United States Environmental Protection Agency

Office of Emergency and Remedial Response

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Superfund Record of Decision:

Sinclair Refinery, NY

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Sinclair Refinery site is a former refinery in Wellsville, Allegany County, New York. The site is composed of a 90-acre refinery area, 10-acre landfill area, and 14-acre offsite tank farm. Surrounding land use is primarily residential. The site borders the Genesee River, which is used as a local source of drinking water supplied by the Village of Wellsville Municipal System. The underlying ground water flow at the site is generally to the north and east, discharging directly into the Genesee River. From 1901 to 1958, the site was used to process Pennsylvania grade crude oil until a fire in 1958 halted operations. Currently, some private companies and the State University of New York occupy the site. A 1981 site inspection revealed that debris from the eroding landfill area has washed into and contaminated the Genesee River. A 1985 Record of Decision (ROD) addressed Operable Unit 1 (OU1) and provided for: removal and disposal of drums; excavation and consolidation of the south landfill area and filling of the excavated area with clean soil; partial channelization of the Genesee River to protect the landfill from erosion and flooding; capping of the consolidated landfill; construction of a fence around the entire landfill site; and an evaluation of the refinery portion of the site. This

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Sinclair Refinery, NY
Second Remedial Action - Final
Contaminated Media: soil, gw
Key Contaminants: VOCs (benzene, xylenes), other organics (Napthalene, nitrobenzene), metals (arsenic, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 104
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

EPA/ROD/R02-91/161
Sinclair Refinery, NY
Second Remedial Action - Final

Abstract (Continued)

ROD addresses OU2, remediation of the remaining contaminated areas at the site located within the 90-acre refinery area and the offsite tank farm including the contaminated ground water beneath the refinery. Data collected during the OU2 RI have not shown contaminant levels in landfill ground water to be in excess of Federal and State standards; therefore, EPA has chosen not to address landfill ground water remediation under this OU2 ROD. The primary contaminants of concern affecting the soil and ground water are VOCs including benzene and xylenes, semi-volatile compounds including naphthalene and nitrobenzene, and metals including arsenic and lead.

The selected remedial action for this site includes excavating soil contaminated in excess of arsenic 25 mg/l and lead 1,000 mg/l to a depth of 1 foot; treating excavated soil onsite prior to consolidation in the landfill; capping the landfill, and filling and revegetating excavated areas; conducting long-term monitoring of biota, surface water, ground water, and soil-gas to track any potential contaminant migration from the sub-surface soil; onsite pumping and treatment of contaminated ground water followed by discharging the treated ground water onsite to the Genesee River or offsite to the publicly owned treatment works (POTW); and implementing institutional controls in the form of local zoning ordinances. This ROD also provides contingency measures for ground water all or some of which may be implemented based on the monitoring data colleted. These measures include variations in pumping rates, implementing engineering or institutional controls, monitoring specified wells, reevaluation of remedial technologies, and invoking chemical-specific ARAR waivers. The estimated present worth cost for this remedial action is $15,549,700, which includes an annual O&M cost of $750,183 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific goals for soil include arsenic 25 mg/l and lead 1,000 mg/l. Ground water will be treated to attain Federal MCLs or State standards.

ROD FACT SHEET

SITE

Name:	Sinclair Refinery
Location/State:	Wellsville, Allegany Co., New York
EPA Region:	II
HRS Score (date):	53.90 (6/83)
NPL Rank (date):	119 (9/83)

ROD

Date Signed: September 30, 1991

Selected Remedy

Surface soils:	Excavate, treat, and dispose of in on-site landfill surface soils that exceed cleanup criteria for arsenic and lead.
Subsurface soils:	Public awareness program and institutional controls to manage excavation scenarios that open exposure pathway.
Groundwater:	Pump and treat groundwater with goal of achieving ARARs. Treated groundwater to be discharged into Genesee River.
Capital Cost:	$ 3,897,500
O & M:	$ 750,183
Present Worth:	$ 15,549,700

LEAD

Enforcement, PRP Lead
Primary Contact (phone): Michael Negrelli (212-264-1375)
Secondary Contact (phone): Kevin Lynch (212-264-6194)

WASTE

Type:	Surface soil - metals. Subsurface soil - VOCs, semi-volatiles, metals. Groundwater - VOCs, semi-volatiles, metals.
Medium:	Surface soil, subsurface soil, groundwater.
Origin:	Pollution originated as a result of refinery operations from approximately 1901-1958.

DECLARATION FOR RECORD OF DECISION

SITE NAME AND LOCATION

Sinclair Refinery
Wellsville
Allegany County, New York

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 2 for the Sinclair Refinery site, located in Wellsville, Allegany County, New York, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan. This decision document summarizes the factual and legal basis for selecting the remedy for this site.

The State of New York concurs with the selected remedy; a letter of concurrence is attached. The information supporting this remedial action decision is contained in the administrative record for this site, an index of which is attached as Appendix F.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The remedy selected for this operable unit at the Sinclair Refinery site is a final remedy for the contaminated surface soils, subsurface soils, and groundwater at the site. The site soils and groundwater contain elevated levels of volatile organic compounds, semi-volatile organic compounds, and metals.

The major components of the selected remedy include the following:

- Excavation of surface soils in excess of 25 ppm arsenic and 1000 ppm lead to a depth of one (1) foot to ensure that cleanup goals are met. The excavated soils will then be treated on-site to comply with the Resource Conservation and Recovery Act (RCRA) Land Disposal Restriction (LDR) regulatory levels prior to consolidation into the on-site landfill. A treatment option will be chosen and incorporated into the remedial design after a pilot study is undertaken to determine the effectiveness and feasibility of several technologies. The landfill will then be capped under an ongoing remedial action, and the excavated area will be backfilled with six (6) inches of clean soil followed by six (6) inches of topsoil and revegetated. Confirmatory sampling will be performed prior to backfilling to ensure that the soils that remain after the excavation will have arsenic and lead concentrations that do not exceed the cleanup criteria. Institutional controls, in the form of local zoning ordinances, will be recommended to account for any construction activity that would alter present site use. If such construction activity were to occur, an evaluation of the impacts of the proposed construction in regard to site contamination and exposure pathways will be provided to the New York State Department of Health for their review and comment.

- Long-term surface water, groundwater, and soil-gas monitoring to track any potential contaminant migration from the subsurface soils. Institutional controls, in the form of local zoning ordinances, will be recommended in an attempt to control any future site use that could open an exposure pathway to subsurface soils, and a public awareness program will be implemented, including public meetings if requested by the public.

- Treatment of contaminated groundwater with the goal of achieving applicable or relevant and appropriate requirements. Contaminated groundwater will be extracted and stored in a central collection tank for treatment in an above-ground system. A treatment system to meet discharge requirements will be developed during the design phase following a pilot study to determine its effectiveness and feasibility. The treated groundwater will be discharged either directly to the Genesee River or via the Publicly Owned Treatment Works. Institutional controls, in the form of local zoning ordinances, will be recommended to be implemented during the period of remediation, and monitoring of the surface water, groundwater, groundwater seeps, and indigenous biota will take place to track any potential contaminant migration.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. Because treatment is being used to address the principal threats at the site, this remedy satisfies the statutory preference for treatment as a principal element of the remedy.

As the remedy for this Operable Unit will result in hazardous substances remaining on the site above health-based levels, a review will be conducted within five (5) years after commencement of the remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

Constantine Sidamon-Eristoff
Regional Administrator

9/30/91
Date

DECISION SUMMARY

SINCLAIR REFINERY SITE
WELLSVILLE, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

NEW YORK

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I. SITE LOCATION AND DESCRIPTION

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 Figures 1 and 2). According to 1989 estimates, the population of the Village of Wellsville is 5,070 persons. 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 off-site tank farm, located approximately one-quarter mile west of the site.

The refinery area is characterized by generally flat land sloping gently towards the Genesee River on the eastern side of the site. The former off-site tank farm is located on a sloping area of a hill west of the site. Site geology is dominated by fluvial and glacial sediments, namely highly variable unconsolidated deposits beneath the site 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. Similar soils were encountered at the off-site tank farm with depth to bedrock measured between 9 and 27 feet. 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 is not known to contain any ecologically significant habitat, wetlands, agricultural land, historic or landmark sites, which are impacted by the site. A wetland assessment and restoration plan will, however, be required for any wetlands impacted by remedial activity. Similarly, a floodplain assessment and cultural resources survey will also be required prior to remedial activity.

Currently, seven companies and the State University of New York occupy the site. Approximately 40 structures exist on-site, made of either brick or corrugated aluminum and steel frame construction. Other site features include a stormwater sewer system, including four oil-water separators, a sanitary sewer system, a drainage swale which runs parallel to the river between the refinery and a flood-control dike, 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 single recently consolidated landfill and a recently built flood-control dike. The former off-site tank farm is an open area with no discernable features.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

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. The Sinclair Refining Company then transferred the majority of the property to the Village of Wellsville, which, in turn, conveyed some of the parcels to various companies and other entities, most of whom currently occupy the refinery portion of the site. In 1969, the Sinclair Refining Company merged with the Atlantic Richfield Company (ARCO).

In 1981, debris from the Sinclair landfill was reported to have washed into the Genesee River due to erosion. The Genesee River is the primary drinking water source for the Village of Wellsville. 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.

For purposes of investigation and remediation, the Sinclair Refinery site is being addressed in two distinct operable units, or sub-sites. Operable Unit 1 (OU1), also referred to as the Landfill sub-site, is concerned with the 10-acre landfill portion of the site, consisting of the Central Elevated Landfill Area (CELA), the South Landfill Area (SLA), and the area between the two landfills. Operable Unit 2 (OU2), also referred to as the Refinery sub-site, is concerned with the 90-acre refinery and what is referred to as the 14-acre off-site tank farm portions of the site.

In 1983, the United States Environmental Protection Agency (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 extent and nature 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.

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 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 CELA, partial channelization of the Genesee River to protect the landfill from erosion and flooding, and the construction of a fence around the entire landfill site. ARCO agreed to implement these remedial actions as memorialized in a judicial Consent Decree entered into between the United States and ARCO in 1988, and entered by the Western District of New York on May 19, 1989. Currently, all intact drums have been removed from the CELA surface and the remaining drums have been shredded and consolidated into the landfill, the SLA has been excavated and consolidated onto the CELA, and the partial river channelization project is 95% complete. The landfill cap design is in progress and preparatory work will commence once the design has been completed.

The 1985 ROD also called for an evaluation of the refinery portion of the site and the groundwater underlying the landfill portion of the site through a supplemental (OU2) RI/FS. ARCO also agreed to perform this RI/FS as memorialized in an Administrative Consent Order issued by EPA in 1988. ARCO submitted the draft Final RI and FS reports to EPA in March, 1991. EPA approved these documents in May, 1991, and the respective Addenda in June, 1991. In addition, in June, 1991, EPA and ARCO entered into an Administrative Order on Consent for the removal of asbestos-containing material from an abandoned building on the refinery portion of the site and for the removal of material from, and the subsequent decommissioning of, an oil separator located in the northern area of the site.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS reports and the Proposed Plan for the Sinclair Refinery site were released to the public for comment on July 26, 1991. These documents were placed in the public information repositories which are maintained at the EPA Region II offices and the David A. Howe Library in Wellsville. The notice of availability of these documents was published in the Olean Times-Herald and Wellsville Reporter on July 26, 1991. A 30-day public comment period on the documents was held from July 26, 1991 through August 24, 1991. At ARCO's request, EPA extended the public comment period through September 6, 1991. EPA notified the public of the comment period extension in the two periodicals mentioned above. In addition, a public meeting was held on August 1, 1991. At this meeting, representatives from EPA presented the Proposed Plan, and later answered questions concerning such plan and other details related to the RI/FS reports. Responses to comments and questions received during this period are included in the Responsiveness Summary, which is appended to this ROD.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION WITHIN SITE STRATEGY

As previously stated, the Sinclair Refinery site is being addressed in two distinct operable units, or sub-sites. OU1, also referred to as the Landfill sub-site, includes the 10-acre landfill portion of the site, consisting of the CELA, the SLA, and the area between the two landfills. OU2, also referred to as the Refinery sub-site, includes the 90-acre refinery and 14-acre off-site tank farm portions of the site.

In 1985, EPA signed a ROD for OU1, based on an RI/FS performed by New York State. Following the signing of a ROD, a remedial design is developed to meet the requirements of the ROD. After completion of the remedial design, the remedial action is implemented to carry out the requirements of the ROD. As previously mentioned, in 1988, ARCO agreed to implement the provisions of the OU1 ROD. The ROD components were divided into the river channelization phase, the landfill consolidation phase, and the landfill capping phase. Presently, construction of the river channelization and landfill consolidation phases are near completion and the remedial design for the landfill cap is also near completion. In addition, the OU1 ROD called for an evaluation of the refinery portion of the site and the groundwater underlying the landfill portion of the site, to be designated as OU2. The landfill groundwater data collected during the OU2 remedial investigation has not shown the landfill groundwater to exceed the applicable or relevant and appropriate requirements (ARARs) of federal and State environmental laws, and, therefore, EPA has chosen not to address landfill groundwater remediation under the OU2 ROD. However, during OU1 construction, some pockets of oil were observed on top of the water table in an isolated area outside the landfill boundary. Since landfill groundwater management and monitoring is an important component of the OU1 operation and maintenance (O&M) phase of the remedial action for the landfill remediation, a slurry wall has been added as a design constituent to better manage the groundwater associated with the landfill and landfill groundwater monitoring will continue indefinitely as per the landfill remediation O&M Plan. The landfill O&M monitoring wells will be installed such that the top of the water table can be adequately sampled. If a future monitoring event indicates that ARARs have been exceeded in the landfill groundwater, the appropriate action will then be taken. Therefore, this OU2 ROD focuses on cleanup methods for remediating the remaining contaminated areas at the site located on the 90-acre refinery area and the off-site tank farm, including the contaminated groundwater beneath the refinery. ARCO will be given the opportunity to carry out these requirements through a remedial design and subsequent remedial action. This ROD thereby addresses OU2 and will form the basis for final remediation of the site.

V. SUMMARY OF SITE CHARACTERISTICS

The contamination to be addressed by this OU2 ROD has been identified by the affected site media, namely surface soils, subsurface soils, and groundwater. As previously stated, special consideration has been given to groundwater underlying the landfill in the area addressed by OU1. Also previously noted, the cleanup of the Sinclair site has been separated into two distinct phases or operable units. EPA selected a cleanup plan for the landfill portion of the site in its OU1 ROD on September 26, 1985.

In contaminated areas of the refinery, surface soils were found to contain elevated concentrations of lead and arsenic. The lead was found at levels up to 1190 parts per million (ppm) in a limited area near the location of the former tetraethyl lead sludge pits. Lead at lower concentrations was also found aligned with the former railroad tracks across the eastern border of the site. Elevated levels of arsenic were also found in surface soils along the former railroad bed, with the maximum concentration measured at 43 ppm. No volatile organic compounds (VOCs) were found in surface soils, with the exception of two samples showing low methyl chloride measurements. Several semi-volatile compounds, including benzo(a)pyrene, were found in isolated surface soil samples at levels comparable to background. A summary of site surface soil contamination is provided in Table 1 of Appendix B.

The subsurface soils at the site showed only a few elevated lead concentrations, primarily in the general area of the tetraethyl sludge pits, with a maximum measurement of 791 ppm. Arsenic also occurred at only a few elevated levels in the subsurface soils, tentatively identified as backfill areas, with a maximum concentration measured at 88 ppm. The VOCs detected in subsurface soils include benzene, xylene, and carbon disulfide. Benzene in subsurface soils was measured up to 1450 ppb, xylene up to 26,000 ppb, and carbon disulfide up to 190 ppb. These were concentrated in the northern and southern areas of the refinery and may be attributable to former refinery operations. Several chlorinated compounds were also detected in subsurface soils. More semi-volatile compounds were found in subsurface soils than in surface soils, including benzo(a)pyrene in concentrations up to 19 ppm and naphthalene in concentrations up to 3.3 ppm. A summary of chemicals found in site subsurface soils is provided in Table 2 of Appendix B.

Contamination is also prevalent in groundwater beneath the refinery. Benzene and xylene were the most commonly detected VOCs, with maximum measured values of 1200 ppb for benzene and 1500 ppb for xylene. There are also isolated areas of chlorinated hydrocarbon contamination in the groundwater. Semi-volatile compound contamination includes elevated levels of naphthalene and nitrobenzene, measured in concentrations up to 0.23 ppm and 8.2

ppm, respectively. Elevated levels of metals detected in refinery groundwater include arsenic, measured at a maximum of 0.884 ppm, chromium, measured at a maximum of 0.298 ppm, and lead, measured at a maximum value of 0.249 ppm. Arsenic, chromium, and lead exceeded federal maximum contaminant levels (MCLs) for drinking water; levels of arsenic, chromium, lead, barium, copper, iron, manganese, sodium, and zinc were found to exceed State drinking water standards. A summary of chemicals detected in site groundwater can be found in Table 3 of Appendix B.

Soils at the off-site tank farm contained benzene at very low levels (maximum reading of 1 part per billion (ppb)) and metals were measured comparable to background conditions. The groundwater at the off-site tank farm was found to be uncontaminated. The drainage swale along the eastern border of the site had a single anomalous arsenic reading of 46 ppm in a sediment sample, but was otherwise uncontaminated. The Genesee River was also found to be generally free of contaminants; a single sediment sample out of 15 total sediment samples analyzed for metals had an arsenic reading of 98.3 ppm and two water samples out of 29 water samples analyzed for metals exceeded State drinking water standards for iron. Of the 26 surface water samples analyzed for VOCs, four samples exceeded State guidance values for chlorinated hydrocarbons and one sample exceeded the State guidance value for benzene. Stormwater sewers and the northern oil separator at the site were found to contain elevated levels of certain VOCs, semi-volatiles, and metals. Discharges from the sewers at the outfalls, however, appear to be at very low concentrations, indicating that the separators may still be functioning. The northern oil separator is being addressed through a separate remedial (removal) action.

VI. SUMMARY OF SITE RISKS

EPA conducted a baseline Risk Assessment (sometimes referred to as an Endangerment Assessment) to evaluate the potential risks to human health and the environment associated with the Sinclair Refinery site in its current state. The Risk Assessment focused on contaminants in the surface soils, subsurface soils, and groundwater which are likely to pose significant risks to human health and the environment. A summary of the chemicals of potential concern is listed in Table 4, Appendix B.

EPA's Risk Assessment identified several potential exposure pathways by which the public may be exposed to contaminant releases at the site under current and future land-use conditions. Surface soil, subsurface soil, and groundwater exposures were assessed for both potential present and future land use scenarios. A total of 4 exposure pathways were evaluated under possible on-site current and future land use conditions; potential subchronic risks associated with the subsurface soil (i.e., an excavation scenario) were assessed only for a future land use scenario. Reasonable maximum exposure assumptions were used to evaluate the risk associated with the pathways. These exposure pathways, illustrated in Table 5, include:

- Inhalation of volatile organic compounds by excavation workers exposed to subsurface soils;
- Inhalation of fugitive dust emissions of metals and semi-volatile organic contaminants by on-site occupants;
- Inadvertent ingestion of soil contaminants by both excavation workers and trespassing children (at the refinery and off-site tank farm); and
- Ingestion of dissolved contaminants in surface water by local residents.

Under current EPA guidelines, the likelihood of carcinogenic (cancer causing) and non-carcinogenic effects due to exposure to site chemicals are considered separately. It was assumed that the toxic effects of the site-related chemicals would be additive. Thus, carcinogenic and non-carcinogenic risks associated with exposures to individual compounds of concern were summed to indicate the potential risks associated with mixtures of potential carcinogens and non-carcinogens, respectively.

