Five-Year Review Report

Second Five-Year Review Report

for

Ohio River Park

Neville Township

Allegheny County, Pennsylvania

EPA ID Number PAD980508816

PREPARED BY:

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Region III
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3/27/08
Date

FIVE-YEAR REVIEW REPORT

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BLRA	Basline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator (EPA)
DCE	1,2-dichloroethylene
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
FS	Feasibility Study
ISC	Island Sport Center
LEL	Lower Explosive Limit
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NLC	Neville Land Co.
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PCBs	Polychlorinated Biphenyls
PC&C	Pittsburgh Coke & Chemical Co.
PQL	Practical Quantitation Limit or Reporting Limit
ppb	part per billion
ppm	part per million
RA	Remedial Action
RAO	Remedial Action Objective
RBC	EPA Region 3 Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RMU	Robert Morris University
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
TBC	To Be Considered
TCE	Trichloroethylene
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

The remedy for the Ohio River Park site, Operable Unit 1, required the construction of a multi-layer cap with a gas venting system over the former disposal trenches, an erosion cap, and a vertical barrier wall along the Ohio River Back Channel. The remedy, which was constructed in 1998, effectively reduces the risk of direct exposure to the soil contamination and controls the migration of contaminated soil. It also effectively reduces migration of contaminants to the groundwater and the surface water. During the site inspection, the capped areas were covered by a good stand of well maintained grass. There was no erosion of the slopes and no tar seeps on the river banks. The surface water monitoring data did not indicate any difference in concentrations upstream or downstream of the site. Institutional controls have been implemented to discourage fishermen from eating bottom-feeding fish and the public from visiting the slopes and riverbanks. In addition, deed restrictions prohibit residential development of the site, prohibit any use incompatible with a multi-layer cap, and prohibit the use of groundwater from the site. These deed restrictions were filed in the Recorder of Deeds Office for Allegheny County, Pennsylvania on September 10, 2002.

The remedy for the Ohio River Park site, OU3, requires monitoring for groundwater natural attenuation parameters. The monitoring revealed that natural attenuation reduced the concentrations of benzene and 2,4,6-trichlorophenol in groundwater beneath the site. The compliance is measured in the monitoring wells located along the Back Channel shoreline. By the end of 2006 the concentrations of benzene and 2,4,6-trichlorophenol achieved the levels required by the Performance Standards in all but two wells located along the Back Channel shoreline. The shallow groundwater elevations dropped one to two feet in the capped area demonstrating that the cap reduces groundwater recharge from surface precipitation. Fourteen of the 97 organic compounds analyzed were detected during the last five years. Those compounds were detected at lower concentrations than the highest concentrations reported in the remedial investigation. The monitoring of other natural attenuation parameters indicates that anaerobic natural attenuation within the plume continues as expected. Because VOCs are still present in the groundwater, vapor intrusion potential was considered in this review. In the event a new structure would be planned on the cap or in the vicinity of the groundwater plume, a potential of vapor intrusion must be evaluated during the design phase of the project.

Available information suggests that the remedy for OU1 is functioning as intended and is protective of human health and the environment. The remedy for OU3 is protective in the short term, and its long-term protectiveness is expected to be achieved through natural attenuation of contaminants in groundwater.

This is the second Five-year Review for the Ohio River Park site. The trigger for this five-year review was the previous five year review report signed on March 24, 2003.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Ohio River Park, Superfund Site		
EPA ID (from WasteLAN): PAD980508816		
Region: EPA Region III	**State:** Pennsylvania	**City/County:** Neville Township Allegheny County
SITE STATUS		
NPL status: x Final Deleted Other (specify)		
Remediation status (choose all that apply): _Under Construction _ Operating x Complete		
Multiple OUs?* xYES NO	**Construction completion date:** 09 /22 /1999	
Has site been put into reuse? xYES _NO		
REVIEW STATUS		
Lead agency: **xEPA** _State _Tribe Other Federal Agency		
Author name: Romuald A. Roman		
Author title: Remedial Project Manager	**Author affiliation:** EPA Region 3	
Review period:** **12 /02 / 2007 to 03 / 24/ 2008**		
Date(s) of site inspection: 01 / 18 / 2008		
Type of review: **X Post-SARA** Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review number: 1 (first) **2 (second)X** 3 (third) Other (specify)		
Triggering action: First Five-year review _X Actual RA Onsite Construction at OU #1 Actual RA Start at OU#____		
Triggering action date (from WasteLAN): 03 /24 / 2003		
Due date (five years after triggering action date): 03 / 24 / 2008		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

No issues were identified during this 5-year review.

Recommendations and Follow-up Actions:

In the event a new structure would be planned on the cap or in the vicinity of the plume, a potential of vapor intrusion must be evaluated during the design phase of the project

Protectiveness Statement(s):

Available information suggests that the remedy for OU1 is functioning as intended and is protective of human health and the environment. The remedy for OU3 is protective in the short term, and its long-term protectiveness is expected to be achieved through natural attenuation of contaminants in groundwater.

Other Comments:

1.0 INTRODUCTION

The purpose of this Five-year Review is to determine whether the remedy at The Ohio River Park site ("the site") is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-year Review reports. In addition, Five-year Review reports identify issues found during the review, if any, and provides recommendations to address them.

The U.S. Environmental Protection Agency (the "Agency" or "EPA") is preparing this Five-year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The EPA, Region 3, has conducted a Five-year Review of the remedial actions implemented at the Ohio River Park site in Neville Township, Pennsylvania. This review was conducted from December 2007 through February 2008. This report documents the results of the review. Figures and Tables were provided by URS Corporation, the Engineer for the Settling Defendants.

This is the second Five-year Review for the Ohio River Park site and is a statutory review. The triggering action date for this review is March 23, 2003, the date of the previous Five-year Review. The Five-year Review is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

EPA has divided the Ohio River Park site into three operable units (OUs). Operable Unit 1 (OU1) addresses buried wastes and contaminated soil. The OU1 Record of Decision (ROD) selected a remedy which included capping, surface water runoff controls, monitoring and institutional controls. The remedial action (RA) for OU1 was completed in 1998 and is currently undergoing long-term monitoring.

Operable Unit 2 is a small portion (approximately 1 acre) of the Site that includes soils. OU 2 is also known as the bridge portion of the Site because this area was used for construction of a bridge connecting Neville Island with Coraopolis, Pennsylvania.

The OU2 Record of Decision (ROD) documented the selected RA for OU2 to be "No Further Action." Consequently, OU2 is not a subject of this Five-year Review.

Operable Unit 3 (OU3) addresses groundwater contamination for the entire Site. The ROD for OU3 documented the selected RA to be monitored natural attenuation (MNA). The remedial design for OU3 was implemented in 2004. This Five-year Review addresses OU1 and OU3.

2.0 SITE CHRONOLOGY

Chronology of Site Events

Date	Event
1920s to 1970	Site owned by Pittsburgh Coke & Iron Co. [later named Pittsburgh Coke & Chemical Co. (PC&C)]
1930s to mid-1950s	The site served as a landfill for municipal wastes from Neville Township
1949 to 1955	Agricultural Chemicals Division of PC&C manufactured pesticides
1952 to 1965	Trenches were dug to dispose of coking sludges, cement production wastes and pesticides.
1965-66	PC&C ceased operations.
1970	Property transferred to wholly owned subsidiary, Neville Land Co. (NLC)
1977	Site donated to Allegheny County
1977-79	Allegheny County developed the site as a park.
1979	Allegheny County consultant reported on-site groundwater and soil contained benzene; toluene; 2,4-D; 2,4,6-trichlorophenol; and 2,4-dichlorophenol, subsequently the land was returned to NLC.
August 1990	Site included on the National Priorities List of Superfund Sites
October 1991	EPA and NLC enter into an Administrative Order on Consent in which NLC agreed to conduct a Remedial Investigation/Feasibility Study (RI/FS).
March 31, 1993	Operable Unit 2 ROD Signed
June 1994	Remedial Investigation Report Submitted
January 1995	Baseline Risk Assessment Submitted
April 1995	Feasibility Study Submitted
September 27, 1996	OU1 ROD Signed
December 31, 1997	Consent Decree requiring the Settling Defendants to implement the provisions of the OU1 ROD was entered by the United States District Court of Western Pennsylvania.
January 29, 1998	Final design for the Northeast Development Area submitted
February 3, 1998	Construction on the Northeast Development Area of OU1 begins
February 1998 to September 1999	Remedial Construction for OU1
July 31, 1998	Final Design Submittal OU 1 submitted
September, 17 1998	Record of Decision, OU 3 signed

Date	Event
October 1998	Opening of the first phase of the Island Sports Center, a recreation facility open to the public, constructed on the Northeast Development Area. Additional phases of the Island Sports Center open as rest of the remedial and developmental construction is completed.
August 18, 1999	Pre-Certification Inspection
September 24, 1999	Remedial Construction Completion Report Submitted
April 25, 2000	Environmental Monitoring Plan (Revision 2), OU 1 approved
September 27, 2000	EPA accepts Construction Completion Report
November 13-30, 2000	First Quarterly Monitoring Sampling Event for OU1
January 2002	First Annual Environmental Monitoring and Operation and Maintenance Report Submitted.
August 2, 2002	Amended Consent Decree requiring the Settling Defendants to implement the provisions of the OU3 ROD was entered in to the Untied States District Court of Western Pennsylvania.
September 10, 2002	Deed Restrictions required by the OU1 and OU3 RODs placed on Site.
Spring 2003	URS installed a new monitoring well, URS-24S, to replace ERT-24M.
September 2, 2003	NLC sold the portion of the Ohio River Site the surface of which was within OU-1, together with the majority of its facilities to Robert Morris University (RMU). In 2004, NLC sold two more parcels, adjacent to the site.
November 2003	EPA and PADEP agreed to the proposed sampling program for OU3. It was implemented in 2004-2006.
June 2004	NLC performed slope stabilization along the Ohio River back channel near DM-24D and other wells. One thousand four hundred tons of large riprap was placed along approximately 90 linear feet of shoreline to prevent bank erosion and protect the monitoring wells.
April - Sep 2004 and Spring 2005	RMU constructed new practice fields, running track and other outdoor track and field amenities west of the Golf Dome. Construction included installation of a dual-layer subsurface geogrid structure above the main multi-layer cap to distribute the additional pressure of the athletic field and track fill and add protection for the multi-layer cap.
February 2007	Handee Marts, Inc., the owner of the 7-Eleven store located at 7412 Grand Avenue, notified RMU that it was completing site characterization work under the Pennsylvania Storage Tank and Spill Prevention Act and Regulations related to an alleged release of MTBE and related gasoline constituents.
2007	NLC voluntarily sampled in the last three quarters in 2007 at the rate recommended in the 2004-2006 Environmental Monitoring Plan ("EMP") while the new long-term EMP was under discussion with EPA..
July 2007	A citizen reported seeing "dark" substance near shoreline at the western tip of the island. NLC collected appropriate samples in the area indicated and concluded that the substance was not related to the site.

3.0 BACKGROUND

3.1 PHYSICAL CHARACTERISTICS

The Site consists of approximately 32 acres on the western end of Neville Island, approximately 10 miles downstream of the City of Pittsburgh (Figure 1). The Ohio River borders the Site to the north, and the Back Channel of the Ohio River borders it to the south. The Site is accessible from the mainland via the new Coraopolis Bridge, linking the Town of Coraopolis with Neville Island.

3.1.1 Surface Features

Prior to the remedial action (RA) and development of the Island Sports Center ("ISC"), the Site was mostly open area with a few improvements. The central portion of the Site included open meadows sparsely covered with brush and encircled by an abandoned asphalt biking path. Most of the manufacturing and municipal wastes were disposed at the south-central portion of the Site beneath the former parking lot, in the meadows, and along the Back Channel river banks. Steep river ledges at the western part of the Site were created by piles of foundry sand.

The Site is currently used by Robert Morris University ("RMU"). It includes skating rinks,the Golf Dome, and athletic fields. The Site also includes parking lots to supports these facilities.

3.1.2 Geology

The Site lies within the Allegheny Plateau section of the Appalachian Plateau Physiographic Province. The Allegheny Plateau is characterized by gently folded, parallel, northeast-southwest trending folds. At the Site, the bedrock is identified as the Glenshaw and Casselman Formations of the Pennsylvanian Age Conemaugh Group. These formations are primarily composed of interbedded shale, siltstone and sandstone with thin beds of limestone and coal. The Glenshaw Formation is the upper member of the Conemaugh Group and are separated by the Ames Limestone in Western Pennsylvania.

Like most stream valleys in Western Pennsylvania, the Ohio River consists of unconsolidated sediments overlying bedrock. Neville Island is a portion of a dissected river terrace that was deposited by the ancestral Ohio River. The unconsolidated sediments at the Site are approximately 60 feet thick and 20 feet thick in the Ohio River Channel. At the Site, the upper portion of the unconsolidated sediments consist of approximately 25 feet of fill, and Quarternary fluvial deposits of clay, silt and sand. The lower 35 feet consists of glaciofluvial deposits of sand and gravel with

minor amounts of silt and clay that were deposited from glacial meltwaters during the Pleistocene interglacial stages. The top of bedrock at the site appears to gently slope toward the south-southwest. Fill is found throughout the Site, with the exception of the eastern boundary where it is absent. Former trenches in the south-central portion of the Site extend to a maximum depth of 12 feet. Foundry sand disposed in the western part of the Site is up to 27 feet deep.

