Public Health
MADISON & DANE COUNTY
Healthy people and places

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An Evaluation of the Potential Health Concerns Associated with the Construction of the Goodman Center Splash Pad

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Introduction

The upcoming construction of a splash pad at the Goodman Community Center has raised some concern from area residents about the safety of the planned site. The historical industrial activity of the property and the series of site investigation and remediation events over the past two decades have led to concerns of potential exposure to harmful levels of soil contaminants during the construction process of the splash pad and during the operation of the water activity following its completion[1-3].

In order to address these concerns, Public Health Madison and Dane County (PHMDC) conducted a review of the available information in order to provide the public with accurate information concerning this construction project. Due to the nature of the complaints received by local and state health agencies, the following information will primarily focus on the potential exposure of workers and local residents to contaminated materials during the excavation of the site for the construction of the splash pad and to users of the water activity to these materials during normal operation.

Overview of the Splash Pad Site

The site of the Goodman Community Center has experienced over 100 years of industrial activity. During this time frame, the American Shredder Company (1880 – 1906), Steinle Machine Company (1906 – 1936), Theo. Kupfer Iron Works (1940 – 1985), and Durline Scale and Manufacturing (1990 – 2003) had each occupied this site; the manufacturing processes reportedly engaged by these companies included machining, cutting and welding, sandblasting, and painting of steel[2, 3]. A consequence of this activity was the contamination of the soils with metals and industrial chemical compounds; primarily lead, arsenic, and several PAHs (polycyclic aromatic hydrocarbon) including the potential human carcinogens benzo[a]pyrene, benzo[a]anthracene, chrysene, and indenol[1,2,3-c, d]pyrene that exceed the industrial and non-industrial direct contact residual contaminant levels (RCLs) established by the Wisconsin Department of Natural Resources (WI DNR)[4, 5]. As reported in the contaminated soil cap maintenance plan in 2008, soil samples were collected from depths ranging from surface soils to 8.5 feet below the surface with the highest levels of contamination observed at soil depths ranging from 0 to 0.5 feet. Soil samples that exceeded the RCL listed in the report are shown in the table below[4]. Samples were collected prior to excavation and removal of soil from the site.[3, 4]

Contaminant	Non-Industrial RCL (mg/kg)*@	Range of Exceedance of RCL (mg/kg)@	Estimated Increase in Disease Risk (%)#
Arsenic	0.039	1.7 – 20.4	0.044 – 0.52
Lead	50	51 – 12,600	0.001 – 0.25
Benzo[a]pyrene	8.8	55 – 28,000	0.006 – 3.18
Benzo[a]anthracene	88	370 – 24,000	0.004 – 0.27
Chrysene	8,800	14,000 – 37,000	0.002 – 0.18
Indenol[1,2,3,-c, d]pyrene	88	130 – 16,000	0.002 – 0.004

***** The specific contaminant RCL is determined based on aggregate exposure through incidental ingestion of soil, inhalation of soil vapors and particulates, and dermal contact with soils. The RCL is the estimated contaminant that would potentially result in 1 additional cancer case in 100,000 people over a lifetime for carcinogenic contaminants or a hazard index of 1 for non-carcinogenic contaminants.

@ RCL and Range of Exceedance for Benzo[a]pyrene, Benzo[a]anthracene, Chrysene, and Indenol[1,2,3,-c,d]pyrene are µg/kg.

Percentage calculated by the level of RCL exceedance divided by 100,000 population. For example, if the sample concentration was 50 times higher than the RCL this would potentially translate into 50 additional cases of cancer in a 100,000 person population that would equal a 0.05% increase in disease risk (50/ 100,000 = 0.0005 x 100 = 0.05%). This percentage may be higher or lower dependent upon the level of exposure or exposure to multiple contaminants.

Potential Exposure to Soil Contaminants

Overview of potential exposure

Lead, arsenic, and PAHs are present in the air, water, soil, dusts, and sediment due to both natural and man-made processes. At the Goodman Community Center site, the likely routes of exposure to these specific contaminants would be ingestion of contaminated soils and water, inhalation of contaminated soil dust and/or water droplets, and the direct contact with soils containing one or more of the contaminants reported at this site. Typically, multiple routes of exposure would occur simultaneously that could impact the absorbed dose of one or more these reported contaminants and, dependent upon the contaminant(s) and the length and frequency of exposure, greatly influence the probability of acute or chronic disease risk[6-8].