Non-carcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and safe levels of intake, or Reference Doses (RfDs). RfDs have been developed by EPA for indicating the potential for adverse health effects. RfDs, which are expressed in units of mg/kg-day, are estimates of daily exposure levels for humans which are thought to be safe over a lifetime (including sensitive individuals). Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) are compared with the RfD to derive the hazard quotient for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds across all media.

An HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The RfDs for the chemicals of potential concern at the Sinclair Refinery site are presented in Table 6.

A summary of the non-carcinogenic risks associated with the chemicals of potential concern across various exposure pathways is found in Table 7. It can be seen from Table 7 that the greatest non-carcinogenic risk from the site is associated with fugitive dust inhalation by on-site occupants. The HI for this pathway is $9.75x10^{-1}$ and is primarily attributable to barium detected in the surface soil.

Potential carcinogenic risks were evaluated using the cancer slope factors (SFs) developed by EPA for the chemicals of potential concern. Sfs have been developed by EPA's Carcinogenic Risk Assessment Verification Endeavor (CRAVE) for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Sfs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes the underestimation of the risk highly unlikely. The SF for each indicator chemical is presented in Table 6.

For known or suspected carcinogens, EPA considers excess upper bound individual lifetime cancer risks of between 10^{-4} to 10^{-6} to be acceptable. This level indicates that an individual has not greater than a one in ten thousand to one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year period under specific exposure conditions at the site. The total cancer risks at the Sinclair Refinery site are outlined in Table 8. The total cancer risk for on-site occupants is 1.97×10^{-4}, based on the inhalation of fugitive dust, primarily due to arsenic, and the ingestion of surface water. The total cancer risk for trespassing children is 3.79×10^{-5} at the refinery and 4.25×10^{-5} at the off-site tank farm, based on the ingestion of surface soil and surface water.

The cumulative upper bound cancer risk at the Sinclair Refinery site for on-site occupants under a current potential land use scenario is 1.97×10^{-4}, which is at the high end of the acceptable risk range. However, EPA has determined that the point of departure for cancer risks at the site should be 10^{-6}, based on the sensitivity of the on-site and neighboring populations (on-site students and residents in close proximity to the site).

UNCERTAINTIES

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of potential concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of potential concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Risk Assessment provides upper bound estimates of the risks to populations near the site.

A specific uncertainty inherent in the Sinclair Refinery risk assessment is that the methodology used to calculate the site risks are site-wide averages, which give a clear overall understanding of site risks. However, as previously stated, EPA has taken into account the sensitivity of the on-site and neighboring populations and has determined that the target risk for the site should be on the order of 10^{-6}.

Therefore, actual or threatened releases of hazardous substances from this site, if not addressed by the selected alternative or one of the other remedial measures considered, may present an imminent and substantial endangerment to the public health, welfare, and the environment. Consequently, a risk-based arsenic cleanup number was generated. This cleanup value, along with a focused sampling program, will ensure that the isolated high risk areas of the site are properly remediated (a discussion of cleanup levels for the site follows). More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the RI report.

CLEANUP LEVELS FOR THE SITE

EPA has chosen cleanup levels for the contaminants at the site based on a number of factors. The cleanup levels are derived from the acceptable risk range and point of departure set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a published guidance document, and requirements of federal and State laws and regulations. The levels are chosen to be protective of human health and the environment.

The cleanup level chosen for arsenic in site surface soils is 25 ppm. This cleanup goal, derived from the NCP, is based on the same assumptions used in the risk assessment, and corresponds to an acceptable cancer risk level. Document 3 of Appendix C provides the calculation of this cleanup level.

The cleanup level chosen for lead in site surface soils is 1000 ppm. This cleanup goal is established in a published EPA guidance document entitled "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive #9355.4-02)." This guidance recommends setting cleanup goals for lead in dust and soils at levels from 500-1000 ppm when current or predicted land use is residential. EPA has chosen 1000 ppm as the cleanup goal for the site as the site-specific conditions do not conform to a residential setting. The areas of the site where cleanup levels for arsenic and lead are exceeded are illustrated in Figure 3.

Cleanup levels for groundwater are established by federal and State laws and regulations. According to RI data, the shallow groundwater aquifer beneath the site is contaminated with a variety of chemicals. Although this is not a current drinking water source, the aquifer is designated by New York State as a class GA aquifer, or potential source of potable water. This designation requires that ARARs for drinking water be met. Cleanup levels are thereby driven by MCLs and ambient water quality standards (AWQSs) established by federal and State regulations. Documents 4 and 5 of Appendix C list AWQSs and MCLs for site groundwater.

VII. DESCRIPTION OF ALTERNATIVES

The remedial alternatives are presented by the media of the site which they address. They are numbered to correspond with their presentation in the FS report. The time to implement refers only to the actual construction and remedial action time and excludes the time needed to design the remedy, procure contracts, and negotiate with the Potentially Responsible Parties (PRPs), all of which can take 15-30 months.

MEDIUM 1: SURFACE SOILS

An estimated 7700 cubic yards of surface soils (defined as soils at a depth from the surface to one foot) with arsenic and lead concentrations above the cleanup levels of 25 ppm and 1000 ppm, respectively, are located in isolated "hot spots" of the site. The possible remedial alternatives for surface soils include: no action, capping, excavation with on-site disposal after treatment, excavation with off-site disposal after treatment, and in situ fixation. Figure 3 identifies the approximate aerial extent of surface soils which exceed the cleanup criteria for arsenic and lead.

Alternative 1A - No Action

Capital Cost: $46,700
Annual Operation & Maintenance (O&M) Costs: Year 1-5: $91,600
Year 6-30: $28,500
Present Worth: $743,000
Time to Implement: Construction: 2 Months
Remedial Action: 30 Years

The Superfund program requires that a no action alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, a public awareness program concerning surface soil contamination would be implemented, including the distribution of project fact sheets, conducting public meetings (if requested), and posting warning signs. Long term groundwater monitoring would also be included to track any contaminant migration. In accordance with Section 121 of CERCLA, remedial actions that leave hazardous substances above health-based levels at a site are to be reviewed at least once every five years to assure that the action is protective of human health and the environment. The no action alternative would have to be reviewed by EPA at least once every five years.

Alternative 1B - Capping

Capital Cost: $700,300
Annual O&M Costs: Year 1-5: $104,100
Year 6-30: $41,000
Present Worth: $1,583,200
Time to Implement: Construction: 6 Months
Remedial Action: 30 Years

This alternative involves capping of surface soils measured above 25 ppm arsenic and 1000 ppm lead to eliminate the exposure pathway. The cap would consist of one foot of clean soil and six inches of topsoil, which would then be revegetated. Long-term monitoring and maintenance of the cap would be performed and deed restrictions would be included to protect the integrity of the cap. Because hazardous substances will remain on-site above health-based levels, a five year review will be conducted.

Alternative 1C - Excavation and On-Site Disposal After Treatment

Capital Cost: $1,505,000
Annual O&M Costs: $0
Present Worth: $1,505,000
Time to Implement: Construction: 6 Months
Remedial Action: 30 Years (OU1 CELA Monitoring)

Under this alternative, surface soils measured above 25 ppm arsenic and 1000 ppm lead would be excavated to a depth of one foot to ensure that cleanup goals are met. The excavated soils would then be treated to comply with the Resource Conservation and Recovery Act (RCRA) Land Disposal Restriction (LDR) regulatory levels prior to consolidation into the CELA located in the southern portion of the site. A treatment option will be chosen and incorporated into the remedial design after a pilot study to determine its feasibility. The treatment options, in order of preference, are as follows: solidification/fixation, a chemical process whereby soils are converted into a stable, cement-like matrix using such additives as cement, lime, flyash, sodium silicate, or asphalt; thermoplastic solidification, a chemical process which mixes soils with materials such as asphalt, paraffin, or polyethylene in a heated mixer, producing a rigid, homogenous end product; contaminant extraction, or "soil washing", whereby excavated soils are flushed with a solvent in an above-ground treatment system and then rinsed with water. The cost estimate for this alternative is based on the solidification/fixation treatment option. The CELA would then be capped under an on-going remedial action and the excavated area would be backfilled with six inches of clean soil followed by six inches of topsoil and then revegetated. This alternative permanently removes the contaminated surface soils, eliminating this exposure pathway. Annual O&M costs are not included under this alternative because they will be covered under the remedy for the OU1 ROD. Also, although this alternative will allow for use and exposure at its completion under current (industrial) site uses, a five year review is considered necessary, since the cleanup criteria for lead is based on current site use, and a five year review would evaluate the protectiveness of the remedy should site use change. Accordingly, EPA will recommend the implementation of a local zoning ordinance that will require that the New York State Department of Health (DOH) be notified in the event of any construction activity that would alter present site use. If such a construction activity were to occur, an evaluation of the impacts of the proposed construction and its future use in regard to site contaminantion and exposure pathways will be provided to DOH for their review and comment.

Alternative 1D - In Situ Fixation

Capital Cost: $1,757,700
Annual O&M Costs: Year 1-5: $87,600
Year 6-30: $24,500
Present Worth: $2,394,600
Time to Implement: Construction: 6 Months
Remedial Action: 30 Years

In situ fixation refers to treatment of surface soils measured above 25 ppm arsenic and 1000 ppm lead in place to solidify and stabilize the contaminants. This involves the use of conventional construction equipment to mix in additives to immobilize the affected soils into an unleachable matrix without any soil removal. The soils would be treated to a depth of one foot and covered by six inches of topsoil and vegetation. This alternative would also require land use restrictions to maintain the integrity of the fixated material and periodic maintenance of the soil cover. Because hazardous substances will remain on-site above health-based levels, a five year review will be conducted.

Alternative 1E - Excavation and Off-Site Disposal After Treatment

Capital Cost: $4,110,700
Annual O&M Costs: $0
Present Worth: $4,110,700
Time to Implement: Construction: 6 Months
Remedial Action: 6 Months

This alternative is identical to Alternative 1C, except that excavated surface soils would be transported to an appropriate off-site facility after treatment. The treatment options are identical to those detailed in Alternative 1C. As in the previous alternative, the surface soil exposure pathway is permanently eliminated. Also as in the previous alternative, although this alternative will allow for unrestricted use and unlimited exposure at its completion under current site uses, a five year review is considered necessary, since the cleanup criteria for lead is based on current site use, and a five year review would evaluate the protectiveness of the remedy should site use change.

MEDIUM 2: SUBSURFACE SOILS

An estimated 44,000 cubic yards of subsurface soils (defined as soils at a depth from one foot to the water table) with elevated levels of VOC (benzene, xylene), semi-volatile (naphthalene), and metal (arsenic and lead) contaminants have been measured in the RI. However, no known pathway presently exists that would expose the human population to these contaminants and there is no evidence that subsurface soils are any longer acting as a significant source of groundwater contamination. The remedial alternatives for subsurface soils include: no action, excavation with off-site disposal after treatment, and in situ vapor extraction.

Alternative 2A - No Action

Capital Cost: $81,300
Annual O&M Costs: Year 1-5: $108,700
Year 6-30: $31,400
Present Worth: $882,100
Time to Implement: Construction: 2 Months
Remedial Action: 30 Years

The no action alternative provides the baseline against which other alternatives can be compared. This alternative involves implementation of a public awareness program concerning subsurface soil contamination, including the distribution of project fact sheets and conducting public meetings (if requested). Long-term surface water, groundwater, and soil-gas monitoring would also be included to track any contaminant migration. Institutional controls, in the form of local zoning ordinances, would also be recommended to control any future site uses which could open an exposure pathway. The site would be reviewed every five years to evaluate the protectiveness of the remedy.

Alternative 2B - Excavation and Off-Site Disposal After Treatment

Capital Cost: $22,869,800
Annual O&M Costs: $0
Present Worth: $22,869,800
Time to Implement: Construction: 6-12 Months
Remedial Action: 6-12 Months

Under this alternative, contaminated subsurface soils which exceed the cleanup criteria, derived from soil to groundwater modeling, would be excavated and transported to an appropriate off-site facility after treatment to comply with LDR requirements. Treatment options are identical to those presented in Alternative 1C. The potential cleanup criteria are derived from a model included in Appendix F of the FS which calculates a cleanup value based on a chemical's contributive effect to groundwater. The excavated areas would then be filled with clean soil brought from off-site. Temporary fencing would be erected around areas of open excavation. There is no need for a five year review, since this alternative would allow for unrestricted use and unlimited exposure at its completion.

Alternative 2C - In Situ Vapor Extraction

Capital Cost: $1,998,000
Annual O&M Costs: Year 1-5: $106,500
Year 6-30: $29,200
Present Worth: $2,766,100
Time to Implement: Construction: 24 Months (6 Months/Extraction)
Remedial Action: 30 Years

This alternative involves the in place treatment of contaminated subsurface soils. Areas of contamination are defined by subsurface soils which exceed the modeled cleanup criteria, detailed in the FS. Components of this alternative include the installation of extraction wells drilled through the contaminated zones and connected to high volume vacuum pumps via a pipe system, treatment of gas emissions to comply with air quality regulations, and monitoring to assess the effectiveness of the treatment. Residuals of this application would be treated off-site. Long-term groundwater monitoring is also a component of this alternative. This application is most effective in the removal of VOC contamination. There is no need for a five year review, since this alternative will allow for unrestricted use and unlimited exposure at its completion.

MEDIUM 3: GROUNDWATER

The RI measured levels exceeding federal and State drinking water standards for VOCs (benzene, ethylbenzene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane, toluene, and xylene), semi-volatiles (nitrobenzene), and metals (arsenic, barium, chromium, copper, iron, lead, manganese, sodium, and zinc) in site groundwater. The contamination is restricted to the upper aquifer, which is approximately 10-20 feet thick and underlies the entire site at varying depths. As previously mentioned, however, the groundwater beneath the landfill is being addressed under the OU1 action.

The ultimate goal of the EPA Superfund Program's approach to groundwater remediation as stated in the NCP (40 CFR Part 300) is to return usable groundwater to its beneficial use within a time frame that is reasonable. Therefore, for this aquifer, which is classified by New York State as a potential drinking water source, the final remediation goals will be federal and State drinking water standards. The remedial alternatives for groundwater include no action and groundwater treatment.

Alternative 3A/B - No Action

Capital Cost: $307,000
Annual O&M Costs: Year 1-5: $199,400
Year 6-30: $51,900
Present Worth: $1,716,400
Time to Implement: Construction: 2 Months
Remedial Action: 30 Years

As previously stated, the Superfund program requires that a no action alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, a public awareness program concerning groundwater contamination would be implemented, including the distribution of project fact sheets and conducting public meetings (if requested). Institutional controls, in the form of local zoning ordinances, would be recommended to prevent groundwater use on the site. Long-term surface water and groundwater monitoring would be included to track any contaminant migration. The site would be reviewed every five years to evaluate the protectiveness of the remedy. (Note: This alternative combines alternatives 3A and 3B, as they are presented in the FS.)

Alternative 3C - Groundwater Treatment

Capital Cost: $2,311,200
Annual O&M Costs: $705,900 (Consistent over 30 years)
Present Worth: $13,162,600
Time to Implement: Construction: 24 Months
Remedial Action: 30 Years

This alternative involves the treatment of contaminated groundwater with the goal of achieving ARARs. There are numerous design options which would be analyzed in the remedial design phase. This alternative assumes approximately 11 wells strategically placed to extract the bulk of the contaminated groundwater from the aquifer and prevent its migration into the Genesee River. The pumped groundwater would be stored in a central collection tank for subsequent treatment in an above-ground system. A treatment system would be developed during the design phase to meet discharge requirements following a pilot study to determine its feasibility. The cost of this alternative is based on treatment options which include a solids removal step (such as a chemical feed/rapid mix system followed by a flocculation and clarification step) in order to precipitate and filter out large suspended solids, air stripping of the clarified effluent for the removal of VOCs, and carbon adsorption, which utilizes activated carbon to selectively adsorb organic molecules and some metals by surface attraction to the internal pores of carbon granules. The treated groundwater would then be either discharged directly to the Genesee River or via the Publicly Owned Treatment Works (POTW). Institutional controls, in the form of local zoning ordinances, would be recommended during the period of remediation. Monitoring under this alternative will include surface water, groundwater, groundwater seeps, and Genesee River biota. The biota monitoring will entail the sampling of various indigenous species at points upstream and adjacent to the site and an evaluation of site-related impacts on the biota. Sampling will take place before any design implementation, and if no impacts are found, the biota monitoring will be discontinued. If significant impacts are found, however, a post-remedial interval for further biota monitoring will be established.

Recent studies have indicated that pumping and treatment technologies may contain uncertainties in achieving the ppb concentrations required under ARARs over a reasonable period of time. However, these studies also indicate significant decreases in contaminant concentrations early in the system implementation, followed by a leveling out. For these reasons, this alternative stipulates contingency measures, whereby the groundwater extraction and treatment system's performance will be monitored on a regular basis and adjusted as warranted by the performance data collected during operation. Modifications may include any or all of the following:

a) at individual wells where cleanup goals have been attained, pumping may be discontinued;

b) alternating pumping at wells to eliminate stagnation points;

c) pulse pumping to allow aquifer equilibration and to allow adsorbed contaminants to partition into groundwater; and

d) installation of additional extraction wells to facilitate or accelerate cleanup of the contaminant plume.

If it is determined, on the basis of the preceding criteria and the system performance data, that certain portions of the aquifer cannot be restored to their beneficial use in a reasonable time frame, all or some of the following measures involving long-term management may occur, for an indefinite period of time, as a modification of the existing system:

a) engineering controls such as physical barriers, source control measures, or long-term gradient control provided by low level pumping, as containment measures;

b) chemical-specific ARARs may be waived for the cleanup of those portions of the aquifer based on the technical impracticability of achieving further contaminant reduction;

c) institutional controls, in the form of local zoning ordinances, may be recommended to be implemented and maintained to restrict access to those portions of the aquifer which remain above remediation goals;

d) continued monitoring of specified wells; and

e) periodic reevaluation of remedial technologies for groundwater restoration.

The decision to invoke any or all of these measures may be made during a periodic review of the remedial action, which will occur at intervals of no less often than every five years. At that time, the State of New York will be given the opportunity to review, comment, and concur on all contingency decisions.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, a detailed analysis of each alternative is required. The purpose of the detailed analysis is to objectively assess the alternatives with respect to nine evaluation criteria that encompass statutory requirements and include other gauges of the overall feasibility and acceptability of remedial alternatives. This analysis is comprised of an individual assessment of the alternatives against each criterion and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs, that is, relative advantages and disadvantages, among them.

The nine evaluation criteria against which the alternatives are evaluated are as follows:

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. **Overall Protection of Human Health and the Environment:**
   This criterion addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with ARARs:**
   This criterion addresses whether or not a remedy will meet all the ARARs of other federal or State environmental statutes and/or provide grounds for invoking a waiver.

Primary Balancing Criteria - The next five "primary balancing criteria" are to be used to weigh major trade-offs among the different hazardous waste management strategies.

3. **Long-term Effectiveness and Permanence:**
   This criterion refers to the ability of the remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. **Reduction of Toxicity, Mobility, or Volume:**
   This criterion addresses the degree to which a remedy utilizes treatment technologies to reduce the toxicity, mobility, or volume of contaminants.

5. **Short-term Effectiveness:**
   This criterion considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are met.

6. **Implementability:**
   This criterion examines the technical and administrative feasibility of a remedy, including availability of materials and services needed to implement the chosen solution.

7. **Cost:**
   This criterion includes capital and O&M costs.

Modifying Criteria - The final two criteria are regarded as "modifying criteria," and are to be taken into account after the above criteria have been evaluated. They are generally to be focused upon after public comment is received.

8. **State Acceptance:**
   This criterion indicates whether, based on its review of the FS and Proposed Plan, the State concurs with, opposes, or has no comment on the proposed alternative.

9. **Community Acceptance:**

This criterion indicates whether, based on its review of the FS and Proposed Plan, the public concurs with, opposes, or has no comment on the proposed alternative.

The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria.

