# Fourth Five-Year Review Report
# Hyde Park Landfill Superfund Site
# Niagara County
# Niagara Falls, New York

**Prepared by:**

**United States Environmental Protection Agency**
**Region 2**
**New York, New York**

**September 2011**

## Table of Contents

| List of Key Acronyms | |
|---|---|
| APL | Aqueous Phase Leachate |
| CIC | Community Involvement Coordinator |
| CRCR | Comprehensive Remedial Characterization Report |
| EDD | Enforcement Decision Document (precursor of ROD) |
| EPA | United States Environmental Protection Agency |
| ESD | Explanation of Significant Differences |
| NAPL | Non-aqueous Phase Leachate |
| NPL | National Priorities List |
| NYS | New York State |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| MCL | Maximum Contaminant Level |
| PMP | Performance Monitoring Plan |
| PPB | Parts per billion |
| PPM | Parts per million |
| PPMV | Parts per million by volume |
| PRP | Potentially Responsible Party |
| RA | Remedial Action |
| RCR | Remedial Characterization Report |
| RD | Remedial Design |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| RRT | Requisite Remedial Technology |
| OBCS | Overburden Barrier Collection System |
| OCC | Occidental Chemical Corporation |
| O&M | Operation and Maintenance |
| SVOCs | Semi-volatile Organic Compounds |
| TCDD | 2,3,7,8-tetrachlorodibenzo-p-dioxin |
| TCP | Trichlorophenol |
| VOCs | Volatile Organic Compounds |

## Executive Summary

This is the fourth Five-Year Review for the Hyde Park Landfill Superfund Site located in Niagara Falls, Niagara County, New York.

Based upon reviews of the Enforcement Decision Document, the Stipulation on Requisite Remedial Technology, Quarterly Sampling Results, Annual Operation & Maintenance Reports, Site Inspection Reports as conducted by the New York State Department of Environmental Conservation and a Site inspection by EPA in June 2011, it has been concluded that the remedies as defined by the Site's decision documents continue to protect human health and the environment.

## Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site name *(from WasteLAN)*:** Hooker Hyde Park Landfill Superfund Site | | |
| **EPA ID *(from WasteLAN)*:** NYD000831644 | | |
| **Region:** 2 | **State:** NY | **City/County:** Niagara Falls/Niagara |

| SITE STATUS | |
|---|---|
| **NPL status:** ■ Final □ Deleted □ Other (specify) | |
| **Remediation status** (choose all that apply): □ Under Construction ■ Constructed ■ Operating | |
| **Multiple OUs?*** □YES ■ NO | **Construction completion date:** July 18, 2003 |
| **Has site been put into reuse?** □YES ■ NO □ N/A | |

| REVIEW STATUS | |
|---|---|
| **Lead agency:** ■EPA □State □ Tribe □ Other Federal Agency | |
| **Author name:** Gloria M. Sosa | |
| **Author title:** Remedial Project Manager | **Author affiliation:** EPA |
| **Review period:**** September 2006 to September 2011 | |
| **Date(s) of site inspection:** June 8, 2011 | |
| **Type of review:** □ Post-SARA ■ Pre-SARA □ NPL-Removal only □ Non-NPL Remedial Action Site □NPL State/Tribe-lead □Regional Discretion □Statutory | |
| **Review number:** □ 1 (first) □ 2 (second) □ 3 (third) ■ Other (specify) 4 fourth | |
| **Triggering action:** □ Actual RA Onsite Construction □ Actual RA Start □Construction Completion ■ Previous Five-Year Review Report □ Other (specify) | |
| **Triggering action date *(from WasteLAN)*:** 9/27/2006 | |
| **Does the report include recommendation(s) and follow-up action(s)?** ■ yes □ no | |
| **Is the remedy protective of the environment?** ■ yes □ no □ not yet determined | |

* ["OU" refers to operable unit.]

## Five-Year Review Summary Form (continued)

*Issues, Recommendations, and Follow-Up Actions*

This Site has ongoing operation, maintenance and monitoring activities as part of the selected remedy. As was anticipated by the decision documents, these activities are subject to routine modification and adjustment. This report did not identify any issue or make any recommendation for the protection of public health and/or the environment which was not included or anticipated by the Site decision documents.

*Protectiveness Statement*

The remedy at the Hyde Park Landfill Site protects human health and the environment. There are no exposure pathways that could result in unacceptable risks and none are expected as long as the engineered controls currently in place continue to be properly operated, monitored, and maintained.

## I. Introduction

This fourth Five-Year Review of the Hyde Park Landfill Superfund Site (the "Site") was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii) and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001).

The purpose of a Five-Year Review is to ensure that implemented remedies continue to be protective of public health and the environment and that they continue to function as intended by the Site's decision documents. This document, prepared by the Hyde Park Landfill Site Remedial Project Manager, Gloria M. Sosa, will become part of the Site file.

In accordance with Section 1.3.3 of the Five-Year Review guidance, a Five-Year Review is triggered by the signing date of the previous Five-Year Review Report. The previous Five-Year Review Report was signed on September 27, 2006.

## II. Site Chronology

Table 1, which is attached, summarizes the Site-related events running from the placing of hazardous wastes on the Site through the present.

## III. Background

Physical Characteristics

The Hyde Park Landfill is a fifteen-acre Site in the northwest corner of the Town of Niagara, New York. The geology underlying the Site is glacial overburden overlying Lockport Dolomite, a fractured bedrock. Groundwater in the vicinity of the landfill flows in both the overburden and the bedrock. Generally, the overburden is saturated at depths below ten feet. The groundwater movement from the landfill is both downward and horizontal. At one time some of this groundwater exits the Niagara Gorge Face in the form of seeps which flowed into the Niagara River. Contaminants migrate from the landfill in two forms: aqueous phase liquid (APL or contaminated groundwater) and dense non-aqueous phase liquid (NAPL). The fractured bedrock environment typical of the Niagara Falls area makes it difficult to locate and remove NAPL.

The Hyde Park APL plume is composed primarily of benzoic acids, chlorobenzoic acids, chlorendic acid and phenol. Total organic halogen, phenols and other compounds have been detected in the APL Plume in the bedrock seeps at the Niagara Gorge Face in the parts per million (ppm) range. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) has been detected in the Gorge Face seeps at 0.18 parts per trillion (ppt).

The major known constituents of the Hyde Park NAPL are dichlorotoluene, chlorotoluene, toluene, tetrachloroethylene, phenol, methyl benzoate, benzoic acid and benzochlorotrifluorides.

Twenty ppm of TCDD and substantial amounts of polychlorinated biphenyls have been detected in the NAPL. Forty to fifty per cent of the constituents of NAPL are high molecular weight compounds which have not been identified by gas chromatograph mass spectrometry analysis. Hyde Park NAPL is denser than water, weighing approximately 80 pounds per cubic foot, compared to water which weighs 62.4 pounds per cubic foot. TCDD has been detected in the bedrock water within the NAPL plume at concentrations between 0.44 and 0.9 ppt.

There were two onsite lagoons and four rail tank cars in which NAPL was stored.

The Bloody Run is a small drainage area flowing north from the landfill and considered part of the Site. The stream flows under a neighboring industry via a storm sewer, and under University Drive via a storm sewer which emerges at the Niagara Gorge.

Land and Resource Use

The Site is immediately surrounded by several industrial facilities and property owned by the New York Power Authority. Residential neighborhoods are located to the northwest and south of the landfill. The Niagara River, an international boundary, is located 2,000 feet to the northwest, down the Niagara Gorge which descends approximately 350 feet below the surface of the landfill. The Niagara River flows into Lake Ontario approximately 10 miles downstream of the Site. Lake Ontario is a drinking-water source for millions. Niagara University, which has three thousand students, is less than one mile in distance from the Site.