3.1.3 Hydrology

The site is bounded by the back channel of the Ohio River to the south and by the main channel of the Ohio River to the north. The flow rate in the river has varied from 108,000 cubic feet per minute (measured at Sewickley in 1957) to 4,440,000 cubic feet per minute (measured at Sewickley in 1935). Since approximately 90 percent of the flow occurs in the Main Channel, the minimum and maximum flow in the back channel is approximately 10,800 and 44,400 cubic feet per minute, respectively. The Ohio River is navigable and chemicals, coal, and coke are routinely transported on the river by barges.

The Site sediments constitute an unconfined surficial aquifer that extends beneath the Ohio River and is interconnected to the river. Bedrock, consisting of shale, siltstone and fine-grained, micaceous sandstone, underlies these sediments. The groundwater in the sand/gravel aquifer beneath the Site discharges primarily to the Main and Back Channels of the Ohio River. However, this aquifer interconnects with groundwater beneath the river and on the shores. Groundwater is used as a source of drinking water by several municipalities which flank the Ohio River. The nearest one is the municipality of Coraopolis. The Coraopolis well field is located approximately 750 feet southwest from the western boundary of the Site, along the Back Channel. The well field consists of seven wells that produce an average of 127 cubic feet per minute.

3.1.4 Climate

The climate of Allegheny County is classified as humid continental. The annual average precipitation is 37 inches, and it is evenly distributed throughout the year. The mean annual temperature is approximately 50 degrees Fahrenheit.

3.2 LAND AND RESOURCE USE

Land use on Neville Island is generally industrial/commercial, although there are some residential areas. The middle section of the island east of the Site and west of Highway I-79 is mostly residential and commercial while the eastern end of the island is heavily industrialized. Most of

Neville Island's residents live in the area between the Coraopolis Bridge and Highway I-79. The nearest residence is located approximately 485 feet from the site. According to the 1990 census, the population within an approximate four-mile radius of the Site is 18,058 people.

The site is currently used by RMU as its main training facility. It is used by local residents for recreation, golfing, and skating.

3.3 HISTORY OF CONTAMINATION

Prior to the 1940's, the predominant land use at the Site was agricultural. Beginning in the mid-1930's until the mid-1950's, a portion of the Site was used for municipal landfill operations including the disposal of domestic trash and construction debris. Industrial waste disposal activities were conducted at the Site from 1952 through the 1960's. Available information indicates that Pittsburgh Coke and Chemical Company ("PC&C") disposed of much of the industrial waste at the Site. PC&C began production of coke and pig iron on the eastern end of the island in 1929, operated a cement products plant during the 1930's, and produced coal coking by-products during the 1940's. Between 1949 and 1955, PC&C's Agriculture Chemicals Division manufactured pesticides. Two methods of waste disposal were used by PC&C at the Site: wet wastes were placed into trenches and dry wastes were piled on the surface. Fifty-four trenches have been identified as being used for disposal of tar acid, tar decanter, and occasionally agricultural chemical wastes. PC&C ceased operations in 1965-66. PC&C merged into Wilmington Securities, Inc., the parent corporation of the Neville Land Company (" NLC").

3.4 INITIAL RESPONSE

In 1977, NLC donated the Site area to Allegheny County. Allegheny County began construction of a park on the Site in 1977 and completed the construction in 1979. The park was never opened to the public, however, and was subsequently dismantled. During the course of the work, approximately 13,000 cubic yards of various wastes were discovered at the Site. While most of these materials were excavated and removed from the Site, some materials were reburied. After this discovery, Allegheny County transferred the title to the land back to NLC.

Based on information and data collected from 1977 through 1989 by Allegheny County, EPA, the NLC, and the Pennsylvania Department of Environmental Resources (PADER), now the Pennsylvania Department of Environmental Protection (PADEP), the EPA proposed to include the Site on the National Priorities List of Superfund sites on October 16, 1989. The analytical data collected were used to evaluate the relative hazards posed by the Site using EPA's Hazard Ranking

System (HRS). EPA uses the HRS to calculate a score for hazardous waste sites based upon the presence of potential and observed hazards. If the final HRS score exceeds 28.5, the Site may be placed on the National Priorities List, making it eligible to receive Superfund monies for remedial cleanup. This Site scored 42.24, and was placed on the list on August 30, 1990.

In October 1991, EPA and NLC (the owner of the Site) entered into an Administrative Order on Consent in which the NLC agreed to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the Site with EPA and State oversight. The Remedial investigation (RI) Report for the Site, based on the 1992 and 1993 field sampling, was approved by EPA in June 1994. The Ecological Risk Assessment was completed in November 1994 and the Baseline Human Health Risk Assessment was completed in January 1995. Based on these documents, NLC submitted a Feasibility Study (FS) in April 1995 describing the remedial action objectives and comparing cleanup alternatives for the Site. In April 1996, EPA presented a Proposed Plan, which utilized the Feasibility Study, and evaluated four alternatives to remediate contamination at the Site.

3.5 BASIS FOR TAKING REMEDIAL ACTION

The primary objective of the RI was to characterize the nature and extent of hazardous substances present at the Site. As a part of this effort, the RI identified and evaluated Site-related contaminants, their potential migration routes, and exposure pathways for human and ecological receptors. The following discussion of contamination is based on the RI and is reflective of conditions at the time the RI was written.

3.5.1 Air Quality

EPA found trace amounts of naphthalene, 2-methylnaphthalene, and selected VOCs in the air both upwind and downwind of the site. EPA believes that these contaminants are present in the background in the area and do not originate from the Site.

3.5.2 Surface Soil Contamination

Surface soil sampling detected semi-volatile organic compounds (semi-volatiles), including PAHs at concentrations up to 340 parts per million (ppm); pesticides including benzene hexachlorides; dioxin; polychlorinated biphenyl's (PCBs) at concentrations typically less than 0.5 ppm; and metals including arsenic (43.3 ppm), beryllium (5.1 ppm) and chromium (106 ppm).

3.5.3 Subsurface Soil Contamination

Subsurface soil sampling detected VOCs, semi-volatiles including PAHs, pesticides, and metals. The VOC benzene was detected at concentrations up to 11 ppm. The highest total concentration of PAHs was 38 ppm. Alpha-BHC, a pesticide, was detected at concentrations of up to 7.9 ppm. The metals aluminum, beryllium, and manganese also were detected in the subsurface soil samples.

3.5.4 Buried Waste

Waste material samples collected from a trench area contained VOCs (benzene at concentrations up to 8.9 ppm). These also were detectable amounts of pesticides and the herbicide, 2,4-D.

3.5.5 Surface Water

Surface water samples collected during RI from the river contained metals and pesticides. The highest concentrations of metals were mercury at 0.79 parts per billion (ppb), chromium at 19 ppb, and copper at 87 ppb. The pesticide gamma-chlordane was detected at 0.024 ppb. EPA determined that the site, prior to the construction of the cap and the slurry wall, was a likely source of contamination to the Ohio River in the vicinity of Neville Island.

3.5.6 River Sediment

Upstream and downstream sediment sampling revealed the presence of site-related contaminants. However, the quality of sediment upstream and downstream of the site was similar. Contaminants detected at levels of potential concern to human health were PCBs, dibenz(a,h)anthracene, arsenic, and chromium. Contaminants of potential ecological concern included heavy metals, pesticides, PCBs and PAHs. Once the construction of the cap and additional slope stabilization along the Back Channel were completed in 1998, and large riprap was placed along the shoreline in 2004, the site ceased to be a potential source to the Back Channel sediments.

3.5.7 Groundwater

Groundwater samples collected from the site showed VOC, semi-volatile, pesticide, and metals contamination. The VOCs benzene and trichloroethane were detected at concentrations up to 50 ppm and 18 ppb, respectively. The semi-volatile compound 2,4,6-trichlorophenol was detected at concentrations up to 210 ppm. Delta-BHC, a pesticide, was detected in one sample at 1.15 ppb. 2,4-D, an herbicide, was detected at concentrations up to 190 ppb. Cadmium and nickel were found at concentrations above the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and

EPA Region III Human Health Risk-Based Concentrations. In additions, the results indicated that dense non-aqueous phase liquids (DNAPLs), organic compound, or a mixture of compounds, may be present.

3.5.8 Summary of Site Risks

Following the RI, analyses were conducted to estimate the human health and environmental hazards that could result if contamination at the Site was not cleaned up. These analyses are commonly referred to as risk assessments and identify existing and future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment (BLRA) evaluated human health risks and the Ecological Risk Assessment (ERA) evaluated environmental impacts from the Site.

Based on the results of the RI, the primary contaminants associated with potential human health risk at the site include:

- VOCs including benzene, 1,2-dichloroethane, and 1,1,2-trichloroethane
- SVOC including benzo(a)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene, 4-methylphenol, 2,4-dichlorophenol, and 2,4,6-trichlorophenol
- Pesticides including dieldrin, alpha-BHC, and gamma-chlordane
- Inorganics including manganese, beryllium, arsenic, and mercury .

The results of the Baseline Human Health Risk Assessment indicated that contamination at the site would present a risk above EPA's acceptable level to the following populations:

- People using water from on-site wells for drinking, showering, and bathing
- People eating contaminated fish
- Children and construction workers accidentally ingesting uncovered on-site soil

NLC and EPA collectively evaluated the ecological risks associated with the Site. Contamination in surface water, sediment, soil, and groundwater had the potential to adversely impact the ecosystem of the river. In surface water, concentrations of mercury, copper, and chromium (VI) were potentially harmful to the ecosystem of the Main Channel. Chromium and copper presented an ecological risk in the Back Channel.

Groundwater, which was a potential pathway by which soil contaminants could reach the river, was contaminated by several contaminants of ecological concern, particularly mercury, zinc, phenols, phthalates, and pesticides. Similarly, storm water from the site contributed soil contaminants to surface water and river sediments. During the time of RI/FS, one of the remediation objectives,

presented in the Treatability Study, 1995, was "minimization of any erosion... to restrict the movement of soil, both on-and off-site, by the provision of engineered runoff control systems and by the maintenance of stable land surfaces over the entirety of the site. Storm water at the site will be managed is such a way that sediment loading is maintained at *de minimus* levels." EPA did not consider removal of contaminated river sediment along the banks of the site, because the RI/FS report stated that "sediment at upstream locations from the ORS (Ohio River Site) exhibit similar constituents and concentrations to sediment lateral to the ORS. These data suggest the Ohio River sediment have been subjected to discharges of contaminants from upstream sources." Once the caps, the vertical barrier walls, and rip-raps were constructed, site-related contamination to the surface water and river sediments were eliminated.

4.0 REMEDIAL ACTIONS

4.1 REMEDY SELECTION

4.1.1 Operable Unit 1 - Soil

As documented in the OU1 ROD, the remedy for OU1 is comprised of the following components:

- Capping of concentrated waste areas with a multilayer cap designed in accordance with *Pennsylvania Residual Waste Management Regulations*.
- An Erosion Cap on the rest of the site.
- A surface water control system to control transport of surface soil both on- and off-site.
- Abandonment of the existing on-site oil well in accordance with Pennsylvania Oil and Gas Well *Regulations*.
- Installation of a passive gas collection system to ensure the integrity of the cap.
- Deed restrictions preventing residential use of the Site.
- Long-term monitoring of groundwater, surface water, and sediment to ensure the remedy is working.
- Implementation of institutional controls to prohibit residential development of the site, prohibit any use that is incompatible with a multi-layer cap, and prohibit the use of groundwater from the site.

4.1.2 Operable Unit 3- Groundwater

As documented in the OU3 ROD, the remedy for OU3 is comprised of the following components:

- Natural attenuation processes shall be allowed to reduce the concentrations of benzene and 2,4,6-trichlorophenol in groundwater beneath the Site to levels protective of human health and the environment. The EPA has determined that the appropriate cleanup levels for benzene and 2,4,6-trichlorophenol are 5.0 and 61 ppb, respectively.
- Monitoring of natural attenuation processes to measure changes in contaminant concentrations in the groundwater plume at the Site until benzene and 2,4,6-TCP concentrations meet their MCLs for 12 consecutive quarters throughout the area of attainment. The area of attainment encompasses the groundwater monitoring points located along the property line on the shoreline.
- Deed restrictions preventing residential use of groundwater at the Site until cleanup levels have been achieved. Warning signs posted along the shoreline of the Site to warn fishermen not to eat fish caught in the area so long as fish in the Ohio River are found to have high levels of contaminants that can cause adverse human health effects.

4.2 REMEDY IMPLEMENTATION

4.2.1 Operable Unit 1

Remedial construction activities for OU 1 consisted of the following activities:

- Abandonment of one oil well and several monitoring wells
- Construction of a multi-layer cap and gas collection/venting system
- Construction of an erosion cap over areas that did not have suitable cover or areas disturbed for future development
- Construction of a stormwater runoff and erosion control system including vertical barrier walls.
- Implementation of institutional controls to prohibit residential development of the site, prohibit any use that is incompatible with a multi-layer cap, and prohibit the use of groundwater from the site.

The construction of the OU1 began on February 3, 1998 and continued until September of 1999. Additional monitoring wells were installed in the fall of 2000 and 2003.

Well Abandonment

The on-site oil well was properly abandoned in accordance with appropriate and relevant provisions of the Pennsylvania Oil and Gas Regulations. Numerous monitoring wells were also properly abandoned.