1. Overall Protection

Surface Soils: All of the alternatives, with the exception of Alternative 1A, would provide adequate protection of human health and the environment by eliminating or controlling risk through containment, removal, or treatment. Alternative 1C would remove soils with arsenic contamination over 25 ppm and lead contamination over 1000 ppm and consolidate these soils after treatment into the on-site landfill, thereby eliminating the risk of exposure and contaminant migration.

Alternative 1A is not an acceptable remedial option given the calculated risks. EPA has determined that, based on the sensitivity of the on-site and neighboring populations, the current risk from arsenic posed to site occupants is unacceptable and the guidance value for lead is exceeded in certain areas of the site.

Subsurface Soils: Each of the alternatives for subsurface soils provide adequate protection of human health and the environment. No risks presently exist from subsurface soils due to the lack of a known exposure pathway. Alternative 2A is protective in that potential sources of risk are controlled through containment (by overlying soils) and will remain protective through monitoring and the enforcement of the institutional controls which will address any future site uses which could open an exposure pathway.

Groundwater: Only Alternative 3C for groundwater attempts to provide adequate protection of human health and the environment by reducing contaminant levels to ARARs. Although there is no current exposure pathway for groundwater use on the site, the Alternative 3A/B is not protective of any future possible groundwater use since ARARs are exceeded in a potential drinking water aquifer. Furthermore, statistical evidence is not strong enough to support the claim that groundwater discharge from the site to the Genesee River does not exceed the New York State Class A Surface Water Standards. Alternative 3A/B offers limited protection provided the institutional controls to restrict groundwater use are implemented and enforced and that the Genesee River is adequately monitored, but Alternative 3C also attempts to reduce potential risk by actively removing and treating contaminants in the groundwater aquifer and prevent any migration of these contaminants into the Genesee River. Consequently, and in accordance with EPA groundwater policy as set forth in the NCP, site remediation is warranted to restore groundwater to its beneficial use.

2. Compliance with ARARs

Surface Soils: All of the alternatives would meet the ARARs of federal and State environmental laws. Chemical-specific, Action-specific, and Location-specific ARARs are outlined in Tables 9, 10, and 11 in Appendix B of this document.

LDRs are chemical- and action-specific ARARs that are triggered by the placement of wastes regulated under RCRA. LDRs require that excavated hazardous wastes be treated to acceptable levels before disposal. On-site disposal of treated wastes is permitted provided the wastes are not, after treatment, RCRA listed or characteristic hazardous wastes. Wastes that are listed must be either delisted or disposed of off-site; wastes that are characteristic may be disposed of on-site after they have been treated to levels such that they are no longer characteristic. Soils containing arsenic and lead must be treated to the extent whereby the concentration of arsenic or lead remaining in the leachate (as determined by the Toxicity Characteristic Leaching Procedure (TCLP)) is less than 5 ppm in order to no longer be considered characteristic and therefore eligible for on-site disposal. Delisting is not required, since it does not appear that the contaminated surface soils are RCRA listed wastes. Alternative 1C therefore complies with the LDR ARAR. Other action-specific and location-specific ARARs that are applicable or relevant and appropriate would also be met under each of the alternatives. Examples include Occupational Safety and Health Administration (OSHA) Standards for Hazardous Responses and New York RCRA Hazardous Waste Facility Requirements for the handling and storage of hazardous wastes.

Subsurface Soils: As with surface soils, all of the alternatives would meet the applicable or relevant and appropriate requirements of federal and State environmental laws. Alternative 2A does not trigger any action-specific or location-specific ARARs and no federal or State chemical-specific ARARs exist for soils.

Groundwater: Safe Drinking Water Act (SDWA) MCLs are federal chemical-specific ARARs and NYSDEC Class GA AWQSs are State chemical-specific ARARs that apply to the groundwater underlying the site. New York State Class A Surface Water Quality Standards (SWQSs) are State chemical-specific ARARs that apply to groundwater discharges from the site into the Genesee River. According to the federal Site-Specific Classification scheme, the groundwater is Class 2B, which is potential drinking water. New York State classifies the site groundwater "GA" and the Genesee River as class "A", both drinking water sources. Alternative 3A/B fails to meet these ARARs. Alternative 3C attempts to meet these ARARs; if ARARs are demonstrated to be unattainable after implementation of a groundwater extraction and treatment system, the contingency exists for a waiver of these ARARs, as outlined in the Summary of Alternatives section.

Alternative 3C would also meet action-specific ARARs. Location-specific ARARs that are applicable or appropriate would also be met under the preferred alternative. Examples include OSHA Standards for Hazardous Responses and New York State Pollutant Discharge Elimination System (SPDES) Requirements for Site Runoff, Surface Water and Groundwater Discharge Limits.

3. Long-term Effectiveness and Permanence

Surface Soils: Alternative 1C will be both effective and permanent once the construction phase is complete. The potential for direct exposure to the contaminated surface soils will be removed and the contaminated soil areas will be restored to ambient conditions. The soils consolidated in the CELA will be capped and maintenance and monitoring of the CELA will be conducted in accordance with the 1985 ROD.

Alternative 1A is neither effective nor permanent in maintaining protection of human health and the environment over time since the potential for contact with contaminated soils will not have been removed (although it will have been reduced by fencing). Each of the remaining alternatives offer long-term effectiveness and permanence by removing the exposure pathway, although Alternative 1B and Alternative 1D both require institutional controls for current land use which need to be enforced for complete effectiveness.

Subsurface Soils: No known risk exposure pathway currently exists for contact with subsurface soils. Based on the available data, the subsurface soils do not appear to be acting as a significant source of groundwater contamination. Alternative 2A is therefore effective and permanent in maintaining reliable protection of human health and the environment, provided the institutional controls to address any future site use scenario which could open an exposure pathway are enforced.

Alternative 2B and Alternative 2C also offer long-term effectiveness and permanence for the same reasons.

Groundwater: Alternative 3A/B is not effective and permanent in maintaining reliable protection of human health and the environment, since ARARs are exceeded in a drinking water aquifer. Alternative 3C is effective and permanent in that the remedial goal is to achieve ARARs and that the pumping and treatment would remove the groundwater contamination, thereby lessening the impact on the Genesee River. EPA acknowledges, however, that pumping-and-treatment technologies may contain uncertainties in achieving ARARs over a reasonable time period.

4. Reduction of Toxicity, Mobility, or Volume

Surface Soils: Alternative 1A provides no reduction in toxicity, mobility, or volume of contaminants since there is no treatment. Alternative 1B also provides no reduction in toxicity or volume due to no treatment, but does reduce the mobility of contaminants in the soil since they would be contained and no longer available for transport by wind or water erosion. Alternative 1D would reduce contaminant mobility by reducing their solubility. However, there would be no reduction in toxicity under this alternative and the volume of treated material would increase by roughly thirty percent.

Alternative 1C will reduce the mobility of contaminants first through treatment and then by placement in the CELA which will be contained by a cap. Alternative 1E would also reduce contaminant mobility for the same reasons. No reduction in toxicity or volume of contaminated soils would occur under either of these alternatives.

Subsurface Soils: No reduction in toxicity, mobility, or volume is provided by Alternative 2A. Alternative 2B would reduce contaminant mobility through treatment and landfill disposal, but there would be no reduction in the toxicity or volume of contaminants. Alternative 2C would result in a significant reduction in mobility of VOCs in subsurface soils through removal, as well as a reduction in toxicity and volume as the VOCs would ultimately volatilize. This technology, however, is ineffective for the cleanup of metals.

Groundwater: Alternative 3A/B for groundwater does not involve any removal, treatment, or disposal of contaminants and therefore provides no reduction in toxicity, mobility, or volume. Alternative 3C would contain the groundwater contaminants, thereby reducing mobility and the ability of contaminants to migrate into the Genesee River. The treatment process would reduce contaminant concentrations in the treated groundwater to below surface water discharge or POTW pretreatment standards and would have the goal of reducing contaminant concentrations in the aquifer to below ARARs, effectively diminishing both toxicity and volume.

5. Short-term Effectiveness

Surface Soils: The short-term effectiveness of all the alternatives is high since each alternative involves little construction and implementation. Although the potential for dust release is higher for Alternatives 1C and 1E, both alternatives are still high in regard to short-term effectiveness. Reliable technologies will be used in the excavation, treatment, transport, and consolidation phases to ensure that any dust releases will be minimized. The time for implementation of the construction phase of Alternative 1C is 6 months, with a minimum of 30 years of CELA monitoring (under OU1), while Alternative 1E would take 6 months with no monitoring component.

Subsurface Soils: The short-term effectiveness of Alternative 2A is high since the implementation of local zoning ordinances and monitoring will not disturb any potentially contaminated subsurface soils. Any exposures during sampling under the monitoring activities will be mitigated by proper personal protection equipment and procedures. The implementation time for the construction component of this alternative is estimated to be 2 months, followed by a minimum of 30 years of monitoring. Alternative 2B is slightly less favorable in terms of short-term effectiveness. The affected areas under construction would require dust control measures, air monitoring, erosion and sediment control measures, and personal protection equipment and procedures to mitigate any exposures. The construction implementation period for this alternative would take 6-12 months, with no monitoring component. The short-term effectiveness of Alternative 2C is measured against the short-term risk associated with the inhalation of VOCs during construction. These risks are mitigated through proper operational procedures and health and safety precautions. The estimated implementation time for construction of this alternative is 6 months for each extraction area or 24 months total, to be followed by at least 30 years of monitoring.

Groundwater: The short-term effectiveness of each alternative is high since there is no exposure to contaminated groundwater during implementation. Any short-term risks are derived from the potential of constructing and using a groundwater well on-site before institutional controls are in place, which is considered highly unlikely since the site is provided with water from the Village municipal system. The estimated implementation time for Alternative 3A/B is 2 months for construction and a minimum of 30 years monitoring. Alternative 3C is also effective in the short-term. Any short-term impact is also measured against the likelihood of any groundwater use before the institutional controls are in place. Implementation of Alternative 3C would not result in any exposures through proper operational procedures. The estimated time for implementation of the construction phase of this alternative is 24 months, with a minimum of 30 years of monitoring and O&M to complete the remedial action.

6. Implementability

Surface Soils: Alternatives 1A, 1B, and 1D are technically easy to implement, although each requires maintenance to remain effective.

Alternative 1C utilizes technologies that are readily implementable. The equipment and personnel required for this alternative are readily available. Excavation of contaminated soils in the area of the flood control dike may require specialized equipment to maintain the integrity of the flood control berm. Long-term monitoring of the CELA, which is part of the OU1 remedy, is also a component of the implementation of this alternative. The implementability of Alternative 1E involves the same implementation requirements except that off-site transportation technology would replace CELA monitoring.

Subsurface Soils: Alternative 2A for subsurface soils is technically easy to implement and would involve implementing institutional controls and annual inspections and public awareness programs. Alternative 2B involves proven and commercially available technology. However, the available capacity of off-site disposal and treatment facilities could pose a potential problem in the implementation of this alternative and this option would also require public access restrictions to the affected areas during remediation. Alternative 2C is a commercially available technology that has been demonstrated on a number of other sites. The implementability of this technology is questionable, however, in regard to achieving required cleanup levels due to areas of low permeability and low porosity in the subsurface soils. This technology is also ineffective for the cleanup of metals. Extensive soil sampling and long-term groundwater monitoring are also implementation components of this alternative.

Groundwater: Alternative 3A/B for groundwater is easily implemented since remedial activities are limited to posting signs, conducting a public awareness program, and long-term monitoring. Establishing well restriction areas through local zoning ordinances are also part of the implementation of this alternative.

Alternative 3C uses standard equipment and well developed technologies that are commercially available. Treatment alternatives for the extracted groundwater would require treatability testing during remedial design. The small volume of residuals from the construction of this alternative would be transported off-site for disposal. Whether or not ARARs can be met in a reasonable time frame is an unproven component of the implementability of this alternative. However, contingencies will be included to maximize the pump and treatment system's effectiveness in realizing this goal.

7. Cost

Surface Soils: The present worth cost of Alternative 1C for surface soils is approximately $1,505,000. This is also the capital cost figure, as no O&M cost for the CELA is included in this remedial alternative. (CELA O&M is a component of the 1985 ROD.) The estimated cost range of the alternatives for surface soil remediation are from a present worth of $743,000 for Alternative 1A to $4,110,700 for Alternative 1E. Individual cost breakdowns are included in the Description of Alternatives section of this ROD.

Subsurface Soils: The present worth cost of Alternative 2A for subsurface soils is approximately $882,100. The capital cost for this alternative is $81,300 and annual O&M is expected to cost

$108,700 for years 1-5 and $31,400 for years 6-30. The estimated cost range of the alternatives for subsurface soil remediation are from a present worth of $882,100 for Alternative 2A to $22,869,800 for Alternative 2B. Individual cost breakdowns are included in the Description of Alternatives section of this ROD.

Groundwater: The present worth cost of Alternative 3C for groundwater is approximately $13,162,600. The capital cost for this alternative is $2,311,200 and annual O&M is expected to cost $705,900. The actual cost of this alternative could be considerably less depending on the contingency measures which may be invoked after initial implementation, and could be more should EPA decide that O&M should be conducted for more than 30 years. The estimated cost range of the alternatives for groundwater remediation are from a present worth of $1,716,400 for Alternative 3A/B to $13,162,600 for Alternative 3C. Individual cost breakdowns are included in the Description of Alternatives section of this ROD.

8. State Acceptance

The State of New York supports the selected remedy presented in this ROD.

9. Community Acceptance

The local community accepts the selected remedy. All comments that were received from the public during the public comment period are addressed in the attached Responsiveness Summary.

IX. THE SELECTED REMEDY

In summary, Alternative 1C for surface soil remediation will achieve substantial risk reduction through the removal of surface soils contaminated with arsenic above 25 ppm and lead above 1000 ppm. These soils would then be treated to the extent whereby the concentration of arsenic or lead remaining in the leachate (as determined by the TCLP) is less than 5 ppm. The treated soils will then be consolidated into the CELA, located in the southern portion of the site. The CELA will then be capped under an on-going remedial action and the excavated area will be backfilled with six inches of clean soil followed by six inches of topsoil and then revegetated. Although this alternative will allow for use and exposure at its completion under current site uses, a five year review is considered necessary, since the cleanup criteria for lead is based on current site use, and a five year review would evaluate the protectiveness of the remedy should site use change. Accordingly, EPA will recommend the implementation of a local zoning ordinance that will require that the New York State Department of Health (DOH) be notified in the event of any construction activity that would alter present site use. If such a construction activity were to occur, an evaluation of the impacts of the proposed construction and its future use in regard to site contaminantion and exposure pathways will be provided to DOH for their review and comment.

Alternative 2A for subsurface soils will be fully protective of human health and the environment through no action, as no known risk pathway presently exists for exposure to contamination. This alternative entails implementation of a public awareness program, long-term surface water, groundwater, and soil-gas monitoring, and the recommendation of institutional controls, in the form of local zoning ordinances, to protect against any future activities or site uses that may open an exposure pathway. Based on the available data, the subsurface soils do not appear to be acting as a significant source of groundwater contamination and, over time, the predominant mass of contaminants affecting groundwater have already migrated into the aquifer. Based on subsurface soil and groundwater sampling data, no correlation has been found to suggest discrete subsurface soil sources of groundwater contamination. Under this alternative, the site will be reviewed every five years to evaluate the protectiveness of the remedy.

Alternative 3C for groundwater attempts to return a usable groundwater aquifer to its beneficial use, as practicable, within a reasonable time frame. Groundwater treatment also prevents migration of contaminants into the Genesee River. Under this alternative, wells will be strategically placed to extract the bulk of the contaminated groundwater from the aquifer; the exact location and pumping rates will be determined during the design stage. The pumped groundwater will be stored in a central collection tank for subsequent treatment in an above-ground system. Treated groundwater will then be either discharged directly to the Genesee River or via the POTW. Institutional controls, in the form of local zoning ordinances, would be recommended during the period of remediation. Monitoring under this alternative will include surface water, groundwater, groundwater seeps, and Genesee River biota. The biota monitoring will entail the sampling of various indigenous species at points upstream and adjacent to the site and an evaluation of site-related impacts on the biota. Sampling will take place before any design implementation, and if no impacts are found, the biota monitoring will be discontinued. If significant impacts are found, however, a post-remedial interval for further biota monitoring will be established. This alternative also stipulates contingency measures, outlined under Alternative 3C in the Description of Alternatives section of this ROD, whereby the groundwater extraction and treatment system's performance will be monitored on a regular basis and adjusted as warranted by the performance data collected during operation. If it is determined, in spite of any contingency measures that may be taken, that portions of the aquifer cannot be restored to its beneficial use, ARARs may be waived based on technical impracticability of achieving further contaminant reduction. The decision to invoke a contingency measure may be made during periodic review of the remedy, which will occur at intervals of no less often than every five years. At that time, the State of New York will be given the opportunity to review, comment, and concur on all contingency decisions.

Each of these preferred alternatives are believed to provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria. Based on the information available at this time, EPA believes the preferred alternatives will be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent technologies to the maximum extent practicable. The preferred alternatives for surface soils and groundwater also meet the statutory preference for the use of a remedy that involves treatment as a principal element.

X. STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedial action for a site must comply with applicable or relevant and appropriate environmental standards established under federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

1. Protection of Human Health and the Environment

The selected remedy is protective of human health and the environment. Surface soils with arsenic levels above 25 ppm will be excavated and treated, then disposed of in the on-site landfill and capped. With a 25 ppm cleanup goal for arsenic, the risk assessment calculated that future-use scenarios for on-site occupants exposed to arsenic would represent an ingestion based risk of $1.0x10^{-5}$, which is within EPA's acceptable risk range of $1.0x10^{-4}$ to $1.0x10^{-6}$. It should be noted that the target risk level of 10^{-6} yielded a cleanup level for arsenic which was below background concentrations. Surface soils with lead levels above 1000 ppm also will be excavated, treated, disposed of in the on-site landfill and capped. The 1000 ppm cleanup goal is derived from guidance which adopts the recommendation contained in a Centers for Disease Control (CDC) statement concerning levels to protect against childhood lead poisoning. The short-term risk from excavating the contaminated soil is considered minimal and construction practices will employ dust control, if necessary, to reduce the short-term risk even further.

The selected remedy for subsurface soils is also fully protective of human health and the environment. No risks presently exist from subsurface soils due to the lack of a known exposure pathway. The no action remedy is protective in that potential sources of risk are controlled through containment (by overlying soils) and will remain protective through monitoring, assuming the enforcement of the institutional controls which are recommended here to address any future site uses which could open an exposure pathway.

Groundwater remediation with the goal of achieving ARARs is also protective of human health and the environment. Although there is no current exposure pathway for groundwater use on the site, the pumping and treatment alternative attempts to restore a future potential drinking water source to drinking water standards. Additionally, the alternative prevents any contamination from migrating to the Genesee River, the surface water body to which the contaminated aquifer discharges, which is a local drinking water source. Although EPA acknowledges that MCLs may be unattainable, by actively removing and treating contaminants in the groundwater aquifer, human health and the environment is fully protected under the chosen remedy.

2. Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will be designed to meet all ARARs (Tables 9-11). Additionally, a wetland assessment and restoration or mitigation plan will be required for any wetlands impacted or disturbed by remedial activity. A cultural resources survey, to comply with the National Historic Preservation Act, and a floodplain assessment will also be required prior to any remedial activity.

3. Cost Effectiveness

The selected remedy is cost effective and provides the greatest overall protectiveness proportionate to costs. On-site disposal of excavated surface soils, at a present worth of $1,505,000 is more cost effective than off-site disposal, at a present worth of $4,110,700, and offers an equivalent degree of protectiveness. The present worth of $882,100 for the no action subsurface soil alternative is cost effective in that it offers the same level of protectiveness as the in situ vapor extraction and excavation alternatives, but at considerably less cost. The $13,162,600 cost associated with groundwater treatment is cost effective in that the remedy provides the greatest overall protectiveness compared with the $1,716,400 cost associated with no action, which is not considered to be protective.

4. Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

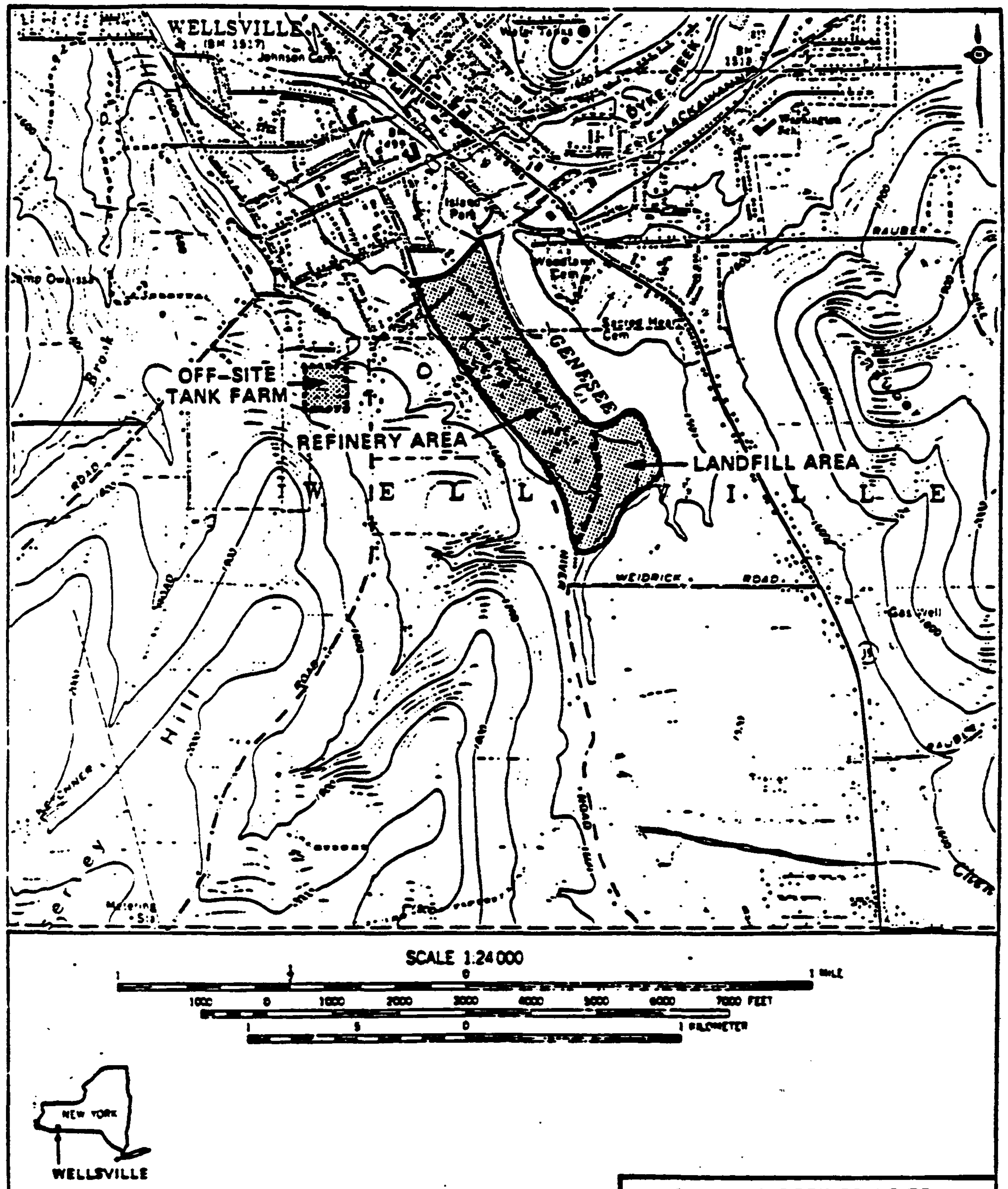
The selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a cost effective manner. Of those alternatives which are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The modifying considerations of State and community acceptance also play a part in this determination.

The long-term effectiveness and permanence of the selected remedy is very high in that the surface soils which exceed the cleanup criteria would be removed and the contaminated areas restored to ambient conditions. As no known risk exposure pathway exists for contact with subsurface soils, the no action alternative is effective and permanent in maintaining reliable protection of human health and the environment. Groundwater treatment also offers long-term effectiveness and permanence in that the remedial goal is to achieve ARARs and that the pumping and treatment would remove the groundwater contamination, thereby lessening the impact on the Genesee River. Reduction of toxicity, mobility, or volume is also evident in the selected remedy. The treatment and placement into the on-site landfill of affected surface soils will effectively reduce the mobility of contaminants in surface soils. Although the no action choice for subsurface soils has no effect on the toxicity, mobility, or volume of contaminants, it is a cost effective alternative that provides adequate protection of human health and the environment. Groundwater treatment has the goal of reducing contaminant concentrations in the aquifer to meet ARARs, effectively diminishing both toxicity and volume. The short-term effectiveness and implementability of the surface soil excavation alternative is high in that it involves simple construction and implementation using proven technologies. The short-term effectiveness and implementation of the no action alternative for subsurface soils is similarly high in that the subsurface soils would essentially remain undisturbed. The short-term effectiveness and implementability of the groundwater treatment alternative is high in that there is no exposure to contaminated groundwater during implementation and the remedy employs standard equipment and well developed technologies. As stated above, the cost associated with the selected remedy is the least costly of each remedy that is protective of human health and the environment and provides for treatment of the most hazardous materials.

5. Preference for Treatment as a Principal Element

The statutory preference for treatment as a principal element is satisfied in the selected remedy for each media except subsurface soils. For subsurface soils, no action has been determined to be as effective in the protection of human health and the environment and less costly than treatment alternatives. The surface soil excavation alternative requires treatment to comply with LDR standards and the groundwater treatment alternative requires treatment to drinking water standards, to the extent practicable.

APPENDIX A



POOR QUALITY ORIGINAL

SINCLAIR REFINERY SITE
WELLSVILLE,NEW YORK

FIGURE 1

SITE LOCATION MAP

EBASCO SERVICES INCORPORATED

FIGURE 2

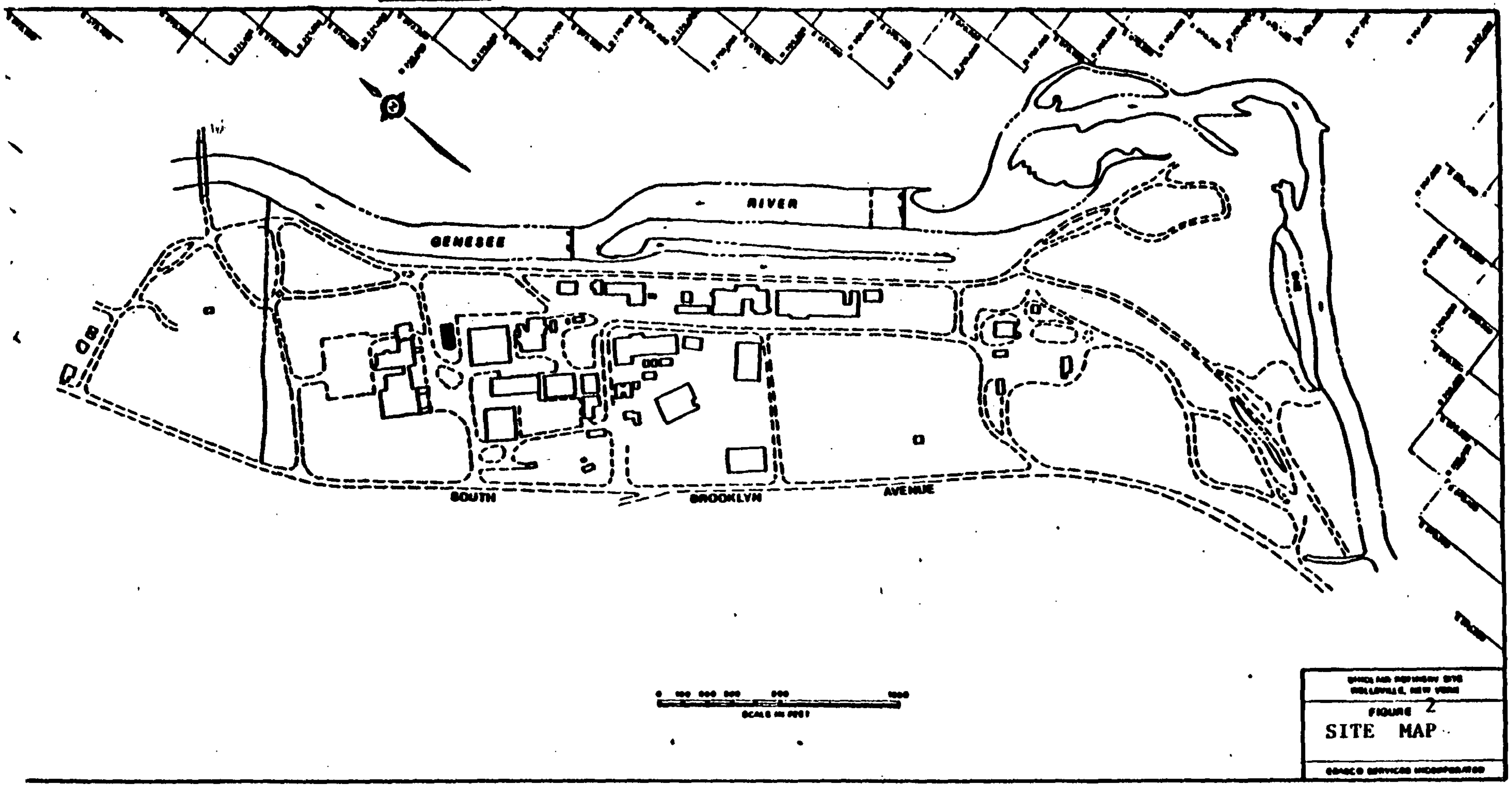
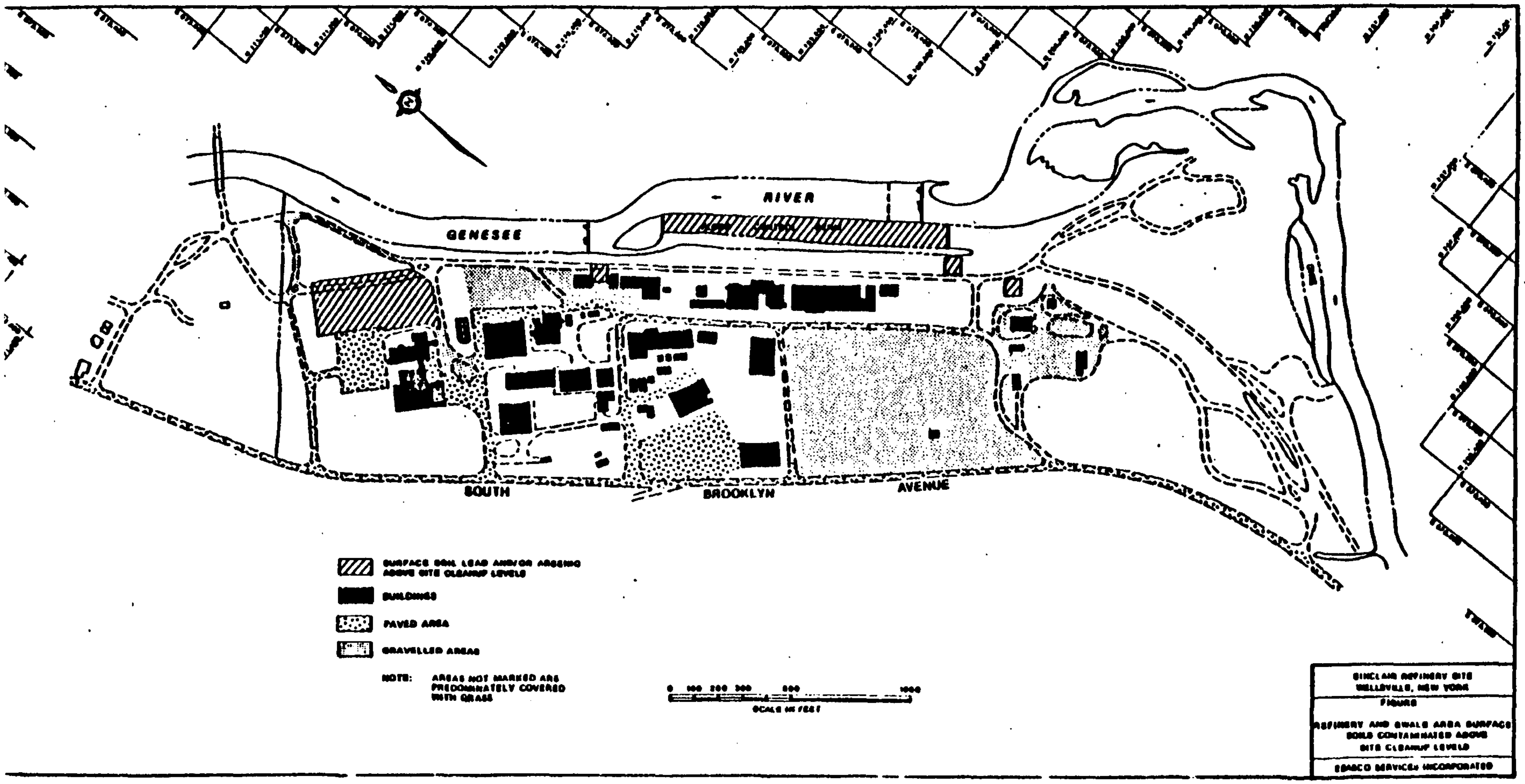


FIGURE 3


GENESEE
RIVER
SOUTH
BROOKLYN
AVENUE
SURFACE SOIL LEAD AND/OR ARSENIC ABOVE SITE CLEANUP LEVELS
BUILDINGS
PAVED AREA
GRAVELLED AREAS
NOTE: AREAS NOT MARKED ARE PREDOMINATELY COVERED WITH GRASS
500
1000
SCALE IN FEET
SINCLAIR REFINERY SITE
WELLSVILLE, NEW YORK
FIGURE
REFINERY AND SWALE AREA SURFACE SOILS CONTAMINATED ABOVE SITE CLEANUP LEVELS
EBASCO SERVICES INCORPORATED

APPENDIX B

TABLE 1

CHEMICALS DETECTED IN REFINERY AREA SURFACE SOILS[a]

RANGE OF CONCENTRATIONS (mg/kg)

	Phase I[c] (1985)	Phase IIa[c] (1986)	Phase IIb (1988)
Number of Samples Analyzed	14	10	35[d]
Volatiles			
Methyl Chloride	0.076– 0.10 (2)[e]	NA	ND
BNAs			
2-Methylnapthalene	ND	NA	0.38–13 (2)
Phenanthrene	1.0 (1)	NA	0.27– 0.37 (1)
Fluoranthrene	1.7 – 2.5 (2)	NA	0.32 (3)
Pyrene	1.0 – 2.8 (3)	NA	0.34– 0.46 (3)
Benzo(a)anthracene	1.5 – 7.5 (4)	NA	ND
Benzo(b)fluoranthene	2.0 – 5.0 (2)	NA	0.42 (1)
Benzo(a)pyrene	2.0 – 3.6 (2)	NA	0.25– 0.72 (3)
Di-n-butylphthalate	ND	NA	0.13– 0.88 (2)
Metals			
Aluminum	NA	NA	3470 –14,850 (35)
Antimony	0.68 (1)	12.5–182 (3)	5.1 – 12 (4)
Arsenic	13 – 31 (14)	ND	4.3 – 43 (32)
Barium	NA	NA	28 – 3,130 (35)
Beryllium	0.5 – 1.2(4)	ND	0.24– 51 (29)
Cadmium	NA	NA	1.1 – 3.5 (8)
Calcium	NA	NA	1580 –53,800 (20)
Chromium	9.2 – 26 (14)	6.3– 29.6 (9)	6.8 – 23 (26)
Cobalt	NA	NA	5.1 – 11.5 (35)
Copper	14 – 47 (14)	10 – 53 (10)	9.6 – 272 (34)
Iron	NA	NA	13700 –43,600 (35)
Lead	53 –1,190 (4)	28 –373 (9)	7.5 – 1,020 (35)
Magnesium	NA	NA	486 –12,000 (31)
Manganese	NA	NA	204 – 1,100 (35)
Mercury	0.07 – 1.9(14)	0.1 (1)	0.13– 9.4 (13)
Nickel	15 – 49 (14)	9.1– 26.1 (10)	7.2 – 26 (31)
Potassium	NA	NA	353 – 1,460 (32)
Silver	NA	NA	1 – 2.4 (20)
Sodium	NA	NA	42.5 – 314 (2)
Thallium	0. 47– 0.98(4)	ND	2.0 (1)
Vanadium	NA	NA	7.8 – 19 (34)
Zinc	58 – 244 (14)	41 –131 (10)	45 – 586 (32)

(a) Compounds listed include all compounds detected two or more times in this media, in any phase, and all indicator chemicals detedted.

