159.9	45.2	154.7	47.6	205.8	NA	356.3	NA	333.8	268
Manganese			405.5	NA	409	NA	842.1	NA	401.4	NA	401.4	NA	236.6	NA	678.3	NA	351.5	NA	334.9	NA	398.6	NA
Nickel			ND	NA	21.3	NA	ND	NA	79.6	NA	57.6	NA	46.2	NA	ND	NA	ND	NA	92.3	NA	99.7	NA
Copper			45.9	NA	37.9	NA	52.1	NA	43.4	NA	49.6	NA	35.5	NA	34.2	NA	87	NA	61.2	NA	44.5	NA
Zinc			168.5	NA	173.4	NA	113.1	NA	102.1	NA	149.3	NA	168	NA	104.6	NA	125.6	NA	145	NA	199.7	NA
Selenium			0.8	NA	ND	NA	ND	NA	ND	NA	0.3	NA	3	NA	3.5	NA	ND	NA	ND	NA	ND	NA
Silver	5100	390	7.2	<1.25	0.8	<1.25	1.4	NA	ND	NA	ND	<1.25	0.9	<1.25	ND	<1.25	0.5	NA	ND	NA	1.6	<1.25
Cadmium			1.4	NA	2.5	NA	0.043	NA	ND	NA	1.7	NA	1.3	NA	1.2	NA	0.3	NA	ND	NA	0.5	NA
Antimony			1.2	NA	10	NA	4.2	NA	2.7	NA	2.6	NA	ND	NA	4	NA	1.6	NA	5.8	NA	4.5	NA
Barium			356	NA	324.8	NA	517	NA	285.8	NA	259.1	NA	267.7	NA	471.5	NA	329.9	NA	283.5	NA	261.9	NA
Lead	--	--	135.9	106.5	169.7	138	45.7	NA	80.4	NA	97.1	70.3	142.6	114.6	39.2	25.9	141.8	NA	152.1	NA	139	99.5
Mercury			ND	NA	ND	NA	ND	NA	ND	NA	0.9	NA	ND	NA	ND	NA	5	NA	1.4	NA	0.047	NA

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Garrett Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample GRP-9, results are as follows: XRF / XRF DUP / DHMH.

## Garrett Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		GRP-1		GRP-2		GRP-3		GRP-4		GRP-5		GRP-6		GRP-7		GRP-8		GRP-9*		GRP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	43.7	30.3	15.7	9.46	10.7	NA	10.7	NA	37.4	27.7	5.1	NA	23.8	5.25	16.4	NA	7.6 5.0	6.44	17.4	6.38
Vanadium	1000	78	134.1	31.1	147.5	30	148.6	NA	117.1	NA	118.1	32.1	98.5	NA	65.5	33	106.3	NA	73.3 108.2	30.5	124.7	48.2
Thallium			ND	NA	2.7	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	136.9	44.5	117.3	45	232.8	NA	177	NA	110.7	27.6	151.7	NA	129.8	33.8	216.7	NA	146.9 182.0	48.2	214.9	44.6
Manganese			343.2	NA	340	NA	587.6	NA	463.7	NA	324.1	NA	870	NA	534.6	NA	526.1	NA	305.8 311.0	NA	606.7	NA
Nickel			ND	NA	ND	NA	ND	NA	ND	NA	23.5	NA	ND	NA	ND	NA	55.7	NA	ND	NA	ND	NA
Copper			76.2	NA	67.4	NA	66.8	NA	61.1	NA	37.6	NA	57.1	NA	65.1	NA	92.1	NA	105.1 132.6	NA	65.2	NA
Zinc			223.7	NA	332.4	NA	210.1	NA	148.2	NA	120.2	NA	145.7	NA	115.9	NA	237.9	NA	305.2 332.5	NA	207.3	NA
Selenium			1.1	NA	2	NA	ND	NA	1.3	NA	2.9	NA	1	NA	0.6	NA	2.9	NA	1.0 0.8	NA	ND	NA
Silver	5100	390	0.3	NA	1.2	NA	0.7	NA	5.2	NA	1.8	NA	0.8	NA	1.9	NA	0.9	NA	5.6 8.2	NA	1.7	NA
Cadmium			1.1	NA	3.5	NA	0.4	NA	3.2	NA	0.2	NA	0.3	NA	0.4	NA	1.3	NA	ND 3.3	NA	1.1	NA
Antimony			15.7	NA	9	NA	11.2	NA	ND	NA	ND	NA	ND	NA	0.2	NA	0.9	NA	11.6 5.2	NA	4.6	NA
Barium			313.3	NA	297.3	NA	375.4	NA	334.6	NA	422.3	NA	497.6	NA	309.2	NA	362.8	NA	389.5 453.5	NA	473.7	NA
Lead	--	--	206.5	164	208.6	132	166.9	NA	114.5	NA	98.4	74.7	98.6	NA	52.5	52.7	174.2	NA	208.2 231.6	150	179.6	135
Mercury			ND	NA	ND	NA	ND	NA	3	NA	ND	NA	12.4	NA	ND	NA	ND	NA	4.4 ND	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Latrobe Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample LAT-4, results are as follows: XRF / XRF DUP / DHMH.