History of Contamination

Hooker Chemical and Plastic Corporation, now Occidental Chemical Corporation (OCC), disposed of approximately 80,000 tons of waste (drummed and bulk liquids, and solids) at the Site, from 1953 to 1975, consisting primarily of chlorobenzenes, chlorotoluenes, halogenated aliphatics and 2,4,5-trichlorophenol (TCP) from still bottoms. An estimated 3,300 tons of TCP were disposed of at the Site; TCP wastes are known to contain significant amounts of TCDD. EPA has estimated that approximately 0.7 - 1.6 tons of TCDD were associated with the TCP wastes at the Site.

Basis for Taking Action

EPA filed a lawsuit in 1979 in federal district court under the authority of the Resource Conservation and Recovery Act and the Clean Water Act seeking to require that OCC remediate the Site. EPA, New York State and OCC filed a *Stipulation and Judgment Approving Settlement Agreement* (Settlement Agreement) in January 1981, which the Court approved in April 1982. The Settlement Agreement required OCC to perform an Aquifer Survey (which can be compared to a remedial investigation study) to define the extent of contamination in the overburden and bedrock and assess remedial alternatives. OCC completed this effort in 1983. The results of the aquifer survey were used by the negotiation team (EPA/NewYork State and OCC) to agree on remedial actions to be performed at the Site. These required remedial actions were documented in a *Stipulation on Requisite Remedial Technology* (RRT Stipulation), which was approved by the

Court in August 1986. EPA issued an Enforcement Decision Document (EDD – a precursor to a Record of Decision) on November 26, 1985, which documented the remedial action selected for Site cleanup. The Site was listed on the National Priorities List in 1982.

EPA acknowledged that the APL and NAPL plumes would not be remediated to drinking-water standards because of the persistent nature of NAPL. Therefore, the goal of the remedies selected in the EDD is to hydraulically contain contaminated groundwater (APL plume) in the vicinity of the Site, while extracting as much NAPL as is practicable. The achievement of hydraulic containment of APL would be proved by the creation of an inward hydraulic gradient surrounding the landfill (*i.e.*, groundwater in the vicinity of the Site would flow radially inward towards the landfill). The reduction of NAPL volume would create less driving force (head) on the NAPL plume, preventing further NAPL migration. The RRT stipulated that the extracted NAPL would be destroyed by incineration.

The RRT established the basis for a groundwater monitoring program to provide data for assessing any potential adverse impacts from the Site to the surrounding community. A series of monitoring programs were also established to determine if contaminants from the Site had migrated beyond the shale, which was believed to be an aquitard that would prevent contamination from further downward migration.

Under the agreement, OCC was required to cap the landfill and its perimeter to prevent further infiltration of rain water, which produces leachate. Remedial action would be performed by OCC at neighboring industries. Sediments in the Bloody Run would be excavated or capped. Remedial action would be conducted at the Niagara River Gorge Face.

During the RRT negotiations, EPA performed a risk assessment using worst case exposure scenarios, which was the approach used before the 1989 Risk Assessment Guidance for Superfund, Part A. This risk assessment indicated that the greatest risk from the Site was the consumption of fish contaminated with TCDD. Therefore, the RRT required that a study be performed by EPA, New York State and OCC to determine if TCDD was bioaccumulating in fish consumed by anglers in Lake Ontario.

## IV. Remedial Actions

Remedy Selection

The Hyde Park Landfill remedy selected in the 1985 EDD includes the following specific elements:

- Source control (prototype extraction wells);
- Containment and collection of APL and NAPL in the overburden;
- Containment and collection of APL and NAPL in the bedrock;
- Treatment of collected APL and NAPL;
- Community Monitoring Program (monitoring wells for early detection of Site chemicals);
- Intermediate and Deep Formations Study (monitoring wells);
- Industrial Protection Program (remediation of sumps and sealing of manholes);

- Perimeter Capping (clay cap around perimeter of landfill);
- Gorge face seeps remediation;
- Bloody Run Excavation or Capping;
- Final capping and Site closure; and,
- TCDD Bioaccumulation Study in Lake Ontario

The EDD did not identify remedial action objectives. However, during the remedial investigation, EPA acknowledged that the APL and NAPL plumes would not be remediated to drinking water standards because of the persistent nature of NAPL. Therefore, the goal of the remedies selected in the EDD is to hydraulically contain contaminated groundwater (APL plume) in the vicinity of the Site, while extracting as much NAPL as is practicable.

The RRT established APL Plume Flux Action Levels for the following chemicals: TCDD (0.5 grams/year); perchloropentacyclodecane [Mirex] (0.005 lbs/day); Aroclor 1248 (0.005 lbs/day); and, chloroform (1.7 lbs/day). These action levels represent concentrations of these contaminants that, if detected entering the river (flux of contaminants to the river) at or above these concentrations, would cause OCC to take additional remedial actions (e.g. increased pumping, installing additional wells or other remedial measures) to reduce these contaminant levels.

Remedy Implementation

*Source Control*

The purpose of the source control program is to reduce the amount of chemicals migrating downward from the landfill by removing any mobile NAPL remaining in the landfill. The source control remedial program, as described in the RRT Stipulation, consists of a prototype system of up to six 36-inch diameter wells installed in the overburden inside the landfill. These wells were designed to collect NAPL for subsequent destruction by incineration.

As required by the RRT, OCC installed two 36-inch extraction wells in the landfill in 1990. OCC performed pump tests on these wells and also investigated potential NAPL source areas within the landfill through 1993. However, the large-diameter source-control wells did not collect as much NAPL as was expected. The source control system was redesigned using the 2-inch NAPL extraction well design OCC had successfully utilized at its Durez facility. OCC installed four 2-inch source control wells in the landfill with two-phase flow pumps to facilitate the pumping of NAPL. Nine monitoring wells were also installed in the landfill. One source-control well has since been converted to a monitoring well because of low NAPL collection.

Although the source control program has not recently yielded large quantities of NAPL originally anticipated, more than 300,000 gallons of NAPL have been collected and treated to date. EPA believes that most of NAPL which was once present in the overburden in the landfill has either flowed into the bedrock, been captured, or remains in pockets or pools that are not hydraulically connected to the source control wells. In addition, the installation of the final cap on the landfill has eliminated the continued production of leachate from rainfall and thereby dramatically reduced the hydraulic head of APL within the landfill, removing the driving force for

the NAPL.

NAPL is extracted by the source-control wells and flows into a decanter at the onsite Storage and Treatment Facility. The total recovered NAPL volume is measured monthly and the potential amount of NAPL contributed by each well is estimated annually by OCC. The source-control wells are currently pumped only once per month because of low NAPL volume.

*Overburden - APL and NAPL Plume Containment System*

The goal of the remedy selected for the overburden is to contain the lateral migration of the NAPL plume and contain the APL plume, to the extent practicable, as stated in the RRT Stipulation. The remedy was implemented by construction of the Overburden Barrier Collection System (OBCS), a drain around the entire landfill to contain and collect contaminated groundwater. The OBCS was installed in 1991. Eight monitoring-well pairs were installed beyond the alignment of an existing drain around the landfill. One well from each pair is inside the APL plume limits and one well from each pair is outside the APL plume. The inner wells are pumped to create an inward hydraulic gradient. Hydraulic stabilization was deemed to have occurred in 1994, following one year of continuous dewatering of the OBCS (*i.e.*, no accumulation of water in the wet wells).

Hydraulic monitoring of the OBCS is performed by water-level measurements taken at the eight well pairs. Water-level measurements indicate whether an inward gradient is being achieved, thereby capturing the contaminated groundwater associated with the Site.

*Bedrock NAPL Plume Containment System*

OCC performed an investigation which defined the extent of the NAPL plume in the bedrock surrounding the landfill in 1982 and revised the extent of the NAPL plume again in 1996 after performing further investigation. OCC performs NAPL presence checks at all 49 bedrock wells and these checks indicate that the NAPL plume has not significantly migrated since 1996.