(c) Composite samples
(d) includes 10 near surface test pit samples analyzed for volatiles, BNAs and metals and 22 surface soils for metals only
(e) Value in parenthesis indicates number of samples with value above detection limits.
ND = not detected, NA = not analyzed

TABLE 2

CHEMICALS DETECTED IN SUBSURFACE SOILS[a]
ORGANIC COMPOUNDS

RANGE OF CONCENTRATIONS (mg/kg)

	Phase I[c] 1985	Phase IIa[c] Jan-Nov. 1986	Phase IIb Oct-Dec. 1988
Total Number of Samples Analyzed	31	35	3[d]
COMPOUNDS			
Volatiles			
Acetone	ND	1.2 (1)[b]	0.018-0.12 (2)
Carbon Disulfide	ND	0.004 - 0.19 (19)	ND
2-Butanone	ND	0.027 - 0.13 (3)	ND
1,1,1-Trichloroethane	ND	0.0001- 0.018 (6)	ND
Benzene	ND	0.0009- 1.45 (21)	ND
4-Methyl-2-Pentanone	ND	0.14 - 5.1 (8)	ND
2-Hexanone	ND	0.014 - 1.9 (8)	ND
1,1,2,2-Tetrachloroethane	2.1 (1)	0.022 - 0.63 (6)	ND
Toluene	ND	0.002 - 0.91 (5)	ND
Chlorobenzene	ND	0.010 - 0.37 (6)	ND
Ethylbenzene	ND	0.045 - 3.6 (8)	ND
Styrene	ND	0.0017- 0.0018(2)	ND
Total Xylenes	ND	0.0003-26 (17)	ND
BNAs			
Nitrobenzene	ND	0.076 - 0.24 (2)	ND
2,4-Dimethylphenol	ND	0.02 - 0.19 (2)	ND
Napthalene	1.0 (1)	0.029 - 3.3 (14)	ND
2-Methylnapthalene	ND	0.018 -17 (21)	37.1 (1)
Dimethylphthalate	ND	0.033 - 0.037 (3)	ND
Acenapthylene	ND	0.016 - 0.35 (2)	ND
Acenapthene	ND	0.022 - 1.5 (4)	ND
Dibenzofuran	ND	0.041 - 0.59 (6)	ND
Diethylphthalate	ND	0.036 - 1.0 (14)	ND
Fluorene	ND	0.031 - 2.5 (12)	ND
N-Nitrosodiphenylamine	ND	0.13 - 0.58 (4)	ND
Phenanthrene	1.2-1.5 (2)	0.005 - 6.1 (14)	22 (1)
Anthracene	ND	0.024 - 1.5 (5)	ND
Fluoranthrene	1.0-1.6 (3)	0.04 - 0.58 (7)	33 (1)
Pyrene	2.6 (1)	0.06 - 1.5 (8)	30 (1)
Butyl Benzyl Phthalate	ND	0.026 - 1.9 (7)	ND
Benzo(a)Anthracene	1.7 (1)	0.014 - 0.57 (5)	17 (1)
Chrysene	ND	0.14 - 0.8 (5)	25 (1)
Di-N-OctylPhthalate	ND	0.007 - 0.4 (11)	ND
Benzo(a)Pyrene	ND	0.026 - 1.0 (8)	0.44-19 (2)
Bis(2-ethylhexyl)phthalate	ND	ND	0.48- 0.67 (2)
Phenol	ND	0.036 - 0.1 (4)	ND
Metals			
Aluminum	NA	NA	4,230 -22,700 (46)
Antimony	ND	12. -134 (4)	4.6 - 15 (5)
Arsenic	2.8 - 88 (31)	3.8 - 50 (27)	2.3 - 49 (44)
Barium	NA	NA	68 - 283 (46)
Beryllium	0.61- 0.65 (2)	0.5 - 1.3 (5)	0.26- 1.1 (38)
Cadmium	NA	1 - 1.3 (4)	1.1 - 2.8 (6)
Calcium	NA	NA	632 -68,800 (25)
Chromium	3.3 - 23 (31)	3.3 - 54.4 (26)	6.7 - 23 (32)
Cobalt	NA	NA	4.6 - 15 (46)
Copper	10 -1,020 (31)	5.6 - 43.4 (32)	5.5 - 38 (46)
Iron	NA	NA	215 -34,000 (46)
Lead	3.2 - 791 (31)	1.5 - 77.2 (35)	7.7 - 763 (52)
Magnesium	NA	NA	1,270 - 8,590 (46)
Manganese	NA	310 -386 (2)	138 - 3,660 (44)
Mercury	0.03- 1.95 (10)	0.1 - 0.11 (5)	0.12- 0.94 (4)
Nickel	9.1 - 39 (31)	8.0 - 57.7 (32)	9.6 - 31 (38)
Potassium	ND	NA	221 - 1,850 (41)
Silver	0.48- 1.5 (5)	0.24- 30.7 (8)	0.89- 2.5 (23)
Sodium	NA	NA	42 - 75 (7)
Thallium	0.75- 0.95 (2)	2.0 - 6.2 (3)	2.0 (2)
Vanadium	NA	10.1 (1)	5.4 - 30 (45)
Zinc	22- 158 (31)	16.3 -165 (35)	38 - 117 (43)

(a) Compounds listed include all compounds detected in two or more samples in this media, in any phase and all indicator chemicals detected.
(b) Value in parenthesis indicates number of samples with value above detection limits.
(c) Composite samples.
(d) Includes 3 samples analyzed for organics and 52 for metals.

ND = not detected
NA = not analyzed

TABLE 3

CHEMICALS DETECTED IN GROUNDWATER(a)
ORGANIC COMPOUNDS

RANGE OF CONCENTRATIONS (mg/l)

	Phase I 1985	Phase IIa(b) Dec. 1986	Phase IIb Nov-Dec. 1988
Total Number of Samples Analyzed	11	22	23
COMPOUNDS			
Volatiles			
Acetone	ND	ND	0.016 -8.5 (8)
1,1-Dichloroethane	0.044-0.067 (2)(c)	0.005 (1)	0.012 -0.69 (3)
1,1,1-Trichloroethane	0.113 (1)	0.001-0.24 (2)	0.035 -1.8 (2)
Benzene	0.002-0.73 (6)	0.005-0.53 (15)	0.004 -1.2 (14)
Toluene	0.004-0.057 (6)	0.002-0.53 (7)	0.001 -0.39 (12)
Ethylbenzene	0.004-0.07 (4)	0.006-0.83 (10)	0.0004-0.17 (14)
Total Xylenes	0.008-1.31 (5)	0.023-1.1 (11)	0.001 -1.5 (17)
BNAs			
Nitrobenzene	ND	0.011-1.7 (2)	8.2 (1)
Naphthalene	0.001-0.075 (2)	0.003-0.17 (6)	0.032 -0.23 (2)
2-Methylnaphthalene	ND	0.007-0.34 (16)	0.008 -0.27 (9)
Phenanthrene	ND	0.015-0.090 (4)	0.018 -0.053 (3)

Note:

(a) Compounds listed include all indicator chemicals detected.

(b) Does not include landfill area samples

(c) Number in parenthesis indicates number of samples with value above detection limit

ND = not detected

NA = not analyzed

METALS	Phase I 1985	Phase IIa(b) (Dec 1986)	Phase IIb (Nov-Dec 1988) (Unfiltered)
Total Number of Samples Analyzed	11	22	18
Aluminum	NA	0.12 - 0.14 (5)	0.75 -113. (17)
Arsenic	0.003-0.095 (9)(c)	0.005- 0.24 (20)	0.01 - 0.884 (17)
Barium	NA	0.078- 0.6 (9)	0.16 - 2.36 (18)
Beryllium	ND	ND	0.001 - 0.007 (11)
Cadmium	0.003-0.005 (2)	ND	0.004 - 0.005 (2)
Calcium	NA	14.2 -77.2 (9)	14.5 -105 (18)
Chromium	0.005-0.006 (2)	0.010- 0.031 (5)	0.017 - 0.298 (17)
Cobalt	NA	0.011 (1)	0.005 - 0.089 (17)
Copper	0.004-0.016 (8)	0.028- 0.131 (3)	0.021 - 0.956 (17)
Iron	NA	5.2 -42.6 (9)	42.5 -280 (18)
Lead	ND	0.006- 0.102 (6)	0.026 - 0.249 (17)
Magnesium	NA	2.4 -16.3 (9)	6.05 - 33.80 (18)
Manganese	NA	0.659- 8.35 (9)	0.537 - 31.5 (18)
Mercury	ND	ND	0.00015- 0.00025 (2)
Nickel	0.004-0.026 (10)	ND	0.025 - 0.362 (17)
Potassium	NA	1.0 - 6.9 (9)	2.850 - 12.900 (18)
Silver	0.002-0.020 (4)	0.011- 0.026 (2)	0.0043 - 0.0097 (6)
Sodium	NA	5.7 -54.4 (9)	4.570 - 70 (18)
Vanadium	NA	NA	0.0046 - 0.149 (17)
Zinc	0.750-7.35 (11)	0.059-18.1 (22)	0.273 - 21.5 (18)

Note:

(a) Compounds listed include all compounds detected in two or more samples in this media, in any phase and all indicator chemicals detected.

(b) Does not include landfill area samples

(c) Number in parenthesis indicates number of samples with value above detection limit

ND = not detected

NA = not analyzed

TABLE 4

<u>Chemicals of Potential Concern</u>

Volatile Organic Compounds

methyl chloride (chloromethane)
trichloroethene
benzene
xylene

Semivolatile Organic Compounds

nitrobenzene
benzo(a)pyrene (excluded for the offsite tank farm)

Inorganic Metals

arsenic
barium
lead
nickel
zinc

TABLE 5

POTENTIAL MIGRATION PATHWAY AND EXPOSURE ROUTE EVALUATION

MEDIUM	ROUTE	POTENTIALLY EXPOSED POPULATIONS EXCAVATION WORKERS	ONSITE OCCUPANTS	TRESPASSING CHILDREN OFFSITE TANK	REFINERY
SUBSURFACE SOIL #	INHALATION OF VOCs	X			
	INGESTION	X			
SOIL	INHALATION OF FUGITIVE DUST		X		
	INGESTION			X	X
SURFACE WATER	INGESTION		X	X	X

For a future potential land-use scenario only.

TABLE 6

CRITICAL TOXICITY VALUES

CHEMICAL	INHALATION RfD's (mg/kg.day)	INHALATION RfD (mg/kg.day)	INHALATION Carcinogenic Potency Factor * 1/(mg/kg.day)	ORAL RfD's (mg/kg.day)	ORAL RfD (mg/kg.day)	ORAL Carcinogenic Potency Factor* 1/(mg/kg.day)
Arsenic	0	0	5.00E+01 (a)	1.00E-02 (d)	1.00E-03 (c)	1.80E+00 (f)
Barium	1.00E-03 (b)	1.00E-04 (b)	0	5.00E-02 (b)	5.00E-02 (a)	0
Benzene	0	0	2.09E-02 (a)	0	0	2.09E-02 (a)
Benzo[a]pyrene	0	0	6.10E+00 (e)	0	0	1.15E+01 (e)
Lead	4.30E-03 (d)	4.30E-04 (e)	0	1.40E-02 (d)	1.40E-03 (e)	0
Methyl Chloride	0	0	0	0	0	0
Nickel	0	0	1.70E+00 (a)	2.00E-02 (a)	2.00E-02 (a)	0
Nitrobenzene	6.00E-03 (b)	6.00E-04 (b)	0	5.00E-03 (b)	5.00E-04 (b)	0
Trichloroethene	2.60E-01 (d)	2.60E-02 (g)	1.30E-02 (b)	1.00E-01 (d)	1.00E-02 (a)	1.10E-02 (b)
Xylene	7.00E-01 (b)	4.00E-01 (b)	0	4.00E+00 (b)	2.00E+00 (a)	0
Zinc	0	0	0	2.00E-01 (b)	2.00E-01 (b)	0

Notes: Zeros represent unavailable or unapplicable data

Sources:
(a) IRIS
(b) HEA Summary Tables
(c) Estimated based on MCL
(d) Estimated from chronic RfD
(e) HEA source (SPHEM)
(f) Estimated from unit risk in Risk Assessment Forum Report
(g) Based on conversion of oral RfD

* Carcinogenic Potency Factor = Cancer Slope Factor (SF)

POOR QUALITY ORIGINAL

TABLE 7

NONCARCINOGENIC HAZARD INDEX ESTIMATES FOR THE SINCLAIR REFINERY SITE

MEDIUM	ROUTE	POTENTIALLY EXPOSED POPULATIONS EXCAVATION WORKERS	ONSITE OCCUPANTS	TRESPASSING CHILDREN OFFSITE TANK	REFINERY
SUBSURFACE SOIL #	INHALATION OF VOCs	1.22E-2			
	INGESTION	1.05E-1			
SOIL	INHALATION OF FUGITIVE DUST		9.45E-1		
	INGESTION			2.48E-2	3.02E-2
SURFACE WATER	INGESTION*		3.02E-2	3.45E-1	2.11E-1
TOTAL HI		**1.17E-1**	**9.75E-1**	**3.7E-1**	**2.41E-1**

\# For a future potential land-use scenario only.

* Exposure calculations using monitored data (B calculations).

TABLE 8

CARCINOGENIC RISK ESTIMATES FOR THE SINCLAIR REFINERY SITE

MEDIUM	ROUTE	POTENTIALLY EXPOSED POPULATIONS ONSITE OCCUPANTS	TRESPASSING OFFSITE TANK	CHILDREN REFINERY
SOIL	INHALATION OF FUGITIVE DUST	1.64E-4 (Ar=1.53E-4)		
	INGESTION		9.4E-6	4.89E-6
SURFACE WATER	INGESTION*	3.3E-5	3.3E-5	3.3E-5
TOTAL CANCER RISK		**1.97E-4**	**4.25-5**	**3.79E-5**

* Exposure calculations using monitored data (B calculations).

TABLE 9

CHEMICAL-SPECIFIC ARARS

SINCLAIR REFINERY SITE, NEW YORK

REQUIREMENT	REQUIREMENT SYNOPSIS	APPLICABILITY/RELEVANCE AND APPROPRIATENESS
Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	The SDWA MCLs establish maximum acceptable levels of organic chemicals and metals in drinking water at the tap.	EPA has determined that SDWA MCLs are ARARs for the Sinclair Refinery Site
New York State Department of Environmental Conservation (NYSDEC) Class GA Groundwater Quality Standards (6 NYCRR 703.5(a))	The NYSDEC Class GA groundwater standards provide ambient standards for organic chemicals and metals in groundwater.	EPA has determined that Class GA groundwater standards are ARARs for the Sinclair Refinery Site.
New York State (NYS) Surface Water Quality Standards (SWQS) (6 NYCRR 701)	The NYS SWQS provide ambient levels for contaminants in surface waters used for drinking, fishing and fish propagation.	New York surface water quality standards would be relevant and appropriate requirements with respect to an ACL, which relies upon groundwater discharges to surface water, and to any other remedial alternative or component which involves a discharge of treated or untreated wastewater to the Genesee River.

TABLE 10

ACTION-SPECIFIC ARARs

Requirement	Requirement Synopsis	Applicability/Relavance and Appropriateness
New York RCRA Hazardous Waste Facility Requirements (6 NYCRR 370 and 373)	The NY RCRA facility regulations govern the operation and design of equipment and systems treating or storing hazardous waste. Although RCRA is not applicable to the site overall, requirements that apply to specific hazardous waste handling activities, such as equipment design and operating standards, are relevant and appropriate.	Although RCRA is not applicable to the site, requirements that apply to specific hazardous waste handling activities, such as equipment design and operating standards, are relevant and appropriate.
New York RCRA Closure and Post-Closure Standards for Landfills (6 NYCRR 370 and 373)	The NY RCRA closure standards provide requirements for closing RCRA hazardous waste facilities. The requirements include waste removal or capping, site maintenance, and groundwater monitoring. The primary closure goal is to "...minimize or eliminate maintenance controls needed ... and minimize or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste to groundwater, air, or surface water." This goal can be attained using a combination of waste containment, removal and site monitoring activities.	Although the Sinclair Refinery Site was not a RCRA treatment, storage or disposal facility, the presence of contamination in site soils is sufficiently similar to a RCRA landfill that the primary RCRA closure goal is relevant and appropriate.
New York RCRA Generator and Transportation Standards (6 NYCRR 372)	These standards require that a generator manifest tracking form accompany all shipments of hazardous waste off-site.	These requirements would be applicable to any offsite shipment of a hazardous waste in a non-CERCLA context.
New York General Prohibition on Air Emissions (6 NYCRR 211)	These prohibitions restrict the emission of particulate matter, fumes, mist and smoke, among other visible emissions.	These requirements would be applicable to construction activities that produce fugitive emissions.
New York General Process Air Emissions Standards and VOC Guidance Values (6 NYCRR 212, NY Air Guide 1)	These standards establish emissions levels for VOCs from specific sources and methods for calculating VOC emission levels from unspecified sources.	These requirements would be applicable to remedial activities using equipment or treatment systems that emit VOCs to the atmosphere.
New York State Pollution Discharge Elimination System (SPDES) Requirements for Site Runoff, Surface Water and Groundwater Discharge Limits (6 NYCRR 750-757)	The SPDES requirements provide for the control of site runoff that would degrade surface water quality, or discharging to surface water from an on-site treatment system. Effluent limits are included in the regulations as guidelines for the development of site-specific effluent limits.	These requirements would be applicable to (1) site runoff during remediation work and (2) discharges from any on-site treatment unit.

TABLE 10 (Cont'd)

ACTION-SPECIFIC ARARs

Requirement	Requirement Synopsis	Applicability/Relavance and Appropriateness
Local (Wellsville) POTW Wastewater Pretreatment Requirements	The local POTW requires that all wastewaters be pretreated prior to discharge, such that POTW-treated effluent does not exceed permissable contaminant levels. The "USEPA Guidance on POTW Discharges", OSWER Directive #9330.2-04, provides further information on how to evaluate and pretreat wastewaters for POTW discharges.	These requirements would be applicable to discharges of wastewater, generated by the remedial activities, to the Wellsville POTW.
RCRA Land Disposal Restrictions (LDR) (40 CFR 268)	The RCRA LDR requires that RCRA hazardous waste be treated to meet certain numeric or BDAT standards, prior to off-site disposal or "placement" in a landfill.	These requirements may be applicable to disposal of sludge from the separator, depending upon the characterization of the sludge and the relevance of the RCRA petroleum exclusion. They are to be considered for contaminated soil and debris disposal
Occupational Safety and Health Administration (OSHA) Standards for Hazardous Responses (29 CFR 1904, 1910, and 1926)	The OSHA standards provide safety and protection procedures for workers on hazardous waste sites. The standards include protective clothing, worker training, medical surveillance, among other requirements.	These standards are applicable requirements.
Department of Transportation (DOT) Rules for Hazardous Materials Transport (49 CFR 107 and 171.1 to 171.500)	The DOT transport rules set procedures for manifesting, labeling, and packaging of waste for off-site transport to disposal or treatment facilities.	These are applicable requirements.
National Emission Standards for Hazardous Air Pollutants (NESHAPs) Asbestos Regulations (40 CFR 61, Subpart M, Sections 61.140 to 61.156)	The NESHAPs address handling, removal, disposal and emissions of asbestos and asbestos-containing material (ACM)	These standards are applicable requirements.
Occupational Safety and Health Administration	The Asbestos Standards establish ACM handling worker safety requirements. They are applicable to asbestos abatement projects.	These are applicable requirements.

TABLE 11

LOCATION-SPECIFIC ARARs

Requirement	Requirement Synopsis	Applicability/Relevance and Appropriateness
Location-Specific		
USEPA (Region II) Policy on Floodplains and Wetlands (CERCLA/SARA Environmental Review Manual, January 1988)	This policy outlines procedures for evaluating the adverse effects of remediating in floodplains and wetlands and presents some measures for minimizing adverse impacts.	To be considered during remedial design phase.
Floodplain and Wetlands Executive Order #'s 11900 and 11988	These executive orders call for the protection, preservation and mitigation of adverse impacts on wetlands and floodplains.	To be considered during remedial design phase.
USEPA's Statement of Policy on Wetlands and Floodplain Assessments for CERCLA Sites	This statement requires that wetlands and floodplain assessments be conducted at Superfund Sites and that measures be taken to protect the integrity of wetlands and prevent floodplain damages.	To be considered during remedial design phase.
RCRA Land Disposal Restrictions (LDR) (40 CFR 268)	The RCRA LDR requires that RCRA hazardous waste be treated to meet certain numeric or BDAT standards, prior to off-site disposal or "placement" in a landfill.	To be considered during remedial design phase.
National Historic Preservation Act	Requires that a cultural resources survey be completed prior to construction activities.	To be considered during the remedial design phase.

APPENDIX C

EPA
United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
Directive: 9347.3-05FS
July 1989

Superfund LDR Guide #5

Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions

CERCLA Section 121(d)(2) specifies that on-site Superfund remedial actions shall attain "other Federal standards, requirements, criteria, limitations, or more stringent State requirements that are determined to be legally applicable or relevant and appropriate (ARAR) to the specified circumstances at the site." In addition, the National Contingency Plan (NCP) requires that on-site removal actions attain ARARs to the extent practicable. Off-site removal and remedial actions must comply with legally applicable requirements. **This guide outlines the process used to determine whether the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs) established under the Hazardous and Solid Waste Amendments (HSWA) are "applicable" to a CERCLA response action.** More detailed guidance on Superfund compliance with the LDRs is being prepared by the Office of Solid Waste and Emergency Response (OSWER).

For the LDRs to be applicable to a CERCLA response, the action must constitute placement of a restricted RCRA hazardous waste. Therefore, site managers (OSCs, RPMs) must answer three separate questions to determine if the LDRs are applicable:

(1) Does the response action constitute placement?

(2) Is the CERCLA substance being placed also a RCRA hazardous waste? and if so

(3) Is the RCRA waste restricted under the LDRs?

Site managers also must determine if the CERCLA substances are California list wastes, which are a distinct category of RCRA hazardous wastes restricted under the LDRs (see Superfund LDR Guide #2).

(1) DOES THE RESPONSE CONSTITUTE PLACEMENT?