## Latrobe Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		LAT-1		LAT-2		LAT-3		LAT-4*		LAT-5		LAT-6		LAT-7		LAT-8		LAT-9		LAT-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	12.5	5.11	18.5	NA	55.1	37.8	31.3 27.4	19.4	32.7	NA	28.2	NA	24.9	9.75	20.3	NA	37.6	22	20.7	9.86
Vanadium	1000	78	77.7	29	147	NA	191.8	42.7	125.5 136.1	33	110.9	NA	90.8	NA	62.6	12.5	80.7	NA	71.9	38.1	147.8	31
Thallium			ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA	3.3	NA	ND	NA	ND	NA	3.1	NA
Titanium			ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	158.2	27.8	336.1	NA	186.7	47.3	276.8 223.4	35.7	181.8	NA	144.2	NA	166.8	26.2	158.9	NA	174.7	36.8	134.8	30.3
Manganese			293.5	NA	408.9	NA	470.5	NA	302.6 367.1	NA	329.7	NA	420.2	NA	144.6	NA	252.2	NA	275.9	NA	404.2	NA
Nickel			ND	NA	ND	NA	ND	NA	ND 25.9	NA	ND	NA	ND	NA	23.4	NA	ND	NA	ND	NA	ND	NA
Copper			52.7	NA	154	NA	89.1	NA	51.5 46.5	NA	153.8	NA	117.5	NA	31	NA	73.8	NA	92.2	NA	107.9	NA
Zinc			122.2	NA	280.8	NA	161.3	NA	186.3 200.4	NA	239.6	NA	310	NA	130.4	NA	169.7	NA	179.2	NA	2637.4	NA
Selenium			1.2	NA	3	NA	1.3	NA	1.9 ND	NA	0.6	NA	0.7	NA	ND	NA	ND	NA	1.6	NA	ND	NA
Silver	5100	390	ND	NA	ND	NA	2.6	NA	ND ND	NA	4.3	NA	0.6	NA	ND	NA	1.9	NA	0.6	NA	ND	NA
Cadmium			ND	NA	0.4	NA	2.9	NA	4.5 1.8	NA	1.9	NA	0.1	NA	0.2	NA	ND	NA	0.4	NA	2.3	NA
Antimony			14.7	NA	3.7	NA	ND	NA	1.0 5.8	NA	0.8	NA	10.1	NA	3.5	NA	ND	NA	9.9	NA	9.6	NA
Barium			292.8	NA	374.9	NA	403.9	NA	253.2 353.5	NA	283.9	NA	387.2	NA	124.3	NA	247.2	NA	293.9	NA	219	NA
Lead	--	--	72.9	42.4	213.7	NA	182.4	129.9	134.1 146.6	91.3	123.3	NA	202.6	NA	82.4	70.9	92.6	NA	101.1	76.3	111.2	92.6
Mercury			ND	NA	ND	NA	11.1	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Leone Riverside Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample LEO-4, results are as follows: XRF / XRF DUP / DHMH.