The NAPL Plume Containment System was designed to create an inward hydraulic gradient in the bedrock aquifer surrounding the landfill in order to capture groundwater contaminated by Site chemicals. The system was designed and installed in a phased approach in order to achieve proper placement of the extraction wells. The first set of wells would be installed, pump tested and connected by force mains to the onsite treatment facility. The capture zones of the wells would be evaluated, and based on the results of the evaluation, additional wells would be installed in areas where capture was not being attained.

Phase I, consisting of six purge wells, was installed by OCC in 1990. Two well nests of three wells each were installed in the upper, middle and lower units of bedrock. OCC conducted pump tests on individual and multiple wells throughout 1991. OCC submitted to EPA and New York State Department of Environmental Conservation (NYSDEC) a Phase I pump test report in February 1993. EPA and New York State approved OCC's recommendation for the location of Phase II purge and recirculation wells and required OCC to install two additional wells. The installation of the Phase II wells was completed in 1993. OCC conducted pump tests on the Phase

II wells which were completed in 1994. The results of these pump tests indicated that further hydraulic control was necessary. Additional wells were installed and a network of eleven bedrock purge wells was operational in 1997.

The RRT Stipulation established a monitoring program with well location selected along vectors radiating from the center of the landfill. As required, the purge wells are on the inside of the NAPL plume with monitoring wells outside the NAPL plume. The RRT required an inward gradient across the NAPL plume boundary. Implementation of the vector scheme was not as effective a monitoring system as originally designed. To enhance the vector monitoring scheme, with which OCC reports its Site cleanup progress, local groundwater contour maps were developed.

In 2000, as discussed below, OCC began a re-characterization of the Site. The conceptual model of three groundwater zones in the bedrock was replaced with eleven distinct flow zones. OCC retrofitted existing wells to monitor the groundwater in these 11 zones. After collecting water levels over a two year period, OCC concluded that the Bedrock NAPL Plume Containment System satisfies the performance objectives of the RRT and that the containment objective is maintained year-round.

*Bedrock APL Plume Containment System*

The APL Plume Containment System, consisting of three purge wells installed at the Niagara Gorge Face, was designed to collect a significant portion (60-88%) of the contaminated groundwater outside the NAPL plume (as required by the RRT Stipulation). These wells were installed in 1994. The portion of the APL plume not collected is monitored by three flux monitoring well clusters to the west of the Site and 3 piezometer clusters in the northern and eastern portion of the APL plume.

None of the APL plume flux parameters was detected above their respective reporting levels in groundwater samples collected in November 2010. As a result, OCC was not required to perform calculation of the flux to the Niagara River Gorge.

*Leachate Storage and Treatment Facility*

APL is treated onsite at the Leachate Storage and Treatment Facility constructed by OCC which began operating in April 1990. The APL/NAPL mixture is pumped from the wells through force mains into a decant tank. The NAPL, denser than water, settles to the bottom. APL is taken off the top of the decanter and pumped into the storage tanks. The APL first passes through sacrificial activated carbon beds (which cannot be recycled because of the dioxin and are disposed offsite). The APL is then treated in an activated carbon system.

The treatment capacity of the Leachate Treatment Facility is 400 gallons per minute (gpm) of influent. Approximately 24 million gallons of groundwater were treated in 2010 at the Hyde Park Leachate Treatment Facility.

*NAPL Treatment*

During the early remedial operations at the Site, NAPL was transferred by tanker truck to OCC's Buffalo Avenue Plant in Niagara Falls for incineration. OCC required a permit modification for its Buffalo Avenue Plant incinerator to burn wastes containing dioxins. There was no commercial incinerator available to destroy these wastes. The five years spent in obtaining the permit modification significantly delayed the Hyde Park remedial schedule. OCC was issued this modification by EPA and New York State Department of Environmental Conservation in November 1990. This was the first industrial incinerator permitted to burn dioxin.

OCC suspended incinerating NAPL at its Buffalo Avenue Plant in 1996 and it now transports the NAPL via trucks to Laidlaw Environmental Services in Deer Park, Texas, for incineration. To date, more than 300,000 gallons of NAPL have been removed and destroyed. One hundred and fifty-five gallons of NAPL were collected in 2010.

*Lake Ontario TCDD Bioaccumulation Study*

The APL Plume Flux Action Level for TCDD in the RRT Stipulation is 0.5 g/yr. TCDD is presently found in fish in levels which require the issuance of Federal, State and Canadian fish health advisories. At the time of the development of the RRT, there was no consensus in the scientific community on the bioaccumulation of dioxin. Without this consensus, fish uptake of TCDD could not be calculated. Therefore, the RRT required that EPA, New York State and OCC perform a Lake Ontario TCDD Bioaccumulation Study in order to determine a bioaccumulation factor for TCDD specific to Lake Ontario. The results of this study would then be used to re-examine the TCDD APL Plume Flux Action Level.

EPA Region II, New York State and OCC designed and implemented a work plan to collect fish and sediment samples from Lake Ontario and analyze them for TCDD. Lab studies were performed by EPA's Duluth lab and the University of Minnesota. The draft Lake Ontario TCDD Bioaccumulation Study was completed in July 1989 and distributed for scientific peer review. The final TCDD Bioaccumulation Study report reflecting the comments of the peer reviewers was released to the public in September 1991.

As part of this study, EPA's Large Lakes Research Station in Grosse Isle, Michigan, collaborated with Manhattan College's Department of Environmental Engineering to produce the Lake Ontario TCDD Modeling Report. A mass-balance model was developed based upon models of fallout radionuclides and PCB contamination of the Great Lakes. The predicted steady-state TCDD concentrations for an input comparable to the TCDD APL Plume Flux Action Level of 0.5 g/yr are 0.026 nanograms/year (sorbed sediment concentrations) and $9.5 \times 10^{-5}$ picograms/liter (water column dissolved concentration).

The TCDD Study, together with the model, indicated that TCDD was bioaccumulating in the tissues of various species of Lake Ontario fish at a range of rates such that the overall TCDD APL Plume Flux Action Level of 0.5 g/yr stipulated by the RRT remains protective.

*Landfill Cap*

The Settlement Agreement required OCC to cap the landfill with 36 inches of clay and with a 12-inch vegetative cover. Before a final cap could be placed on the landfill, wastes associated with remedial activities needed to be managed. OCC developed the Waste Disposal Plan, which was implemented in 1988. Waste disposal cells lined with clay were constructed on top of the landfill to consolidate wastes resulting from remedial actions and investigations conducted at the Site. Contaminated soils from investigative activities and sediment from the Bloody Run remediation were consolidated in the landfill. The perimeter cap of the landfill was completed in 1991, and the entire landfill was capped in 1994. The final cap consisted of the following: low-permeability clay; a synthetic membrane; a drainage layer and topsoil seeded with native vegetation for barrier protection. EPA routinely inspects the landfill cap for erosion. The current condition of the cap is excellent.

*Community Monitoring Program*

The Community Monitoring Wells, a system of wells installed in 1987 throughout the neighborhood, provide early warning of the presence of Hyde Park contaminants in the groundwater. These wells are sampled and analyzed quarterly. Should contamination be detected, OCC must take further remedial action. Hyde Park contaminants have never been detected in these wells. The data collected have demonstrated that the groundwater flow is vertically downward in the nearby community. EPA and New York State review the analytical results from sampling of these wells to ensure the community is being protected.

*Industrial Protection Program*

The Industrial Protection Program, implemented in 1987, established engineering controls to eliminate the exposure of nearby workers to contaminants present in the NAPL and APL plumes. Sumps and manholes in neighboring industries, including Grief Brothers, were sealed, eliminating worker exposure to vapors that may migrate into the sump. OCC relocated a sewer at neighboring Tams Ceramics in 1989. The College Heights sewer was remediated in 1990.

OCC purchased the Grief Brothers building. Future access to this facility is now controlled by OCC. Periodic surveys of neighborhood manholes and sumps are performed to ensure the remedies remain intact.

