First Five - Year Review Report
Gas Works Park Site
Seattle, Washington

Prepared By

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Acronyms and Abbreviations

AS/SVE	Air-Sparging/Soil Vapor Extraction
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CAP	Cleanup Action Plan
DAF	Dilution Attenuation Factor
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
MGP	Manufactured Gas Plant
MTCA	Model Toxics Control Act
NPL	National Priorities List
PAHs	Polycyclic Aromatic Hydrocarbons
WAC	Washington Administrative Code

1.0 Introduction

Chapter 173-340 the Model Toxics Control Act requires the Department to review the status of site cleanups every five years. This five year review is for the Gas Works Park Site. The site was cleaned under Consent Decree Number 99-2-52532-9SEA. This Consent Decree is currently being modified to allow public access to the NW corner of the Park which was previously fenced.

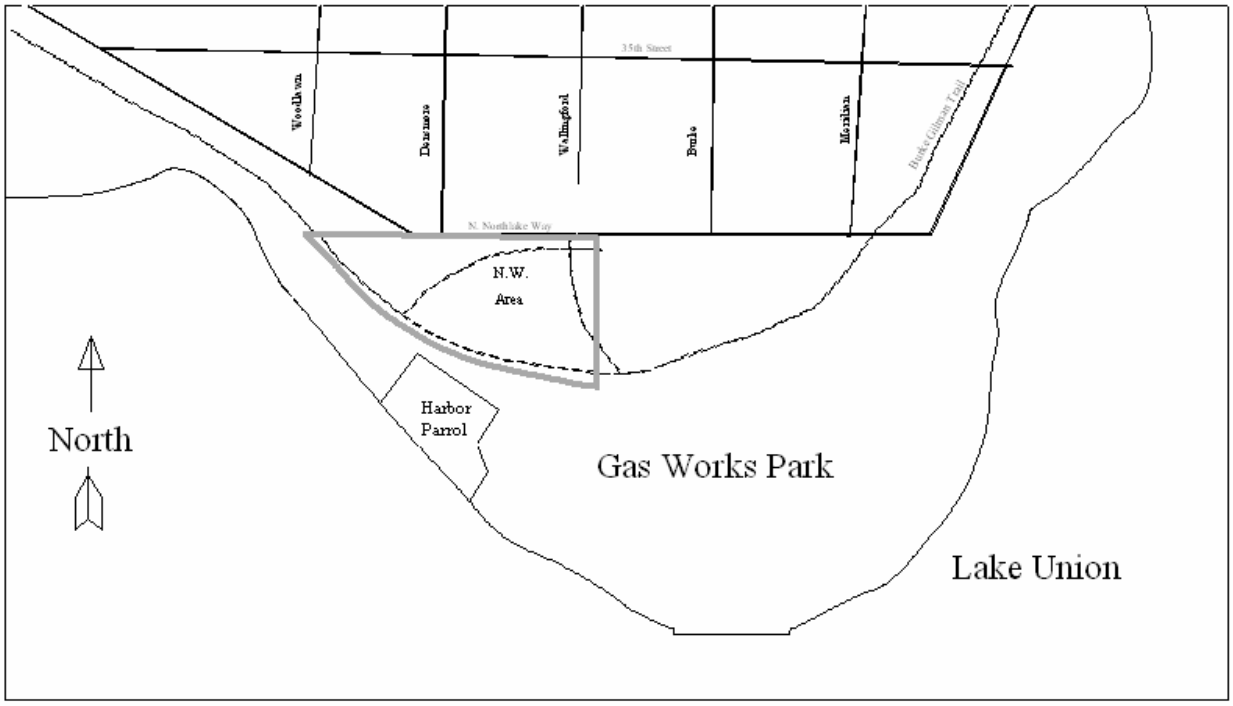
This site is not a CERCLA site, and is not on the NPL. EPA's review protocols do not apply to this site, and no EPA review form is included in this document.