## Leone Riverside Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		LEO-1		LEO-2		LEO-3		LEO-4*		LEO-5		LEO-6		LEO-7		LEO-8		LEO-9		LEO-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	14.3	NA	18.2	NA	5.3	2.67	14.4 5.5	6.37	13.5	NA	13	5.32	21.3	12.8	12.7	NA	37.5	14	26	14.2
Vanadium	1000	78	91.8	NA	111.3	NA	97.8	28.9	89.4 96.7	29.6	62	NA	68.1	26	66.5	33.6	103	NA	213.2	42.5	118	34.6
Thallium			ND	NA	8.9	NA	ND	NA	ND 2.7	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	198.5	NA	255.8	NA	127.4	23.4	94.8 77.2	24.1	92	NA	103.8	19.7	197.2	35.2	180.2	NA	282.7	52.2	284.7	70.4
Manganese			385.9	NA	515.4	NA	302.2	NA	472.6 432.0	NA	295.7	NA	373.8	NA	296.3	NA	329.4	NA	180.8	NA	264.2	NA
Nickel			ND	NA	25.8	NA	ND	NA	ND ND	NA	11.2	NA	ND	NA	59.9	NA	ND	NA	ND	NA	ND	NA
Copper			73.2	NA	101.8	NA	26	NA	46.5 59.9	NA	36.3	NA	24.8	NA	98.3	NA	63.5	NA	72.8	NA	137.6	NA
Zinc			161.1	NA	299.5	NA	51.5	NA	104.0 94.8	NA	135.9	NA	66.6	NA	145.5	NA	139.2	NA	112.4	NA	182.7	NA
Selenium			0.3	NA	ND	NA	ND	NA	2.3 3.8	NA	0.8	NA	1.4	NA	ND	NA	0.4	NA	3.3	NA	4.1	NA
Silver	5100	390	2.6	NA	ND	NA	0.2	NA	ND 4.8	NA	2.9	NA	ND	NA	ND	NA	4.9	NA	1.5	NA	5.1	NA
Cadmium			ND	NA	1.1	NA	ND	NA	0.4 2.4	NA	0.3	NA	ND	NA	ND	NA	1.9	NA	2	NA	ND	NA
Antimony			ND	NA	12.5	NA	ND	NA	2.3 5.2	NA	1.9	NA	ND	NA	11.2	NA	10.7	NA	8.4	NA	18.9	NA
Barium			362.5	NA	254.1	NA	483.1	NA	207.4 299.5	NA	278.8	NA	287.7	NA	255.2	NA	325.7	NA	262.2	NA	299.4	NA
Lead	--	--	180.2	NA	305.4	NA	24.4	14.3	59.6 68.7	44.7	59.7	NA	49.9	38.1	131.2	96.3	165.3	NA	144.9	115.8	277.4	194.5
Mercury			ND	NA	ND	NA	2.4	NA	ND ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Middle Branch Park, Cherry Hill, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Middle Branch Park (Cherry Hill) Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		MBC-1		MBC-2		MBC-3		MBC-4		MBC-5		MBC-6		MBC-7		MBC-8		MBC-9		MBC-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	15.6	NA	39.3	44.09	14.7	NA	110.9	76.45	43.7	NA	14.4	5.82	23.5	18.4	20.2	14.84	55.7	NA	57.5	33.77
Vanadium	1000	78	81.7	NA	147.8	36.69	94.1	NA	168.8	44.47	138	NA	125.8	25.11	131.3	41.68	73.5	30.1	140.1	NA	127.6	45.27
Thallium			2.1	NA	ND	NA	3.5	NA	ND	NA	4.1	NA	5.5	NA	ND	NA	2.2	NA	6	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	75	NA	123.1	62.44	111	NA	176.2	98.6	107.8	NA	204.2	95.32	148.7	52.59	104.4	35.67	132.2	NA	159.6	67.76
Manganese			176.7	NA	315.4	NA	352.2	NA	420.9	NA	442.3	NA	384.5	NA	383	NA	375.1	NA	279.4	NA	310	NA
Nickel			27.2	NA	85.5	NA	ND	NA	69	NA	77.7	NA	209.2	NA	36.7	NA	321.2	NA	49.4	NA	ND	NA
Copper			44.5	NA	136.1	NA	45	NA	308.8	NA	128.1	NA	139.5	NA	113.7	NA	96.2	NA	150.1	NA	128.4	NA
Zinc			127.9	NA	220.9	NA	148.7	NA	478.1	NA	623	NA	243.7	NA	259.6	NA	574.8	NA	240	NA	249.7	NA
Selenium			ND	NA	0.8	NA	1.3	NA	2.2	NA	ND	NA	ND	NA	1.2	NA	0.5	NA	3.1	NA	1	NA
Silver	5100	390	2.2	NA	ND	NA	4.8	NA	1.3	NA	2.7	NA	4.8	NA	1.6	NA	ND	NA	1.6	NA	2.9	NA
Cadmium			ND	NA	0.4	NA	2.7	NA	ND	NA	2.5	NA	2	NA	0.4	NA	0.1	NA	0.2	NA	0.8	NA
Antimony			3.1	NA	0.3	NA	ND	NA	5.7	NA	15	NA	4.4	NA	10.7	NA	7.3	NA	7.2	NA	4.9	NA
Barium			141	NA	358.8	NA	457.5	NA	262.9	NA	350.3	NA	266.5	NA	238.9	NA	168	NA	327.6	NA	317.7	NA
Lead	--	--	55.6	NA	134	106.81	102.8	NA	224.3	169.93	258.8	NA	67.6	41.85	136.1	77.17	98.7	66.59	153.2	NA	130.1	90.96
Mercury			4.6	NA	ND	NA	9.9	NA	ND	NA	ND	NA	ND	NA	ND	NA	7.6	NA	ND	NA	ND	NA

