Five-Year Review Report
Sinclair Refinery Site
Village and Town of Wellsville
Allegany County, New York

Prepared by
U.S. Environmental Protection Agency

September 2002

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Sinclair Refinery

EPA ID *(from WasteLAN)*: NYD980535215

Region: 2	**State:** NY	**City/County:** Wellsville/Allegany

SITE STATUS

NPL status: **O** Final **G** Deleted **G** Other (specify) _____

Remediation status (choose all that apply): **O** Under Construction **O** Constructed **O** Operating

Multiple OUs?* **O** YES **G** NO	**Construction completion date:** N.A.

Has site been put into reuse? **O** YES **G** NO **G** N/A

REVIEW STATUS

Lead agency: **O** EPA **G** State **G** Tribe **G** Other Federal Agency _____

Author name: Michael J. Negrelli

Author title: Remedial Project Manager	**Author affiliation:** EPA

Review period:** 09/29/1997 to 09/30/2002

Date(s) of site inspection: 5/20/2002

Type of review:

G Post-SARA **G** Pre-SARA **G** NPL-Removal only
G Non-NPL Remedial Action Site **G** NPL State/Tribe-lead
G Regional Discretion **O** Statutory

Review number: **G** 1 (first) **O** 2 (second) **G** 3 (third) **G** Other (specify) _____

Triggering action:

G Actual RA Onsite Construction at OU #____ **G** Actual RA Start at OU#____
G Construction Completion **O** Previous Five-Year Review Report
G Other (specify) _____

Triggering action date *(from WasteLAN)*: 09/29/1997

Does the report include recommendation(s) and follow-up action(s)? **O** yes **G** no
Is human exposure under control? **O** yes **G** no **G** not yet determined
Is contaminated groundwater under control? **O** yes **G** no **G** not yet determined
Is the remedy protective of the environment? **G** yes **G** no **O** not yet determined

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

I. Introduction

This five-year review was conducted by Michael J. Negrelli, U.S. Environmental Protection Agency (EPA) Remedial Project Manager (RPM). This review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Liability and Compensation Act (CERCLA), as amended, 42 U.S.C. Section 9601, et seq., and 40 C.F.R. 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 sites remain protective of public health and the environment and remedies function as designed. This document will become part of the site file.

This is the second five-year review for the Sinclair Refinery site. Upon completion of the remedial action, contaminants will remain on the site. This five-year review is being conducted as a statutory requirement.

This site is being addressed in two operable units (OUs). OU1 consists of the landfill remediation and river rechannelization and has been completed. OU2 consists of the surface soils and groundwater at the former refinery. The remediation of the surface soils has been completed. The remedy for the groundwater is not yet complete and is not expected to be completed for several years.

II. Site Chronology

Table 1, below, summarizes site-related events from discovery to construction completion.

Table 1: Chronology of Site Events

Event	Date
Debris from landfill first reported in Genesee River	1981
Village, County, and State take steps to mitigate erosion of the landfill from Genesee River flood waters	1983
Site placed on National Priorities List (NPL)	1983
Record of Decision (ROD) for OU1	1985
Relocation of Village water supply intake completed	1988
Remedial Investigation/Feasibility Study started for OU2	1988
OU1 Consent Decree between EPA, ARCO entered with court	1989
Remedial Investigation/Feasibility Study completed for OU2	1991
Record of Decision for OU2	1991
EPA issues administrative order to ARCO for OU2 Remedial Action - Surface Soils	1992

Event	Date
EPA issues administrative order to ARCO for OU2 Remedial Action - Groundwater	1992
Remedial Action for OU1 completed - River Channelization	1992
Remedial Action for OU1 completed - Landfill Consolidation	1992
Remedial Action for OU1 completed - Landfill Capping	1994
Remedial Action for OU2 completed - Surface Soil Remediation	1994
Removal Action completed - Valley Steel property, soils	1995
Removal Action completed - Valley Steel property, drums	1995
Removal Action completed - Sinclair oil/water separator and powerhouse	1995
Remedial Design for OU2 completed - Phase 1 groundwater remedy	1995
Remedial Action for OU2 completed - Phase 1 groundwater remedy	1995
Long-Term Remedial Action for OU2 started - Phase 1 groundwater remedy	1996
EPA issues first Five Year Remedy Assessment	1997
Remedial Design for OU2 started - Phase 2 groundwater remedy	2002*
Supplemental OU2 investigation completed	2003*
Supplemental OU2 remedial action started	2004*
Remedial Action for OU2 completed - Phase 2 groundwater remedy	2004*
Long Term Remedial Action for OU2 started - Phase 2 groundwater remedy	2005*

* projected

III. Background

Physical Characteristics

The Sinclair Refinery site is situated between the Genesee River and South Brooklyn Avenue, one-half mile south of downtown Wellsville, in Allegany County, New York (see Figure 1). The northerly flowing Genesee River forms the eastern and southern boundaries of the site, South Brooklyn Avenue forms the western boundary, and an old refinery access road forms the northern boundary. The site can be viewed as three separate areas comprised of a 90-acre refinery area, a 10-acre landfill area, and a 14-acre tank farm, located approximately one-quarter mile west of the site. Investigation of the tank farm has found no

contaminants of concern so site response actions are limited to the 100 acres of the refinery and landfill.