*Bloody Run Remediation*

The Settlement Agreement set forth two possibilities for remedial action at the Bloody Run, sediment excavation or capping. The 1992 EPA risk assessment determined the excavation of

sediments in the Bloody Run would not pose an adverse risk (from fugitive dust emissions), would be protective of human health, and, was the preferred alternative.

OCC excavated approximately thirty thousand cubic yards of contaminated sediment from the Bloody Run drainage area. The area was then backfilled and covered with riprap. This work was completed in January 1993. The Bloody Run now flows via a storm sewer which surfaces at the Niagara Gorge. The restored area was observed to have abundant vegetation during a Site visit in June 2011.

*Niagara River Gorge Face Remediation*

Groundwater seeps from the rock at the Niagara Gorge, approximately 2000 feet from the Site. TCDD was detected in one sample from a seep during remedial investigations at 0.2 ppt. EPA and New York State determined that humans should be isolated from the seeps to prevent an exposure pathway to the contaminants. The Gorge Face Seeps were remediated in 1988, except for the Bloody Run portion, which was remediated in 1994. Access by humans to the seeps has been prevented by the installation of fences and the diversion of seeps into culverts. All contaminated sediments were scraped away. The pumping of the APL wells has strongly influenced the seeps, drying many. Annual inspections of the Gorge Face are conducted by representatives of EPA, New York State and OCC. The most recent inspection conducted in June 2011 confirmed that conditions in the gorge remain unchanged and no repairs are required.

The Ontario Ministry of the Environment (MOE) has collected surficial sediment samples at the base of the Bloody Run, as well as samples of caged mussels kept in the river near these sediments for 21 days. The sampling is conducted as part of the Niagara River biomonitoring program. The September 1999 biomonitoring report indicates that concentrations of dioxins and furans in sediment and mussels are lower than pre-remediation levels. The report suggests that the remedial action taken to cover contaminated sediment on the river bank has reduced the bioavailability of the dioxins and furans present. However, the MOE raised concern that these levels were higher than in other Great Lakes basins. TCDD was found in sediment at 45 parts per billion (ppb) in the MOE sampling results.

In order to verify if TCDD was present in sediments at the mouth of Bloody Run, EPA collected three sediment samples in 1999. TCDD was detected in one of these samples at 14 ppb. EPA's 1997 OSWER Directive regarding exposures to dioxins established a cleanup goal of 1 ppb for residential properties. The area where the sediment was collected limits access to a lower frequency than a residential scenario that assumes exposures of 350 days/year for a period of 6 years as a child and 24 years as an adult, because of several factors. These factors include that there is not a significant quantity of sediment present at the shoreline. The volume of water in the Niagara River fluctuates daily because of the operations of the Robert Moses Power Plant. The sediment is covered by the river early in the morning and remains covered until after dark because the release of water from the power authority raises the level of the river by several feet. The sediment is inaccessible when underwater and therefore the sediment is not available for human exposure when underwater. In addition, the population EPA considers most at risk from exposure to this sediment are adolescent and adult anglers. Anglers, however, would only be at this

location for a limited time each year, considering school attendance for children and winter conditions that prevent all-year access. EPA performed a risk assessment for potential exposure and its calculations indicated that the level of TCDD in the sediment is within EPA's acceptable cancer risk range of one in ten thousand ($10^{-4}$) to one in one million ($10^{-6}$) excess cancers.

*Intermediate and Deep Bedrock Formations Study*

The Intermediate and Deep Formations Study was designed to determine if contaminants from the Hyde Park Landfill had penetrated the Rochester Shale (aquitard) formation below the Lockport Dolomite. If action levels documented in the RRT Stipulation are exceeded in the Intermediate Formations, then monitoring wells will be installed in the Deep Formations. In addition, a total flux to the Niagara River is calculated, and if the Flux Action Levels are exceeded, further remedies would be required to reduce the loading to the river.

Monitoring wells were installed in the intermediate formations in 1990 without detecting the presence of NAPL. Most wells contained insufficient volumes of groundwater for sample collection after purging activities, indicating that the shale is a good aquitard. The *Monitoring Report, Intermediate Formations Wells, November 1991/1992* summarizes the results of the investigation. Most of the parameters were not detected above the survey levels determined in the RRT Stipulation. However, phenol, total organic halogen, Aroclor 1248 (a commercial mixture of PCBs) and conductivity did exceed the survey levels. OCC calculated a flux in the monitoring report which was four to five orders of magnitude below action levels.

OCC was not required to install monitoring wells in the Deep Formations because the Intermediate Formations' investigation indicated that Hyde Park contaminants had not migrated through the shale and were not present in the Intermediate Formations.

*Additional Remedial Action*

OCC has performed additional remedial actions at the Site in addition to those previously discussed. The onsite lagoons were remediated in 1991. NAPL in the lagoons was pumped into the leachate storage facility and the lagoons were closed. NAPL was also pumped from four railroad tank cars, which had been used onsite for years as storage for NAPL generated from remedial investigations because there was no facility permitted to destroy dioxin through incineration. In 1991, the tank cars were placed in the waste disposal cells.

OCC also remediated sewers in the area. Sewers provided preferential pathways for contaminants to migrate through the overburden. As previously mentioned, OCC relocated a sewer at TAM Ceramics and remediated the College Heights sewer. The remediation of the University Drive (bordering Niagara University) sewer was completed in August 1993. NAPL contaminated soils were removed from under University Avenue; these soils were placed in a waste disposal cell at the landfill, prior to installing the final cap.

*Site Re-Characterization*

OCC performed a detailed groundwater modeling study of the Site during 2000-2001 to address uncertainties with respect to groundwater flow and evaluate the performance of the bedrock remedial system. The Site is located in a very complex hydrogeologic setting and OCC sought to formulate a conceptual model which synthesized data collected from the Site and the regional hydrogeologic setting. Particle tracking was utilized to determine the capture zones of the existing bedrock wells. The model indicated that there was a vertical component of flow (i.e., some of the water from the Upper Bedrock zone was being captured in the Lower Bedrock zone).

Subsequent to the development of the groundwater model, OCC revised the Site conceptual model which provided the basis for the numerical simulation of the hydrogeologic system. OCC conducted field investigations from 2001 to 2003, including down-borehole geophysics and water-level measurements in 113 piezometers (retrofitted monitoring wells.) The analysis of the field data resulted in a revised hydrolgeologic framework consisting of eleven discrete flow zones separated by aquitards. OCC has documented its revised hydrogeologic framework in two documents: *Site Characterization Report: Revised Geologic and Hydrogeologic Characterization* (February 2002) and *Site Characterization Report: Hydrologic Characterization* (February 2003).

The eleven flow zones replace the Upper, Middle and Lower Bedrock framework formerly used at this Site. Groundwater monitoring has been conducted in the eleven flow zones since late 2002 and OCC is now building a data base of water-level measurements.

After the geology at the Site was re-characterized, OCC revised their groundwater model to assist them in determining if the groundwater remedy provides capture of the contaminated water associated with the Site. OCC issued the *Site Characterization Report: Groundwater Flow Model* in June 2003. The results of the groundwater model indicate that capture of contaminated groundwater is achieved in the bedrock.

OCC issued the *Site Characterization Report: Remedial Characterization Report* (RCR) which concludes that the Bedrock NAPL Plume Containment System satisfies the performance objectives of the RRT (inward gradient). Although the data for two of the flow zones suggest some uncertainty in the inward gradient, chemical analyses of the groundwater from these two zones indicate that Site-related contaminants are not present in this groundwater. This indicates that no migration of contaminants outside of the containment system is occurring.

In November 2003, OCC issued the *Major Ions Study*. This report concluded that sulfate ions are an indicator of the relative age of groundwater and that the vertical and horizontal distribution of sulfate ions near the Site support the revised conceptual model of groundwater flow. Sampling results from the Gorge Seeps indicate that the seeps appear to originate primarily from surface runoff (water of a very young age) and not water which has migrated from the Site (water of an older age.)