The LDRs place specific restrictions (e.g., treatment of waste to concentration levels) on RCRA hazardous wastes prior to their placement in land disposal units. Therefore, a key q[illegible]n is whether the response action will constitute placement of wastes into a land disposal unit. As defined by RCRA, land disposal units include landfills, surface impoundments, waste piles, injection wells, land treatment facilities, salt dome formations, underground mines or caves, and concrete bunkers or vaults. If a CERCLA response includes disposal of wastes in any of these types of off-site land disposal units, placement will occur. However, uncontrolled hazardous waste sites often have widespread and dispersed contamination, making the concept of a RCRA unit less useful for actions involving on-site disposal of wastes. Therefore, to assist in defining when "placement" does and does not occur for CERCLA actions involving on-site disposal of wastes, EPA uses the concept of "areas of contamination" (AOCs), which may be viewed as equivalent to RCRA units, for the purposes of LDR applicability determinations.

An AOC is delineated by the areal extent (or boundary) of contiguous contamination. Such contamination must be continuous, but may contain varying types and concentrations of hazardous substances. Depending on site characteristics, one or more AOCs may be delineated. Highlight 1 provides some examples of AOCs.

Highlight 1: EXAMPLES OF AREAS OF CONTAMINATION (AOCs)

- A waste source (e.g., waste pit, landfill, waste pile) and the surrounding contaminated soil.
- A waste source, and the sediments in a stream contaminated by the source, where the contamination is continuous from the source to the sediments.*
- Several lagoons separated only by dikes, where the dikes are contaminated and the lagoons share a common liner.

* The AOC does not include any contaminated surface or ground water that may be associated with the land-based waste source.

For on-site disposal, placement occurs when wastes are moved from one AOC (or unit) into another AOC (or unit). Placement does not occur when wastes are left in place, or moved within a single AOC. Highlight 2 provides scenarios of when placement does and does not occur, as defined in the proposed NCP. The Agency is current reevaluating the definition of placement prior to the promulgation of the final NCP, and therefore, these scenarios are subject to change.

> **Highlight 2: PLACEMENT**
>
> Placement <u>does</u> occur when wastes are:
>
> - Consolidated from different AOCs into a single AOC;
> - Moved outside of an AOC (for treatment or storage, for example) and returned to the same or a different AOC; or
> - Excavated from an AOC, placed in a separate unit, such as an incinerator or tank that is within the AOC, and redeposited into the same AOC.
>
> Placement <u>does not</u> occur when wastes are:
>
> - Treated in situ;
> - Capped in place;
> - Consolidated within the AOC; or
> - Processed within the AOC (but not in a separate unit, such as a tank) to improve its structural stability (e.g., for capping or to support heavy machinery).

In summary, if placement on-site or off-site does not occur, the LDRs are not applicable to the Superfund action.

(2) IS THE CERCLA SUBSTANCE A RCRA HAZARDOUS WASTE?

Because a CERCLA response must constitute placement of a restricted <u>RCRA hazardous waste</u> for the LDRs to be applicable, site managers must evaluate whether the contaminants at the CERCLA site are RCRA hazardous wastes. Highlight 3 briefly describes the two types of RCRA hazardous wastes --listed and characteristic wastes.

> **Highlight 3: RCRA HAZARDOUS WASTES**
>
> A RCRA solid waste* is hazardous if it is <u>listed</u> or exhibits a hazardous <u>characteristic</u>.
>
> <u>Listed RCRA Hazardous Wastes</u>
>
> Any waste listed in Subpart D of 40 CFR 261, including:
>
> - F waste codes (Part 261.31)
> - K waste codes (Part 261.32)
> - P waste codes (Part 261.33(e))
> - U waste codes (Part 261.33(f))
>
> <u>Characteristic RCRA Hazardous Wastes</u>
>
> Any waste exhibiting one of the following characteristics, as defined in 40 CFR 261:
>
> - Ignitability
> - Corrosivity
> - Reactivity
> - Extraction Procedure (EP) Toxicity
>
> * A solid waste is any material that is discarded or disposed of (i.e., abandoned, recycled in certain ways, or considered inherently waste-like). The waste may be solid, semi-solid, liquid, or a contained gaseous material. Exclusions from the definition (e.g., domestic sewage sludge) appear in 40 CFR 261.4(a). Exemptions (e.g., household wastes) are found in 40 CFR 261.4(b).

Site managers are not required to presume that a CERCLA hazardous substance is a RCRA hazardous waste unless there is affirmative evidence to support such a finding. Site managers, therefore, should use "reasonable efforts" to determine whether a substance is a RCRA listed or characteristic waste. (Current data collection efforts during CERCLA removal and remedial site investigations should be sufficient for this purpose.) For listed hazardous wastes, if manifests or labels are not available, this evaluation likely will require fairly specific information about the waste (e.g., source, prior use, process type) that is "reasonably ascertainable" within the scope of a Superfund investigation. Such information may be obtained from facility business records or from an examination of the processes used at the facility. For characteristic wastes, site managers may rely on the results of the tests described in 40 CFR 261.21 - 261.24 for each characteristic or on knowledge of the properties of the substance. Site managers should work with Regional RCRA staff, Regional Counsel, State RCRA staff, and Superfund enforcement personnel, as appropriate, in making these determinations.

In addition to understanding the two categories of RCRA hazardous wastes, site managers will also need to understand the derived-from rule, the mixture rule, and the contained-in interpretation to identify correctly whether a CERCLA substance is a RCRA hazardous waste. These three principles, as well as an introduction to the RCRA delisting process, are described below.

Derived-from Rule (40 CFR 261.3(c)(2))

The derived-from rule states that any solid waste derived from the treatment, storage, or disposal of a listed RCRA hazardous waste is itself a listed hazardous waste (regardless of the concentration of hazardous constituents). For example, ash and scrubber water from the incineration of a listed waste are hazardous wastes on the basis of the derived-from rule. Solid wastes derived from a characteristic hazardous waste are hazardous wastes only if they exhibit a characteristic.

Mixture Rule (40 CFR 261.3(a)(2))

Under the mixture rule, when any solid waste and a listed hazardous waste are mixed, the entire mixture is a listed hazardous waste. For example, if a generator mixes a drum of listed F006 electroplating waste with a non-hazardous wastewater (wastewaters are solid wastes - see Highlight 3), the entire mixture of the F006 and wastewater is a listed hazardous waste. Mixtures of solid wastes and characteristic hazardous wastes are hazardous only if the mixture exhibits a characteristic.

Contained-in Interpretation (OSW Memorandum dated November 13, 1986)

The contained-in interpretation states that any mixture of a non-solid waste and a RCRA listed hazardous waste must be managed as a hazardous waste as long as the material contains (i.e., is above health-based levels) the listed hazardous waste. For example, if soil or ground water (i.e., both non-solid wastes) contain an F001 spent solvent, that soil or ground water must be managed as a RCRA hazardous waste, as long as it "contains" the F001 spent solvent.

Delisting (40 CFR 260.20 and .22)

To be exempted from the RCRA hazardous waste "system," a listed hazardous waste, a mixture of a listed and solid waste, or a derived-from waste must be delisted (according to 40 CFR 260.20 and .22). Characteristic hazardous wastes never need to be delisted, but can be treated to no longer exhibit the characteristic. A contained-in waste also does not have to be delisted; it only has to "no longer contain" the hazardous waste.

If site managers determine that the hazardous substance(s) at the site is a RCRA hazardous waste(s), they should also determine whether that RCRA waste is a California list waste. California list wastes are a distinct category of RCRA wastes restricted under the LDRs (see Superfund LDR Guide #2).

(3) IS THE RCRA WASTE RESTRICTED UNDER THE LDRs?

If a site manager determines that a CERCLA waste is a RCRA hazardous waste, this waste also must be restricted for the LDRs to be an applicable requirement. A RCRA hazardous waste becomes a restricted waste on its HSWA statutory deadline or sooner if the Agency promulgates a standard before the deadline. Because the LDRs are being phased in over a period of time (see Highlight 4), site managers may need to determine what type of restriction is in

Highlight 4: LDR STATUTORY DEADLINES

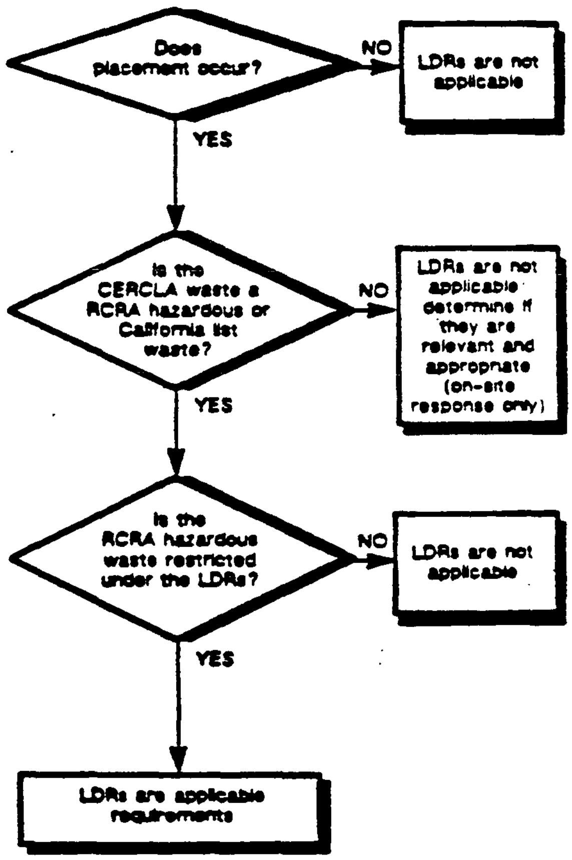
Waste	Statutory Deadline
Spent Solvent and Dioxin-Containing Wastes	November 8, 1986
California List Wastes	July 8, 1987
First Third Wastes	August 8, 1988
Spent Solvent, Dioxin-Containing, and California List Soil and Debris From CERCLA/RCRA Corrective Actions	November 8, 1988
Second Third Wastes	June 8, 1989
Third Third Wastes	May 8, 1990
Newly Identified Wastes	Within 6 months of identification as a hazardous waste

effect at the time placement is to occur. For example, if the RCRA hazardous wastes at a site are currently under a national capacity extension when the CERCLA decision document is signed, site managers should evaluate whether the response action will be completed before the extension expires. If these wastes are disposed of in surface impoundments or landfills prior to the expiration of the extension, the receiving unit would have to meet minimum technology requirements, but the wastes would not have to be treated to meet the LDR treatment standards.

APPLICABILITY DETERMINATIONS

If the site manager determines that the LDRs are applicable to the CERCLA response based on the previous three questions, the site manager must: (1) comply with the LDR restriction in effect, (2) comply with the LDRs by choosing one of the LDR compliance options (e.g., Treatability Variance, No Migration Petition), or (3) invoke an ARAR waiver (available only for on-site actions). If the LDRs are determined not to be applicable, then, for on-site actions only, the site manager should determine if the LDRs are relevant and appropriate. The process for determining whether the LDRs are applicable to a CERCLA action is summarized in Highlight 5.

Highlight 5 - DETERMINING WHEN LDRS ARE APPLICABLE REQUIREMENTS



DOCUMENT 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

SEP 7 1989

OSWER Directive #9355.4-02

MEMORANDUM

SUBJECT: Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites.

FROM: Henry L. Longest II, Director
Office of Emergency and Remedial Response

Bruce Diamond, Director
Office of Waste Programs Enforcement

TO: Directors, Waste Management Division, Regions I, II, IV, V, VII and VIII
Director, Emergency and Remedial Response Division, Region II
Directors, Hazardous Waste Management Division, Regions III and VI
Director, Toxic Waste Management Division, Region IX
Director, Hazardous Waste Division, Region X

PURPOSE

The purpose of this directive is to set forth an interim soil cleanup level for total lead, at 500 to 1000 ppm, which the Office of Emergency and Remedial Response and the Office of Waste Programs Enforcement consider protective for direct contact at residential settings. This range is to be used at both Fund-lead and Enforcement-lead CERCLA sites. Further guidance will be developed after the Agency has developed a verified Cancer Potency Factor and/or a Reference Dose for lead.

BACKGROUND

Lead is commonly found at hazardous waste sites an .s a contaminant of concern at approximately one-third of the sites on the National Priorities List (NPL). Applicable or relevant and appropriate requirements (ARARs) are available to provide cleanup levels for lead in air and water but not in soil. The current

National Ambient Air Quality Standard for lead is 1.5 ug/m^3. While the existing Maximum Contaminant Level (MCL) for lead is 50 ppb, the Agency has proposed lowering the MCL for lead to 10 ppb at the tap and to 5 ppb at the treatment plant(1). A Maximum Contaminant Level Goal (MCLG) for lead of zero was proposed in 1988(2). At the present time, there are no Agency-verified toxicological values (Reference Dose and Cancer Potency Factor, ie., slope factor), that can be used to perform a risk assessment and to develop protective soil cleanup levels for lead.

Efforts are underway by the Agency to develop a Cancer Potency Factor (CPF) and Reference Dose (RfD), (or similar approach), for lead. Recently, the Science Advisory Board strongly suggested that the Human Health Assessment Group (HHAG) of the Office of Research and Development (ORD) develop a CPF for lead, which was designated by the Agency as a B2 carcinogen in 1988. The HHAG is in the process of selecting studies to derive such a level. The level and documentation package will then be sent to the Agency's Carcinogen Risk Assessment Verification Exercise (CRAVE) workgroup for verification. It is expected that the documentation package will be sent to CRAVE by the end of 1989. The Office of Emergency and Remedial Response, the Office of Waste Programs Enforcement and other Agency programs are working with ORD in conjunction with the Office of Air Quality Planning and Standards (OAQPS) to develop an RfD, (or similar approach), for lead. The Office of Research and Development and OAQPS will develop a level to protect the most sensitive populations, namely young children and pregnant women, and submit a documentation package to the Reference Dose workgroup for verification. It is anticipated that the documentation package will be available for review by the fall of 1989.

IMPLEMENTATION

The following guidance is to be implemented for remedial actions until further guidance can be developed based on an Agency verified Cancer Potency Factor and/or Reference Dose for lead.

Guidance

This guidance adopts the recommendation contained in the 1985 Centers for Disease Control (CDC) statement on childhood lead poisoning(3) and is to be followed when the current or predicted land use is residential. The CDC recommendation states that "...lead in soil and dust appears to be responsible for blood levels in children increasing above background levels when the concentration in the soil or dust exceeds 500 to 1000 ppm". Site-specific conditions may warrant the use of soil cleanup levels below the 500 ppm level or somewhat above the 1000 ppm level. The administrative record should include background documents on the toxicology of lead and information related to site-specific conditions.

The range of 500 to 1000 ppm refers to levels for total lead, as measured by protocols developed by the Superfund Contract Laboratory Program. Issues have been raised concerning the role that the bioavailability of lead in various chemical forms and particle sizes should play in assessing the health risks posed by exposure to lead in soil. At this time, the Agency has not developed a position regarding the bioavailability issue and believes that additional information is needed to develop a position. This guidance may be revised as additional information becomes available regarding the bioavailability of lead in soil.

Blood-lead testing should not be used as the sole criterion for evaluating the need for long-term remedial action at sites that do not already have an extensive, long-term blood-lead data base[1].

EFFECTIVE DATE OF THIS GUIDANCE

This interim guidance shall take effect immediately. The guidance does not require that cleanup levels already entered into Records of Decisions, prior to this date, be revised to conform with this guidance.

---

[1] In one case, a biokinetic uptake model developed by the Office of Air Quality Planning and Standards was used for a site-specific risk assessment. This approach was reviewed and approved by Headquarters for use at the site, based on the adequacy of data (due to continuing CDC studies conducted over many years). These data included all children's blood-lead levels collected over a period of several years, as well as family socio-economic status, dietary conditions, conditions of homes and extensive environmental lead data, also collected over several years. This amount of data allowed the Agency to use the model without a need for extensive default values. Use of the model thus allowed a more precise calculation of the level of cleanup needed to reduce risk to children based on the amount of contamination from all other sources, and the effect of contamination levels on blood-lead levels of children.

REFERENCES

1. 53 FR 31516, August 18, 1988.
2. 53 FR 31521, August 18, 1988.
3. Preventing Lead Poisoning in Young Children, January 1985, U.S. Department of Health and Human Services, Centers for Disease Control, 99-2230.

DATE: 7 June 1990

SUBJECT: Risk Based Soil Clean-up Levels for the Sinclair Site

FROM: Marina Stefanidis *Marina Stefanidis*

TO: Mike Negrelli

Soil Clean-up Levels for the Sinclair Site

The determination of soil clean-up levels was based on recreational and industrial use scenarios. Wherever possible, the assumptions for those scenarios were taken from the Endangerment Assessment (EA). Both the ingestion and inhalation routes of exposure were evaluated. The following table lists the scenarios considered in addition to the one based solely on the EA (*). The other scenarios assumed parameters similar to those found in the EA (x).

Risk Based Soil Clean-up Levels

	Ingestion	Inhalation
Recreational		
Child	*	x
Adult	x	x
Industrial		
Adult	x	x

Outline

I. Determination of Soil Clean-up Levels Based on Ingestion of Site Soil

   A. Child Recreational Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Levels

   B. Adult Recreational Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Levels

   C. Adult Industrial Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Levels

II. Determination of Soil Clean-up Levels Based on Inhalation of Fugitive Dust from RI Data and Approach

III. Determination of Soil Clean-up Levels Based on Inhalation of Fugitive Dust from RI Data and Suggested Approach

   A. Child Recreational Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Level

   B. Adult Recreational Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Level

   C. Adult Industrial Use Scenario
      1. General Exposure Equation
      2. Determination of Soil Clean-up Level

IV. Summary

I. Determination of Soil Clean-up Levels Based on Ingestion of Site Soil

Project: Determination of soil cleanup levels for arsenic based on ingestion of site soils in recreational and industrial site use scenarios.

Assumptions: A residual cancer risk of 1E-6 under the ingestion pathway of exposure will provide a protective level of exposure to site contaminants.

Scenarios: On p.3-35 of the Endangerment Assessment (EA) report, the soil pathways evaluated included children playing onsite and at the offsite tank farm. The assumptions made are listed below. Construction workers encountering subsurface soil during excavation activities were also evaluated. This scenario will, however, not be addressed because the workers were only assumed to be exposed for 1 year. Rather, adult recreational and industrial ingestion scenarios will be evaluated.