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Middle Branch Park, Dickman Street, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Middle Branch Park (Dickman) Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		MDE Cleanup Standards Non-residential (mg/kg)	MBD-1		MBD-2		MBD-3		MBD-4		MBD-5		MBD-6		MBD-7		MBD-8		MBD-9		MBD-10	
	Industrial (mg/kg)	Residential (mg/kg)		XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	3.8	110.2	60.8	107.9	NA	109.8	NA	231.7	195.0	95.0	53.8	100.7	NA	105.3	98.7	81.3	60.0	86.7	NA	38.3	24.0
Vanadium	1000	78	1400	130.2	38.9	177.7	NA	87.2	NA	161.8	53.4	119.6	36.8	182.3	NA	56.3	54.0	121.8	72.4	153.1	NA	76.8	35.3
Thallium				ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Titanium				ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	610	189.3	86.9	217.1	NA	221.9	NA	258.1	158.0	173.7	69.5	257.0	NA	213.9	93.8	197.8	90.8	176.1	NA	176.9	72.0
Manganese				366.0	NA	335.3	NA	460.9	NA	438.4	NA	414.6	NA	263.7	NA	339.2	NA	1150.2	NA	329.9	NA	388.6	NA
Nickel				ND	NA	ND	NA	74.0	NA	ND	NA	41.5	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Copper				299.9	NA	317.7	NA	340.9	NA	511.3	NA	242.2	NA	276.2	NA	253.6	NA	244.9	NA	250.7	NA	178.5	NA
Zinc				548.6	NA	527.7	NA	1040.0	NA	961.5	NA	550.1	NA	514.6	NA	359.6	NA	621.3	NA	384.4	NA	410.1	NA
Selenium				4.5	NA	3.4	NA	2.2	NA	3.8	NA	1.4	NA	3.0	NA	1.1	NA	0.1	NA	4.5	NA	1.7	NA
Silver	5100	390	1000	1.1	NA	1.0	NA	0.7	NA	ND	NA	2.3	NA	4.6	NA	1.7	NA	1.6	NA	1.7	NA	0.3	NA
Cadmium				3.7	NA	0.5	NA	ND	NA	2.8	NA	ND	NA	ND	NA	0.3	NA	ND	NA	0.9	NA	ND	NA
Antimony				9.1	NA	10.5	NA	ND	NA	12.2	NA	9.6	NA	11.4	NA	6.6	NA	ND	NA	5.8	NA	14.1	NA
Barium				263.1	NA	430.2	NA	189.4	NA	289.8	NA	296.2	NA	465.2	NA	349.6	NA	319.5	NA	388.9	NA	212.7	NA
Lead	--	--	400	267.2	165.0	263.3	NA	421.6	NA	526.2	475.0	319.7	208.0	474.8	NA	255.7	270.0	415.5	349.0	210.8	NA	282.9	130.0
Mercury				ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	7.6	NA