OCC issued the *Comprehensive Remedial Characterization Report* (CRCR) in August 2004. This report concludes the conventional hydraulic performance monitoring requirements defined in

the RRT were not suitable for the Site because of the complex hydrogeologic complexity of the Lockport bedrock which was poorly understood when the RRT Stipulation was issued. EPA recognizes that there may be concerns with conventional monitoring approaches in *Elements for Effective Management of Operating Pump and Treat Systems* (542-R-02-009 OSWER 9335.4-27FS-A) and recommends utilizing converging "lines of evidence" for containment demonstration. OCC adopted this approach for the performance evaluation documented on the CRCR. Several lines of evidence were selected for the performance evaluation:

- Flow directions interpreted from potentiometric surface maps;
- Flow directions estimated from vertical gradients
- The distribution of Site-related parameters in groundwater;
- The distribution of major ions and the relative age of groundwater; and,
- Groundwater-flow modeling.

Following these lines of evidence, the Bedrock NAPL Plume Containment System satisfies the performance objectives of the RRT Stipulation and the containment objective is maintained year-round. The Bedrock NAPL Plume Containment System has been maintained and upgraded continuously since 1993.

Systems Operation/Operation and Maintenance (O&M)

OCC conducts extensive operations and maintenance (O&M) at the Site. The carbon beds at the treatment facility are routinely changed and regenerated. The sacrificial carbon beds must also be changed and disposed. OCC conducts influent and effluent analyses to ensure compliance with the discharge permit. OCC monitors the effluent from the treatment facility and prepares daily, weekly and quarterly Treatment System Effluent Monitoring data Reports.

Quarterly groundwater sampling is performed. Hydraulic and chemical data are collected and analyzed. These results are documented in a Quarterly Report. OCC collects water-level elevations in the 11 flow zones and in the overburden on a quarterly basis and presents potentiometric-contour maps and water-elevation summaries in the Quarterly Reports.
OCC performs extensive well and pump maintenance because NAPL often fouls wells and pumps.

OCC performs a biannual Gorge Face Seep Survey to ascertain that the remedial actions taken in the Gorge remain protective of human health and the environment.

Table 2 presents an estimate of annual operation and maintenance costs.

Institutional Controls Implementation

A Declaration of Restrictive Covenants and Environmental Easement was placed on the deed to the Site property at the County recording office in Niagara County on October 7, 2010. The Grantor (Occidental) grants a permanent restrictive covenant and an environmental easement to the Grantee (Town of Niagara) to provide a right of access over the approximately twenty-one acre property (the "Property") for purposes of implementing, facilitating and monitoring the remedial action. The covenant/easement also imposes on the Property certain use restrictions that will run

with the land for the purpose of protecting human health and the environment in the future.

The following restrictions apply to the use of the Property, run with the land, and are binding on the Grantor: the Property shall not be used in any manner that would interfere with or adversely affect the implementation, integrity, or effectiveness of the remedial action performed at the Site, including, but not limited to: a) the extraction of on-site groundwater; b) any digging, excavation, extraction of materials, construction, or other activity outside the requirements of the remedial action that would disturb the cap placed upon the landfill at the Site; or c) other activity that would disturb or interfere with any portion of the remedial action for the Site enumerated in the RRT Stipulation. The Property also may not be used for residential use. However, the Property may be used for commercial or industrial use as long as long-term engineering controls are employed and remain effective. That is, specifically, the operation of the portion of the response action pertaining to the pumping of the extraction wells, the operation of the treatment facility, and maintenance of the landfill cap.

In addition to the Site-specific institutional control, the Niagara County Department of Health imposes restrictions on the drilling and usage of wells at the Site. These restrictions ensure that drinking-water wells are not installed in areas of contaminated groundwater, effectively preventing exposure to Site-related contaminants through ingestion.

## V. Progress Since Last Five-Year Review

The third Five-Year Review was completed in September 2006, pursuant to OSWER Directives 9355.7-02 (1991), 9355.7-02A (1994), and 9355.7-03A (1995). The third Five-Year Review concluded that the remedy at the Hyde Park Landfill Superfund Site protects human health and the environment. There are no exposure pathways that could result in unacceptable risks, and none are expected as long as the engineered controls currently in place continue to be properly operated, monitored, and maintained. In addition, a Declaration of Restrictive Covenants and Environmental Easement was placed on the deed to the Site property at the County recording office in Niagara County on October 7, 2010.

In 2006, OCC issued the Performance Monitoring Plan (PMP) which specifies the monitoring to conducted at the Site. The PMP requires annual assessment of the Overburden Monitoring Program, the Bedrock Monitoring Program and the Community Monitoring Program. OCC conducts quarterly monitoring and the results are presented in Quarterly Reports and in the Annual Report prepared by OCC.

## VI. Five-Year Review Process

Administrative Components

The Five-Year Review Team consisted of: Gloria M. Sosa (Remedial Project Manager), Edward Modica (Hydrogeologist), Marian Olsen (Risk Assessor), Mike Basile (Community Involvement Coordinator), Peter Mannino (Western New York Remediation Section Chief) and Henry Guzman (Attorney).

Community Involvement

The EPA Community Involvement Coordinator for the Site, Michael J. Basile, published a notice in the *Niagara Gazette,* a local newspaper, on December 23, 2010, notifying the community of the initiation of the Five-Year Review process. The notice indicated that the EPA would be conducting a Five-Year Review of the remedy for the Site to ensure that the implemented remedy remains protective of public health and the environment and is functioning as designed. It was also indicated that once the Five-Year Review is completed, the results will be made available in the local Site repository. The notice also solicited public comments or questions related to the Five-Year Review Process or to the Site.

In addition, the notice included the RPM's mailing address, e-mail address, and telephone number for any public comments or questions. No public comments were received.

Document Review

The documents, data, and information which were reviewed in completing this fourth Five-Year Review are summarized in Table 3 (attached).

Monitoring and Data Review

The 2006 Performance Monitoring Plan (PMP) outlines the monitoring requirements for the Site. The PMP requires annual assessment of the following three monitoring programs:

- Overburden Monitoring Program
- Bedrock Monitoring Program
- Community Monitoring Program

The results of these three monitoring programs are submitted in an Annual Site Remedial Performance Evaluation Report. This report also includes an assessment of the Treatment System Monitoring Program.

Overburden Monitoring Program

The Overburden Monitoring program involves the monitoring of the Source Control (SC) Wells and the Overburden Collection System. The SC Wells are a series of production wells installed within the landfill to recover NAPL, while the Overburden Collection System is comprised of a pair of French-drain systems designed to control the lateral migration of dissolved phase constituents and NAPL in the overburden.

The overburden groundwater elevation data were used to generate quarterly groundwater potentiometric surface maps. The overburden potentiometric surface maps indicated containment. However, pumping data from 2010 indicate that the SC wells do not appear to be yielding as much NAPL. The NAPL presence data from the five SC wells indicates that the majority of material removed from the wells is APL, and not NAPL. NAPL presence checks are completed annually in the Overburden Barrier Collection System (OBCS), Overburden

Monitoring Wells (OMWs) and the OBCS manholes. The NAPL presence monitoring data from the OMW wells and manholes indicate that NAPL is present in 4 of the 17 manholes monitored (MH-29, MH-30, MH-33, and MH-32). These manholes are located at the southwest corner of the landfill. However, NAPL is not present in OMW-11, 12R, 13R, and 14R. These wells are located outside of the OBCS, to the southwest of the manholes with NAPL present. The lack of NAPL presence in these OMW wells indicates that any overburden NAPL is contained within the boundaries of the OBCS and is not bypassing the OBCS. Based on the overburden data collected, the overburden monitoring systems are operating properly and overburden containment is being achieved.

Bedrock Monitoring Program

The Bedrock Monitoring program includes the Lockport Bedrock APL and NAPL Plume Containment Systems and the Bloody Run Creek Monitoring Program. The Lockport Bedrock APL and NAPL Plume Containment Systems consist of 19 purge wells that control lateral migration of dissolved phase constituents and NAPL in the bedrock, while the Bloody Run Creek Monitoring Program ensures that contaminant migration via the Bloody Run Creek remains under control.