Geology/Hydrogeology

The refinery area is characterized by generally flat land sloping gently towards the Genesee River. Site geology is dominated by fluvial and glacial sediments, which are highly variable unconsolidated deposits composed of sands, clays, and gravel. Fill material is also present in site soils, similarly composed of sands, clays, and gravel. Within the unconsolidated deposits beneath the site are at least three hydrologic units: an upper aquifer comprised of recent fluvial deposits, an aquitard comprised of glaciolacustrine clay, and a poorly defined lower aquifer comprised of glacial sands. Depths to the glaciolacustrine clay layer at the refinery range on average between 15 and 30 feet from the surface and average depth to the water table ranges between 5 and 10 feet from the surface. Groundwater flow at the site is generally to the north and east, discharging directly into the Genesee River. The Genesee River is a local source of drinking water, and the intake for the Village of Wellsville municipal water supply is located approximately one-quarter mile upstream of the site. Water on the site is supplied by the Village municipal system.

The area where the site is located also contains a man-made wetland area referred to as the main drainage swale. This wetland habitat was created as a result of the construction of a dike to prevent the Genesee River from eroding portions of the site. The Genesee River is also an important ecological resource for the State of New York, as well as being the primary drinking water source for the Village of Wellsville.

Land and Resource Use

When refinery operations ceased in 1958 as the result of a fire, the Sinclair Refining Company transferred the majority of the site property to the Village of Wellsville, which, in turn, conveyed some of the parcels to various companies and other entities. Currently, five companies and the State University of New York at Alfred's Wellsville Campus occupy the site. About 40 structures exist on-site, made of either brick or corrugated aluminum and steel frame construction. Other site features include a storm water sewer system, a sanitary sewer system, the main drainage swale, and a shallow drainage swale running perpendicular to the river near the site's north boundary. Features at the landfill portion of the site include a capped landfill and a recently built flood-control dike. The former tank farm is an open area with no discernable features.

As previously mentioned, the site is located one-half mile south of downtown Wellsville, a village with a population of about 6,000. Additionally, approximately 500 people use the buildings located on the site on a daily basis. Site usage is considered active and is expected to continue to be an actively used site.

History of Contamination

The refinery was built in 1901 for the processing of Pennsylvania grade crude oil. The Sinclair Refining Company purchased the refinery in 1919 and operated it through 1958, when a fire halted operations. In 1969, the Sinclair Refining Company merged with the Atlantic Richfield Company (ARCO). During the

operating history of the refinery, the company manufactured products such as heavy oils and grease for lubrication applications, light oil for fuel, naphtha, gasolines, aniline, lighter fluid and paraffin at the site. Additionally, a Wellsville, Addison and Galeton railroad line and spurs passed through the site which serviced the refinery. Also during Sinclair's refinery operations, tetraethyl lead sludge generated in the refinery process was temporarily buried in pits within the refinery area. The sludge was then oxidized or burned, causing the creation of lead oxide. The burned sludges were eventually reburied within the landfill located along the southernmost portion of the site. Other wastes generated during the course of the refinery operations included tank sludges from a solvent plant, sludges from an oil separator, acids, pesticides, waste oil and heavy metals. While these wastes were primarily disposed of at the landfill located at the site, manufacturing and waste handling operations at the time also led to the contamination of the refinery surface soils, subsurface soils and groundwater.

Initial Response

In 1981, debris from the Sinclair landfill was reported to have washed into the Genesee River due to erosion. Reports from the community and site inspections conducted by the New York State Department of Environmental Conservation (NYSDEC) indicated that the site warranted proposal for the National Priorities List (NPL). In September 1983 the Sinclair Refinery site was placed on the NPL.

In 1983, EPA and NYSDEC signed a cooperative agreement that identified NYSDEC as the lead agency responsible for overseeing the remedial cleanup activities at the site. In 1984, NYSDEC initiated a Remedial Investigation/Feasibility Study (RI/FS) to determine the nature and extent of contamination at the site and evaluate alternatives for the long-term remediation of the landfill portion of the site. In 1985, EPA authorized an initial remedial measure at the site, consisting of the relocation of the surface water intake for the Village of Wellsville's public water supply. The intake was moved to a location one-quarter of a mile upstream from the site in order to eliminate the possibility of landfill wastes contaminating the Village's drinking water supply. The relocation of the drinking water intake was completed in the Spring of 1988. In 1987, EPA took over lead agency status from NYSDEC.