Construction of Multi-Layer Cap and Gas Collection/Venting System

Site preparation for the multi-layer cap consisted of sediment and erosion controls, establishing an equipment decontamination area, removing trees and brush, and abandoning manholes, inlets and piping. Waste materials from site preparation, such as residuals from well abandonment and decontamination activities, were consolidated beneath the subgrade layer of the multi-layer cap. The multilayer cap was constructed over historic waste disposal trenches. The multilayer cap consists of the following components:

- A cap subgrade layer comprised of engineered fill, to provide a suitable and firm foundation for the barrier and adequate slope for drainage, including a Liner Subgrade Layer free of materials that might damage the barrier layer;

- A barrier layer of 40-mil thick high density polyethylene liner;

- A cap drainage layer of synthetic drainage net (geonet), overlain with geotextile to minimize intrusion of overlying vegetative soil cover;

- A vegetative soil layer totaling three feet in thickness, including top 6 inches covered with Vegetative Fill Material (loamy soil). Vegetated areas were then seeded and mulched;

- For portions of the multi-layer cap that support roadways, parking areas, pavement or structures, the cover over the Initial Liner Cover consists of well compacted coarse aggregate or Engineered Fill;

- A passive gas collection system, consisting of gravel filled trenches leading to vent pipes to relieve gas that might build up beneath the liner.

Erosion Cap

The objective of the erosion cap was to create a sustainable cover that would prevent mobility of soil

by wind or water erosion. The entire portion of OU 1 disturbed by construction was covered with an erosion cap. The erosion cap in development areas consisted of either asphalt or concrete paving over a prepared subgrade surface, or a 10-inch minimum thickness Vegetative Soil Layer. The remaining portions of OU 1, outside the limits of the multi-layer cap, have an erosion cap only where vegetative cover suitable to resist erosion did not already exist, based on a site study. Erosion features and potential erosion features along the river bank slopes were addressed through the design of a rip-rap toe buttress to repair identified slope distress. The buttress consisted of angular large rock over a layer of geotextile. Steep slopes on the western tip of the island were hydroseeded and covered with erosion resistant matting. A series of berms, inlets, and pipes were constructed to collect excess surface water runoff from the multi-layer cap and other developed areas and direct it onto the surrounding Ohio River and Ohio River Back Channel. Outlet structures, such has gabion downchutes, are provided to transmit concentrated flows from the upper plateau to the Ohio River

Vertical Barrier Walls

Prior to the remedial action, ribbons of tar-like substance were observed at the surface of a slope failure. Tar appeared to be migrating in a thin layer in the interface between native soil and the overlying fill. To prevent migration of this substance, the responsible parties voluntarily designed and installed an in-ground vertical barrier system. The primary barrier was a cement-bentonite slurry wall, which extended through the fill to native soil, immediately inside the southern limit of the larger multi-layer cap. Cement-bentonite was selected to provide high shear strength characteristics, as the barrier was near a steep slope. A secondary barrier was constructed to a depth of at least 2 feet below where the base of the encountered tar-like material was found. The secondary barrier consisted of a trench lined with 40-mil HDPE and filled with clean fill. The exposed tar-containing materials were removed from the face of the slope.

Environmental Monitoring Program

The monitoring program for OU1 included the following tasks:

- Evaluation of groundwater quality adjacent to the site to assess the effectiveness of the remedy;
- Assessment of the quality of sediment in drainage systems to evaluate the performance of the erosion cap and stormwater runoff and erosion control structures;
- Evaluation of the post-remediation environmental quality in surface water;

- Sampling and characterization of the gas emission from passive gas vents of the multi-layer cap.

The environmental monitoring activities for OU1 were implemented in two stages, an initial monitoring program, and a long-term monitoring program.

Institutional Controls

Institutional Controls consisted of installing permanent signs on the banks of the Ohio River to caution fisherman against eating bottom-feeding fish. A total of 15 signs were installed at approximately 300 foot intervals along the Ohio River and back-channel shore. In addition, a series of 39 signs were installed to deter visitors from the slopes and riverbanks, as these areas did not receive additional fill placement or covering. Finally, deed restrictions were recorded to 1) prohibit residential development of the site, 2) prohibit any use that is incompatible with a multi-layer cap, and 3) prohibit the use of groundwater from the site.

The three-year initial monitoring program which involved quarterly monitoring of groundwater wells and gas vents and semi-annual monitoring of surface water, sediment, and on-site surface water seeps ended in 2003. It was replaced in 2004 by a long-term monitoring program which was continued during the rest of the review period. The new program no longer included sediment monitoring because construction of the cap and the rip-raps of the river banks eliminated site seeps. Based on the 2001 to 2003 monitoring results, surface water monitoring was reduced to annual sampling for metals, and air monitoring was reduced to annual events. Pesticide, and herbicide analysis of groundwater was also eliminated. The groundwater monitoring network, Figure 2, was reduced to one background well (ERT-46S), three wells located within the cap (DM-51S, DM-58S, DM-58M); four wells along the Back Channel (DM-24D, DM-26D, ERT-27S, and URS-24S); three Barcad wells located beneath the back Channel (ERT-6M, DM-57, DM-59); one water supply monitoring well (Coraopolis Sentinel Well), and one well along the Ohio River Main Channel (ERT-32S). This network is designed to evaluate the downgradient edge of the benzene plume and provide warning signals if the plume spreads toward municipal wells on the other bank of the Back Channel. Water levels were measured from 21 wells to evaluate the impact of the cap on reducing surface precipitation.

Surface water monitoring program included annual collection samples from four locations within the Ohio River and the Back Channel, both upstream and downstream from the site, as well as any surface water seeps that may be identified on the banks by visual inspection. Samples were collected only during normal flow conditions. The surface water samples, analyzed for metals, indicated that there was no noticeable difference between upstream and downstream results that

would indicate that the site is affecting surface water.

Air monitoring involved collecting samples quarterly in 2004 and annually thereafter. The air samples were collected within the vent pipes from the passive gas venting system beneath the large multi-layer cap area, at sampling ports along the Buckeye Pipeline, and within the Golf Dome and adjacent Support Building. The air samples, analyzed for combustible gases, indicated soil gas concentrations below the concentration creating an explosion or fire hazard.

The monitoring data from this five year review period are included in the Three-year Environmental Monitoring Report and the 2003 Operation and Maintenance Report - OU-1, (URS Corporation, February 2004); 2004-2006 Three-year Environmental Monitoring Report and 2006 Operation and Maintenance Report - OU-1, (URS Corporation, February 2007); and 2007 Annual Monitoring Report and O&M Report (URS Corporation, January 2008).

4.2.2 Operable Unit 3

A three-year monitoring program for OU3 , monitored natural attenuation ("MNA"), consisted of quarterly groundwater monitoring from points along the shoreline on the Back Channel side of Neville Island, along the shoreline on the Main Channel, beneath the Back Channel at the downgradient edge of the benzene plume, at an upgradient well, and at the Coraopolis public water supply sentinel well. Following the completion of the required monitoring period of three years, the required statistical evaluation of the groundwater data was performed in 2006. It demonstrated that natural attenuation processes are reducing the contaminant concentrations and that contaminants are not migrating.

In January 2008, The Settling Defendants presented to EPA and PADEP a proposed Long-term Site Environmental Monitoring Plan, which was reviewed by Region 3 and EPA Ada, Oklahoma Laboratory vis-a-vis sampling results generated for this Five-year Review report. After discussing details with EPA, the Settling Defendants re-submitted the plan in February 2008, and the revised plan was approved by EPA and PADEP on March 10, 2008.

4.3 SYSTEM OPERATION AND MAINTENANCE

Operation and maintenance performed since March 2003 included the following activities:

1. In the Spring of 2003, URS replaced a monitoring well ERT-24M with URS-24S located in the vicinity of the old well. The screen of the new well was placed at the same depth, in the shallow aquifer, as the old ERT-24M.

2. NLC performed maintenance and stabilized slope along the Ohio River back channel near DM-24D and other wells in June 2004. One thousand four hundred tons of large riprap were placed along approximately 90 linear feet of shoreline to prevent bank erosion and protect the monitoring wells.

3. Capping of waste areas with a multi-layer cap caused groundwater elevations to drop one to two feet in the capped area, demonstrating that the multi-layer cap is effective in reducing groundwater recharge from surface precipitation and consequently reducing the probability of migration of the contaminant plume toward municipal wells. No contaminated water has reached the Coraopolis well field across the back channel, and the data indicate that contaminated groundwater from the site will not or has not reach the well field. The cap, vegetative cover, and sport fields are intact, and there is no possibility of direct contact with buried waste. The site does not contribute contaminants to the back Channel and Ohio River.

4. Maintaining grass cover on the entire ISC area, including areas not covered with the multi-layer cap.

5. Maintaining a surface water control system to control transport of surface soil both on- and off-site. Routinely inspect river banks to localize potential seeps and visible erosion damage.

6. Maintaining a passive gas collection/venting system to ensure the integrity of the cap is operational and removes gases from beneath the cap and the Golf Dome.

7. Performing long-term monitoring to evaluate the remedy progress.

4.4 SITE REDEVELOPMENT

The construction of the Island Sport Center ("ISC") by NLC, which followed the construction of the caps at the site redeveloped the site into a sport and recreation center for Neville Island. The ISC included a five-acre building housing two Olympic class indoor ice skating rinks, a golf training facility, a fitness center with a restaurant, a covered golf dome, and accompanying parking lots and sidewalks. It was listed in several publications as an example of Superfund site re-use. (Reusing Superfund Sites: Commercial Use Where Waste is Left on Site, EPA 540-K-01-008, OSWER 9230.0-100, February, 2002.)

Further site redevelopment was stimulated once Robert Morris University ("RMU") purchased the site to utilize it as its main sport facility. A description of RMU's site redevelopment is presented in section 5.0.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second Five-year Review for the site. The first Five-year Review stated that :"The remedy for OU1 is protective of human health and the environment. The remedy is functioning as intended. No information was identified in this Five-year Review that would suggest that the remedy for OU3 will not be protective of human health and the environment." During the current review period the protectiveness of the remedies for OU3 and OU1 has not changed.

Progress since the last five-year review included further redevelopment of the site once it was purchased by RMU:

On September 2, 2003, NLC sold a portion of the Ohio River Site, the surface of which was within OU1, together with the majority of its facilities to RMU. The Site was sold under various restrictive covenants, including covenants prohibiting residential development or use of the groundwater at the Site. In 2004 two more portions of land, in the vicinity of OU1 were sold by NLC to RMU. The deed conveying these properties to RMU contain an express restrictive covenant prohibiting groundwater use. Between April and September of 2004, and continuing into early 2005, RMU re-developed ISC and constructed additional athletic facilities for its students at the end of the island. Practice fields, a running track, and other outdoor track and field amenities were built on the open space west of the Golf Dome. Construction included installation of a dual-layer subsurface geogrid structure above the main multi-layer cap to distribute the additional pressure of the athletic field and track fill and add protection for the multi-layer cap. EPA contractor, Ttech/NUS, and PADEP performed routine inspections and participated in the progress meetings during this construction. The construction leveled a significant area of the Site, and covered it with a thicker layer of soil and field surface, Picture 3.

6.0 FIVE YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

The PADEP, the NLC, and the contractors for the NLC (URS Corporation) were notified of the initiation of the five-year review in December 2007. The five-year review team included representatives of EPA, PADEP, NLC, and RMU.

The review team established the review schedule whose components included the following:

- Community involvement
- Document review
- Data review
- Site inspection
- Five-Year Review report development and review

6.2 COMMUNITY INVOLVEMENT

The Community Involvement Coordinator (CIC) for this site has received no calls or inquiries regarding the site for several years, with the notable exception of a call in late-July 2007. On that occasion, a caller who identified herself as a recreational boater, contacted EPA to report an incident in which her children, who were allowed to play on a sand bar near the site, had returned to their boat with "dark, oily smears" on their clothing. When the caller later learned that the island was the site of a Superfund cleanup, she contacted EPA to inquire about potential exposures.

EPA, subsequently, contacted the NLC's representative, who in turn, contacted their environmental consultant for the site. The most recent copy of the semi-annual operation and maintenance report (January through June 2007) was forwarded to EPA, and on August 1, 2007, the NLC's representative and her consultant, accompanied by a representative of RMU, visited the site and inspected it by land and from a water craft. No seeps, sheens, or odors were detected. All signs, which read: "Private Property; No Trespassing: Do Not Consume Bottom-Feeding Fish" and "Stay off Slope", were intact. Samples of soil/sediment with visible dark stains, believed to be coal and/or leaf particles, were taken and analyzed. The analytical results revealed no contamination from the site. EPA later contacted the caller to report these activities and findings and conveyed to the caller that although the remedies for the site are working as planned, swimming in a heavily industrialized river can pose health risks.

No other inquiries have been received in the last five years. EPA's CIC contacted Neville Township during the Five-year Review process and spoke with Ms.Gerry Russel. Ms. Russel is Assistant Secretary for the Township and is the person who fields calls and complaints for the municipality. For the last two years, calls which may have earlier been routed through the local police department have come to Ms. Russel, because police services are now provided by the Ohio Township Police Department. Ms. Russel has received no calls concerning the Ohio River Park Site cleanup or the maintenance and operation of the site. Because neither the Township nor the EPA has received any reports or inquiries concerning the site, the CIC did not conduct further inquiry in the community. An ad reporting EPA's Five-Year Review and providing contact

information for community members to use to provide pertinent comments or inquiries about the site and EPA's review was published in the local paper in February 2008.