The bedrock flow zone groundwater elevation data were used to generate groundwater potentiometric surface maps for each of the monitored flow zones. The quarterly potentiometric surface maps for each monitored flow zone indicated containment. The bedrock purge well monthly average flow rate data indicate that the purge well flow rates throughout were consistent with historic flow rates. Groundwater samples were collected quarterly. The data collected in 2010 demonstrate that the APL and NAPL purge well systems are operating properly, and containment is being maintained in each of the flow zones. No changes to the bedrock purge or monitoring systems are needed at this time.

The Bloody Run Creek Monitoring Program is required to be monitored every 5 years. The Creek was last monitored in August of 2006. Analysis includes VOCs, SVOCs, and organic acids. The next event is scheduled to be conducted in 2011.

Community Monitoring Program

The Community Monitoring program was developed to ensure that the public is not being adversely exposed to Site-related parameters. The Community Monitoring program includes the Gorge Face Seep Program, the APL Flux Monitoring Program, and the Residential Community Monitoring Program. The Gorge Face Seep Program involves biennial inspections of the Niagara River Gorge to ensure that Site-specific parameters are not discharging to a publicly accessible area. The APL Flux Monitoring Program ensures that the mass loading via groundwater discharged to the Niagara River Gorge is less than the defined Flux Action Level. The Residential Community Monitoring Program ensures that residents in the area are not adversely exposed to Site-related constituents in the groundwater or from soil vapors above the groundwater.

The results of the Gorge Face Seep Survey performed on June 8, 2011 indicate that conditions in the Gorge have not changed since the previous survey in 2009 and that no additional actions are

necessary. Sulfate concentrations were consistent with sulfate concentrations observed during sampling events in 2003, 2006, 2007, and 2009. These data indicate that the age of the water in the seeps is relatively new (surface water infiltration) and not groundwater from the landfill, which would have a relatively older age.

APL Plume Flux Sampling: APL plume flux composite sampling is performed quarterly. If APL plume flux parameters are detected above their respective reporting levels, calculation of the flux to the Niagara River Gorge is required. Calculation of the flux to the Niagara River Gorge was not required from 2006 through 2011.

Soil Vapor Monitoring: Annual soil vapor monitoring is collected. There were no exceedances (greater than 0.050 parts per million per volume [ppmv] above background) of total VOCs at any of the soil vapor monitoring locations in 2010.

NAPL Presence Monitoring: A NAPL presence check is conducted annually at the catch basin on the north side of the Grieff Brothers building. Although NAPL was not present in the inspections conducted in 2007 and 2010, a sheen was noted on the water in the open catch basin along with a slight chemical odor during the inspections conducted in July 2008 and April 2009.

Treatment System Monitoring and Maintenance Inspections
The systems have been appropriately monitored and maintained since the last Five-Year Review. Maintaining the Site remedial elements is critical to the remedial performance. As a result, daily, weekly, and monthly inspection of the monitoring points (wells and piezometers), the landfill cap, and the security fence surrounding the landfill have been included in the PMP.

Annually, the active monitoring wells and piezometers are inspected to ensure that the casings and caps are secure and in good condition. Also, well depths are monitored for possible infilling. Maintaining the landfill cap minimizes the potential for a breach of the cap and ensures a long operational life. The cap is routinely inspected during field sampling events. This is an informal inspection and is conducted once per year. The landfill fence is inspected informally every weekday by a walkover or drive-by inspection.

Site Inspection

The Site was inspected by EPA's Remedial Project Manager, Gloria M. Sosa, and OCC's Project Manager, Joseph Branch, on June 8, 2011. During the site inspection, the EPA representative did not observe any problems or deviations from the ongoing operation and maintenance activities being implemented at the site. The current condition of the cap is excellent. Brian Sadowski, NYSDEC Region 9, inspected the site with Joseph Branch on May 4, 2011.

Interviews

No interviews were conducted for this review.

## VII. Technical Assessment

***Questions A: Is the remedy functioning as intended by the decision documents?***

The remedy for the Hyde Park Landfill Site as set forth in the EDD calls for hydraulic containment and collection of contaminated groundwater (APL) and NAPL in the overburden and fractured-carbonate bedrock aquifer (Lockport Dolomite) beneath the landfill. The EDD recognizes that the APL and NAPL plumes would not be remediated to drinking water standards due to the persistence of NAPL at the Site. Consequently, the remedial action objective focuses on the hydraulic containment of the APL plume that surrounds the landfill and the reduction of NAPL to reduce the driving force and prevent further migration. Various monitoring programs have been established for the overburden, the bedrock, and the residential community next to the Site to evaluate the performance of the remedy and ensure that the components of the remedy are functioning properly. Based on an evaluation of data from these programs, the remedy is functioning as intended by the decision documents.

Overburden Containment

The overburden containment system consists of source control wells that are used to recover NAPL/APL within the Landfill. The OBCS controls the lateral migration of NAPL and APL in the overburden, and consists of a system of French drains and sumps encircling the landfill. The overburden NAPL/APL plume containment system has been operating since 1991 and has been performing consistently to prevent lateral migration of contaminated groundwater.

Data collected for the Overburden Monitoring Program for the last five years indicate that the source control purge wells are generally effective in removing liquid wastes (NAPL and APL) from within the landfill. However, total gallons purged on a monthly basis have declined from 799 gallons in 2006 to 155 gallons in 2010. Furthermore, based on water level and NAPL thickness data, it appears that the Source Control wells may no longer be producing significant amounts of NAPL. Based on water-level data from piezometers, the potentiometric surface in the overburden shows that the plume is contained. The NAPL Presence Monitoring shows that NAPL does not bypass the OBCS and detected NAPL is consistent with historical data. Based on these data, the containment system for the overburden operates properly and containment is being achieved.

Bedrock Containment

The bedrock NAPL/APL plume containment system has been designed to prevent lateral migration of groundwater in the bedrock by creating inward and downward flow gradients. Prior to 2002, it could not be demonstrated that full containment had been achieved in the bedrock

aquifer. Investigative studies conducted in 2002 and 2003, which were aimed at re-characterizing the Lockport bedrock, showed that the bedrock consists of multiple discreet bedding-parallel flow zones. As a result, plume boundaries were re-defined for each flow zone, previously-installed wells were retrofitted to communicate with specific flow zones, and the Bedrock Monitoring Plan was modified to reflect the updated understanding of the bedrock flow system.

The Bedrock Monitoring Program involves the evaluation of water levels, fluxes, and water quality of wells screened in discreet fracture zones in the Lockport Bedrock. Nineteen purge wells are used to control the lateral migration of APL/NAPL in the bedrock. Potentiometric data collected for the past five years indicate that the contaminant plume within each flow zone is contained by groundwater flow gradients, and that the purge well flow rates have been consistent with historic values. There were some operational issues noted for well PW-2M in July 2009 which resulted in a decreased flow rate at the well. These decreases were compensated for by increasing flow rates in well PW-1L. The problem with the pump was eventually resolved. Currently, the purge well system operates as designed.

In the bedrock plume containment system, hydraulic containment is implemented by controlling water levels at target set points. Based on the past five years of data, the pumping level set points for wells are all maintained within an acceptable operating range. To control flow migration in the area between the landfill and wells APW-1 and APW-2 (outcrop along New York Power Authority access road), unsaturated conditions need to be maintained in Flow Zone 09 in this area by keeping water levels at or below the elevation of 526 feet. Water levels have been consistently maintained below 526 feet, and for the past five years have averaged close to 519 feet.

