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Office of
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Remedial Response

EPA/ROD/R05-87/049
September 1987

EPA

Superfund Record of Decision:

Northside Sanitary Landfill/ Environmental Conservation and Chemical, IN

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/ROD/R05-87/049	2.	3. RECIPIENT'S ACCESSION NO.
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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Northside Sanitary Landfill (NSL) and the Environmental Conservation and Chemical Corporation (ECC) are adjacent sites located in Boone County, Indiana. These two sites have been combined into the first remedial action because of their close proximity, and due to similarities in contaminants, affected media, remediation needs and regulatory status. Between 1977 and 1982, ECC was involved in the recovery/reclamation/brokering of primary solvents, oils and other wastes received from industrial clients. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Onsite accumulation of contaminated stormwater, poor management of drum inventory and several spills prompted State and U.S. EPA investigation of ECC. Between 1977 and 1981 some still bottom and oily liquid wastes were permitted to be disposed of at NSL. In May 1982, ECC was ordered by the court to close and environmentally secure the site for failure to produce hazardous waste inventories. Two emergency actions in March 1983 and March 1985 eliminated the major sources of contamination at the site. Soils on site contain high concentrations of organic compounds including trans-1,2-DCE, trichloroethene, 1,1-DCE and vinyl chloride. The possibility exists for the presence of other sources of contamination at the site.

(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Northside Sanitary LF/Enviro-Chem., IN First Remedial Action Contaminated Media: soil, sediments, gw, sw Key contaminants: VOCs, TCE, organics, inorganics, pesticides, oils		

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EPA/ROD/R05-87/049
Northside Sanitary Landfill/Environmental Conservation and Chemical Corporation, IN
First Remedial Action

16. ABSTRACT (continued)

Sometime between 1955 and 1962, NSL began landfill operations. From 1972 to 1973, numerous operational deficiencies, including failure to cover refuse, surface burning, underground fires, leachate and vermin problems resulted in three Indiana State Board of Health (ISBH) orders to cease operations. Operations were permitted at the site by February 1975. By November 1982, NSL had accepted at least 16 million gallons of hazardous substances. Ground water, surface water, soil and sediments are contaminated with inorganics, organics, pesticides, acids, base-neutral compounds, oils and VOCs including benzene, 1,1-DCE and TCE.

The recommended alternative for the two sites combined includes: implementing deed and access restrictions to prevent future site development; excavation and dewatering of 4,200 yd^3 of leachate soils and sediments with onsite disposal under a RCRA multi-layer cap; soil capping on non-RCRA capped areas; site grading; demolition of former ECC process building followed by capping; re-routing of surface waters; leachate collection and treatment at NSL; and ground water collection and onsite treatment for both sites. The estimated present worth cost for this remedial action is $33,900,000.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Environmental Conservation and Chemical Corporation, and Northside Sanitary Landfill, Zionsville, Indiana

Documents Reviewed

The following documents, which describe the physical characteristics of the Environmental Conservation and Chemical Corporation, also referred to as the Enviro-Chem Corporation, or ECC, and Northside Sanitary Landfill (NSL) sites, and which analyze the cost-effectiveness of various remedial alternatives, have been reviewed by U.S. EPA and form the basis for this Record of Decision (ROD):

- "Remedial Investigation Report, ECC Site", CH_2M Hill, March 14, 1986.
- "Remedial Investigation Report, Northside Sanitary Landfill," CH_2M Hill, March 27, 1986, as amended on June 18, 1986.
- "Feasibility Study, ECC Site", CH_2M Hill, December 5, 1986.
- "Feasibility Study, Northside Sanitary Landfill", CH_2M Hill December 5, 1986.
- "Combined Alternatives Analysis Report, Northside Sanitary Landfill and Environmental Conservation and Chemical Corporation", CH_2M Hill, December 5, 1986.
- Summary of Remedial Alternative Selection.
- Community Relations Responsiveness Summary.
- Partial Consent Decree, dated September 21, 1983.
- Other Documents as shown in the Index of the Administrative Record.

Description of Selected Remedial Alternative

The selected remedial alternative is ground water interception and treatment plus capping, and includes the following major components:

- Deed and access restrictions to prevent future development of the sites.
- A multi-layer cap over both sites which meets the requirements of the Resource Conservation and Recovery Act.
- Re-routing surface waters to reduce potential for contaminant movement to surface water.
- Leachate collection and treatment for NSL.
- Ground water collection and treatment for both sites.
- Monitoring to ensure effectiveness of remedy components listed above.

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (P.L. 99-499)(SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, I have determined that, at the Enviro-Chem Corporation and Northside Sanitary Landfill Superfund sites, the selected remedial alternative is cost-effective, consistent with a permanent remedy, provides adequate protection of public health, welfare and the environment, and utilizes treatment to the maximum extent practicable.

The State of Indiana has been consulted and concurs with the selected remedial alternative.