6.3 DOCUMENT REVIEW

The Five-year review consisted of a review of relevant documents including the RODs for OU1 and OU3 and monitoring data. The documents reviewed include the following:

- ROD for Operable Unit 1 Ohio River Park Site, September 1996
- ROD for Operable Unit 3 Ohio River Park Site, September 1998
- Intrinsic Remediation Demonstration, Ohio River Site, Neville Township, Pennsylvania, Volumes 1, 2, 3, (Dames and Moore, 1996)
- Intrinsic Remediation Demonstration - Revision I, Ohio River Park Site, Neville Township, Pennsylvania, (Dames and Moore, February 27, 1997)
- Revised Annual Environmental Monitoring and Operation and Maintenance Report - OU-1 (URS Corporation, June 2002)
- Site Environmental Monitoring Plan, Ohio River Park Superfund Site, (URS Corporation, November 2003)
- Three-year Environmental Monitoring Report and 2003 Operation and Maintenance Report OU-1, (URS Corporation, February 2004)
- 2004 – 2006 Three-Year Environmental Monitoring Report and 2006 Operation and Maintenance Report, (URS Corporation, February 2007)
- Long- term Site Environmental Monitoring Plan, Ohio River Park Superfund Site, (URS Corporation, January 2008 and its February 2008 revision)
- 2007 Environmental Monitoring Report, Ohio River Park Superfund Site, (URS Corporation, January 2008)
- Memorandum, Monitoring Natural Attenuation, John T. Wilson, Ph.D., February 2008

6.4 DATA REVIEW

EPA reviewed, Annual Monitoring Reports for 2003 and 2007, each of which included one year's worth of monitoring data, and the 2004-2006 Three-year Environmental Monitoring Report. The monitoring data were analyzed statistically in 2006, and the MNA aspect of monitoring was evaluated by EPA, John T. Wilson, Ph.D., EPA, Ada, Oklahoma, in February 2008. Ongoing monitoring of other natural attenuation parameters indicates that anaerobic natural attenuation within the plume continues as expected in the OU3 ROD. Dr. Wilson evaluated monitoring data and their statistical interpretation and stated that : "In general the behavior of benzene and

trichlorophenol contamination in ground water is behaving as expected, and monitored natural attenuation as a remedy meets the expectations set forth in the ROD. ... Concentrations of Benzene in well DM-57 meet the MCL in 2007 and were not subject to statistical analysis. The monitoring record provided for wells ERT-27S and URS-24S is short, only two years long. Between 2004 and 2006 there was no change in the average concentration of benzene in well ERT-27S. The decline in concentration in well URS-24S was enough to be on track to meet the MCL in 30 years, but the decline was not statistically significant at 80% confidence. The statistical evaluation will have more resolution in five years with a longer monitoring record. ... "

At the end of 2007, the Settling Defendants requested a reduction in monitoring for OU1 and OU3 to be reduced since natural attenuation is occurring as predicted in the OU3 ROD and the majority of the monitoring wells have been showing non-detect levels of contamination. At the final stages of the work on this Five-year Review report, the Settling Defendants submitted two consecutive versions of a proposed Long-term Site Environmental Monitoring Plan in which they responded to EPA and PADEP comments and requests. The new plan was approved on March 10, 2008, and it further reduces the level of monitoring at the site.

6.4.1 Groundwater Data

Benzene is the best representative of the contaminant plume. The results of benzene monitoring are provided in Tables 1 through 4. Between 2004 and 2008 seven of twelve wells scheduled for quarterly analysis had one or more detection of benzene above the PQL. The highest concentrations were from wells DM- 51S, DM-58-S, DM-59, ERT-27S, and URS-24-S. The overall site-wide trend is downward. In the Sentinel well, benzene was detected during the last five years only once, in the third quarter of 2006. Benzene concentration in this sample was 1.9 ug/L, well below 5ug/L drinking water criterion. The construction of the RMU athletic facilities took place between April and September 2004. Coincident with and shortly after the construction, concentrations of benzene in several wells increased. The largest increase was observed a few months after the construction was completed in wells (DM-51S and DM-58S) located under the center of the cap. Although geogrid reinforcement was added to prevent additional weight of the fill to impact the tar pits located under the cap, it appears that this additional weight temporarily pressured layers beneath the cap and caused a tar release.

4, 6-Trichlorophenol (TCP). The results of trichlorophenol monitoring are provided in Tables 5 through 8. The OU3 ROD and the Amended Consent Decree set a performance standard of 61 ug/L for TCP. During the past five years, TCP above this concentration was detected in 13 out of 17quarters in ERT-27S, and once (62 ug/L) during 14 sampling events in URS-24S. Therefore,

in 2007, only ERT-27S was analyzed for TCP. The results from 2007 continued to reflect significant variability with an overall downward trend.

Benzene and TCP Statistical Trend Analysis

The analysis of benzene and TCP monitoring, Table 12, was performed by NLC in 2006, and the results were evaluated by Dr. Wilson, EPA.

The ERT-27S statistical analysis indicates that benzene concentrations will be in compliance within 31.3 years at the current rate of attenuation, instead of 30 years predicted in modeling. Comparing the mean annual concentrations:

- Geometric mean TCP concentration in ERT-27S, 2004 = 3914 μg/L
- Geometric mean TCP concentration in ERT-27S, 2006 = 444 μg/L

Statistical comparison of the two data sets using the Mann Whitney U test indicates that the sets are different with a 90% confidence. Although this non-parametric test does not quantify the trend, it supports the conclusion that the plume is decreasing. The URS -24S statistical analysis indicates that benzene concentrations will be in compliance within 31.5 years at the current rate of attenuation, instead of 30 years predicted in modeling. Comparing the mean annual concentrations::

- Geometric mean benzene concentration in URS-24S, 203 to 204 = 51,679 μg/L
- Geometric mean benzene concentration in URS-24S, 106 to 406 = 22,176 μg/L

Statistical comparison of the two data sets using the Mann Whitney U test indicates that the sets are different with a 83% confidence. Although this non-parametric test does not quantify the trend, it supports the conclusion that the plume is decreasing.

6.4.2 Surface Water Data

Surface water samples were collected annually at four locations (see Figure 2), two upstream and two downstream of the Site. They were analyzed for metals. During the last five years, there were no metals detected in surface water above their respective PQLs except for two locations in 2005 where lead was slightly above the PQL. In these two cases, the results were not substantially above the level reported in the laboratory calibration blank. The upstream samples were approximately the same as the downstream samples for all the analytes detected, therefore, the Site is not impacting surface water.

6.4.3 Air Monitoring Data

Air samples were analyzed annually for combustible gas from eleven locations within the vent pipes, pipeline monitoring ports, and golf support buildings. There was no combustible gas concentrations above ambient air background in the buildings or in the ambient air near the cap vents or pipeline sampling points with the following exceptions:

- At location A-1, cap vent, 13% of the Lower Explosive Limit (LEL) was detected in 2003
- At location A-2, cap vent, 17 % of LEL was detected in 2003
- at location AP-9, pipeline monitoring port, 2 % of LEL was detected in 2004,
- at location A-1, cap vent, 8% of LEL, was detected in 2006
- at location A-3, cap vent, 5 % of LEL was detected in 2006.

However, photoionization detector readings at these locations were all zero.

6.5 SITE INSPECTION

An inspection of the site was conducted on January 18, 2008.

The inspection was attended by Mr. Romuald Roman, EPA Remedial Project Manger, Ms. Dawna Sonders, PADER RPM, Ms. Marian Dietrich, NLC, Mr. Bruce Crocker, NLC, Mr. Dennis Guthrie, URS Corporation, Mr. Don Smith, Director, Conference and Facility Services, RMU, Mr. Scott Baldwin, ISC Maintenance, RMU, and Mr. Peter Pezzin, Director, Construction & Maintenance, RMU.

The purpose of the inspection was to assess the protectiveness of the remedy, including the integrity of the caps and athletic field surfaces, the integrity of the monitoring wells and gas vents, and the presence and condition of signs located along the shoreline warning fisherman not to eat bottom feeding fish and signs along the top of the slope to the river bank warning the public to stay off of the slopes. No significant issues were identified at any time regarding the multilayer cap, erosion cap, monitoring wells, gas vents, or warning signs. The institutional controls have been put in place by NLC implementing deed restrictions to prohibit residential development and use of groundwater from the Site. No development of the Site is allowed which is incompatible with the multilayer cap. During the site visit, no activities were observed that would have violated the institutional controls. The multilayer cap and the erosion caps were protected by additional layers of soil used to level the athletic field. No uses of groundwater were observed.

During the walk-through, the inspectors evaluated the distance between the cap and nearest residence and discussed whether there is a potential for vapor intrusion into the basement of residential homes. Since there is almost 500 feet between the edge of the cap and the nearest residence, they agreed that there is no need to perform an additional vapor intrusion study. The inspectors also noticed that there is no need to maintain a fence at the Von Reise Lane, because the ISC is open to the public.

7.0 TECHNICAL ASSESSMENT

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

Yes, the remedy for OU1 and OU3 is functioning as intended by the OU1 and OU3 RODs.

Operable Unit-1 Multi-layer cap, erosion cap and gas collection/venting system

Multi-layer caps with gas collection/venting systems were constructed over areas where waste disposal trenches were located. In addition, a vertical barrier wall was constructed at a location where tar-like material had been observed emerging from a slope adjacent to the Ohio River back channel. Based on monitoring results of the surface water, groundwater, and gas, the capping of waste has been effective in reducing the risk of direct contact exposure to the soil contamination and controlling the migration of contaminated soil. The multilayer cap is effective in limiting the further migration of contaminants to the groundwater, the surface water, and the sediments. The benzene plume in the groundwater does not migrate toward the municipal wells. The plume has decreased in size and magnitude since the RI. The concentrations of the benzene plume appear to be trending downward, therefore the caps appear to be effective in limiting further migration in the groundwater. Prior to installation of riprap along the Back Channel banks, stream sediment from the capped areas sediment could be collected in storm water inlets. Since 2004, these sampling points do not contain sediment and were, therefore, not sampled. This indicates that the caps are effective in limiting erosion. During the site inspection, the inspectors did not observe erosion rills anywhere in the capped areas and the entire OU1 was covered by a good stand of well maintained grass. The surface water monitoring data for metals did not indicate any difference in concentrations upstream or downstream of the Site. Observation of the river bank in the vicinity of the vertical barrier wall did not reveal the presence of any tar seeps indicating that the barrier wall has been effective in containing the tar seeps.

Institutional controls

Institutional controls have been implemented to discourage fisherman from eating bottom-feeding fish and the public from visiting the slopes and riverbanks. In addition, deed restrictions were imposed to 1) prohibit residential development of the site, 2) prohibit any use that is incompatible with a multi-layer cap, and 3) prohibit the use of groundwater from the site. The deed restrictions were filed in the Recorder of Deeds Office for Allegheny County, Pennsylvania on September 10, 2002. These institutional controls appear to be effective.

Operable Unit-3 Groundwater

The groundwater remedy for OU3 started in 2004 and its statistical evaluation was performed in 2006. The monitoring revealed that natural attenuation reduced the concentrations of benzene and 2,4,6-trichlorophenol in groundwater beneath the site. The compliance is measured in the monitoring wells located along the Back Channel shoreline. By the end of 2006 the concentrations of benzene and 2,4,6-trichlorophenol achieved the levels required by the Performance Standards in all but two wells located along the Back Channel shoreline. Ongoing monitoring of other natural attenuation parameters indicates that anaerobic natural attenuation within the plume continues as expected in the OU3 ROD. In February 2008, John T. Wilson, Ph.D., EPA, Ada, Oklahoma, evaluated monitoring data and their statistical interpretation and stated that : "In general the behavior of benzene and trichlorophenol contamination in ground water is behaving as expected, and monitored natural attenuation as a remedy meets the expectations set forth in the ROD." Attenuation is occuring, but performance standards have not been achieved.

7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEAN-UP LEVELS, AND RAOs USED AT THE TIME OF THE REMEDY SELECTION STILL VALID?

There have been no changes in the physical conditions of the site and the exposure assumptions that would affect the protectiveness of the remedy.

7.2.1 Changes in Standards and To Be Considers (TBCs)

All ARARs cited in the OU1 and OU3 RODs have been met. During the last five years, the industrial risk-based concentrations ("RBCs") for some compounds have changed, i.e.

benzo(a)pyrene (from 780 ppb at the time of the first Five-year review to 390 ppb) and benzo(a)anthracene (from 7800 ppb to 3900 ppb). Those changes, however, are not expected to result in additional risk for this site, since the remediation goals were based on the EPA Region III Risk- Based Concentration (RBC) table for industrial land use, dated April 19, 1996. The latest EPA Region III RBC table (2007) indicates that the concentrations utilized at the time of the ROD have not changed and are still applicable.

The only change in the risk assessment methodology that may result in additional remediation is the evaluation of vapor intrusion into buildings. A qualitative assessment presented in 7.3 indicates, however, that the probability of vapor intrusion into buildings onsite is very low.

7.2.2 Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the human health risk assessment for the Ohio River Park Site are listed in both the OU1 and OU3 RODs. In the OU1 ROD areas of soil contamination in excess of 7800 ppb for benzo(a)anthracene and 780 ppb for benzo(a)pyrene were to be covered by the multilayer cap.