Groundwater samples are collected quarterly for organic acids, and collected every '5$^{th}$ Quarter' for a more comprehensive list of chemical constituents (VOCs , SVOCs, organic acids, and sulfate). Sampling results are compared to the Site Organic Indicators (SOI) chlorendic acid, benzene, 1,1,2,2-tetrachloroethane, tetrachloroethene, trichloroethene, vinyl chloride, and cis-1,2-dichloroethene. For the past five years, data from these sampling events show that several locations exhibit exceedences to the established screening levels for some SOIs. However, no appreciable trends in concentrations of chemical constituents have been noted. Concentrations are not expected to change significantly until NAPL is recovered.

An annual NAPL presence check is conducted at the catch basin on the north side of the former Grief Brothers building. For the past five years NAPL has not been present in the open basin, although a sheen was noted for some of the sampling events. An annual APL sample from the basin and analysis of the sample for organic acid is also required. Based on sampling data for the past five years, there were no exceedences of screening levels; organic acid parameters were not detected.

Another component of the Bedrock Monitoring Program involves monitoring Bloody Run Creek, which is done to confirm that contamination via the creek remains under control. Bloody Run Creek is monitored every five years. Analysis includes VOCs, SVOCs, and organic acids. The Creek was last monitored in August of 2006. The results from the sampling event indicated that there were minor exceedences of bis(2-chloroethoxy)phthalate in wells BR-3 and BR-4. The next

monitoring event is scheduled for October 2011.

Community Monitoring

The Community Monitoring Program has been put in place at the Site to provide early warning to the residential community and make certain that residents in the area adjacent to the Landfill are not adversely exposed to contaminants in groundwater or from soil vapors above groundwater. Results from last five years of hydraulic measurements in paired community monitoring wells near the Landfill show that, with one exception noted in the 1st quarter of 2008, downward and vertical gradients are maintained at each well pair. Results of soil vapor monitoring for the same period show that there were no exceedences (greater than 0.05 parts per million by volume (ppmv) above background) of total VOCs at any soil monitoring locations.

The Community Monitoring Program includes annual APL flux monitoring to ensure that mass loading via groundwater discharge to the Gorge is less than the defined Flux Action Level as stipulated in the Requisite Remedial Technology. Data for the last five years show that no APL plume flux parameters (i.e., PCBs, pesticides, dioxin and furans) were detected above their reporting limit, consequently calculations of flux to the Niagara River Gorge were not necessary.

The Program also calls for a biennial inspection of the Gorge Face to ensure that contaminants are not discharging to public access areas. Gorge Face Seep surveys were conducted in 2006, 2009, and 2011. For each survey, previously identified seep locations or wet areas were inspected and notes were made regarding flow, vegetation, and odors. Based on surveys performed to date, there were no significant changes noted from previous surveys and no recommendations for groundwater sampling.

Maintenance & Inspection

Regular inspection and maintenance of the landfill cap ensures that the cap is in good working order and works to significantly reduce leachate. The cap is inspected annually and, based on the recent maintenance records, is in good working condition with no major subsidence concerns. The Site wells and piezometers are routinely inspected to confirm that casings and caps are secure and in good working condition. The well depths are also sounded to confirm that infilling is not taking place. A perimeter fence had been installed to prevent access by trespassers. The fence is inspected on weekdays and appears to be in excellent condition.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

There have been no changes in the physical conditions of the Site over the past five years that would change the protectiveness of the remedy. In general, the Site has limited access based on location within an industrial area and the fencing and security guards at the Site limit or prevent access to the Site. The establishment of an inward gradient for groundwater in the area and monitoring within the community to identify Site-related contaminants in groundwater early,

provide additional protection against exposures to the groundwater.

Soil and groundwater use at the Site is not expected to change during the next five years, the period of time considered in this review. The Non-Aqueous Phase Liquid (NAPL) Contaminants of Concern identified in the 1985 EDD and 2001 Five-Year Review in groundwater were: TCDD, dichlorotoluene, chlorotoluene, toluene, tetrachloroethylene, phenol, methyl benzoate, benzoic acid and benzochlorotrifluorides. The APL contaminants of concern identified in the 1985 EDD and 2001 Five-Year Review in groundwater were TCDD, benzoic acid and benzochlorotrifluorides.

The Site land use is industrial and is expected to remain industrial.

Protection of Human Health

The implementation of the EDD addresses the groundwater contaminants listed above by creating an inward groundwater gradient onsite. The Community Monitoring Program provides further protection by identifying potential Site related contaminants in groundwater early.
The landfill cap interrupts potential direct contact with soil contaminants through ingestion and dermal contact and inhalation. Other activities such as maintenance of the cap and fencing, and having onsite security interrupt potential exposures by trespassers.

The excavations of contaminants at Bloody Run and Niagara River Gorge have also reduced potential exposures to contaminants. The fences in the area of the Gorge have reduced potential exposures by limiting access.

In conclusion, the remedial actions at the Site and other activities identified above interrupt any potential ingestion, dermal and inhalation contact with soil and sediment. The groundwater actions also reduce potential exposures. These actions have interrupted exposures and the remedy remains protective.

Soil vapor monitoring was performed in 2010 at the Community Monitoring Wells (see Figure 2). There were no exceedances (greater than 0.050 parts per million per volume [ppmv] above background) of total VOCs at any of the soil vapor monitoring locations during 2010.
Soil vapor intrusion sampling was not conducted at the Site. The landfill is covered with the equivalent of a Part-360 cap. The landfill is owned by OCC and the RRT Stipulation requires OCC to regularly maintain the landfill in accordance with the O&M Plan and advise EPA of any changes to its condition, including ownership. In addition, the RRT Stipulation requires the Town of Niagara and the City of Niagara Falls to notify EPA and NYSDEC of all applications for permits for construction activities. Furthermore, a Declaration of Restrictive Covenants and Environmental Easement was placed on the deed to the Site property at the County recording office in Niagara County on October 7, 2010. In the unlikely event that any construction occurs on the landfill, further investigation of the potential for soil vapor intrusion should be conducted using OSWER's 2001 Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway for Groundwater and Soil or any future updates to this document.

At the current time, the review and analysis of the toxicity of dioxin, trichloroethylene, tetrachloroethylene, PCBs for non-cancer health effects continues. At the next Five-Year Review, the toxicity of these chemicals should be re-evaluated.

During the remedial investigation, off-Site soils were detected with concentrations of dioxin greater than 1 ppb. EPA's dioxin reassessment has been developed and undergone review over many years with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. EPA followed current cancer guidelines and incorporated the latest data and physiological/biochemical research into the assessment. The results of the assessment have currently not been finalized have not been adopted into state or federal standards. EPA anticipates that a final revision to the dioxin toxicity numbers may be released by the end of 2011. In addition, EPA has proposed to revise the interim preliminary remediation goals (PRGs) for dioxin and dioxin-like compounds, based on technical assessment of scientific and environmental data. However, EPA has not made any final decisions on interim PRGs at this time. Therefore, the dioxin toxicity reassessment for this Site will be updated during the next Five-Year Review.

**Question C: Has any other information come to light that could call into question the protectiveness of the remedy?**

No human health or ecological risks have been identified, and no weather-related events have affected the protectiveness of the remedy. No other information has come to light that could call into question the protectiveness of the remedy.

**Technical Assessment Summary**

Based upon the results of this fourth Five-Year Review process, including a review of the Site data and the Site inspection, it has been concluded that the remedy is functioning as intended by the Site's decision documents. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. The hydraulic containment stipulated in the RRT has been achieved. There have been no changes in the toxicity factors for the contaminants of concern and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

## VIII. Recommendations and Follow-up Actions

There are no recommendations or follow-up actions stemming from this five-year review.

## IX. Protectiveness Statement

The remedy at the Hyde Park Landfill Superfund Site protects human health and the environment. There are no exposure pathways that could result in unacceptable risks, and none are expected as

long as the engineered controls currently in place continue to be properly operated, monitored, and maintained.

## X. Next Review

Since hazardous substances, pollutants or contaminants remain at the Hyde Park Landfill Superfund Site, the next Five-Year Review for the site should be completed within five years of the signature date below.