2. Background

2.1 Location

The 20-acre park is on the north shore of Lake Union, approximately 5 miles north of downtown Seattle. The park juts into Lake Union (the lake lies to the east, west, and south sides of the park), while the north end of the park is bounded by Northlake Way. Gas Works Park was built on the site of a former Manufactured Gas Plant (MGP) located at the north end of Lake Union. The street address is 200 N Northlake Way. The map below (Figure 1.) shows Gas Works Park and the Seattle Police Harbor Patrol location that is also part of the site.

Figure 1.



2.2 Owners and Operators

The Manufactured Gas Plant (the Gas Works) that occupied the site from 1906 to 1962 was constructed, owned and operated by the Seattle Gas Company which became Washington Natural Gas and then Washington Energy. The site was bought by the City of Seattle for use as a park. The Manufactured Gas Plant was not operated by the City.

2.3 Operating Characteristics

Manufactured gas was a synthetic natural gas composed of methane, carbon monoxide, and hydrogen that was used for lighting, cooking, and heating. The plant was originally built to convert coal into a manufactured gas and did so between 1906 and 1937. A coking unit was used to prepare the cola for gasification. The American Tar Company operated a tar refinery on a portion of the site. The refinery used steam distillation to produce tar and tar products. In 1937 the plant was modified to convert oil rather than coal into manufactured gas. Judging from historical photographs the coking plant and tar refinery were removed at this time. Both processes generated benzene, toluene, naphthalene, and tar as by-products. Operations ceased in 1956, and the property was then used for storage.

2.4 Site Chronology:

- **1906** MGP opened using coal as a feedstock.
- **1937** The plant was modified to operate on oil.
- **1956** Operations cease.

- **1962** The property was purchased by the City of Seattle.
- **1970** Park development studies began.
- **1976** Gas Works Park was opened to the public.
- **1984** In April, Gas Works Park was closed to the Public on the recommendation of the EPA. After evaluation of site risks, the City of Seattle reopened the Park in August.
- **1985** Approximately one foot of clean soil was placed over the most contaminated portions of the park.
- **1996** An Agreed Order for a focused feasibility study and a Cleanup Action Plan (CAP) was negotiated.
- **1999** A CAP for the cleanup of Upland Areas of the Park was finalized in June. A Consent Decree was entered.
- **2000** Remedial Construction began November 1st. The Park reopened in June.

2.5 History of Contamination and Pathways Contaminants of Concern

Leaks and wastes from the gas works and tar production facilities contaminated the soil and groundwater. The primary contaminants of concern on the site are benzene and polycyclic aromatic hydrocarbons (PAHs) including the double ring aromatic hydrocarbon naphthalene. PAHs are the largest constituent of coal tar. Benzene along with other single ring aromatic compounds were produced by the manufactured gas process, both from coal coking and from oil processing.

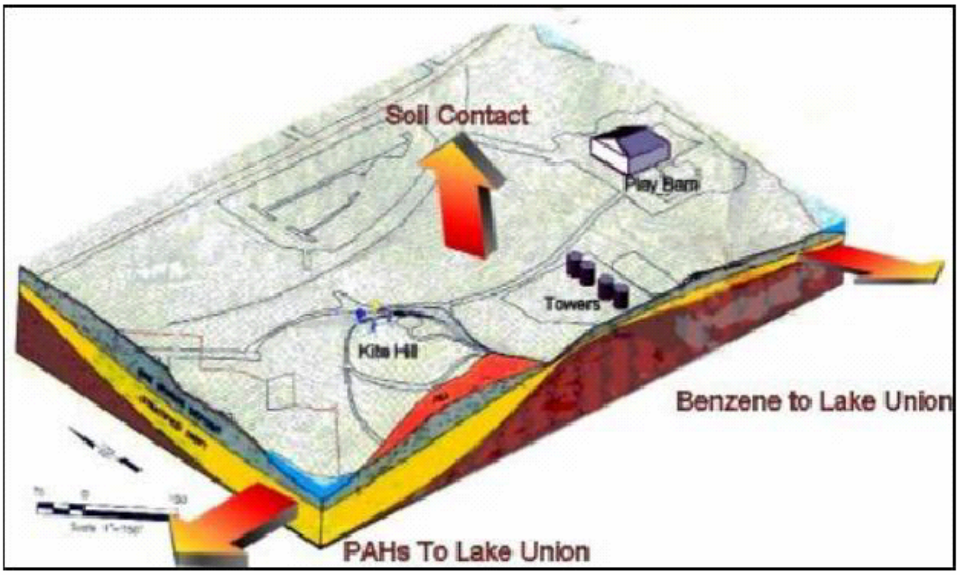
Benzene is both toxic and carcinogenic. The MTCA method B cleanup levels for benzene are 0.0795µg /l, 22.7µg /l, and 0.321µg /m^3 in ground water, surface water, and air respectively.