Similarly the groundwater cleanup levels listed in the OU3 ROD were based on National Primary Drinking Water Standards Maximum Contaminant Levels (MCLs) and EPA Region III RBCs. Benzene and 2,4,6-trichlorophenol are indicator contaminants at the property boundary. The most recent MCLs (2006) and the most recent EPA Region III RBC table were reviewed, and EPA determined that the levels of COCs did not change since the OU3 ROD was signed.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT CALLS INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

The potential for exposure to toxic vapors generated beneath the cap and entering residences and ISC buildings was evaluated during the final on-site inspection and during evaluation of the sampling data.

There are two occupied buildings constructed over the cap. The Golf Dome and the Golf Dome Support Building (GDSB), also called "Pro-Shop". They are attached by a small corridor and air-lock doors. The golf dome is an air-supported building that is under constant positive pressure and it is unlikely that vapors can intrude into this building. Therefore, the only building on the cap with a potential for a vapor intrusion that could be affected is the GDSB.

The ice ring building is located outside the cap covering the groundwater plume. The nearest residential home is located even further, 485 feet, from the edge of the cap.

There are several reasons why the potential for vapor intrusion into the GDSB is not considered as likely:

1. The Golf Dome and GDBS are constructed over a multi-layer cap system. The first layer over the disposal area is an engineered soil fill which is sloped away from the center of the multi-layer cap to allow infiltrating water and vapors to drain towards a collection system around the cap perimeter. The second layer is a granular liner-subgrade material that aids in venting potential vapors to the gas collection and venting system. This gas venting system consists of a series of perforated pipes in gravel-filled trenches that direct vapors to the five cap vents installed through sealed penetrations in the cap liner. Because these vents direct soil gas away from the golf dome and GDSB, the existing system most likely prevents vapor intrusion into the building.

2. A 40-mil HDPE liner, located above the engineered soil fill, creates a "vapor cap". It is installed over the liner subgrade followed by a granular drainage layer intended to direct infiltrating water away from the liner. An additional layer of granular fill is installed on top of the drainage layer under the two buildings. In the event some vapors would escape the gas collection system and penetrate the HDPE liner, the granular fill under the buildings would further vent them away from the buildings.

3. The GDSB is constructed with a reinforced concrete floor slab to further impede vapors from entering the building.

4. Combustible landfill gas has not been detected in either of the two buildings over the past seven years of air sampling and combustible gas has only rarely been detected in cap vents themselves.

In conclusion, at the time of this Five-year Review Report, vapors are not expected to reach either building, and vapor intrusion is unlikely a pathway of concern for the existing buildings onsite.

To ensure safety of future users of the ISC, in the event there are any structures constructed in the future at the site, their design should consider installing the vapor intrusion system.

There is no other information that calls into question the protectiveness of the remedy as specified in the OU1 and OU3 RODs.

7.4 TECHNICAL ASSESSMENT SUMMARY

According to the data reviewed and the site inspection, the OU1 and the OU3 remedy is functioning as intended by the OU1 ROD and there is nothing to indicate that the remedy selected for OU3 will not continue to be effective. There have been no significant changes in the physical conditions of the site that would affect the protectiveness of the remedies, because the source and levels of a potential exposure slightly decreased since the signing of the RODs. There is no other information that calls into question the protectiveness of the selected remedies.

8.0 ISSUES

No issues were identified during this Five-year Review.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

There were no recommendations resulting from issues identified in this five-year review. However, in the event a new structure would be planned on the cap or in the vicinity of the groundwater plume, a potential of vapor intrusion must be evaluated during the design phase of the project.

10.0 PROTECTIVENESS STATEMENT

Available information suggests that, in the short term, the remedy for OU1 and OU3 is functioning as intended and is protective of human health and the environment. Long-term protectiveness of the remedy is expected to be achieved through natural attenuation of contaminants in groundwater.

11.0 NEXT REVIEW

The next Five-year Review will be completed no later than five years from the signature date of this Five-year Review.

APPENDIX A

PHOTOGRAPHS

Photo 1
Well URS-24S

Photo 2
Well ERT-27

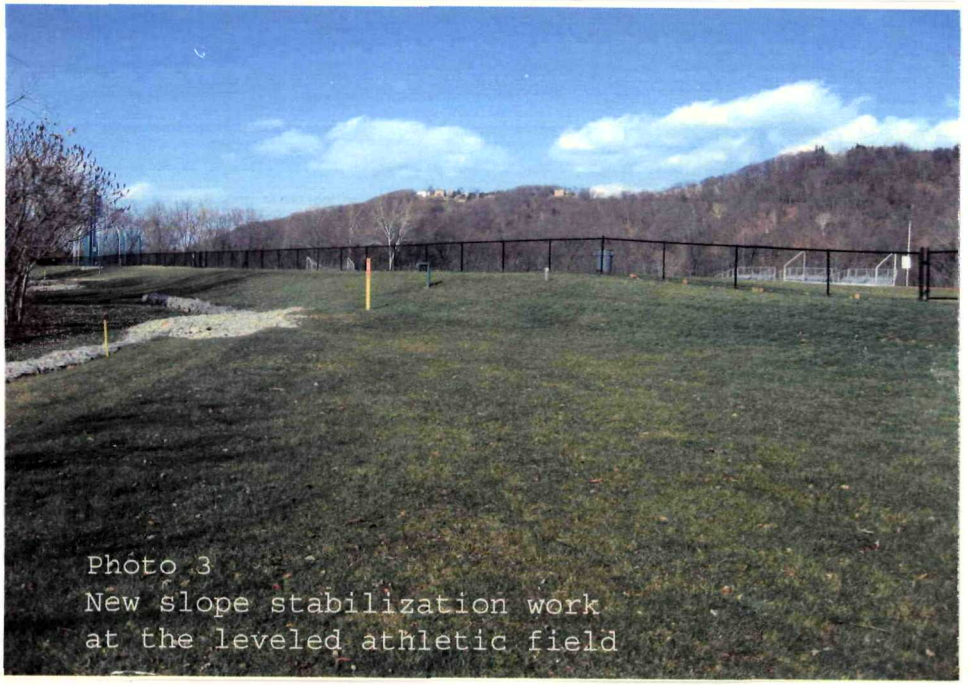


Photo 3
New slope stabilization work
at the leveled athletic field

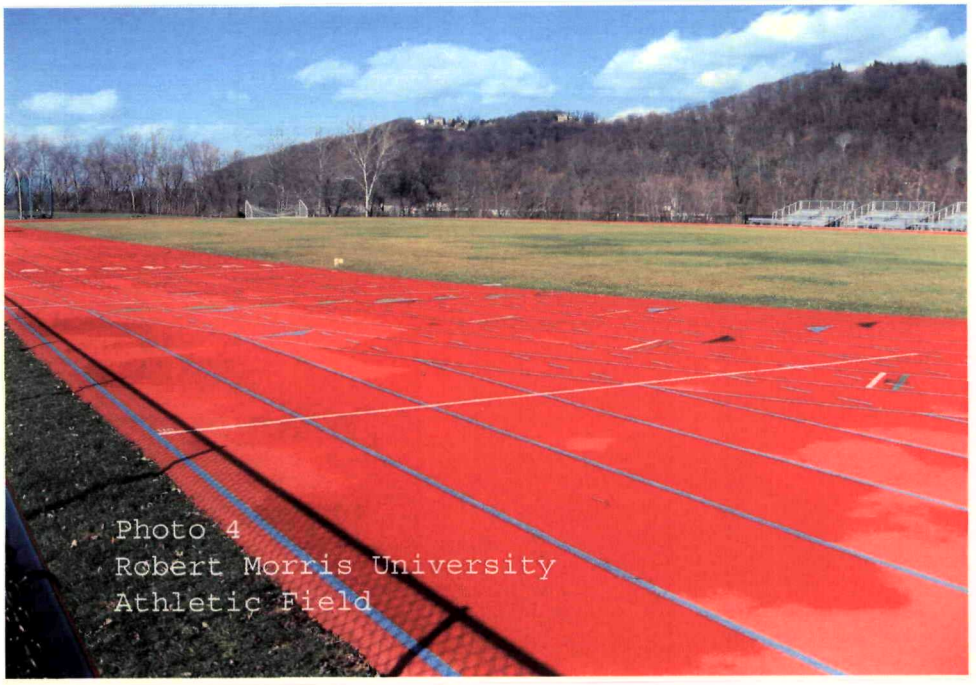


Photo 4
Robert Morris University
Athletic Field

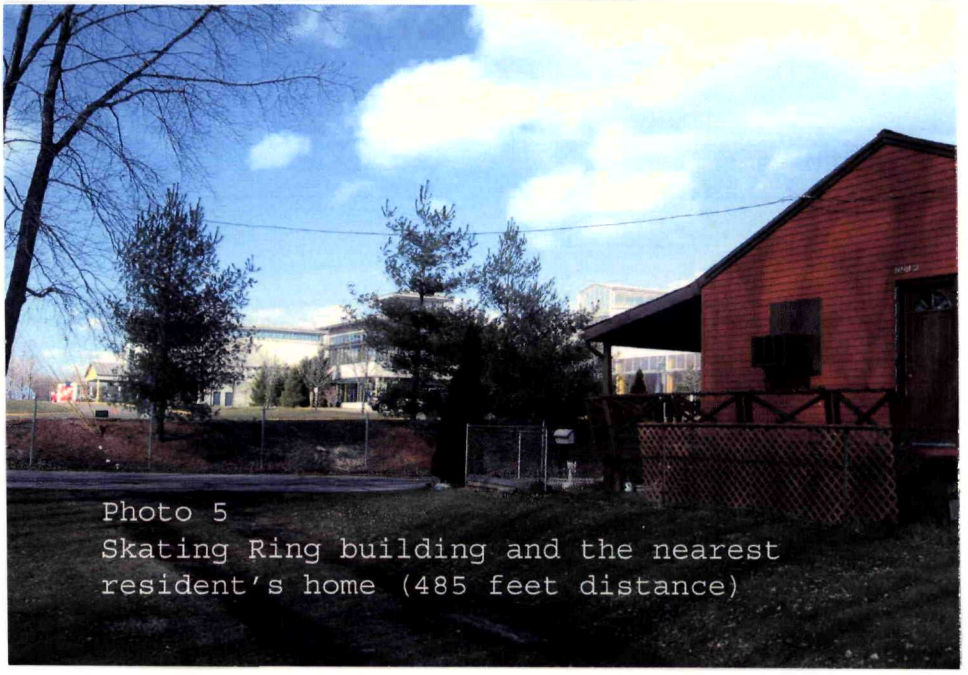
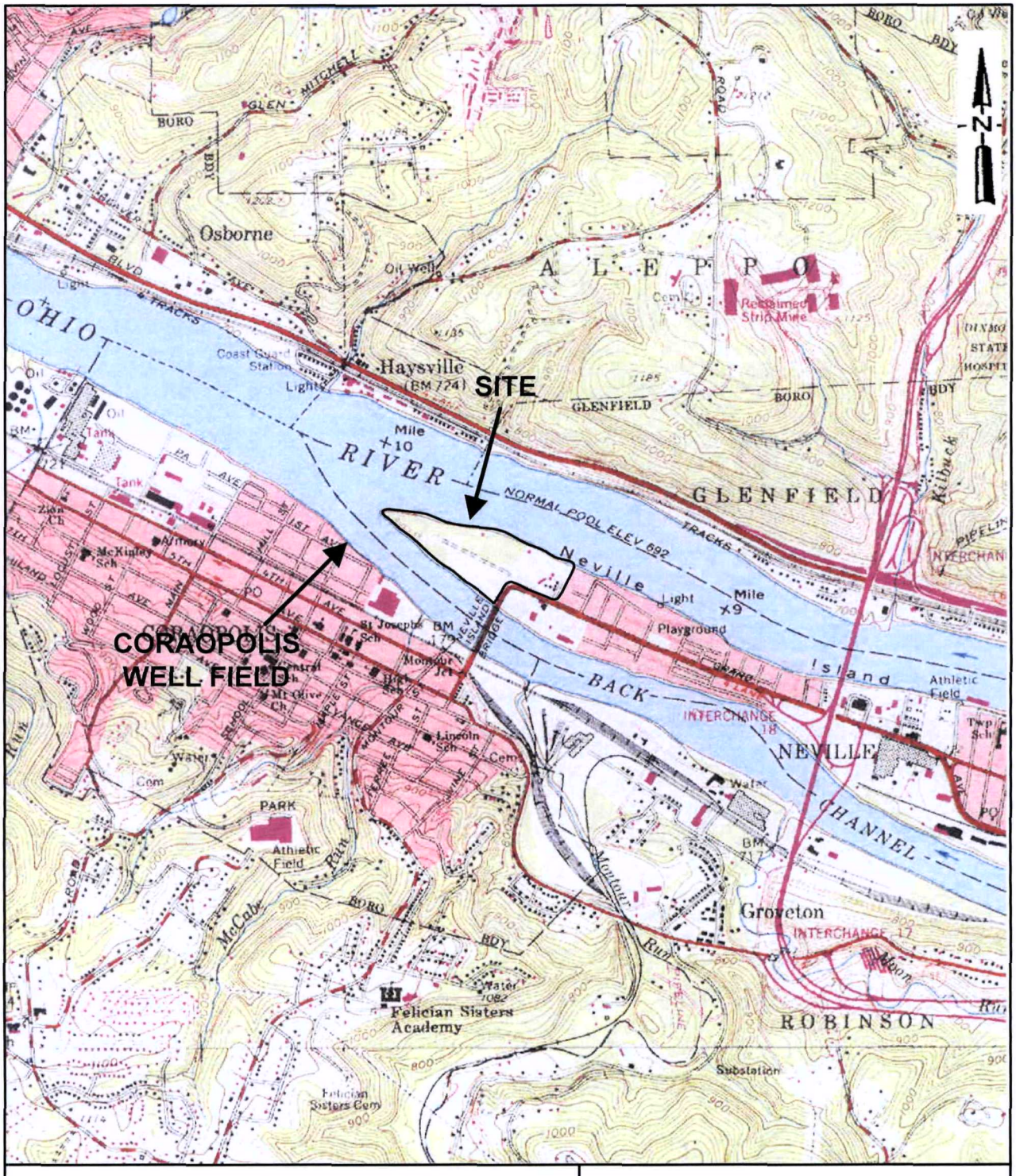