**Approved:**

Walter E. Mugdan, Director
Emergency and Remedial Response
EPA – Region 2

Sept. 27, 2011
Date

| TABLE 1: CHRONOLOGY OF EVENTS | |
|---|---|
| **REMEDIAL ACTIVITY** | **DATE** |
| Landfill Closed by Occidental Chemical Corporation | 1975 |
| Clay Cap Placed on Landfill | 1978 |
| Stipulation and Judgment Approving Settlement Agreement | 04/82 |
| Aquifer Survey | 12/83 |
| Enforcement Decision Document | 11/85 |
| Stipulation on Requisite Remedial Technology Program | 05/86 |
| Community Monitoring Program | 04/87 |
| Industrial Protection Program | 09/87 |
| Gorge Face Seeps Remediation | 11/88 |
| Leachate Treatment Facility | 04/90 |
| Intermediate and Deep Formations Study | 09/90 |
| NAPL Incineration Permit | 11/90 |
| NAPL Plume Containment System: Phase I Extraction Wells | 11/90 |
| Source Control: Extraction Wells | 12/90 |
| Overburden Barrier Collection System | 12/91 |
| TCDD Bioaccumulation Study released to the public | 09/91 |
| Perimeter Capping | 07/91 |
| Bloody Run Remediation | 01/93 |
| NAPL Plume Containment System: Additional Extraction Wells (Phase II) | 11/93 |
| Source Control: Additional Extraction Wells | 07/94 |
| APL Plume Containment System | 08/94 |
| Final Capping/Site Closure | 12/94 |
| First Five-Year Review | 09/96 |
| Geophysical Investigation (Site Re-Characterization) | 06/01 |
| Second Five-Year Review | 09/01 |

| TABLE 1: CHRONOLOGY OF EVENTS | |
|---|---|
| NAPL Plume Containment System: Additional Extraction Wells (Phase III) | 12/01 |
| Site Characterization Report: Revised Geologic and Hydrogeologic Characterization | 02/02 |
| Retrofit of Existing Monitoring Wells to Piezometers Screened in 11 Flowzones | 12/02 |
| Site Characterization Report: Hydrologic Characterization | 02/03 |
| Site Characterization Report: Groundwater Flow Model | 06/03 |
| Site Characterization Report: Remedial Characterization Report | 06/03 |
| Superfund Preliminary Close-out Report | 07/03 |
| Major Ions Study | 11/03 |
| Comprehensive Remedial Characterization Report | 08/04 |
| Remedy declared Operational and Functional by EPA | 09/04 |
| Third Five-Year Review | 09/06 |

| TABLE 2: ANNUAL OPERATION & MAINTENANCE COSTS | |
|---|---|
| Sampling and Analysis | $300,000 |
| Site Operation/Inspection/Maintenance | $1,200,000 |
| Total Estimated Annual Monitoring Costs | $1,500,000 |

| TABLE 3: LIST OF DOCUMENTS REVIEWED | |
|---|---|
| Enforcement Decision Document | 11/85 |
| Stipulation on Requisite Remedial Technology | 5/86 |
| Intermediate and Deep Formations Study | 9/90 |
| TCDD Bioaccumulation Study | 9/91 |
| First Five-Year Review | 9/96 |
| Second Five-Year Review | 9/01 |
| Site Characterization Report: Revised Geologic and Hydrogeologic Characterization | 02/02 |
| Site Characterization Report: Hydrologic Characterization | 02/03 |
| Site Characterization Report: Groundwater Flow Model | 06/03 |
| Site Characterization Report: Remedial Characterization Report | 06/03 |
| Superfund Preliminary Close-out Report | 07/03 |
| Major Ions Study | 11/03 |
| Comprehensive Remedial Characterization Report | 09/04 |
| Performance Monitoring Plan | 07/06 |
| Third Five-Year Review | 8/06 |
| Quarterly Monitoring Reports | 2007 |
| Annual Report | 2007 |
| Quarterly Monitoring Reports | 2008 |
| Annual Report | 2008 |
| Quarterly Monitoring Reports | 2009 |
| Annual Report | 2009 |
| Quarterly Monitoring Reports | 2010 |
| Annual Report | 2010 |

# Hyde Park Landfill Superfund Site
# Site Location Map

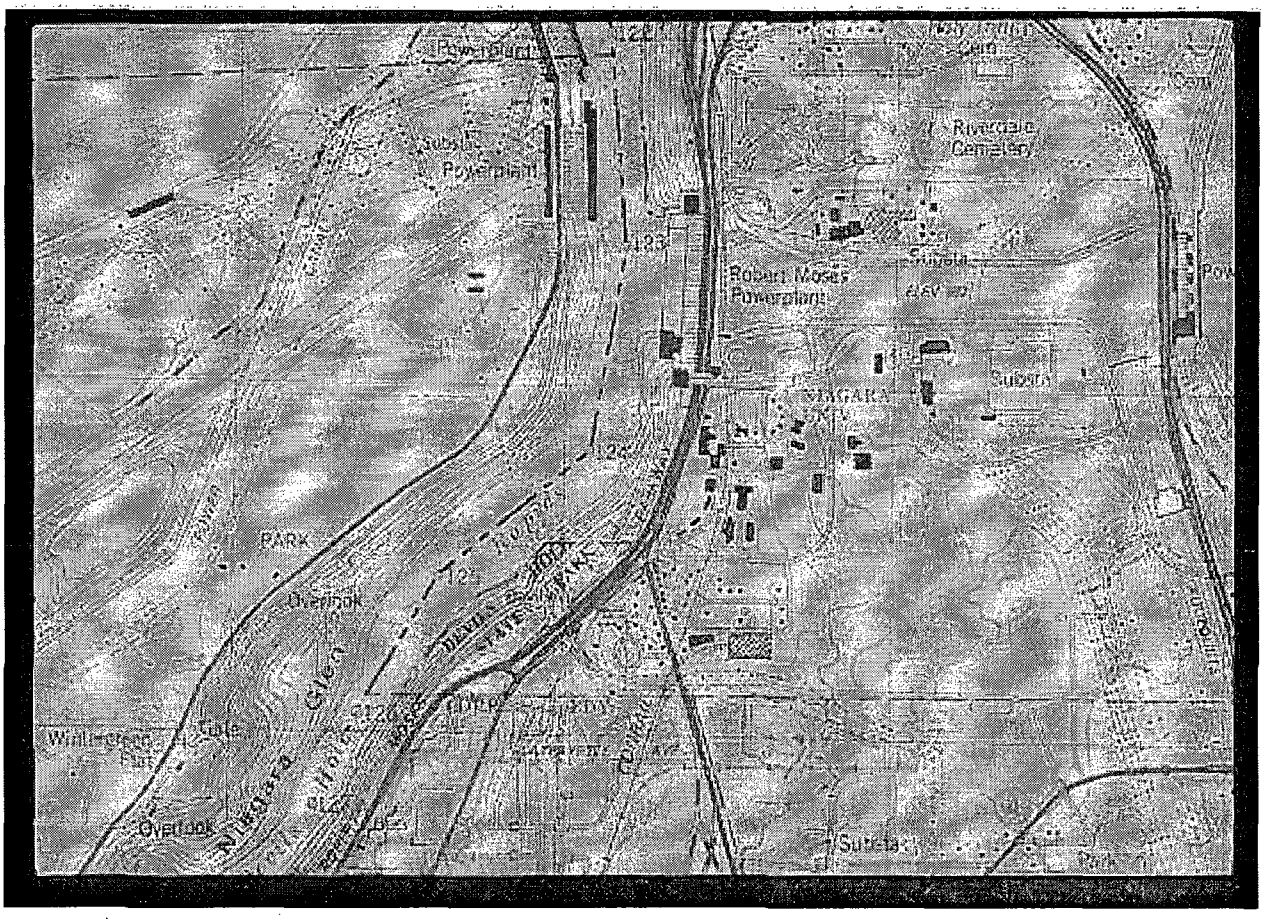


Figure 1