A. Child Recreational Use Scenario

1. General Exposure Equations Scenario

1) $$\text{Intake dose} = \frac{Cs \times IR \times CF \times DF \times EF \times ED}{BW \times AT}$$

Where:

Cs = Contaminant concentration = mg/kg
IR = Ingestion rate = 200 mg/day, children
CF = Conversion factor = 1kg/1E6mg
DF = Desorption factor = 1
EF = Exposure frequency = 100 days/year
ED = Exposure duration = 6 years/lifetime, child
BW = Body weight = 16 kg, child
AT = Averaging time = 365 day/yr x 75 yr

2) Risk = Intake Dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 1.5/(mg/kg/day) as of 4/90
= 1.8/(mg/kg/day) used in RI

2. Determination of Soil Cleanup Levels

1) Risk = Intake Dose X CPF

2) Intake Dose = Risk

CPF

3) Intake Dose =

$$\frac{Cs \times 200mg/day \times 100d/y \times 6y \times 1kg/1E6mg}{75\ year \times 365\ d/year \times 16\ kg}$$

4) Intake Dose = Cs x 2.74E-7

5) $\frac{Risk}{CPF}$ = Cs x 2.74E-7

6) Cs = $\frac{Risk}{CPF \times 2.74E-7}$

7) Residual Risk Goal = 1E-6

8) Cs = $\frac{1E-6}{CPF \times 2.74E-7}$

9) Cs = 2.4 ppm (CPF = 1.5)
2.0 ppm (CPF = 1.8)

B. Adult Recreational Use Scenario

1.General Exposure Equation

1) Intake dose = $\frac{Cs \times IR \times CF \times DF \times ET \times EF \times ED}{BW \times AT}$

Where:

Cs = Contaminant concentration = mg/kg
IR = Ingestion rate = 100 mg/day, adult
CF = Conversion factor = 1kg/1E6mg
DF = Desorption factor = 1
EF = Exposure frequency = 100 days/year
ED = Exposure duration = 30 years/lifetime
BW = Body weight = 70 kg, adult
AT = Averaging time = 365 day/yr x 75 yr

2) Risk = Intake Dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 1.5/(mg/kg/day) as of 4/90
= 1.8/(mg/kg/day) used in RI

2. Determination of Soil Cleanup Levels

1) Risk = Intake Dose X CPF

2) Intake Dose = $\frac{\text{Risk}}{\text{CPF}}$

3) Intake Dose =

$$\frac{\text{Cs x 100mg/day x 100d/y x 30y x 1kg/1E6mg}}{\text{75 year x 365 d/year x 70 kg}}$$

4) Intake Dose = Cs x 1.56E-7

5) $\frac{\text{Risk}}{\text{CPF}}$ = Cs x 1.56E-7

6) Cs = $\frac{\text{Risk}}{\text{CPF x 1.56E-7}}$

7) Residual Risk Goal = 1E-6

8) Cs = $\frac{\text{1E-6}}{\text{CPF x 1.56E-7}}$

9) Cs = 4.3 ppm (CPF = 1.5)
3.5 ppm (CPF = 1.8)

C. Adult Industrial Use Scenario
1. General Exposure Equation

1) Intake dose = $\frac{\text{Cs x IR x CF x DF x ET x EF x ED}}{\text{BW x AT}}$

Where:

Cs = Contaminant concentration = mg/kg
IR = Ingestion rate = 100 mg/day, adult
CF = Conversion factor = 1kg/1E6mg
DF = Desorption factor = 1
EF = Exposure frequency = 250 days/year
ED = Exposure duration = 20 years/lifetime
BW = Body weight = 70 kg, adult
AT = Averaging time = 365 day/yr x 75 yr

2) Risk = Intake Dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 1.5/(mg/kg/day) as of 4/90
= 1.8/(mg/kg/day) used in RI

2. Determination of Soil Cleanup Levels

1) Risk = Intake Dose X CPF

2) $\text{Intake Dose} = \frac{\text{Risk}}{\text{CPF}}$

3) Intake Dose =

$$\frac{\text{Cs x 100mg/day x 250d/y x 20y x 1kg/1E6mg}}{\text{75 year x 365 d/year x 70 kg}}$$

4) Intake Dose = Cs x 2.61E-7

5) $\frac{\text{Risk}}{\text{CPF}} = \text{Cs x 2.61E-7}$

6) $\text{Cs} = \frac{\text{Risk}}{\text{CPF x 2.61E-7}}$

7) Residual Risk Goal = 1E-6

8) $\text{Cs} = \frac{\text{1E-6}}{\text{CPF x 2.61E-7}}$

9) Cs = 2.5 ppm (CPF = 1.5)
2.1 ppm (CPF = 1.8)

II. Determination of Soil Clean-up Levels Based on Inhalation of Fugitive Dust from RI Data and Approach

In the RI, fugitive dust was assumed to be released into the air through vehicular traffic. Based on the geometric mean arsenic concentration, (8.8ppm, p.3-23), The emission rate was calculated (2.07E-4 g/s, p.3-29) for vehicle induced emissions at the site. The mean ambient concentration at 10m (1.17E-4) was calculated using a near-field box model. Intake (p.3-30) and subsequently risk (1.53E-4, p.4-18) were determined.

Based on these calculations, the concentration of arsenic in the soil needed to obtain a 1E-6 risk level would be 5.76E-2 ppm.

III. Determination of Soil Clean-up Levels Based on Inhalation of Fugitive Dust from RI Data and Suggested Approach

Project: Determination of soil clean-up levels for arsenic based on inhalation of fugitive dust emitted from the site.

Assumptions: A residual cancer risk of 1E-6 under the inhalation pathway of exposure will provide a protective level of exposure to site contaminants.

Scenarios: Child and adult recreational use scenarios and adult industrial scenarios were evaluated.

A. Child Recreational Use Scenario

1. General Exposure Equation Scenario

1) $$\text{Intake dose} = \frac{Cs \times IR \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Where:

Cs = Contaminant concentration
IR = Inhalation rate = 1.25 m3/hr
Pc = Particulate concentration = 0.03 ug/m3
ET = Exposure time = 4 hr/day
EF = Exposure frequency = 100 days/year
ED = Exposure duration = 6 years/lifetime
CF = Conversion factor = 1kg/1E9ug
BW = Body weight = 16 kg, child
AT = Averaging time = 365 days/year x 75 years

2) Risk = Intake dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 5.0E1/(mg/kg/day)

2. Determination of Soil Cleanup Level

1) Risk = Intake Dose X CPF

2) Intake Dose = $\frac{Risk}{CPF}$

3) Intake Dose =

$$\frac{Cs x\ 0.03 ug/m3 \times 1.25\ m3/hr \times 4\ hr/d \times 100 d/y \times 6\ y \times 1kg/1E9ug}{75\ year \times 365\ d/year \times 16\ kg}$$

4) Intake Dose = Cs x 2.05E-13

5) $\frac{Risk}{CPF}$ = Cs x 2.05E-13

6) Cs = $\frac{Risk}{CPF \times 2.05E-13}$

7) Residual Risk Goal = 1E-6

8) Cs = $\frac{1E-6}{CPF \times 2.05E-13}$

9) Cs = 97,561 ppm

B. Adult Recreational Use Scenario

1. General Exposure Equation

1) Intake dose = $\frac{Cs \times IR \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$

Where:

Cs = Contaminant concentration
IR = Inhalation rate = 1.25 m3/hr
Pc = Particulate concentration = 0.03 ug/m3
ET = Exposure time = 4 hr/day
EF = Exposure frequency = 100 days/year
ED = Exposure duration = 30 years/lifetime
CF = Conversion factor = 1kg/1E9ug
BW = Body weight = 70 kg, adult
AT = Averaging time = 365 days/year x 75 years

2) Risk = Intake dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 5.0E1/(mg/kg/day)

2. Determination of Soil Cleanup Level

1) Risk = Intake Dose X CPF

2) Intake Dose = $\frac{Risk}{CPF}$

3) Intake Dose =

$$\frac{Cs \times 0.03\ ug/m3 \times 1.25\ m3/hr \times 4\ hr/d \times 100d/y \times 30y \times 1kg/1E9ug}{75\ year \times 365\ d/year \times 70\ kg}$$

4) Intake Dose = Cs x 2.35E-13

5) $\frac{Risk}{CPF}$ = Cs x 2.35E-13

6) Cs = $\frac{Risk}{CPF \times 2.35E-13}$

7) Residual Risk Goal = 1E-6

8) Cs = $\frac{1E-6}{CPF \times 2.35E-13}$

9) Cs = 85,167 ppm

C. Adult Industrial Use Scenario

1. General Exposure Equation

1) Intake dose = $\frac{Cs \times IR \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$

Where:

Cs = Contaminant concentration
IR = Inhalation rate = 1.25 m3/hr
Pc = Particulate concentration = 0.03 ug/m3
ET = Exposure time = 8 hr/day
EF = Exposure frequency = 250 days/year
ED = Exposure duration = 20 years/lifetime

CF = Conversion factor = 1kg/1E9ug
BW = Body weight = 70 kg, adult
AT = Averaging time = 365 days/year x 75 years

2) Risk = Intake dose X CPF

Where:

CPF= Cancer potency factor (1/(mg/kg/d)
= 5.0E1/(mg/kg/day)

2. Determination of Soil Cleanup Level

1) Risk = Intake Dose X CPF

2) Intake Dose = $\frac{\text{Risk}}{\text{CPF}}$

3) Intake Dose =

$$\frac{\text{Cs} \times 0.03 \text{ ug/m3} \times 1.25 \text{ m3/hr} \times 8 \text{ hr/d} \times 250\text{d/y} \times 20\text{y} \times 1\text{kg/1E9ug}}{75 \text{ year} \times 365 \text{ d/year} \times 70 \text{ kg}}$$

4) Intake Dose = Cs x 7.83E-13

5) $\frac{\text{Risk}}{\text{CPF}}$ = Cs x 7.83E-13

6) Cs = $\frac{\text{Risk}}{\text{CPF} \times 7.83\text{E-13}}$

7) Residual Risk Goal = 1E-6

8) Cs = $\frac{1\text{E-6}}{\text{CPF} \times 7.83\text{E-13}}$

9) Cs = 25,550 ppm

IV. SUMMARY

Risk Based Soil Clean-up Levels

	Ingestion	Inhalation
Recreational		
Child	2.4 ppm, 2.0 ppm	97,561 ppm
Adult	4.3 ppm, 3.5 ppm	85,167 ppm
Industrial		
Adult	2.5 ppm, 2.1 ppm	25,550 ppm
EA Fugitive Dust Model		5.8E-2 ppm

DOCUMENT 4

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES FOR CHEMICALS DETECTED IN SITE GROUNDWATER & SURFACE WATER (Revised September 25, 1990)

Substance	Water Class	Standard (ug/L)	Guidance Value (ug/L)
Aluminum, ionic	A	100(A)	
	GA		
Arsenic	A	50	
	GA	25	
Barium	A	1000	
	GA	1000	
Benzene	A		0.7
	GA	0.7*	
Beryllium	A		3
	GA		3
Butyl benzyl phthalate	A		50
	GA		50
Cadmium	A	10	
	GA	10	
Chlorobenzene	A	20	
	GA	5	
Chromium	A	50	
	GA	50	
Cobalt	A	5(A)	
	GA		
Copper	A	200	
	GA	200	
1,1-Dichloroethane	A		5
	GA	5	
Diethylphthalate	A		50
	GA		50

Substance	Water Class	Standard (ug/L)	Guidance Value (ug/L)
Ethylbenzene	A		5
	GA	5	
2-Hexanone	A		50
	GA		50
Iron	A	300	
	GA	300	
Lead	A	50	
	GA	25	
Magnesium	A	35,000	
	GA		35,000
Manganese	A	300	
	GA	300	
Mercury	A	2	
	GA	2	
Naphthalene	A	10	
	GA		10
Nitrobenzene	A	30	
	GA	5	
Phenanthrene	A		50
	GA		50
Silver	A	50	
	GA	50	
Sodium	A		
	GA	20,000	
1,1,2,2-Tetrachloroethane	A		0.2
	GA	5	
Toluene	A		5
	GA	5	
Trans-1,2-Dichloroethene	A		5
	GA	5	
1,1,1-Trichloroethane	A		5
	GA	5	

Substance	Water Class	Standard (ug/L)	Guidance Value (ug/L)
Trichloroethene	A		3
	GA	5	
Vanadium	A	14(A)	
	GA		
Total Xylenes	A		5
	GA	5	
Zinc	A	300	
	GA	300	

Notes:
(A) signifies standard or guidance value designated for protection of aquatic life. All other values for protection of human health.
* signifies a proposed standard.

Water class:
A signifies potable surface water;
GA signifies potable groundwater.

DOCUMENT 5

FEDERAL DRINKING WATER STANDARDS

40 CFR Parts 141 & 142

(as of January, 1991)

ORGANIC
all units are micrograms per liter (ppb)

Chemical	MCL *	PMCL *	MCLG *
Acrylamide @	Treatment Technique	-	0
Benzene	5	-	0
Carbon Tetrachloride	5	-	0
o-Dichlorobenzene @	600	-	600
p-Dichlorobenzene	75	-	75
1,2-Dichloroethane	5	-	0
1,1-Dichloroethylene	7	-	7
cis-1,2-Dichloro-ethylene @	70	-	70
trans-1,2-Dichloro-ethylene @	100	-	100
1,2-Dichloropropane @	5	-	0
Dichloromethane (methylene chloride)	-	5	0 (P)
Di(ethylhexyl)adipate	-	500	500 (P)
Di(ethylhexyl)phthalate	-	4	0 (P)
Epichlorohydrin @	Treatment Technique	-	0
Ethylbenzene @	700	-	700
Ethylene dibromide @	0.05	-	0
Hexachlorobenzene	-	1	0 (P)
Hexachlorocyclopentadiene	-	50	50 (P)
Monochlorobenzene @	100	-	100
PAHs[Benzo(a)pyrene] +	-	0.2	0 (P)
PCBs @	0.5	-	0
Pentachlorophenol	-	1	0 (P)
Styrene @	100	-	100
Tetrachloroethylene @	5	-	0
Toluene	1000	-	1000
1,2,4-Trichlorobenzene	-	9	9 (P)
1,1,1-Trichloroethane	200	-	200
1,1,2-Trichlorethane	-	5	3 (P)
Trichloroethylene	5	-	0
Trihalomethanes (total)	100	-	-
2,3,7,8-TCDD	-	$5x10^{-8}$	0 (P)

Chemical	MCL	PMCL	MCLG
Vinyl Chloride	2	-	0
Xylenes (total) @	10000	-	10000
PESTICIDES/HERBICIDES			
Alachlor @	2	-	0
Aldicarb	-	3	1 (P)
Aldicarb Sulfoxide	-	3	1 (P)
Aldicarb Sulfone	-	3	2 (P)
Atrazine @	3	-	3
Carbofuran @	40	-	40
Chlordane @	2	-	0
Dalapon	-	200	200 (P)
Dibromochloropropane @	0.2	-	0
Dinoseb	-	7	7 (P)
Diquat	-	20	20 (P)
2,4-D ** @	70	-	70
2,4,5-TP *** @	50	-	50
Endothall	-	100	100 (P)
Endrin	0.2	2	2 (P)
Glyphosate	-	700	700 (P)
Heptachlor @	0.4	-	0
Heptachlor epoxide @	0.2	-	0
Lindane @	0.2	-	0.2
Methoxychlor @	40	-	40
Oxamyl (Vydate)	-	200	200 (P)
Picloram	-	500	500 (P)
Simazine	-	1	1 (P)
Toxaphene @	3	-	0

* MCL: Maximum Contaminant Level
PMCL: Proposed Maximum Contaminant Level
MCLG: Maximum Contaminant Level Goal
(P): Proposed MCLG

** 2,4-D: 2,4-Dichlorophenoxypropionic acid

*** 2,4,5-TP: 2,4,5-Trichlorophenoxypropionic acid (Silvex)

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

\+ EPA is also considering the establishment of MCLGs and MCLs for six additional Polycyclic Aromatic Hydrocarbons (PAHs).

INORGANIC

all units are milligrams per liter (ppm), except as noted

Chemical	MCL	PMCL	MCLG
Arsenic	0.05	-	
Antimony	-	0.01/0.005[1]	0.003 (P)
Asbestos[2] @	7	-	7
Barium	1.0	2.0	2.0
Beryllium	-	0.001	0 (P)
Cadmium @	0.005	-	0.005
Chromium @	0.1	-	0.1
Copper[3]	-	1.3	1.3 (P)
Cyanide	-	0.2	0.2 (P)
Fluoride	4	-	4
Lead	0.05	0.005	0 (P)
Mercury	0.002	-	-
Nickel	-	0.1	0.1 (P)
Nitrate (as N) @	10	-	10
Nitrite (as N) @	1.0	-	1.0
Nitrate+Nitrite(as N)@	10	-	10
Selenium @	0.05	-	0.05
Silver	0.05	-	-
Sulfate[4]	-	400/500	400/500(P)
Thallium	-	0.002/0.001[1]	0.0005 (P)

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[1] EPA is considering two alternative MCLs based upon a Practical Quanitative Level (PQL) of five times the Method Detection Limit (MDL) or ten times the MDL.

[2] The PMCL and MCLG for asbestos apply to fibers longer than 10 micrometers, and are in units of million fibers per liter.

[3] A current Secondary MCL exists for this compound.

[4] Sulfate is being regulated for its acute short-term effects. EPA is considering alternative MCLGs and MCLs for sulfate.

DOCUMENT 5 (continued)

COMPARISON OF FEDERAL TO NEW YORK STATE MCLs
(as of January 1991)

ORGANIC

all units are micrograms per liter (ppb)

Chemical	FEDMCL	NYMCL+
Acrylamide @	treatment	-
Benzene	5	5
Bromobenzene	-	5
Bromochloromethane	-	5
Bromomethane	-	5
n-Butylbenzene	-	5
sec-Butylbenzene	-	5
tert-Butylbenzene	-	5
Carbon Tetrachloride	5	5
Chlorobenzene	-	5
Chloroethane	-	5
Chloromethane	-	5
2-Chlortoluene	-	5
4-Chlortoluene	-	5
Dibromomethane	-	5
o-Dichlorobenzene (1,2)@	600	5
m-Dichlorobenzene (1,3)	-	5
p-Dichlorobenzene (1,4)	75	5
Dichlorodifluoromethane	-	5
1,2-Dichloroethane	5	5
1,1-Dichloroethane	-	5
1,1-Dichloroethylene	7	5
cis-1,2-Dichloroethylene@	70	5
trans-1,2-Dichloroethylene@	100	5
1,2-Dichloropropane	5	5
1,3-Dichloropropane	-	5
2,2-Dichloropropane	-	5
1,1-Dichloropropene	-	5
cis-1,3-Dichloropropene	-	5
trans-1,3-Dichloropropene	-	5
Epichlorohydrin @	treatment	-
Ethylbenzene @	700	5
Ethylene dibromide @	0.05	-
Hexachlorobutadiene	-	5
Isopropylbenzene	-	5
p-Isopropyltoluene	-	5
Methylene chloride	-	5

Chemical	FEDMCL	NYMCL+
Monochlorobenzene @	100	-
PCB'S @	0.5	-
n-Propylbenzene	-	5
Styrene @	100	5
1,1,1,2-Tetrachloroethane	-	5
1,1,2,2-Tetrachloroethane	-	5
Tetrachloroethylene @	-	5
Toluene	-	5
1,2,3-Trichlorobenzene	-	5
1,2,4-Trichlorobenzene	-	5
1,1,1-Trichloroethane	200	5
1,1,2-Trichloroethane	-	5
Trichloroethylene	5	5
Trichlorofluoromethane	-	5
1,2,3-Trichloropropane	-	5
1,2,4-Trimethylbenzene	-	5
1,3,5-Trimethylbenzene	-	5
Vinyl Chloride	2	2
Xylenes (total) @	10000	5
Trihalomethanes (total)	100	100
Unspecified organic contaminant (UOC)	N/A	50
Total Principal organic (POCs)+ and UOCs++	N/A	100
PESTICIDES/HERBICIDES		
Alachlor @	2	-
Atrazine @	3	-
2,4-D * @	70	50
2,4,5-TP ** @	50	10
Carbofuran @	40	-
Chlordane @	2	-
Dibromochloropropane @	0.2	-
Endrin	0.2	0.2
Heptachlor @	0.4	-
Heptachlor epoxide @	0.2	-
Lindane @	0.2	4
Methoxychlor @	40	50
Toxaphene @	3	5

* 2,4-D: 2,4-Dichlorophenoxypropionic acid

** 2,4,5-TP: 2,4,5-Trichlorophenoxypropionic acid (Silvex)

N/A = not applicable

\+ Principal organic contaminant (POC) means any organic chemical compound belonging to the following classes, <u>except for</u> Total Trihalomethanes, Vinyl Chloride and regulated Pesticides/Herbicides:

1) Halogenated alkane
2) Halogenated ether
3) Halobenzenes and substituted halobenzenes
4) Benzene and alkyl- or nitrogen-substituted benzenes
5) Substituted, unsaturated hydrocarbons
6) Halogenated nonaromatic cyclic hydrocarbons

Further definition of the POCs is contained in Chapture I of the New York Sanitary Code Part 5, Subpart 5-1.1(ab). A table listing the POCs is found in Table 9A of the same document.

++ Unspecified organic contaminant (UOC) means any organic chemical compound not otherwise specified in Chapture I of the New York Sanitary Code Part 5, Subpart 5-1.

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWSS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

OTHER

The standards for Radiological, Coliform Bacteria and Turbidity have been adopted from the federal MCLs by the states (including VI & PR).