Naphthalene is toxic but not carcinogenic. The MTCA method B cleanup levels for naphthalene is 160µg /l, 4940µg /l, and 1.37 g /m^3 in ground water, surface water, and air respectively.

PAHs are a mixture of a number of different but related compounds. Because of there physical properties, they do not have method B formula values in air or water, but they have a soil value of 0.137mg/kg.

3. Remedial Actions

Figure 2



3.1 Benzene

On the east side of the Park, south of the Play Barn the groundwater is contaminated with benzene. An interim action removed a benzene containing LNAPL that had been discovered during site investigation. The remedy chosen for benzene was an air-sparging/soil vapor extraction (AS/SVE). The AS/SVE system covers approximately 1.5 acres of the Park. It is unnoticeable to Park users except for a small equipment box near the Towers. . An action level was calculated based on MTCA Method B surface water criteria and a dilution attenuation factor (DAF). The calculation used to set the DAF and the action level for benzene is given in appendix 1.

3.2 Naphthalene

A naphthalene plume exists on the west side of the park near the Seattle Police Harbor Patrol facility. Monitored Natural Attenuation was chosen for naphthalene in groundwater. An action level was calculated based on MTCA Method B surface water criteria and a dilution attenuation factor (DAF). The calculation used to set the DAF and the action for naphthalene is given in appendix 1.

3.3 PAHs

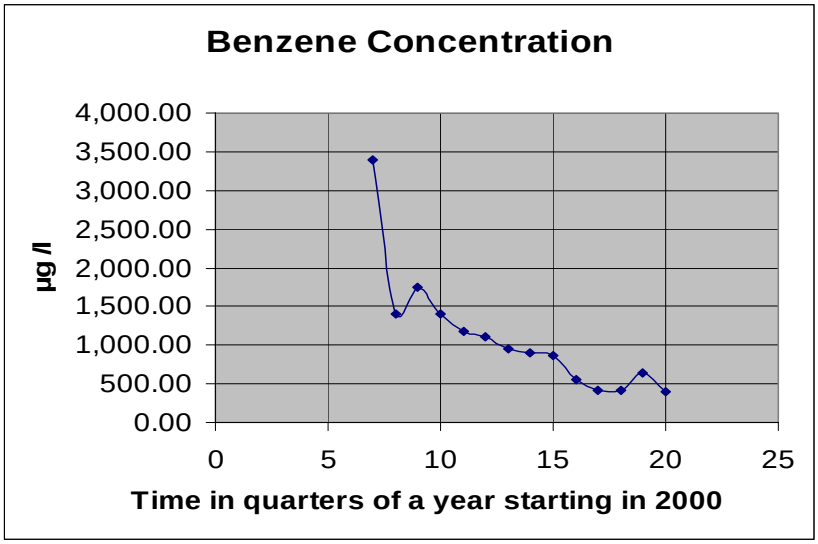
Direct Soil Contact Remedy a vegetative soil cover was installed over contaminated soils. The cover is between 12 and 18 inches thick and covers approximately 6 acres of the Park. An irrigation system was installed as part of the project.