However, over the past two decades, multiple remedial actions have been conducted to address the reported contamination at this site and reclaim this land for public use. Beginning with the removal of gasoline and fuel oil tanks from the site in 1986, this process continued with multiple investigations involving soil and ground water sampling and progressed with the excavation of contaminated soils. In 2007, contaminated soils on the site, including along the neighboring bike path, were excavated to subgrade and capped with concrete walks, foundations for new construction, and landscaped areas; a total of 13,500 tons of contaminated soils were removed from the property and disposed appropriately. In impervious capped areas (e.g. concrete, pavement and building foundations) there is a distance of one foot from the surface to any residual contaminated materials; in landscaped areas there is approximately 2 feet of clean soils

separate the surface from any residual contamination[3-4]. The contaminated soil cap maintenance plan requires that the paved surfaces, landscaped areas, and building foundations overlying the contaminated areas are inspected at least annually to identify and repair any potential damage or deterioration of the cap sites to prevent exposure to underlying soils[4]. These precautions have been approved by the WI DNR and deemed appropriate to provide an adequate barrier to prevent contact with any residual soil contamination that could pose a potential threat to human health[3-4].

Additional concerns have focused on potential exposure of the Goodman Community Center site to air emissions from the stacks of the Madison-Kipp Corporation (MKC) facility located nearby. As reported by the WI DNR, the MKC site meets ambient air standards as required by the air emission permitting process to control the release of pollutants into the environment. As part of the permitting process, air modeling is used to calculate the potential downwind concentrations of air pollutants released from industrial sources by evaluating several variables including the type of emission, stack parameters, meteorological data, terrain, and the height of surrounding structures to estimate potential exposure[9-10]. Modeling conducted by the WI DNR does not predict unhealthy concentrations of pollutants originating from potential blow down of emissions from the MKC facility at the Goodman Community Center site[9].

Potential exposure during splash pad construction and operation

Due to the inevitable disturbance of the soil cap barriers at the south central portion of the site during the construction of the splash pad, appropriate precautions are instrumental in the prevention of human exposure to residual soil contamination. During construction, approximately 36 inches of soil will be excavated from the site at the site for the installation of the water tank and backfilled with clean soil and stone; excavated soil will be deemed hazardous and appropriately disposed in a licensed landfill facility. Appropriate personal protection equipment will be used by the workers, barriers established to separate residents from the excavation site, and dry soils will be wet down to prevent the formation of dusts[11]. Due to the classification of the soil as hazardous, no soil sampling is required by the WI DNR; sampling of the soil would typically be performed to determine the management of the soil following excavation but the classification of the soil as potentially hazardous alleviates the sampling requirement during removal[12]. At the completion of construction, the soil cap will be restored following excavation and an additional concrete cap forming the splash pad and accompanying walkways and bike paths will serve as an additional barrier to prevent exposure to potential residual contamination in underlying soils at the site[13].

During operation of the splash pad, exposure to contaminated soils, dust, and sediment is not expected for patrons of the water activity due to the removal of contaminated soils and the presence of the soil and concrete caps at the site. The design of the water system of the splash pad further reduces the potential exposure to contaminants identified at the Goodman site. The water supplied to the splash pad during operation is derived from a closed system that will use water from the municipal water system, supplied in an underground impermeable tank, and recycled through the splash pad system; therefore, contact of the water with residual soil contamination at the site is unlikely[1, 14]. Similar to local swimming pools throughout the City of Madison, the water will be routinely tested and treated as necessary to protect the safety of splash pad users[14]. The water supplied to the tank is primarily derived from municipal wells 11

and 23 with a limited supply (approximately 0 – 5%) from well 29; each of these wells is routinely tested for water quality by the City of Madison Water Utility[15].

Summary

Due to the reported contamination of soils at the Goodman Community Center the construction of a splash pad at the site raised concerns from the local community about the potential exposure to harmful levels of contaminants during the construction process and the normal operation of the water activity. However, over the past two decades multiple remedial actions have occurred at the site including the excavation of contaminated soils and the installation of clean soil and concrete caps over contaminated areas to prevent exposure to potential residual levels of contamination. These actions coupled with appropriate precautions during the construction of the water activity, the design of the water system, and the planned monitoring procedures of the splash pad is expected to prevent exposure to potentially harmful levels of contaminates to users of the Goodman Community Center splash pad. Therefore, any potential impact on individual and/ or community health is not expected during the construction and operation of the splash pad.

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