The action will require operation and maintenance activities to ensure continued effectiveness of the remedial alternative as well as to ensure that the performance objectives meet applicable State and Federal surface and ground water quality criteria.

I have determined that the action being taken is consistent with Section 121 of SARA, 42 U.S.C. Section 9621.

In accordance with Section 121(c) of SARA, the remedial action taken at Enviro-Chem Corporation and Northside Sanitary Landfill shall be reviewed no less often than every 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

Valdas V. Adamkus
Regional Administrator

Date 9/25/87

Attachments: (1) Summary of Remedial Alternative Selection
(2) Community Relations Responsiveness Summary

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
ENVIRO-CHEM CORPORATION AND NORTHSIDE SANITARY LANDFILL SITES, ZIONSVILLE, INDIANA

I. Location and Description - ECC and NSL

The Enviro-Chem Corporation (also referred to as Environmental Conservation and Chemical Corporation, or ECC) and Northside Sanitary Landfill (NSL) are both on the Superfund National Priorities List, and are adjacent to each other. During the course of U.S. EPA's investigations, it became obvious that it would be difficult and more costly to implement individual remedies at the two sites because of their close proximity. U.S. EPA is selecting a combined remedy to clean up the sites, as explained in this document.

The Enviro-Chem Corporation and Northside Sanitary Landfill (NSL) are located in a rural area of Boone County, about five miles north of Zionsville and ten miles northwest of Indianapolis (Figure 1). Farmland borders the southern and eastern edges of the combined site area. Residential properties are located to the north and west, within one-half mile of the facilities. A small residential community, Northfield, is located north of the sites on U.S. Route 421. Approximately fifty residences are located within a mile of the sites.

An unnamed ditch runs north to south between the two sites, along the western edge of the landfill, and joins Finley Creek at the southwestern corner of the landfill (Figure 1). Finley Creek runs along the eastern and southern edge of the Northside site and flows into Eagle Creek about one-half mile downstream from the sites. Eagle Creek flows south from its confluence with Finley Creek for ten miles before it empties into Eagle Creek Reservoir. The reservoir supplies approximately six percent of the drinking water for the City of Indianapolis.

II. Site History - ECC

ECC began operations in 1977 and was engaged in the recovery/reclamation/brokering of primary solvents, oils, and other wastes received from industrial clients. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal.

Accumulation of contaminated stormwater onsite, poor management of the drum inventory, and several spills caused State and U.S. EPA investigations of ECC. In an attempt to handle wastes generated onsite, approval was sought by ECC to dispose of 5,000 gallons per day of oil recovery wastes and 1,000 to 1,500 gallons per week of still bottoms at NSL. Approval to dispose of the still bottoms was granted (with conditions) by the Indiana Stream Pollution Control Board (SPCB) on October 11, 1977; however, the request to dispose of the liquid waste from the oil recovery operations was denied.

Subsequently, the company sought other avenues of waste disposal. An agreement was reached between the Indiana State Board of Health (ISBH), ECC and NSL to allow disposal of oily wastes in the landfill with municipal refuse. Following expiration of this agreement May 1979, ECC added units to process wastewater by distillation onsite. The product water was used as boiler makeup water.

In September 1979, the SPCB met to discuss an intentional release of process and discharge water from ECC. The board ratified an Agreed Order that included a fine and provisions to upgrade the methods of recordkeeping at the facility.

By April 1980, the ISBH submitted documentation to the Indiana Environmental Management Board (EMB) concerning ECC violations of the Environmental Management Act, the Air Pollution Control Law, and the Stream Pollution Control Law. Based on these violations, the EMB referred the matter to the Office of the Attorney General in May 1980.

On November 19, 1980, a Resource Conservation and Recovery Act (RCRA) Part A application was filed with U.S. EPA to operate a container and tank storage facility. On February 10, 1982, U.S. EPA requested that ECC submit a RCRA Part B permit application. The application was due on August 18, 1982, but was not submitted.

A Consent Decree was issued in July 1981, by the Boone County Circuit Court, imposing a civil penalty against ECC. Furthermore, the court placed ECC into receivership and prohibited the company from using NSL for disposal of wastes. The decree gave ECC until November 1982, to comply with environmental laws and regulations.

In February 1982, the EMB placed a freeze on drum shipments to the facility to assure compliance with the Consent Decree regarding storage of drums, location of materials onsite and in transit, and the removal of sludge.

In May 1982, ECC was ordered by the court to close and environmentally secure the site for failure to reduce hazardous waste inventories. Two days later ECC's court receiver filed a closure plan with the Boone County Circuit Court. By August 1982, ECC was found to be insolvent.

Surface contaminants were removed from ECC in an operation extending from March 1983 through 1984. Actions included removal and treatment or disposal of cooling pond waters, approximately 30,000 drums of waste, 220,000 gallons of hazardous waste from tanks, 5,650 cubic yards of contaminated soil and cooling pond sludge.