Photo 5
Skating Ring building and the nearest
resident's home (485 feet distance)

APPENDIX B

FIGURES



0 2000 4000

APPROXIMATE SCALE IN FEET

BASE MAP SOURCE: USGS 7.5 minute topographic quadrangle map Ambridge, PA 1960 (Photorevised 1990), Emsworth, PA 1960 (Photorevised 1979), Oakdale, PA 1960 (Photorevised 1990) and Pittsburgh West, PA 1993

FIGURE 1
SITE VICINITY MAP
OHIO RIVER SITE
NEVILLE TOWNSHIP, PA 15225

URS

JOB NO. 46230-001-029

E -4000 | E -3500 | E -3000 | E -2500 | E -2000 | E -1500

N

OHIO RIVER (MAIN CHANNEL)

ERT 32S

Restaurant

Mini-Golf Facility

Ice Rink Building

N -8000

ERT 49S

ERT 49D

Future Short Game Center

ERT 42D

ERT 38M

30' ROAD

ERT 45S

DM 54D

DM 53D

DM 53S

DM 51S

ERT 46S

Golf Dome Indoor Field Area

Driving Range Tees

Golf Dome Support Building

ERT 24M

URS 24S

DM 24D

DM 58S

DM 58M

DM 57

N -8500

Batting Cages

ERT-6 M

DM 59

DM 26D

ERT 26M

ERT 41D

DM 41M

ERT 27S

OHIO RIVER (BACK CHANNEL)

SENTINEL WELL

BASE MAP SOURCE: The Gateway Engineers, Inc.
Survey, April 12, 1995
Revised 8/00 to reflect as-built conditions

APPROXIMATE SHORELINE OF OHIO RIVER BACK CHANNEL (CORAOPOLIS SIDE)

— — LIMITS OF CAPPED AREA

Wells to be sampled for OU-1 and OU-3

- WATER LEVEL MEASUREMENT ONLY
- CONVENTIONAL MONITORING WELL
- BARCAD MONITORING WELL

0 100 200
GRAPHIC SCALE

SCALE: AS SHOWN		
PROJECT No. 46200-007-028		
–	–	–
DR BY	DM/AP	11/29/01
–	–	–
APP BY	DAB	12/2/01

PROJECT:
OHIO RIVER SITE
NEVILLE TOWNSHIP, PENNSYLVANIA
URS
Figure 2

SHEET TITLE:
Groundwater Monitoring Locations

5

\\Pghgnt2\Data\Projects\Neville Island Park\Drawings\Draft Site EMP SAMPLE LOCATION Rev.dwg

E -4000 | E -3500 | E -3000 | E -2500 | E -2000 | E -1500

N -8000

N -8500

OHIO RIVER (MAIN CHANNEL)

OHIO RIVER (BACK CHANNEL)

APPROXIMATE SHORELINE OF OHIO RIVER BANK CHANNEL (CORAOPOLIS SIDE)

SW-1 △

SW-2 △

SW-3 △

SW-4 △

Restaurant

Ice Rink Building

Mini-Golf Facility

Future Short Game Center

Golf Dome Indoor Field Area

Driving Range Tees

Golf Dome Support Building

Batting Cages

30th STREET ROAD

Drainage Chute

A-1 A-2 A-3 A-4 A-5

AP-6 AP-7 AP-8 AP-9

AB-11 AB-12

720 722 724 726 728 730 732 716 718

LEGEND:

- A-3 ■ Cap Vent Air Monitoring Station Location and Identification
- AP-6 △ Pipeline Air Monitoring Station Location and Identification
- AB-11 ● Building Air Monitoring Station Location and Identification
- 720 — — — Existing Topographic Contour
- —·—·— Multi-Layer Cap Limits
- SW-1 △ Surface Water Sample Location

BASE MAP SOURCE: The Gateway Engineers, Inc. Survey, April 12, 1996.
Revised 9/99 to reflect as-built conditions

0 100 200
GRAPHIC SCALE

SCALE: AS SHOWN		
PROJECT No. 46230-001-3030		
-	-	-
DR BY	DM/AP	11/29/01
-	-	-
APP BY	DAG	12/2/01

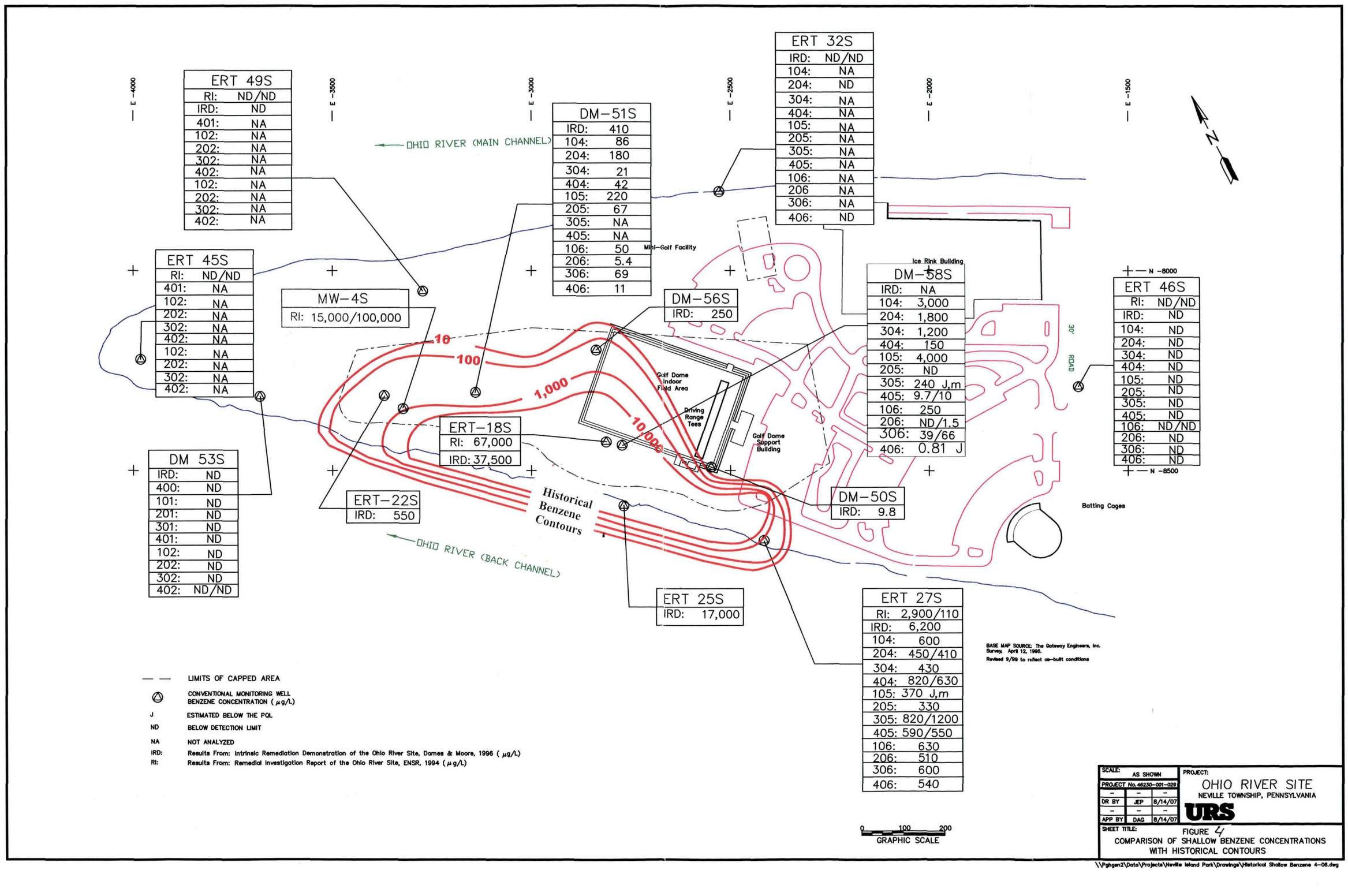
PROJECT:
OHIO RIVER SITE
NEVILLE TOWNSHIP, PENNSYLVANIA

URS

Figure 3

SHEET
Gas Emissions and Surface Water Monitoring Locations

\\Pghgen2\Data\Projects\Neville Island Park\Drawings\monitoring stations.dwg



— — LIMITS OF CAPPED AREA

CONVENTIONAL MONITORING WELL BENZENE CONCENTRATION (µg/L)

J ESTIMATED BELOW THE PQL

ND BELOW DETECTION LIMIT

NA NOT ANALYZED

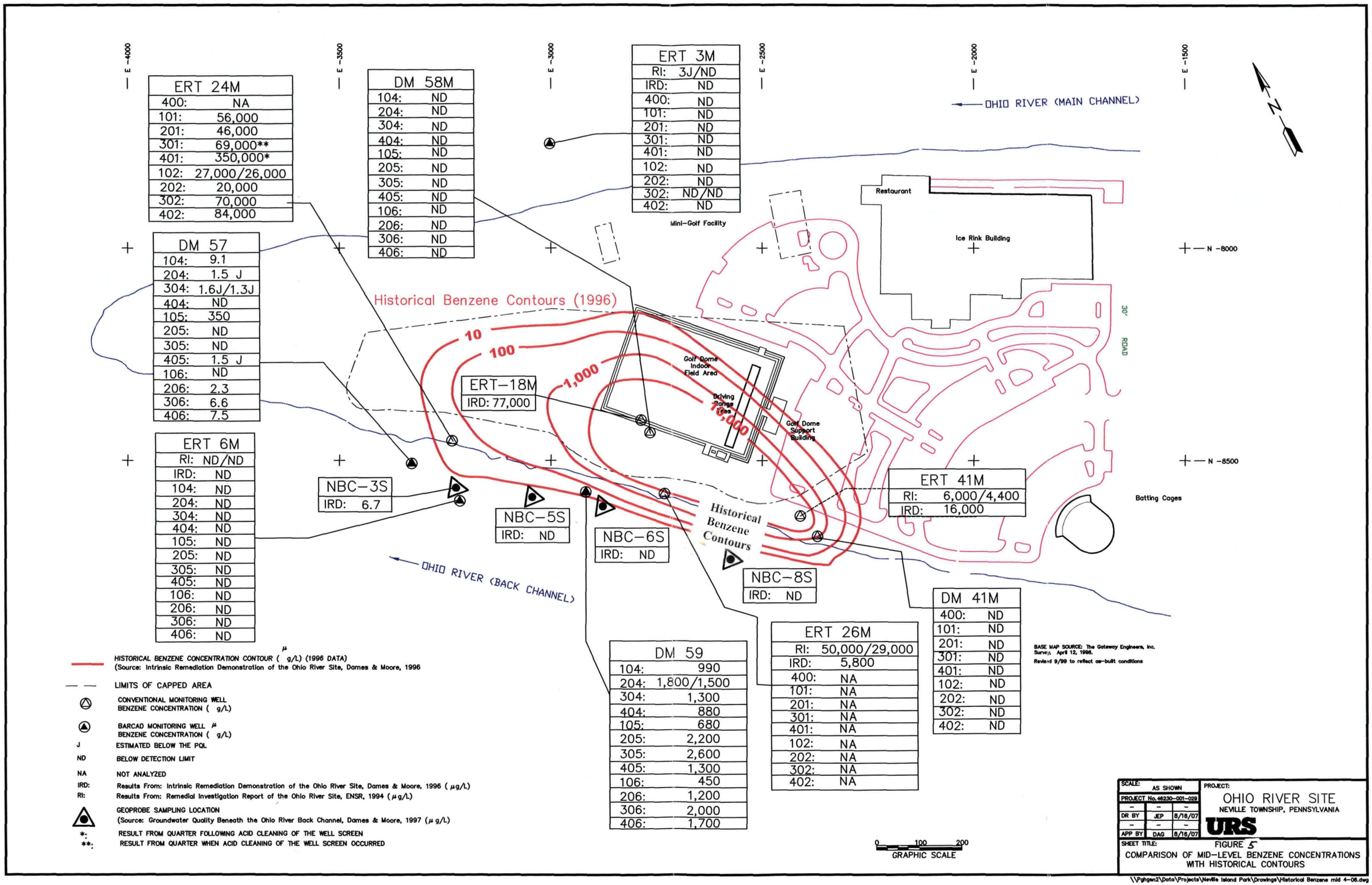
IRD: Results From: Intrinsic Remediation Demonstration of the Ohio River Site, Dames & Moore, 1996 (µg/L)

RI: Results From: Remedial Investigation Report of the Ohio River Site, ENSR, 1994 (µg/L)