Basis for Taking Action

For purposes of investigation and remediation, the Sinclair Refinery site is being addressed in two distinct operable units. OU1, which consists of the 10-acre landfill portion of the site, (formerly consisting of the Central Elevated Landfill Area (CELA), the South Landfill Area (SLA), and the area between the two landfills) and OU2, which consists of the 90-acre former refinery.

The OU1 RI/FS identified the following wastes deposited in the landfill: cloth filters used for straining oil; sludges from an oil/water separator; tank sludges from the solvent plant; “off-specification” products; oil-soaked soils and sludges (deposited daily); burnt Fullers Earth (used for filtering); tank sludges (deposited weekly); acid spills; cinders and ash from the coal-fired boiler plant; tetraethyl lead; pesticides; waste oil; and heavy metals.

As a result of the OU1 RI/FS, EPA selected a cleanup plan for the landfill portion of the site. This cleanup plan was embodied in a September 26, 1985 Record of Decision (ROD) for OU1. The remedial actions identified in the 1985 ROD included the partial channelization of the Genesee River to protect the landfill from erosion and flooding, removal and disposal of drums from the surface of the CELA, the excavation of the SLA and its consolidation onto the CELA, backfilling of the excavated area with clean fill, the construction of a cap over the consolidated landfill, and the construction of a fence around the consolidated landfill. ARCO agreed to implement the remedial actions listed above, with modifications to the original plan for partial channelization of the Genesee River. This agreement was memorialized in a judicial Consent Decree which was signed by the United States and ARCO and entered with the U.S. District Court for the Western District of New York on May 19, 1989.

Subsequently, the required work was organized into three separate remedial actions, namely: the partial channelization of the Genesee River (completed in 1992); the drum removal, excavation, consolidation, and backfilling of the SLA (completed in 1992); and the capping and fencing of the consolidated landfill (completed in 1994).

The OU1 ROD had also called for remedial alternatives addressing the refinery portion of the site to be evaluated as part of a supplemental (OU2) RI/FS. ARCO agreed to perform the OU2 RI/FS as memorialized in an Administrative Consent Order issued by the EPA on July 28, 1988. The results of the OU2 RI/FS identified volatile and semi-volatile organic compounds and metals as contaminants of concern in the refinery area. Sampling and analysis of the surface soils indicated the presence of arsenic and lead above action levels selected for the site. Sampling and analysis of subsurface soils indicated the presence of volatile and semi-volatile organic compounds and arsenic and lead as well, but at levels lower than that found in the surface soils. Sampling and analysis of the groundwater in the refinery area indicated three distinct plumes (the "northern," "central," and "southern" plumes) in the shallow aquifer with levels of benzene, toluene, ethylbenzene, xylene, nitrobenzene, naphthalene, arsenic, chromium and lead above action levels selected for the site.

As a result of the OU2 RI/FS, EPA selected a remedy for the second operable unit in a ROD (OU2 ROD) signed on September 30, 1991. Cleanup measures in the OU2 ROD included the excavation of surface soils exceeding the remedial cleanup criteria for arsenic and lead and their consolidation into the landfill prior to closure, monitoring of surface water, groundwater, and soil gas to track potential contaminant migration from subsurface soils, and pumping and treatment of contaminated site groundwater. Administrative Orders for Remedial Design and Remedial Action were issued by the Agency to ARCO on May 1, 1992 and September 8, 1992 for the OU2 work, which was organized into two separate remedial actions. These consisted of the surface soils excavation and disposal as the first remedial action, completed in 1994, and the monitoring and groundwater remediation components as the second remedial action, which is currently on-going.

Enforcement Activities

Since EPA took over lead agency status in 1987, EPA and ARCO have entered into a number of agreements allowing ARCO to carry out the required work under EPA oversight. In 1988, EPA and ARCO entered into a judicial Consent Decree, which was entered with the U.S. District Court for the Western District of New York on May 19, 1989, to perform the remedial design and remedial action for OU1. These activities (river channelization, landfill consolidation, landfill cap construction) were successfully completed between 1992 and 1994. Additionally, ARCO agreed to perform the OU2 RI/FS as memorialized in an Administrative Consent Order issued by the EPA on July 28, 1988. The RI/FS was successfully completed in 1991 upon EPA's issuance of the OU2 ROD.