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Middle Branch Park, Waterview Avenue, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Middle Branch Park (Waterview) Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		MBW-1		MBW-2		MBW-3		MBW-4		MBW-5		MBW-6		MBW-7		MBW-8		MBW-9		MBW-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	17.9	5.97	10	2.57	7.8	2.42	39.7	18.4	12	NA	13.6	NA	10.2	7.63	22.3	3.87	10	NA	7.8	NA
Vanadium	1000	78	74	28.2	80.1	19.9	71.1	21.9	122.6	87.7	104.7	NA	165.7	NA	102.2	35.9	154.5	31.2	66.7	NA	85	NA
Thallium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	166.8	16.5	57.4	12.9	88.8	13.6	81.1	17.6	77.2	NA	86.1	NA	118.4	32.8	120.6	27.9	121.7	NA	67.3	NA
Manganese			233.3	NA	112.4	NA	142.1	NA	164	NA	317.8	NA	583.1	NA	483.4	NA	418.3	NA	457.3	NA	209.9	NA
Nickel			36.4	NA	ND	NA	ND	NA	ND	NA	ND	NA	19.3	NA	29.9	NA	ND	NA	28.8	NA	12.7	NA
Copper			32	NA	17.1	NA	27.5	NA	45	NA	12.2	NA	30.9	NA	53.6	NA	52.1	NA	59.9	NA	35.1	NA
Zinc			64.8	NA	48.9	NA	58.2	NA	107.5	NA	65.3	NA	130.9	NA	306.3	NA	174.2	NA	179.4	NA	111.8	NA
Selenium			1.1	NA	1.2	NA	ND	NA	3.4	NA	1.7	NA	0.7	NA	ND	NA	1.9	NA	1.3	NA	0.6	NA
Silver	5100	390	0.5	NA	1.7	NA	ND	NA	0.1	NA	ND	NA	ND	NA	ND	NA	0.1	NA	1.8	NA	ND	NA
Cadmium			0.7	NA	0.1	NA	0.6	NA	0.4	NA	0.9	NA	3.5	NA	0.8	NA	0.2	NA	1.5	NA	1.2	NA
Antimony			9.6	NA	1.7	NA	2	NA	0.8	NA	4.6	NA	ND	NA	5.3	NA	4.9	NA	3.2	NA	5.3	NA
Barium			143.5	NA	123.7	NA	139.4	NA	140.2	NA	134.6	NA	303.9	NA	332.2	NA	241.9	NA	253.2	NA	178.1	NA
Lead	--	--	37.2	34.6	36	31.2	38.7	33.7	91.3	51.9	22.2	NA	39.9	NA	123	92.7	111.3	69.1	137.6	NA	61.5	NA
Mercury			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	12.4	NA	14.4	NA	ND	NA	9.1	NA	ND	NA

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded. ND – not detected. NA – not analyzed.

Wegworth Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH). Note for sample WP-7, results are as follows: XRF / XRF DUP / DHMH.



## Wegworth Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		WP-1		WP-2		WP-3		WP-4		WP-5		WP-6		WP-7*		WP-8		WP-9		WP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	8.8	1.93	7.1	NA	10	3.89	6.6	NA	1.6	NA	11.6	4.26	3.3 ND	2.02	5.4	2.21	7.7	NA	7.9	4.98
Vanadium	1000	78	64.2	22.4	108.9	NA	99	29	72.6	NA	148.1	NA	108.9	35.6	94.1 85.9	14	87.3	23.8	71.7	NA	97.4	38
Thallium			8.5	NA	ND	NA	ND	NA	ND	NA	ND	NA	4.1	NA	1	NA	ND	NA	1.1	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	65	16.5	64.4	NA	60.2	20.3	63.5	NA	64.9	NA	77	23.3	75.7 61.7	13.7	102	31.4	136.5	NA	161.2	27.8
Manganese			242.6	NA	375.4	NA	372.3	NA	217.4	NA	209.1	NA	313.3	NA	244 218.4	NA	306.3	NA	461.9	NA	260.7	NA
Nickel			ND	NA	34.9	NA	ND	NA	ND	NA	ND	NA	ND	NA	9.7 ND	NA	ND	NA	ND	NA	ND	NA
Copper			32.5	NA	19.6	NA	57.4	NA	34.8	NA	39.9	NA	49.7	NA	27.5 38.3	NA	54.1	NA	71.8	NA	62.1	NA
Zinc			87.5	NA	131.5	NA	108.6	NA	306.6	NA	106.9	NA	94.6	NA	81.1 87.3	NA	208.7	NA	124.1	NA	136.3	NA
Selenium			2.6	NA	ND	NA	1.5	NA	1.8	NA	0.6	NA	ND	NA	1.4 1.0	NA	ND	NA	0.3	NA	ND	NA
Silver	5100	390	ND	NA	ND	NA	ND	NA	4.7	NA	1.4	NA	1.5	NA	6 ND	NA	0.1	NA	2.3	NA	1.6	NA
Cadmium			0.6	NA	2.2	NA	1.5	NA	3.1	NA	1.7	NA	2.9	NA	ND 1.2	NA	0.2	NA	ND	NA	2.9	NA
Antimony			ND	NA	ND	NA	3.6	NA	2.5	NA	5.7	NA	5.5	NA	12 ND	NA	10.5	NA	1.2	NA	2.4	NA
Barium			262.7	NA	190.9	NA	250	NA	130.9	NA	221.8	NA	273.6	NA	152.8 128.7	NA	269.8	NA	415.2	NA	341.2	NA
Lead	--	--	47	27.3	32.2	NA	57.9	37.4	33.9	NA	50.5	NA	69.2	41.5	32.9 42.3	24.7	82.1	44.1	63.6	NA	84.8	61.1
Mercury			ND	NA	ND	NA	ND	NA	ND	NA	8.1	NA	ND	NA	6.8 ND	NA	ND	NA	3.8	NA	ND	NA