BASE MAP SOURCE: The Gateway Engineers, Inc. Survey, April 12, 1996.
Revised 9/99 to reflect as-built conditions

SCALE: AS SHOWN		PROJECT: OHIO RIVER SITE NEVILLE TOWNSHIP, PENNSYLVANIA
PROJECT No. 46230-001-029		
–	– –	
DR BY	JEP 8/14/07	URS
–	– –	
APP BY	DAG 8/14/07	
SHEET TITLE: FIGURE 4 COMPARISON OF SHALLOW BENZENE CONCENTRATIONS WITH HISTORICAL CONTOURS		

\\Pghgen2\Data\Projects\Neville Island Park\Drawings\Historical Shallow Benzene 4-06.dwg


E -4000
E -3500
E -3000
E -2500
E -2000
E -1500
N -8000
N -8500
OHIO RIVER (MAIN CHANNEL)
OHIO RIVER (BACK CHANNEL)
Historical Benzene Contours (1996)
10
100
1,000
10,000
Historical Benzene Contours
Restaurant
Ice Rink Building
Golf Dome Indoor Field Area
Driving Range Tees
Golf Dome Support Building
Mini-Golf Facility
Batting Cages
30' ROAD
ERT-18M
IRD: 77,000
NBC-3S
IRD: 6.7
NBC-5S
IRD: ND
NBC-6S
IRD: ND
NBC-8S
IRD: ND
ERT 41M
RI: 6,000/4,400
IRD: 16,000
ERT 24M
400: NA
101: 56,000
201: 46,000
301: 69,000**
401: 350,000*
102: 27,000/26,000
202: 20,000
302: 70,000
402: 84,000
DM 58M
104: ND
204: ND
304: ND
404: ND
105: ND
205: ND
305: ND
405: ND
106: ND
206: ND
306: ND
406: ND
ERT 3M
RI: 3J/ND
IRD: ND
400: ND
101: ND
201: ND
301: ND
401: ND
102: ND
202: ND
302: ND/ND
402: ND
DM 57
104: 9.1
204: 1.5 J
304: 1.6J/1.3J
404: ND
105: 350
205: ND
305: ND
405: 1.5 J
106: ND
206: 2.3
306: 6.6
406: 7.5
ERT 6M
RI: ND/ND
IRD: ND
104: ND
204: ND
304: ND
404: ND
105: ND
205: ND
305: ND
405: ND
106: ND
206: ND
306: ND
406: ND
DM 59
104: 990
204: 1,800/1,500
304: 1,300
404: 880
105: 680
205: 2,200
305: 2,600
405: 1,300
106: 450
206: 1,200
306: 2,000
406: 1,700
ERT 26M
RI: 50,000/29,000
IRD: 5,800
400: NA
101: NA
201: NA
301: NA
401: NA
102: NA
202: NA
302: NA
402: NA
DM 41M
400: ND
101: ND
201: ND
301: ND
401: ND
102: ND
202: ND
302: ND
402: ND
HISTORICAL BENZENE CONCENTRATION CONTOUR (μg/L) (1996 DATA)
(Source: Intrinsic Remediation Demonstration of the Ohio River Site, Dames & Moore, 1996
LIMITS OF CAPPED AREA
CONVENTIONAL MONITORING WELL BENZENE CONCENTRATION (μg/L)
BARCAD MONITORING WELL BENZENE CONCENTRATION (μg/L)
J ESTIMATED BELOW THE PQL
ND BELOW DETECTION LIMIT
NA NOT ANALYZED
IRD: Results From: Intrinsic Remediation Demonstration of the Ohio River Site, Dames & Moore, 1996 (μg/L)
RI: Results From: Remedial Investigation Report of the Ohio River Site, ENSR, 1994 (μg/L)
GEOPROBE SAMPLING LOCATION
(Source: Groundwater Quality Beneath the Ohio River Back Channel, Dames & Moore, 1997 (μg/L)
*: RESULT FROM QUARTER FOLLOWING ACID CLEANING OF THE WELL SCREEN
**: RESULT FROM QUARTER WHEN ACID CLEANING OF THE WELL SCREEN OCCURRED
0 100 200
GRAPHIC SCALE
BASE MAP SOURCE: The Gateway Engineers, Inc. Survey, April 12, 1996.
Revised 9/99 to reflect as-built conditions
SCALE: AS SHOWN
PROJECT No. 46230-001-029
DR BY JEP 8/16/07
APP BY DAG 8/16/07
PROJECT: OHIO RIVER SITE
NEVILLE TOWNSHIP, PENNSYLVANIA
URS
SHEET TITLE: FIGURE 5
COMPARISON OF MID-LEVEL BENZENE CONCENTRATIONS WITH HISTORICAL CONTOURS
\\Pghgn2\Data\Projects\Neville Island Park\Drawings\Historical Benzene mid 4-08.dwg

E -4000 | E -3500 | E -3000 | E -2500 | E -2000 | E -1500

N

OHIO RIVER (MAIN CHANNEL)

DM 54D	
6/96:	ND
400:	NA
101:	NA
201:	NA
301:	NA
401:	NA
102:	NA
202:	NA
302:	NA
402:	NA

DM-24D	
104:	34
204:	ND
304:	140/140
404:	11
105:	ND
205:	ND/ND
305:	ND
405:	16,000
106:	150
206:	1.4
306:	ND/ND
406:	ND

ERT 49D	
RI:	ND/ND
IRD:	ND
400:	ND
101:	ND
201:	ND
301:	ND
401:	ND
102:	ND
202:	ND
302:	ND
402:	ND

Historical Benzene Contours (1996)

100
10
1,000
10,000
100,000

Historical Benzene Contours

ERT-18D	
IRD:	210,000

DM-51D	
IRD:	4,500

DM 53D	
IRD:	ND
400:	ND
101:	ND/ND
201:	ND
301:	ND
401:	ND
102:	ND
202:	ND
302:	ND
402:	ND

NBC-2D	
IRD:	ND

NBC-3D	
IRD:	1

NBC-5D	
IRD:	ND

NBC-6D	
IRD:	ND

NBC-1D	
IRD:	ND

OHIO RIVER (BACK CHANNEL)

NBC-7D	
IRD:	ND

NBC-4D	
IRD:	ND

DM-26D	
104:	ND
204:	ND
304:	ND
404:	ND
105:	ND/ND
205:	ND/ND
305:	ND
405:	ND
106:	ND
206:	ND
306:	ND
406:	ND

NBC-8D	
IRD:	ND

DM-50D	
IRD:	33

NBC-9D	
IRD:	ND

ERT 42D	
RI:	ND/ND
IRD:	ND
400:	ND
101:	ND/ND
201:	ND/ND
301:	ND
401:	ND
102:	ND
202:	ND
302:	ND/ND
402:	ND

ERT 41D	
RI:	16
IRD:	ND
400:	ND
101:	ND
201:	ND
301:	ND
401:	ND
102:	ND
202:	ND/ND
302:	ND
402:	ND

Restaurant
Mini-Golf Facility
Ice Rink Building
Golf Dome Indoor Field Area
Driving Range Tees
Golf Dome Support Building
30' ROAD
Batting Cages

N -8000
N -8500

BENZENE CONCENTRATION CONTOUR (µg/L) (1996 DATA)
(Source: Groundwater Quality Beneath the Ohio River Back Channel, Dames & Moore, 1997)

LIMITS OF CAPPED AREA

CONVENTIONAL MONITORING WELL
BENZENE CONCENTRATION (µg/L)

J ESTIMATED BELOW THE PQL

ND BELOW DETECTION LIMIT

NA NOT ANALYZED

IRD: Results From: Intrinsic Remediation Demonstration of the Ohio River Site, Dames & Moore, 1996 (µg/L)

RI: Results From: Remedial Investigation Report of the Ohio River Site, ENSR, 1994 (µg/L)

GEOPROBE SAMPLING LOCATION
(Source: Groundwater Quality Beneath the Ohio River Back Channel, Dames & Moore, 1997 (µg/L)

0 100 200
GRAPHIC SCALE

BASE MAP SOURCE: The Gateway Engineers, Inc.
Survey April 12, 1996.
Revised 9/99 to reflect as-built conditions

SCALE:	AS SHOWN	
PROJECT No. 46230-001-029		
–	–	–
DR BY	JEP	8/16/07
–	–	–
APP BY	DAG	8/16/07

PROJECT:
OHIO RIVER SITE
NEVILLE TOWNSHIP, PENNSYLVANIA

URS

SHEET TITLE:
FIGURE 6
COMPARISON OF DEEP BENZENE CONCENTRATIONS
WITH HISTORICAL CONTOURS

\\Pghgen2\Data\Projects\Neville Island Park\Drawings\Historical Benzene Deep 4-06.dwg

APPENDIX C

TABLES

Table 1

Benzene Concentrations in Groundwater, 2003 (µg/L)

Quarter	103		203		303	
Well	Result	Flag	Result	Flag	Result	Flag
DM-24D	5	U	0.77	J	11,000	
DM-26D	5	U	5	U	5	U
DM-41M	5	U	5	U	5	U
DM-41M	5	U	NA		NA	
DM-51S	52		35		38	
DM-53D	5	U	5	U	5	U
DM-53S	5	U	5	U	5	U
DM-57	1.1	J	2.1	J	2.8	J
DM-57 (dup)	NA		NA		5	U
DM-58M	5	U	29	J,m	5	U
DM-58M (dup)	5	U	NA		NA	
DM-58S	1.7	J	29		15	
DM-58S (dup)	NA		29		13	
DM-59	6700		2100		1200	
ERT-24M	41000		32000		19000	
ERT-27S	580		440		590	
ERT-27S (dup)	NA		520		NA	
ERT-32S	5	U	5	U	5	U
ERT-3M	5	U	5	U	5	U
ERT-3M (dup)	NA		NA		NA	
ERT-41D	5	U	5	U	5	U
ERT-41D(dup)	NA		NA		5	U
ERT-42D	5	U	5	U	5	U
ERT-46S	5	U	5	U	5	U
ERT-46S (dup)	NA		5	U		
ERT-49D	5	U	5	U	5	U
ERT-6M	5	U	5	U	5	U
ERT-6M (dup)	NA		NA		NA	
Sentinel Well	5	U	5	U	5	U
Sentinel Well	NA		NA	5		U
URS-24S	NA		32000		61000	

Notes:

U = Not Detected, PQL shown

dup = Duplicate Sample

J = Estimated Value

NA = Duplicate Not Analyzed this quarter

Table 2

Benzene Concentrations in Groundwater (µg/L) 104 through 205

Quarter	104		204		304		404		105		205	
Well	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
DM-24D	34		5	U	140		11		5	U	5	U
DM-24D (dup)	34		NA		140		NA		NA		5	U
DM-26D	5	U	5	U	5	U	5	U	5	U	5	U
DM-26D (dup)	NA		NA		NA		NA		5	U	5	U
DM-51S	86		180		21		42		220		67	
DM-57	9.1		1.5	J	1.6	J	5	U	350		5	U
DM-57 (dup)	NA		NA		1.3	J	NA		NA		NA	
DM-58M	5	U	5	U	5	U	5	U	5	U	5	U
DM-58M (dup)	NA		NA		NA		NA		NA		NA	
DM-58S	3,000		1,800		1,200		150		4,000		5	U
DM-58S (dup)	NA		NA		NA		NA		NA		NA	
DM-59	990		1,800		1,300		880		680		2,200	
DM-59 (dup)	NA		1,500		NA		NA		NA		NA	
ERT-27S	600		450		430		820		370	J,m	330	
ERT-27S (dup)	NA		410		NA		630		NA		NA	
ERT-32S	NA		5	U	NA		NA		NA		NA	
ERT-46S	50	U	5	U	5	U	5	U	5	U	5	U
ERT-46S (dup)	NA		NA		NA		NA		NA		NA	
ERT-6M	5	U	5	U	5	U	5	U	5	U	5	U
ERT-6M (dup)	NA		NA		NA		NA		NA		NA	
Sentinel Well	5	U	5	U	5	U	5	U	5	U	5	U
Sentinel Well (dup)	5	U	NA		NA		5	U	NA		NA	
URS-24S	58,000		63,000		24,000		33,000		59,000		7,600	
URS-24S (dup)	NA		NA		NA		NA		59,000		NA	

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample

J,m = Estimated, MS/MSD recovery failure
J = Estimated Value
NA = Not Analyzed this quarter

Table 3

Benzene Concentrations in Groundwater (µg/L) 305 through 406

Quarter	305		405		106		206		306		406	
Well	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
DM-24D	5	U	16,000		150		1.4	J	5	U	5	U
DM-24D (dup)	NA		NA		NA		NA		5	U	NA	
DM-26D	5	U	5	U	5	U	5	U	5	U	5	U
DM-26D (dup)	NA		NA		NA		NA		NA		NA	
DM-51S	NA		NA		50		5.4		69		11	
DM-57	5	U	1.5	J	5	U	2.3	J	6.6		7.5	
DM-57 (dup)	NA		NA		NA		NA		NA		NA	
DM-58M	5	U	5	U	5	U	5	U	5	U	5	U
DM-58M (dup)	NA		NA		NA		NA		NA		5	U
DM-58S	240	J,m	9.7		250		5	U	39		0.81	J
DM-58S (dup)	NA		10		NA		1.5	J	66		NA	
DM-59	2,600		1,300		450		1200		2000		1700	
DM-59 (dup)	NA		NA		NA		NA		NA		NA	
ERT-27S	1,200		590		630		510		600		540	
ERT-27S (dup)	820		550		NA		NA		NA		NA	
ERT-32S	NA		NA		NA		NA		NA		5	U
ERT-46S	5	U	5	U	5	U	5	U	25	U	5	U
ERT-46S (dup)	NA		NA		5	U	NA		NA		NA	
ERT-6M	5	U	5	U	5	U	5	U	5	U	5	U
ERT-6M (dup)	NA		NA		NA		NA		NA		NA	
Sentinel Well	5	U	5	U	5	U	5	U	1.9	J	5	U
Sentinel Well (dup)	5	U	NA		5	U	5	U	NA		NA	
URS-24S	27,000		39,000		64,000		5900		21,000		29000	
URS-24S (dup)	NA		NA		NA		NA		NA		32000	