INORGANIC

all units are milligrams per liter (ppm), except as noted

Chemical	FEDMCL	NYMCL
Arsenic	0.05	0.05
Asbestos[1] @	7	-
Barium	1.0	1.0
Cadmium @	0.005	0.01
Chromium @	0.1	0.05
Fluoride (ppm)	4	2.2
Lead	0.05	0.05
Mercury	0.002	0.002
Nitrate (as N) @	10	10
Nitrite (as N) @	1.0	-
Nitrate+Nitrite(as N)@	10	-
Selenium @	0.05	0.01
Silver	0.05	0.05

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWSS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

[1] The MCL for asbestos apply to fibers longer than 10 micrometers, and are in units of million fibers per liter.

APPENDIX D

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

Ms. Kathleen Callahan
Director
Emergency & Remedial Response Div.
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

SEP 30 1991

Dear Ms. Callahan:

Re: Sinclair Refinery Site, Wellsville, New York, Allegany County, Site No. 9-02-003, Record of Decision

The New York State Department of Environmental Conservation (NYSDEC) accepts the remedy selected for this site as outlined in the Record of Decision (ROD).

The proposed remedy is primarily a groundwater containment remedy which will reduce the mass of contaminants in the groundwater at the site and prevent migration of contaminants to the Genesee River combined with select surface soil excavation at areas of high lead and arsenic contamination. The State will be afforded the opportunity to review, comment and concur on all contingency decisions should modification, termination, reconsideration or waiver of any part of the remedy be considered. Although we cannot concur with this remedy as being able to achieve ARARs, we accept that a possibility exists that ARARs may be achieved by this remedy and that the remedy will certainly provide containment of groundwater contaminants at this site.

The acceptance of this letter is conditioned by recent correspondence (see enclosure) which resolved pertinent issues. This correspondence is as follows:

- Letter to Ms. Kathleen C. Callahan, USEPA, from M.J. O'Toole, NYSDEC, dated July 31, 1991.

- Letter to Michael Negrelli, USEPA, from A. Joseph White, NYSDEC, dated September 25, 1991.

- Letter to A. Joseph White, NYSDEC, from Michael Negrelli, USEPA, dated September 25, 1991.

- Letter to A. Joseph White, NYSDEC, from Michael Negrelli, USEPA, dated September 27, 1991.

If you have any comments or questions on this letter, please call Mr. Edward R. Belmore, P.E., at 518/457-0414.

Sincerely,

Edward O. Sullivan
Deputy Commissioner

cc: N. Kim, NYSDOH

Enclosure

TOTAL P.03

APPENDIX F

Document Number: SIN-002-0903 To 0905 Date: / /

Title: Statement of Work - Community Relations Support, Sinclair Refinery, Wellsville, NY

Type: PLAN
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0906 To 0906 Date: / /

Title: (Public Notice inviting public comment on the Proposed Plan for the Remediation of the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0966 To 0966 Date: / /

Title: Draft Press Release: EPA Extends Public Comment Period for Sinclair Refinery Superfund Site in Allegany County, New York

Type: CORRESPONDENCE
Condition: DRAFT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-001-2099 To 2222 Date: / /

Title: Sinclair Refinery Operable Unit No. 2 Risk Assessment (Appendix J)

Type: PLAN
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0617 To 0617 Date: 09/25/85

Title: (Memorandum forwarding the attached Draft Record of Decision for the Sinclair Refinery site, Operable Unit No. 1)

Type: CORRESPONDENCE
Author: Librizzi, William J.: US EPA
Recipient: Daggett, Christipher J.: US EPA
Attached: SIN-002-0618

Document Number: SIN-002-0618 To 0694 Parent: SIN-002-0617 Date: 09/30/85

Title: Record of Decision - Sinclair Refinery Site Landfill (Operable Unit No. 1)

Type: LEGAL DOCUMENT
Author: Daggett, Christopher J.: US EPA
Recipient: none: none

Document Number: SIN-002-0699 To 0812 Date: 07/28/88

Title: Administrative Order on Consent (issued to the Atlantic Richfield Company, Inc.)

Type: LEGAL DOCUMENT
Author: Daggett, Christopher J.: US EPA
Recipient: Leake, William D.: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-0002 To 0185 Parent: SIN-001-0001 Date: 08/01/88

Title: Project Operations Plan for Completion of Phase II Remedial Investigation and Work Plan for Feasibility Study at the Sinclair Refinery Site, Wellsville, New York - Volume I of II, Work Plan

Type: PLAN
Author: none: Ebasco Services
Recipient: none: ARCO Petroleum Products Company

Document Number: SIN-001-0186 To 0380 Date: 08/01/88

Title: Project Operations Plan for Completion of Phase II Remedial Investigation and Work Plan for Feasibility Study at the Sinclair Refinery Site, Wellsville, New York - Volume II of II, Field Operations Plan

Type: PLAN
Author: none: Ebasco Services
Recipient: none: ARCO Petroleum Products Company

Document Number: SIN-001-0382 To 0474 Parent: SIN-001-0381 Date: 08/01/88

Title: Project Operations Plan for Completion of Phase II Remedial Investigation and Work Plan for Feasibility Study at the Sinclair Refinery Site, Wellsville, New York - Revised Field Sampling and Analysis Plan

Type: PLAN
Author: none: Ebasco Services
Recipient: none: ARCO Petroleum Products Company

Document Number: SIN-001-2329 To 2351 Date: 08/08/88

Title: Appendix A.3 - Treatment Standards and Effective Dates for First Third Wastes (Guidance)

Type: DATA
Author: none: none
Recipient: none: none

Document Number: SIN-002-0813 To 0892 Date: 08/22/88

Title: (Sinclair Refinery Operable Unit No. 1 Consent Decree - United States v. Atlantic Richfield Company, Inc.)

Type: LEGAL DOCUMENT
Author: Muszynski, William J.: US EPA
Recipient: Leake, William D.: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-0001 To 0001 Date: 08/30/88

Title: (Letter forwarding the attached Remedial Investigation Project Operations Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Simmons, R. Walter: ARCO Petroleum Products Company
Recipient: Olivo, Paul J.: US EPA
Attached: SIN-001-0002

Document Number: SIN-001-2247 To 2255 Date: 09/30/88

Title: (Technical and Administrative Guidance Memorandum regarding alteration of groundwater samples collected for metals analysis)

Type: CORRESPONDENCE
Author: O'Toole, Michael J., Jr.: NY Dept of Environmental Conservation
Recipient: various: NY Dept of Environmental Conservation

Document Number: SIN-001-0381 To 0381 Date: 10/03/88

Title: (Letter forwarding the attached revised Field Sampling and Analysis Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Granger, Thomas: Ebasco Services
Recipient: Olivo, Paul J.: US EPA
Attached: SIN-001-0382

Document Number: SIN-001-2246 To 2246 Date: 02/03/89

Title: (Memorandum containing comments relating to the filtering of groundwater at Bausch and Laumb)

Type: CORRESPONDENCE
Author: Concannon, Patrick: NY Dept of Environmental Conservation
Recipient: Nattanmai, Vivek: NY Dept of Environmental Conservation

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Document Number: SIN-001-0635 To 0934 Date: 02/23/89

Title: (Remedial Investigation sampling data)

Type: DATA
Author: none: Ebasco Services
Recipient: none: ARCO Petroleum Products Company

Document Number: SIN-002-0894 To 0902 Parent: SIN-002-0893 Date: 06/30/89

Title: Preliminary Health Assessment. Sinclair Refinery, CERCLIS No. NYD980535125, Allegany County, Wellsville, NY

Type: PLAN
Author: none: NY Dept of Health
Recipient: none: Agency for Toxic Substances & Disease Registry (ATSDR)

Document Number: SIN-001-2322 To 2325 Date: 07/01/89

Title: Superfund LDR Guide #5, Determining When Land Disposal Restrictions (LDRs) are applicable to CERCLA Response Actions

Type: PLAN
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0893 To 0893 Date: 07/12/89

Title: (Letter forwarding attached Preliminary Health Assessment for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Nelson, William Q.: Agency for Toxic Substances & Disease Registry (ATSDR)
Recipient: Olivo, Paul J.: US EPA
Attached: SIN-002-0894

Document Number: SIN-001-2272 To 2272 Date: 03/06/90

Title: (Letter providing ARCO with guidance on preparing a Feasibility Study for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Petersen, Carole: US EPA
Recipient: Turco, Michael A.: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0695 To 0697 Date: 04/13/90

Title: (Letter forwarding the attached table of potential groundwater Applicable or Relevant and Appropriate Requirements (ARARs) for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Negrelli, Michael J.: US EPA
Recipient: White, A. Joseph: NY Dept of Environmental Conservation
Attached: SIN-002-0698

Document Number: SIN-001-2232 To 2234 Parent: SIN-001-2229 Date: 04/24/90

Title: (Letter containing NYSDEC and NYSDOH comments on the "Final Endangerment Assessment Report")

Type: CORRESPONDENCE
Author: White, A. Joseph: NY Dept of Environmental Conservation
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-002-0698 To 0698 Parent: SIN-002-0695 Date: 04/30/90

Title: (Letter responding to EPA's April 16, 1990, letter regarding the proposed ARARs for the Sinclair Refinery site)

Type: CORRESPONDENCE
Condition: MISSING ATTACHMENT
Author: White, A. Joseph: NY Dept of Environmental Conservation
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-001-2267 To 2271 Date: 05/24/90

Title: (Letter forwarding the attached table of Applicable or Relevant and Appropriate Requirements for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Petersen, Carole: US EPA
Recipient: Turco, Michael A.: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-2256 To 2266 Date: 06/07/90

Title: (Memorandum discussing the soil clean-up levels for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Stefanidis, Marina: US EPA
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-001-2242 To 2245 Parent: SIN-001-2241 Date: 08/28/90

Title: (Memorandum discussing the performance of risk assessments in Remedial Investigations/Feasibility Studies (RI/FSs) conducted by Potentially Responsible Parties)

Type: CORRESPONDENCE
Author: Clay, Don R.: US EPA
Recipient: various: US EPA

Document Number: SIN-001-2326 To 2328 Date: 09/01/90

Title: (Memorandum discussing the interim guidance on establishing soil lead clean-up levels at Superfund sites)

Type: CORRESPONDENCE
Author: Longest, Henry L., II: US EPA
Recipient: various: US EPA

Document Number: SIN-001-2230 To 2231 Parent: SIN-001-2229 Date: 09/10/90

Title: (Letter discussing major concerns about the Sinclair Refinery site Remedial Investigation which have not been addressed)

Type: CORRESPONDENCE
Author: White, A. Joseph: NY Dept of Environmental Conservation
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-001-2273 To 2321 Date: 09/25/90

Title: New York State Ambient Water Quality Standards and Guidance Values

Type: DATA
Author: none: none
Recipient: none: none

Document Number: SIN-001-2241 To 2241 Date: 10/09/90

Title: (Letter forwarding the attached memorandum regarding the development of risk assessments by EPA for all Superfund sites)

Type: CORRESPONDENCE
Author: Negrelli, Michael J.: US EPA
Recipient: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Attached: SIN-001-2242

Document Number: SIN-001-0476 To 0634 Parent: SIN-001-0475 Date: 10/11/90

Title: Volatile Analysis - Analytical Data Package (for sampling performed at the Sinclair Refinery site)

Type: DATA
Author: none: Versar
Recipient: none: Ebasco Services

Document Number: SIN-001-0475 To 0475 Date: 10/12/90

Title: (Letter forwarding the attached GC/MS volatile results for water samples from the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Cassidy, Sheila: Versar
Recipient: Vanpelt, Bob: Ebasco Services
Attached: SIN-001-0476

Document Number: SIN-001-2235 To 2235 Parent: SIN-001-2229 Date: 10/26/90

Title: (Letter containing information on the presence of federally listed or proposed endangered or threatened species in the vicinity of the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Corin, Leonard P.: US Dept of the Interior
Recipient: Hargrove, Robert W.: US EPA

Document Number: SIN-001-0941 To 1189 Date: 03/01/91

Title: Remedial Investigation Report for the Sinclair Refinery Site, Wellsville, New York - Volume I of IV, Technical Report

Type: REPORT
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-1190 To 1697 Date: 03/01/91

Title: Remedial Investigation Report for the Sinclair Refinery Site, Wellsville, New York, Volume II of IV, Appendices A-E

Type: REPORT
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-1698 To 1894 Date: 03/01/91

Title: Remedial Investigation Report for the Sinclair Refinery Site, Wellsville, New York, Volume III of IV, Appendices F-J

Type: REPORT
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-1895 To 2092 Date: 03/01/91

Title: Remedial Investigation Report for the Sinclair Refinery Site, Wellsville, New York, Volume IV of IV, Appendix K

Type: REPORT
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0001 To 0379 Date: 03/01/91

Title: Feasibility Study Report for the Sinclair Refinery Site, Wellsville, New York

Type: REPORT
Author: none: Ebasco Services
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-2238 To 2240 Date: 03/01/91

Title: (Letter forwarding the revised Final Endangerment Assessment and responding to the finalization of the Sinclair Refinery Remedial Investigation)

Type: CORRESPONDENCE
Condition: MISSING ATTACHMENT
Author: Petersen, Carole: US EPA
Recipient: Zannos, John A. A.: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0446 To 0469 Date: 03/01/91

Title: (Letter addressing Feasibility Study issues, requesting an extension for the submittal of the Feasibility Study Report, and forwarding information about the deep aquifer, calculation of arsenic clean-up levels and barium)

Type: CORRESPONDENCE
Author: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-002-0470 To 0471 Date: 03/01/91

Title: (Letter forwarding a copy of an EPA document entitled "Determining Soil Response Action Levels Based on Potential Contamination to Groundwater: A Compendium of Examples" and discussing its relevance to the Sinclair Refinery site)

Type: CORRESPONDENCE
Condition: MISSING ATTACHMENT
Author: Negrelli, Michael J.: US EPA
Recipient: Zannos, John A. A.: Atlantic Richfield Company (ARCO)

Document Number: SIN-001-2236 To 2237 Date: 03/06/91

Title: (Letter discussing issues pertaining to the Remedial Investigation/Feasibility Study (RI/FS) that require clarification)

Type: CORRESPONDENCE
Author: Negrelli, Michael J.: US EPA
Recipient: White, A. Joseph: NY Dept of Environmental Conservation

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Document Number: SIN-001-2229 To 2229 Date: 03/07/91

Title: (Memorandum forwarding the attached packet of relevant documents for a Biological Technical Assistance Group review of the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Negrelli, Michael J.: US EPA
Recipient: Stevens, Shari L.: US EPA
Attached: SIN-001-2230 SIN-001-2232 SIN-001-2235

Document Number: SIN-001-2227 To 2228 Date: 05/16/91

Title: (Letter commenting on the Sinclair Refinery site Remedial Investigation Report and the Feasibility Study Report)

Type: CORRESPONDENCE
Author: Petersen, Carole: US EPA
Recipient: Zannos, John A. A.: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0438 To 0445 Date: 05/30/91

Title: (Letter forwarding the attached detailed analysis of Alternative 1E identified in the Feasibility Study for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-001-2225 To 2226 Date: 06/06/91

Title: (Memorandum containing the Biological Technical Assistance Group's review of the "Revised Final Endangerment Assessment" and "Final Remedial Investigation Report" for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Hemmett, Roland: US EPA
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-002-0598 To 0616 Date: 06/19/91

Title: (Letter providing comments on the Draft Proposed Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Belmore, Edward R.: NY Dept of Environmental Conservation
Recipient: Petersen, Carole: US EPA

Document Number: SIN-001-2093 To 2098 Date: 07/01/91

Title: Remedial Investigation Report - Addendum (general and specific comments)

Type: REPORT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0380 To 0396 Date: 07/01/91

Title: Feasibility Study Report - Addendum (general and specific comments)

Type: REPORT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0397 To 0419 Date: 07/01/91

Title: Superfund Proposed Plan - Sinclair Refinery Site, Wellsville, New York

Type: PLAN
Condition: DRAFT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-001-0935 To 0940 Date: 07/01/91

Title: Remedial Investigation Report - Addendum

Type: REPORT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-001-2352 To 2368 Date: 07/01/91

Title: Feasibility Study Report Addendum

Type: REPORT
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0420 To 0437 Date: 07/01/91

Title: Superfund Proposed Plan - Sinclair Refinery Site, Wellsville, New York

Type: PLAN
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0594 To 0597 Date: 07/10/91

Title: (Letter responding to NYSDEC's comments on the Draft Proposed Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Petersen, Carole: US EPA
Recipient: Belmore, Edward R.: NY Dept of Environmental Conservation

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Document Number: SIN-001-2223 To 2224 Date: 07/16/91

Title: (Memorandum discussing biological sampling performed at the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Stevens, Shari L.: US EPA
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-002-0590 To 0593 Date: 07/19/91

Title: (Letter discussing the resolution of issues raised by NYSDEC and NYSDOH regarding the revised Proposed Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Belmore, Edward R.: NY Dept of Environmental Conservation
Recipient: Petersen, Carole: US EPA

Document Number: SIN-002-0587 To 0589 Date: 07/23/91

Title: (Letter responding to NYSDEC's comments on the Draft Proposed Plan for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: Petersen, Carole: US EPA
Recipient: Belmore, Edward R.: NY Dept of Environmental Conservation

Document Number: SIN-002-0967 To 0969 Date: 07/29/91

Title: (Press Release:) EPA proposes $15.5 Million Cleanup Remedy for Superfund Site in Wellsville, New York

Type: CORRESPONDENCE
Author: none: US EPA
Recipient: none: none

Document Number: SIN-002-0584 To 0586 Date: 07/31/91

Title: (Letter concurring with the selected remedy for the Sinclair Refinery site)

Type: CORRESPONDENCE
Author: O'Toole, Michael J., Jr.: NY Dept of Environmental Conservation
Recipient: Callahan, Kathleen C.: US EPA

Document Number: SIN-002-0907 To 0965 Date: 08/01/91

Title: (Transcript for the public meeting discussing the proposed plan to remediate the Sinclair Refinery site)

Type: LEGAL DOCUMENT
Author: Bennett, Joan: Bennett Court Reporting
Recipient: none: none

Document Number: SIN-002-0472 To 0472 Date: 08/12/91

Title: (Letter agreeing to extension of time for the submittal of ARCO's comments on the Sinclair Refinery site Proposed Plan)

Type: CORRESPONDENCE
Author: Negrelli, Michael J.: US EPA
Recipient: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Attached: SIN-002-0473

Document Number: SIN-002-0473 To 0473 Parent: SIN-002-0472 Date: 08/15/91

Title: (Letter requesting an extension of time in which to submit comments on the Sinclair Refinery site Proposed Plan)

Type: CORRESPONDENCE
Author: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Recipient: Negrelli, Michael J.: US EPA

Document Number: SIN-002-0477 To 0583 Parent: SIN-002-0475 Date: 08/30/91

Title: Response to EPA's Proposed Plan - Operable Unit II, Sinclair Refinery Site, Wellsville, New York

Type: PLAN
Author: various: various
Recipient: none: Atlantic Richfield Company (ARCO)

Document Number: SIN-002-0475 To 0476 Date: 09/03/91

Title: (Letter forwarding ARCO's response to EPA's Proposed Plan for Operable Unit No. 2 for the Wellsville (Sinclair Refinery) site)

Type: CORRESPONDENCE
Author: Zannos, John A. A.: Atlantic Richfield Company (ARCO)
Recipient: Negrelli, Michael J.: US EPA
Attached: SIN-002-0477

Document Number: SIN-002-0474 To 0474 Date: 09/04/91

Title: (Letter providing comments on the Sinclair Refinery site Proposed Plan)

Type: CORRESPONDENCE
Author: Chaffee, Robert L.: Village of Welllsville, NY, Department of Public Works
Recipient: Negrelli, Michael J.: US EPA