Following the selection of the OU2 remedy in the 1991 ROD, EPA sought to negotiate a Consent Decree with ARCO for the performance of the remedial design and remedial action for OU2. In order for ARCO to expedite the remedy selected for the refinery surface soils and enable most of the excavated material to be placed under the landfill cap before its closure, ARCO requested that EPA issue a UAO for the remedial design and remedial action of the refinery surface soils. The UAO was issued by EPA on May 1, 1992, and the remedial action was successfully completed in 1994. EPA and ARCO were ultimately unable to negotiate a Consent Decree for the groundwater remedy and consequently EPA issued a second UAO to ARCO on September 8, 1992 for the remedial design and remedial action of the groundwater portion of the remedy. Subsequently, in 1993, ARCO petitioned EPA to implement an air sparging/soil vapor extraction (AS/SVE) remedy in lieu of the pumping and treatment remedy called for in the OU2 ROD, claiming the AS/SVE system would be as effective in meeting ROD performance standards and less costly. EPA agreed to allow ARCO to pursue this proposal as a site-wide pilot program with the caveat that if monitoring data collected during the implementation of the AS/SVE system could not demonstrate the effectiveness of the system in achieving the cleanup goals of the ROD, then another program to meet those cleanup goals would have to be implemented by ARCO. This "phased approach" to groundwater remediation was memorialized in a February 28, 1994 letter from EPA to ARCO. ARCO has provided EPA with monitoring data since the Phase 1 systems began operating. The monitoring data are discussed in more detail below. ARCO has been in compliance with each of the legal instruments mentioned in this discussion.

IV. Remedial Actions

Genesee River - Partial Channelization

The remedial action for partial channelization of the Genesee River was carried out in accordance with the requirements of the Judicial Consent Decree between ARCO and the USEPA effective May 19, 1989. The objectives of this phase of the remediation included the following:

- Protection of the consolidated landfill from bank erosion and flood inundation during floods up to a 100-year event on the Genesee River;

- Protection of the east bank from an existing sheet pile weir for approximately 2000 feet from the existing riprap upstream of the weir; and

- Improvement of river flow conditions approaching the weir located downstream from the landfill.

The design to accomplish this work was approved by EPA on February 21, 1990 and construction commenced on July 24, 1990. The work was carried out by ARCO's contractor and overseen by the U.S. Army Corps of Engineers through an interagency agreement with EPA. EPA performed a final inspection of the construction on October 3, 1991; the remedial action was completed upon EPA's approval of the Remedial Action Report on March 27, 1992.

South Landfill Area Excavation and Consolidation

The remedial action for the SLA was implemented in accordance with the Judicial Consent Decree between ARCO and the USEPA, effective May 19, 1989, and consisted of the following:

- Excavate and consolidate the wastes from the 2.3-acre SLA onto the 9.2-acre CELA;

- Fill the excavated area with clean fill from an off-site source; and

- Place a temporary cover over the portion of the CELA which received waste from the SLA, pending the final remediation of the CELA.

The design to accomplish this work was approved by EPA on September 26, 1990 and construction commenced on October 15, 1990. The excavation was completed in November 1990, but backfilling of the excavated area was suspended due to the onset of the winter season and completed the following year. The work was carried out by ARCO's contractor and overseen by the U.S. Army Corps of Engineers through an interagency agreement. EPA performed a final inspection of the construction on October 3, 1991; the remedial action was completed upon EPA's approval of the Remedial Action Report on March 27, 1992.

Landfill Capping

The remedial action for the capping of the consolidated landfill was also carried out in accordance with the requirements of the Judicial Consent Decree between ARCO and the USEPA effective May 19, 1989. The objectives of this phase of the remediation included the following:

- Removal of drums from the landfill, with empty drums shredded and placed over the surface of the waste and drums with contents being disposed of off-site;

- Construction of a soil-bentonite cutoff wall around the landfill perimeter;
- Stabilization of soft sludge wastes within the landfill;
- Regrading of the landfill;
- Construction of a geosynthetic and soil cap over the landfill surface to be tied in to the soil-bentonite cutoff wall;
- Construction of a passive gas vent system within the cap;
- Installation of monitoring wells around the landfill, piezometers within the landfill, and pipe sleeves within the landfill cap for possible future access; and
- Installation of a permanent security fence around the capped landfill.

The design to accomplish this work was approved by EPA on December 6, 1991 and construction commenced in June 1992. The work was carried out by ARCO's contractor and overseen by the U.S. Army Corps of Engineers through an interagency agreement. EPA performed a final inspection of the construction on July 8, 1993; the remedial action was completed upon EPA's approval of the Remedial Action Report on January 28, 1994.

Surface Soils Excavation and Disposal

The remedial action for the refinery surface soils excavation was implemented in accordance with an Administrative Order issued by the EPA to ARCO on May 1, 1992. The objectives of the remedial action consisted of the following:

- Excavate refinery surface soils exhibiting concentrations above 1000 parts per million (ppm) of lead and 25 ppm of arsenic to a depth of one foot below surface;
- Consolidate the excavated soils into the landfill prior to closure;
- Fill the excavated area with 6 inches of clean soil and 6 inches of topsoil; and
- Revegetate the disturbed areas.