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample
J,m = Estimated, MS/MSD recovery failure
J = Estimated Value
NA = Not Analyzed this quarter

Table 4

Benzene Concentrations in Groundwater (μg/L) 207 through 407

Quarter	207		307		407							
Well	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
DM-57	1.9	J	1.5	J	1.4	J						
DM-57 (dup)	NA		3	J	NA							
ERT-27S	420		NA		360							
ERT-27S (dup)	450		NA		NA							
Sentinel Well	5	U	5	U	5	U						
URS-24S	67000		NA		7600							
URS-24S (dup)	NA		NA		9300							

Notes: U = Not Detected, PQL shown
J = Estimated Value
dup = Duplicate Sample
NA = Not Analyzed this quarter

Table 5

2,4,6-Trichlorophenol Concentrations in Groundwater, 2003 (µg/L)

Quarter	103		203		303	
Well	Result	Flag	Result	Flag	Result	Flag
DM-24D	9.4U		9.5U		9.4U	
DM-26D	9.5U		10U		9.4U	
DM-41M	2.5J		9.7U		9.5U	
DM-41M (dup)	9.5U		NA		NA	
DM-51S	9.5U		9.4U		9.4U	
DM-53D	9.5U		9.7U		9.6U	
DM-53S	9.4U		9.5U		9.5U	
DM-53S (dup)	NA		NA		NA	
DM-57	9.5U		9.6U		57U	
DM-57 (dup)	NA		NA		NA	
DM-58M	9.6U		9.5U		9.7U	
DM-58M	9.4U		NA		NA	
DM-58S	9.5U		9.5U		9.4U	
DM-58S (dup)	NA		9.6U		9.4U	
DM-59	9.5U		9.5U		9.4U	
DM-59 (dup)	NA		NA		NA	
ERT-24M	190U		15		9.7U	
ERT-24M (dup)	NA		NA		NA	
ERT-27S	1200		9.4U		280U	
ERT-27S (dup)	NA		9.4U		NA	
ERT-32S	10		9.6U		9.5U	
ERT-32S (dup)	NA		NA		NA	
ERT-3M	9.8U		9.4U		9.4U	
ERT-3M (dup)	NA		NA		NA	
ERT-41D	9.5U		9.4U		9.5U	
ERT-41D (dup)	NA		NA		9.5U	
ERT-42D	9.6U		10U		9.5U	
ERT-42D (dup)	9.6U		10U		NA	
ERT-46S	9.7U		10U		19U	
ERT-46S (dup)	NA		9.4U		9.4U	
ERT-49D	9.5U		9.5U		9.5U	
ERT-6M	9.5U		9.6U		9.6U	
ERT-6M (dup)	NA		NA		NA	
Sentinel Well	9.4U		9.7U		9.5U	
Sentinel Well	NA		NA		9.5U	
URS-24S	NA		19		29	

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample

J,m = Estimated, MS/MSD recovery failure
J = Estimated Value

Table 6

2,4,6-Trichlorophenol Concentrations in Groundwater (µg/L) 104 through 205

Quarter	104		204		304		404		105		205	
Well	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
DM-24D	9.8	U	9.4	U	9.4	U	10	U	9.4	U	10	U
DM-24D (dup)	9.5	U	NA		9.4	U	NA		NA		9.4	U
DM-26D	9.9	U	9.8	U	9.8	U, UJ,h	9.4	U	9.8	U	9.6	U
DM-26D (dup)	NA		NA		NA		NA		9.4	U	9.6	U
DM-51S	9.5	U	39	U	NA		9.4	U	10	U	9.4	U
DM-57	38	U	9.6	U	9.7	U	9.4	U	47	U R,s	39	U
DM-57 (dup)	NA		NA		NA		NA		NA		NA	
DM-58M	9.7	U	9.4	U	10	U	9.4	U	9.9	U	9.6	U
DM-58M (dup)	NA		NA		NA		NA		NA		NA	
DM-58S	9.7	U	9.5	UUJ,r	9.8	U	9.4	U	9.8	U	9.4	U
DM-58S (dup)	NA		NA		NA		NA		NA		NA	
DM-59	29	U	200	U	75	U	190	U	11	U	170	U
DM-59 (dup)	NA		9.7	U	NA		NA		NA		NA	
ERT-27S	5,100		7,700		1,700		3,200		3,800		18,000	
ERT-27S (dup)	NA		8,700		NA		3400		NA		NA	
ERT-32S	NA		9.4	U	NA		NA		NA		NA	
ERT-32S (dup)	NA		NA		NA		NA		NA		NA	
ERT-46S	9.5	U	9.7	UUJ,r	9.6	U	9.5	U	9.5	U	9.5	U
ERT-46S (dup)	NA		NA		NA		NA		NA		NA	
ERT-6M	9.8	U	11	U	9.8	U	12	U	10	U	11	U
ERT-6M (dup)	NA		NA		NA		NA		NA		NA	
Sentinel Well	9.5	U	9.5	UUJ,r	9.8	U	9.4	U	9.7	U	9.9	U R,s
Sentinel Well (dup)	10	U	NA		NA		9.4	U	NA		NA	
URS-24S	57		62		42		27		480	U	5.9	J
URS-24S (dup)	NA		NA		NA		NA		240	U	NA	

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample
UJ,r = Not detected, quantitation limit imprecise, ICAL linearity failure
R,s = Rejected, surrogate failure
UJ,r = Not detected, quantitation limit imprecise, holding time violation
J,m = Estimated, MS/MSD recovery failure
J = Estimated Value
NA = Not Analyzed this quarter

Table 7

2,4,6-Trichlorophenol Concentrations in Groundwater (µg/L) 305 through 406

Quarter	305		405		106		206		306		406	
Well	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
DM-24D	9.4	U	9.7	U	9.8	U	9.6	U	9.4	U	9.4	U
DM-24D (dup)	NA		NA		NA		NA		9.5	U	NA	
DM-26D	10	U	9.4	U	9.4	U	9.4	U	9.4	U	9.4	U
DM-26D (dup)	NA		NA		NA		NA		NA		NA	
DM-51S	NA		NA		9.6	U	9.9	U	NA		NA	
DM-57	9.9	U	11	UR,s	10	U	10	U	190	U	190	U
DM-57 (dup)	NA		NA		NA		NA		NA		NA	
DM-58M	10	U	9.5	U	9.5	U	9.4	U	9.5	U	9.4	U
DM-58M (dup)	NA		NA		NA		NA		NA		9.4	U
DM-58S	9.4	U	10	U	9.4	U	9.8	U	9.4	U	9.4	U
DM-58S (dup)	NA		9.9	UR,s	NA		9.7	U	9.4	U	NA	
DM-59	97	U	11	U	10	U R,s	9.4	U	190	U	190	U
DM-59 (dup)	NA		NA		NA		NA		NA		NA	
ERT-27S	22,000		550	J	1,300		3000		3200		9.9	U
ERT-27S (dup)	19,000		500	J	NA		NA		NA		NA	
ERT-32S	NA		NA		NA		NA		NA		9.8	U
ERT-46S	10	U	10	U	9.4	U	9.4	U	9.5	U	9.6	U
ERT-46S (dup)	NA		NA		9.7	U	NA		NA		NA	
ERT-6M	10	U	9.8	U	9.9	U	10	U	10	U	9.4	U
ERT-6M (dup)	NA		NA		NA		NA		NA		NA	
Sentinel Well	10	U	9.5	U	10	U	9.4	U	9.4	U	9.5	U
Sentinel Well (dup)	10	U	NA		9.4	U	9.6	U	NA		NA	
URS-24S	140	U	15		38		4	J	12	U	6.6	J
URS-24S (dup)	NA		NA		NA		NA		NA		6.4	J

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample
UJ,r = Not detected, quantitation limit imprecise, ICAL linearity failure
R,s = Rejected, surrogate failure
UJ,r = Not detected, quantitation limit imprecise, holding time violation
J,m = Estimated, MS/MSD recovery failure
J = Estimated Value
NA = Not Analyzed this quarter

Table 8

2,4,6-Trichlorophenol Concentrations in Groundwater (µg/L) 207 through 407

Quarter	207		307		407							
Well	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
ERT-27S	14000		NA		38	U						
ERT-27S (dup)	11000		NA		NA							

Notes: U = Not Detected, PQL shown
dup = Duplicate Sample
NA = Not Analyzed this quarter

Table 6 Other Organics Above PQL in Groundwater: see attached pdf.

Table 9

Groundwater Metals Results – 2007

Location	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
DM-57	3.6 B	30.3 B	5 U	5 U	4.3	0.2 U	5 U	5 U
ERT-27S	9.1 B	1540	0.55 B	5 U	2.9 B	0.2 U	10 U	5 U
ERT-27S(dup)	10.7	1540	0.91 B	1.6 B	3.5	0.2 U	5 U	5 U
Sentinel Well	10 U	41.7 B	5 U	5 U	3 U	0.2 U	5 U	5 U
URS-24S	20 U	8.9 B	25 U	65.4	6 U	0.2 U	25 U	10 U

Table 10

Average* Groundwater Metals Results – 2004-2006

	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
DM-57	9.56	34.0 B	5.00 ND	2.18 B	2.68 ND,B	0.20 ND	4.91 ND,B	1.46
ERT-27S	10.13	1423	4.70 ND,B	2.90 B	2.74 ND,B	0.19 ND,B	4.14	1.23 B
Sentinel Well	10.0 ND	62.0 B	5.00 ND	2.36 ND,B	2.81 ND,B	0.19 ND	4.88 ND,B	3.75 ND,B
URS-24S	6.22 B	6.27 B	4.64 ND,B	19.8	4.11	0.20	10.8	1.64 B

* Average of all values reported. Where the metal was not detected the, the PQL was used in the average calculation.
ND = Not detected in any sample.
ND,B = Not detected or below the PQL in all samples, B= Estimated below the PQL in all samples

Table 11

Natural Attenuation Parameters, 2007

Location	Temp, °C	pH	Specific Conductance, µS/cm	Dissolved Oxygen, mg/L	Total Iron, mg/L	Soluble Iron, mg/L	Ferrous Iron, mg/l	Total Mn, mg/L	Soluble Mn, mg/L	Carbon Dioxide, mg/L	Sulfate, mg/L	Alkalinity, mg/L
207												
DM-57	24.00	7.37	1540	0	7.08	7.11	4.8	5.85	5.89	49	563	225
ERT-27S	13.40	6.74	2010	0	93.4	99.1	5.8	10.9	11.8	180	2.5	323
ERT-27S	13.40	6.74	2010	0	94.2	94.3	6	11.1	11.1	180	2.9	329
URS-24S	14.90	4.11	4500	0	629	691	6.2	39.8	45.1	350	4960	NA, pH
407												
DM-57	11.5	7.58	1700	0	NA	NA	3.4	NA	NA	65	645	209
ERT-27S	12.5	7	1800	0	NA	NA	6	NA	NA	140	0.056 B	300
URS-24S	13.3	4.44	1800	0.05	NA	NA	2.8	NA	NA	150	1080	NA, pH
URS-24S	13.3	4.44	1800	0.1	NA	NA	3	NA	NA	200	1090	NA, pH

Notes: J = Result potentially affected by method blank contamination
Results form the same location indicate duplicate samples.
B,p = Associated method blank contamination
NA, pH = Not Able to be measured because of low pH.
U = Not detected, PQL shown
NA = Not Analyzed this quarter
µS/cm = microsiemens per centimeter

Table 12 – Statistical Evaluation Summary as of 2006

Location	$K_{necessary}$	$K_{with\ confidence}$	$K_{achieved}$	Interpretation
DM-59, Benzene	-0.1943	-0.6565	NA	On track to achieve concentration in specified time.
ERT-27S, Benzene	-0.1561	-0.1231	-0.1500	Attenuation is happening, but it may not be fast enough to achieve the goal in expected time.
ERT-27S, TCP	-0.1320	-0.1439	NA	On track to achieve concentration in specified time.
URS-24S, Benzene	-0.2905	-0.1171	-0.2779	Attenuation is happening, but it may not be fast enough to achieve the goal in the expected time.

Statistical Checks

	P	Normal	Interpretation
DM-59, Benzene	$1.5x10^{-07}$	Yes	Data meets assumptions of the method.
ERT-27S, Benzene	$7.5x10^{-05}$	Yes	Data meets assumptions of the method.
ERT-27S, TCP	0.121	No	See the discussion in 5.3.4 below.
URS-24S, Benzene	0.157	Yes	See the discussion in 5.3.4 below.

Note: $K_{necessary}$ is based on a 30-cleanup time from the 4th quarter of 2006