4. Effectiveness of Remedial Actions

4.1 Benzene

Benzene concentration in the compliance well OBS-1 remains below the action level but above the method B groundwater cleanup level. The remedy, therefore, remains effective. See figure 3 below.

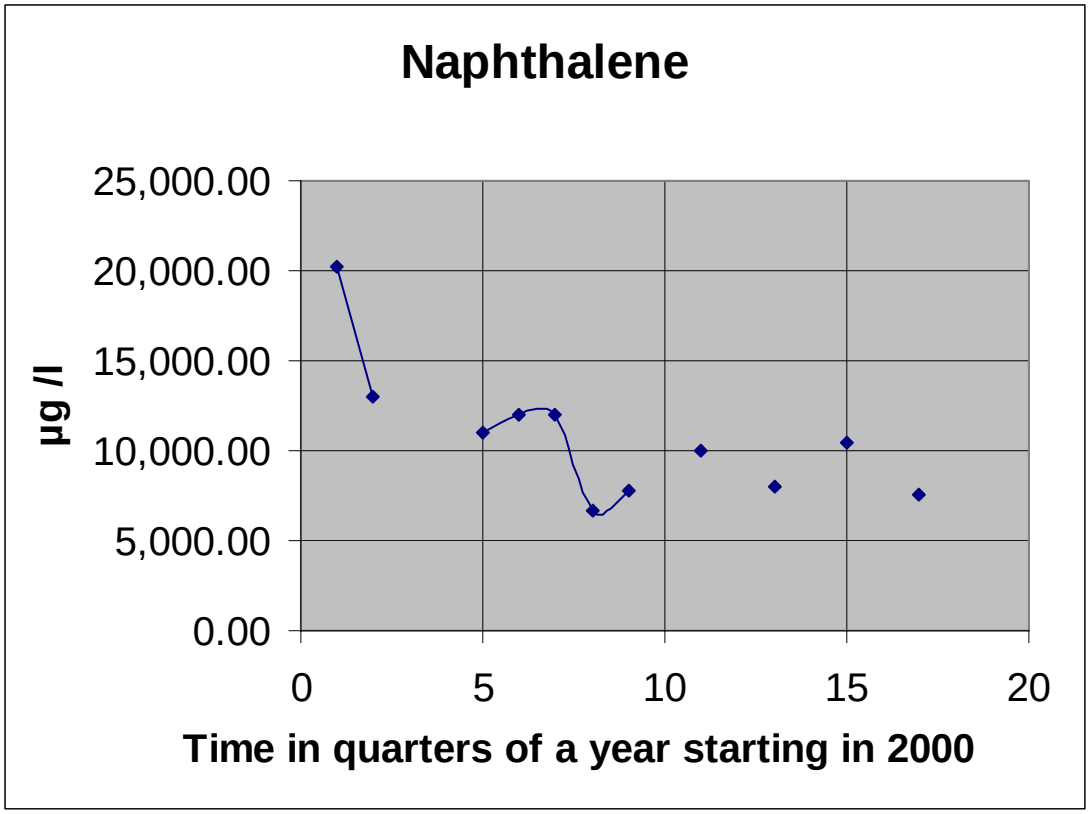
Figure 3.



4.2 Naphthalene

The Naphthalene concentration in monitoring well CMP-1 remains below the action level but above the method b groundwater cleanup level. The remedy therefore remains effective. See figure 4 below.

Figure 4.



Note: the trend line is not continuous because of data lost do to laboratory QA problems.

4.3 PAHs

Inspections by the Department of Ecology show that the vegetative soil cover is intact and being properly maintained. The remedy, therefore, remains effective.

5. Continuing and follow up actions.

The remedies selected for the benzene and naphthalene plumes must remain in place until cleanup levels are met. A properly maintained and irrigated vegetative soil cap with must remain in place. The possible use of phyto-remediation measures should be considered to help reduce the naphthalene plume to below the cleanup level.