\* A duplicate sample was collected at this location and analyzed by XRF.

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.

ND – not detected. NA – not analyzed.

Wyman Park, Arsenic Concentrations in mg/kg



Green text – XRF data. Blue text - both MDE XRF and DHMH analysis run (XRF/DHMH).

## Wyman Park Data Table in mg/kg (XRF and DHMH)

Sample ID	EPA RBC		WYP-1		WYP-2		WYP-3		WYP-4		WYP-5		WYP-6		WYP-7		WYP-8		WYP-9		WYP-10	
	Industrial (mg/kg)	Residential (mg/kg)	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH	XRF	DHMH
Arsenic	1.9	0.43	30.5	15.1	ND	3.9	13.6	6.22	1.2	4.52	6.6	3.98	11.4	3.44	4.8	NA	2.5	NA	3.9	NA	41.2	NA
Vanadium	1000	78	139.4	42.5	113.1	38.9	170.9	45	134.8	48.2	165.5	49	115.3	46.6	107.5	NA	138.2	NA	141.9	NA	164.7	NA
Thallium			ND	NA	ND	NA	ND	NA	ND	NA	9.5	NA	3	NA	ND	NA	ND	NA	0.5	NA	ND	NA
Titanium			ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Chromium	3100	230	194	42.7	149.6	103	117.1	38.4	162.1	47.4	102.2	31.8	61.4	30.9	54.9	NA	71.6	NA	82.5	NA	138.9	NA
Manganese			820.2	NA	418.8	NA	728.8	NA	908.4	NA	861.3	NA	774.2	NA	528.9	NA	121	NA	579.1	NA	524.7	NA
Nickel			ND	NA	ND	NA	ND	NA	47.2	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA
Copper			93.1	NA	83.6	NA	153.4	NA	77.3	NA	25.8	NA	49.1	NA	25	NA	26.4	NA	12.6	NA	52.9	NA
Zinc			951.9	NA	329.6	NA	454.4	NA	296.1	NA	91.8	NA	758.3	NA	86.5	NA	52.8	NA	75.6	NA	289.8	NA
Selenium			2.5	NA	0.5	NA	3.3	NA	ND	NA	1.5	NA	ND	NA	1.3	NA	1.4	NA	ND	NA	0.6	NA
Silver	5100	390	17.9	4.06	3.5	<1.25	1.7	<1.25	0.043	<1.25	2.3	<1.25	3.2	<1.25	ND	NA	2.9	NA	ND	NA	3.1	NA
Cadmium			2.8	NA	6	NA	2.1	NA	ND	NA	2.5	NA	ND	NA	1.4	NA	ND	NA	ND	NA	ND	NA
Antimony			9.9	NA	ND	NA	8.6	NA	5	NA	3.5	NA	0.2	NA	14.2	NA	9.2	NA	ND	NA	4.7	NA
Barium			563.5	NA	551.3	NA	805.2	NA	649.6	NA	586.8	NA	625.6	NA	511.6	NA	195.6	NA	839.5	NA	479.9	NA
Lead	--	--	480.9	351	253.1	202	747.2	556	350.3	322	62.6	47.7	59.8	42.8	37.9	NA	33.2	NA	16.6	NA	246.5	NA
Mercury			ND	NA	ND	NA	ND	NA	ND	NA	5.9	NA	11.8	NA	ND	NA	ND	NA	4	NA	ND	NA

Soil samples analyzed by the fixed laboratory at DHMH are provided in the DHMH column while sampling data analyzed using the XRF is provided in the XRF column. Yellow highlighting indicates that either industrial or residential soil RBCs or MDE's non-residential soil cleanup standard has been exceeded.  
 ND – not detected. NA – not analyzed.

## Appendix C

### XRF Data

## Appendix D

### DHMH Data