The design to accomplish this work was approved by EPA on May 29, 1992 and construction commenced on July 8, 1992. The work was completed in early 1994, necessitating some of the excavated soil to be disposed of at an approved off-site facility. The work was carried out by ARCO's contractor and overseen by the U.S. Army Corps of Engineers through an interagency agreement. EPA performed a final

inspection of the construction on May 10, 1994; the remedial action was completed upon EPA's approval of the Remedial Action Report on November 23, 1994.

Groundwater Remediation - Phase 1

The OU2 ROD called for the pumping and treatment of contaminated groundwater at the site with the goal of achieving drinking water standards. EPA issued an administrative order for the remedial design and remedial action of this remedy to ARCO on September 8, 1992. In late 1993, ARCO approached EPA with a proposal to implement an air sparging/soil vapor extraction (AS/SVE) remedy in lieu of the pumping and treatment remedy, claiming the AS/SVE system would be as effective in meeting the OU2 ROD performance standards and less costly. EPA agreed to allow ARCO to pursue this proposal as a site-wide pilot program (Phase 1) with the caveat that if monitoring data collected during the implementation of the AS/SVE system could not demonstrate the effectiveness of the system in achieving the cleanup goals of the ROD, then another program to meet those cleanup goals would have to be implemented by ARCO (Phase 2). This phased approach to the groundwater remediation was memorialized in a February 28, 1994 letter from EPA to ARCO. In 1995, ARCO began Phase 1 at the site which essentially applied AS/SVE to the southern and central plumes at the site and a limited pumping and treatment component (three recovery wells) at the downgradient edge of the northern plume. After a failed attempt to apply AS/SVE at the upgradient portion of the northern plume, an AS/SVE system was later added further downgradient in a more geologically suitable location. ARCO has provided EPA with continuous monitoring data since the systems began operating.

Groundwater Remediation - Phase 2

The results of the Phase 1 monitoring data have indicated that AS/SVE is not effective in meeting drinking water standards in the groundwater plumes on site. Although the systems implemented by ARCO have effectively removed large quantities of subsurface contamination from the vadose zone (the subsurface soils area that becomes seasonally saturated with a rising and falling water table), the systems have had little, if any, effect on the groundwater plumes. Conversely, the limited pumping and treatment that has been carried out at the site does appear to be an effective means of reducing contaminant levels in the groundwater aquifer, and recent monitoring results show the area of the plumes nearest to the recovery wells to be at or near maximum contaminant levels. In September 2002, EPA notified ARCO by letter that the Phase 1 program has not met the performance standards of the OU2 ROD and that a Phase 2 program, consisting of the original pumping and treatment remedy from the OU2 ROD, needs to be implemented.

Genesee River and Associated Wetlands

Source remediation (Phase 1) was expected to result in the protection of surface water, sediments, and wetlands. However, after source remediation was implemented, certain instances of site contamination not known at the time of the OU2 ROD have been observed. Around 1997, the first instance of light nonaqueous phase liquid (LNAPL) sheens were reported on the surface of the Genesee River adjacent

to the site. Over time, these occurrences have become more prevalent, particularly during summer and early fall when the water table at the site is seasonally depressed. Concurrently, LNAPL was recorded in some of the site monitoring wells. Visual inspections of the main drainage swale indicated the presence of sheens and other discolorations, and sampling events indicated high levels of inorganic contaminants in the swale sediments. Consequently, EPA directed ARCO to perform an investigation of the riverbank and riverbed of the Genesee River adjacent to the site to determine the extent of the LNAPL contamination. This investigation was performed in 2000, and the report submitted by ARCO indicates gross LNAPL contamination of the riverbank and parts of the riverbed adjacent to the site. In 2001, ARCO began a study of site contamination with respect to the indigenous species of the main drainage swale. The results of this study will be reported along with the results from the comprehensive investigation of the swale and river referred to below. Another contaminant release from the site was documented in 1999, with the measurement of nitrobenzene in the Genesee River above ambient water quality standards. This occurrence was attributed to the MW-70 area of the site. These events suggest the need for further site investigations. In September 2002, EPA notified ARCO by letter that a comprehensive investigation of these areas needs to be performed pursuant to the additional response actions section of the 1992 administrative order.

Operation and Maintenance, Monitoring, and Institutional Controls

OU1: Routine operation and maintenance of the OU1 remedy has been ongoing since the completion of the remedial action in 1994. Annual reports are provided to EPA for review. Activities summarized in the report include quarterly inspections of the landfill cap and associated systems and biannual subsidence surveys and groundwater monitoring events. Typical maintenance activities include mowing the vegetation on the cap surface and removing overgrowth around well heads and the riprap on the riverbank. Eroded topsoil on the cap is replaced and reseeded as needed. Review of the annual reports and inspections during site visits indicate that all systems are operating efficiently. Institutional controls in place for OU1 include a security fence which prevents unauthorized access to the landfill. Additionally, there is a restrictive covenant associated with the deed to the land. The covenant provides for: no excavation, operation or parking of vehicles, or any activity that would otherwise disturb the facilities on the premises; access to the site for maintenance by ARCO; and the owner will notify ARCO if any party or event disturbs the facilities.

OU2: The groundwater remedy for OU2 is ongoing and the systems currently operating undergo routine operation and maintenance. These systems include a wastewater treatment plant and air sparging and soil vapor extraction equipment. ARCO employs a company, On-Site Health and Safety Services, Inc., which maintains an office at the wastewater treatment plant and company personnel are on-site full time during normal business hours to monitor and maintain the remedial systems. Weekly reports are provided to EPA which summarize health and safety issues, operations activities, maintenance activities, repairs, and planned activities. A site inspection is performed daily and certain monitoring wells are inspected for LNAPL weekly. A larger group of monitoring wells are sampled quarterly and the analyzed data are presented to EPA biannually in a combined quarterly monitoring report. This report is used to show general trends over time of the effects of the remedial systems on site contamination. Compliance monitoring is also performed

for the water discharged from the wastewater treatment plant; the results are reported monthly and the effluent is consistently in compliance with the discharge permit.

In addition to groundwater, the OU2 ROD also called for the long-term monitoring of surface water and soil gas to track any potential contaminant migration from the subsurface soils. The LNAPL manifestations that have been documented both in the groundwater and the surface water of the Genesee River and main drainage swale are speculated to be the result of contaminants bound to the subsurface soils. Monitoring of the LNAPL outbreaks are generally done visually (attempts at chemical analysis have been difficult due to the inherent problems of securing a viable sample) and outbreaks on the river surface are kept in check with the deployment of booms and absorbent pads as an interim remedy. A study to measure dissolved contaminants in the Genesee River was carried out from October 1999-April 2000; some of the samples taken measured the presence of nitrobenzene in the river above ambient water quality standards. The results of these monitoring and sampling events have resulted in EPA's determination that additional response actions are required and, in September 2002, EPA notified ARCO by letter that a comprehensive investigation of these areas needs to be performed pursuant to the additional response actions section of the 1992 administrative order. With respect to a soil gas survey, in approximately 1993, EPA conducted a survey of the buildings on site with the New York State Department of Health and only one building on site was found to have a basement which would potentially be impacted by soil gas. The building is owned by the State University of New York. The basement of this building is a boiler room, consisting of a boiler and mechanical heat conveyance devices.

Institutional controls for OU2 are essentially a work-in-progress being undertaken by ARCO. ARCO has made contact with all of the land owners at the site and has circulated ideas concerning engineering and institutional controls. No specific agreements with land owners have yet been entered into largely because the OU2 remedy has not been fully implemented. However, all land owners at the site understand that the shallow aquifer zone is known to be contaminated and, since the groundwater is not considered to be a resource by any of the land owners, using deed restrictions as a means to prevent use or exposure to the groundwater is acceptable to all concerned. Although only about one third of the site is in the Village, there is an agreement between the Town and Village for the Village to supply the entire site with water services, thus the groundwater is not used as a potable water source. ARCO reports that the land owners are in agreement that distilling any environmental exposure requirements into generic and easily understandable land use and building restrictions would be in everyone's best interest. It is anticipated that the use restrictions would be placed in the deed restrictions described above. An added level of institutional controls would be achieved using building codes. ARCO will pursue the application of building codes once the final remedy has been implemented. In summary, OU2 institutional controls will include groundwater use restrictions and land use restrictions, including restrictions concerning construction or construction activities. These institutional controls, after review and approval by EPA, will become an integral part of the site remedy.

Finally, there is an interim institutional control currently in place at the site. As previously stated, ARCO employs a full-time presence at the site through On-Site Health and Safety Services, Inc. The employees

of this company are trained in health and safety issues associated with hazardous waste sites and are aware of the nature and extent of the subsurface contamination at the site. This allows for on-site coordination and consultation with respect to any health and safety issues involving site occupants or emergency responders. Most recently, ARCO worked with the State University of New York in their plans to construct a building on the site to ensure that health and safety procedures would be followed during any subsurface intrusions and that any excavated soils would be managed in accordance with site project plans. Additionally, ARCO has arranged for health and safety training for Wellsville Department of Public Works (DPW) personnel that may be required to respond to emergencies at the site.

V. Progress Since the Last Review

The five-year review conducted by EPA in 1997 was categorized as a Type Ia statutory review. That is, the review was conducted as required by statute although the final remedial action had not yet been completed. As such, the 1997 five-year review report provided a summary of those remedial actions that had been completed by 1997 and acknowledged that the groundwater remedy and monitoring activities comprised an on-going remedial action. The "Results" section of the 1997 five-year review report stated the following with respect to the on-going remedial action:

> "EPA is monitoring the progress of the final remedial action to complete making the site protective of human health and the environment. This remedy is currently being augmented to include source-control measures to improve its overall performance. Continued data collection will allow EPA to make a determination as to whether the groundwater remedy is operational and functional and will ultimately enable EPA to determine whether the groundwater remedy is effective in meeting the requirements of the OU2 ROD. It is expected such a determination can be made within the next two years. Within this time frame, EPA will also make a determination as to whether modifications to the remedy warrant issuance of a ROD Amendment or Explanation of Significant Differences (ESD). Pending the outcome of current efforts, certain institutional controls may be an appropriate component of the ROD Amendment or ESD. EPA is scheduled to conduct another Five-Year Review of the remedial action at the Sinclair Refinery Site in the year 2002."

In the five years since the last review, EPA has evaluated the monitoring data generated by the operation of the Phase 1 groundwater remediation program and has determined that the Phase 1 remedy has not been effective in meeting the requirements of the OU2 ROD. Accordingly, EPA is now directing ARCO to carry out a Phase 2 remedy. The two-year time frame cited above proved too short a period to make a determination regarding the effectiveness of the Phase 1 remedy. Also, because the Phase 1 remedy proved ineffective in meeting the OU2 ROD performance standards, EPA did not issue a ROD Amendment or ESD; instead, Phase 2 requires ARCO to carry out the original groundwater remedy as set forth in the OU2 ROD. Institutional controls for OU2, as discussed in Section IV of this Report, are essentially a work-in-progress being undertaken by ARCO. OU2 institutional controls will include groundwater use restrictions and land use restrictions, including restrictions concerning construction or construction activities and, after review and approval by EPA, will become an integral part of the site

remedy. Finally, although the final remedial action remains an on-going action, human health and the environment remains protected through both the on-going remedial action and interim measures.

VI. Five-Year Review Process

Administrative Components

Michael J. Negrelli, EPA Remedial Project Manager (RPM), conducted the five-year review. This is a PRP-lead site. EPA, NYSDEC, and ARCO have provided the information necessary for this review. Interviews with the site occupants and local residents were not deemed necessary for the preparation of this five-year review. Due to the nature of the work planned for the site, it was determined that public outreach activities would play an important role at the outset of the Phase 2 groundwater remediation program. These activities will likely include a public availability session. Additionally, the current site occupants, which comprise the population most impacted by site activities, have the availability of ARCO's on-site contractor as a resource for any questions associated with site operations. The RPM also briefs a contact at the Wellsville DPW periodically with site updates should the DPW receive any inquiries with respect to the site.

Community Involvement

The EPA Community Relations Coordinator for the Sinclair Refinery site, Michael Basile, will arrange for a notice to be published in the *Wellsville Reporter*, a local newspaper, that the five-year review has been completed and is available in the local site repository for any interested members of the public to view. The notice will include the RPM's address and telephone number for questions related to the five-year review process or the Sinclair Refinery site. A public availability session will likely be held in Wellsville prior to the construction of the Phase 2 program for groundwater remediation.

Document Review

The following documents, data, and information were reviewed in completing the five-year review:

- OU1 Record of Decision, EPA, September 1985;
- OU2 Record of Decision, EPA, September 1991;
- National Priorities List Notebook Document, Sinclair Refinery Site, updated March 2002;
- EPA WasteLAN database;
- Progress Monitoring Report for the Remedial Action at OU2, ARCO, December 2001;
- Sinclair Refinery Site Five-Year Review Report, September 1997; and
- EPA Comprehensive Five-Year Review Guidance, June 2001.

Site Inspection

Michael J. Negrelli, RPM, conducted a site inspection on May 20, 2002. During the site inspection, the RPM did not observe any problems or deviations from the on-going remedial action being implemented at the site, nor were any problems or deviations observed with respect to operation and maintenance activities.

VII. Technical Assessment

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

OU1: Yes. The landfill cap, fence, drainage system, and monitoring wells are intact and in good repair.

OU2: No. The selected remedy for OU2 has not been fully implemented. The surface soil removal component discussed under "Remedial Actions", above, has been implemented as intended by the decision document. However, the groundwater remedial action has yet to be fully implemented in accordance with the decision document. The contaminated groundwater plumes have been generally defined and some of the impacted groundwater is extracted and treated. EPA has directed the potentially responsible party, ARCO, to implement the groundwater remedial action in accordance with the OU2 ROD by letter dated September 2002. This remedial action has been identified as Phase 2 of the groundwater remediation and is discussed above. Currently, however, the plumes do not extend to areas where groundwater is used as a potable water supply, and the land owners and site occupants are all informed that the shallow aquifer zone is known to be contaminated and are in agreement regarding the use of deed restrictions as a means to prevent improper use of the groundwater on site.

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

No, since the federal maximum contaminant level (MCL) for arsenic has been revised since the OU2 ROD. On January 21, 2001 EPA lowered the MCL for arsenic from 50 parts per billion (ppb) to 10 ppb, with February 22, 2002 as the effective date for this rule and January 23, 2006 as the compliance date for water purveyors. The performance standard for arsenic established in the OU2 ROD is 50 ppb (the New York State Department of Health MCL is also 50 ppb). However, for the purposes of this review, the change in MCL for arsenic has no effect on the protectiveness of the remedy. That is, arsenic contaminated groundwater will continue to be extracted at the site, removed from the influent in the treatment train, and the effluent discharged to the Genesee River at levels in compliance with the NYSDEC discharge permit. The Phase 2 groundwater program will address the new MCL for arsenic. Otherwise, there are no changes in the cleanup standards, toxicity factors, or Applicable or Relevant and Appropriate Requirements (ARARs) known to the RPM which would affect the remedies selected at the site.

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

Yes. New information has been gathered that has a bearing on the groundwater remediation remedy with respect to protection of the environment. As discussed above, LNAPLs have been found at the site that were not identified in the OU2 RI/FS and ROD. Some of these LNAPLs have migrated from the surface of the water table beneath the site through the riverbank to the surface of the Genesee River and the main drainage swale portion of the site. Accordingly, EPA has directed the potentially responsible party, ARCO, to respond to these new conditions and an interim measure consisting of the placement of oil booms and absorbent collection pads at the seep points on the river has been implemented. Further, by letter of September 2002, EPA has directed ARCO to undertake a comprehensive investigation of the LNAPL contamination such that EPA may evaluate mitigative actions that may be taken in the future. For the time being, the interim action being taken is protective of the environment to the degree that contamination is contained locally. By the time of the next five year review, the investigation of the LNAPL contamination should be completed and any mitigative actions that may be required should be in place.

VIII. Recommendations and Follow-up Actions

Table 2, on the following page, summarizes the recommendations and follow-up actions stemming from this 5-year review.

IX. Protectiveness Statement

The contamination at the Sinclair Refinery site is under control and there is no exposure to human receptors from site-related contaminants due to both permanent and interim measures in place at the site. These conditions are expected to remain so, at least until the next five-year review. It has not yet been determined that the site is fully protective of the environment. Further investigations are planned to address potential impacts to surface waters, wetlands, and sediments. The remediation of this site is on-going and has therefore not been determined to be construction complete. EPA expects that the site will be fully protective of human health and the environment when the groundwater remediation and any additional response actions are completed.

X. Next Review

The next five-year review for the Sinclair Refinery site should be completed by September 2007.

Approved:

William McCabe

George Pavlou, Director
Emergency and Remedial Response Division

9-30-02
Date

Table 2: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Respon-sible	Over-sight Agency	Mile-stone Date	Affects Protectiveness (Y/N)	
					Current	Future
Phase 1 ground water remedy not meeting RAOs	begin the design of the Phase 2 (OU2 ROD) groundwater remedy	ARCO	EPA	Dec 2002	N	Y
LNAPL intermittently seeping into river and swale	investigate LNAPL contamination	ARCO	EPA	Dec 2003	N*	Y
LNAPL intermittently seeping into river and swale	select supplemental remedial action	EPA	EPA	Jun 2004	N*	Y
LNAPL intermittently seeping into river and swale	implement supplemental remedial action	ARCO	EPA	Sep 2004	N*	Y
Phase 1 ground water remedy not meeting RAOs	implement the Phase 2 (OU2 ROD) groundwater remedy	ARCO	EPA	Jul 2004	N	Y
Institutional controls not implemented	implement institutional controls for OU2 subsurface soils and groundwater	EPA, ARCO, Wells-ville, and land owners	None	2005	N	Y

* not yet determined; further studies are planned. Interim measures have been taken to protect the river.

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
AS/SVE	Air sparging/soil vapor extraction
CELA	Central Elevated Landfill Area
DPW	Department of Public Works
EPA	(United States) Environmental Protection Agency
FS	Feasibility Study
LNAPL	Light non-aqueous phase liquid
MCL	Maximum Contaminant Level
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	Operable Unit
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SLA	South Landfill Area