In March 1985, contaminated water was discovered ponded on the concrete cap at the southern end of ECC. It was determined that this water was runoff, and not ground water rising up through the concrete pad. During the resulting emergency action, a sump was constructed at the southeast corner of the site, and 20,000 gallons of contaminated water containing high levels of volatile organics were removed and disposed of.

The ECC site was included on the proposed National Priorities List of December 1982, and was made final in September 1983. The site is currently ranked 230 out of a total of 951 sites.

III. Current Site Status - ECC

As a result of the emergency action in 1983, all drums onsite were removed, and all tanks were emptied and cleaned. The wastes and sludge in the cooling pond were removed and disposed of, and the pond was filled in. The only structures remaining on the site are the cleaned tanks, the process building, the A-frame structure and the concrete pad at the south end of the site (Figure 2). The emergency actions taken have eliminated the major surface sources of contamination at the ECC site. A current source of contaminant at the site is the soil which contains high concentrations of organic compounds. It is possible that other sources may be present within the area to to be remediated.

A. Hazardous Compounds Present at ECC

The contamination found in certain media, such as soil, is obviously attributable to ECC. However, determining the source of contamination in the surface water and sediments, and the ground water is not as straight-forward, because of the location of the sites relative to each other. The following presentations for surface water and sediments, and ground water discuss and identify ECC as the potential source of the contamination, where possible.

1. Soil

Soil samples were taken in two phases - phase I, which was done before the removal of 2 feet of contaminated surface soil from most of the site, and phase II which was done after the surface removal. The results of the phase II sampling show that contaminated soils are present over much of the ECC site. Volatile organic compounds are the most widespread organic contaminant at ECC and were detected to the maximum soil sampling depth of 8.5 feet. The volatile organic compounds ranged up to 14,600,000 ug/kg. Other types of contaminants found in the Phase II sampling effort at ECC include phthalates, acid extractable compounds, polynuclear aromatic hydrocarbons, and polychlorinated biphenyls (PCBs).

2. Surface Water and Sediments

The City of Indianapolis has detected organic compounds in Finley Creek at Highway 421 (Figure 1) since 1984. In addition, during the Remedial Investigation (RI) organic contamination, consisting mainly of chlorinated hydrocarbons, was found at one off-site sample location. This sample location is in Finley Creek downstream of both ECC and NSL. It is therefore difficult to pinpoint the exact source of the chlorinated hydrocarbons. However, a review of ECC site records and the chemical analysis of environmental media at ECC has shown that the types of compounds and their relative ratios are consistent with those compounds identified at the downstream sampling location.

ECC site records report that chlorinated hydrocarbon solvents were processed at the facility. Further, drainage patterns direct overland flow from the vicinity of the ECC and NSL sites toward the downstream sampling location. A second sampling location is approximately 750 feet upstream of the downstream location on Finley Creek but receives runoff only from the NSL site. Surface water from this sampling location was not found to be contaminated by chlorinated hydrocarbons.

Ponded water was discovered on ECC and was sampled after the surface cleanup was completed. Results of these analyses reveal that all three sample locations were contaminated with a variety of base/neutral and volatile organic compounds. Several of the volatiles were also detected at the downstream location.

3. Ground Water

The Remedial Investigation (RI) identified two hydrogeologic units beneath ECC. From the surface, these units are: a zone of glacial till with sand and gravel lenses (also referred to as glacial till water-bearing unit); and a deep confined aquifer consisting of sand and gravel. A large sand and gravel lens was encountered in the glacial till water-bearing unit beneath ECC. In the ECC RI, this unit was referred to as the shallow sand and gravel zone. This sand and gravel zone extends into the southwest corner of NSL.

Ground water below ECC generally travels south and discharges into Finley Creek or the unnamed ditch near the confluence with Finley Creek. Interpretation of hydrogeologic data indicate that Finley Creek is a ground water discharge area.

In the shallow saturated zone, which consists of glacial till above a large sand and gravel lens, the following list of contaminants were found at the indicated levels in two shallow wells (15 feet and 24 feet deep) near the southern end of ECC:

trans-1,2-dichloroethene	4,000 ug/l
trichloroethene	28,000 ug/l
benzene	less than 9 ug/l
1,1-dichloroethane	96 ug/l
chloroform	less than 9 ug/l
1,1-dichloroethene	10 ug/l
trans-1,3-dichloropropene	77 ug/l
vinyl chloride	86 ug/l

The underlying sand and gravel lens was also found to be contaminated with inorganic and organic compounds.

Contamination was not found in the deep confined aquifer.

B. Pathways of Exposure at ECC for the No Action Alternative

1. Soil

Following the 1983-1984 emergency action, a 1-foot glacial till cover was placed over the northern portion of ECC. This material was taken from a borrow area north of NSL, was tested and found to be clean before placement. Samples taken thereafter of ponded water on the cover material, as well as the surface water runoff from this area, reveal contamination of the cover material.

The cover material could have been contaminated in a number of ways. The physical placement of the cover and the use of heavy equipment to put it in place during wet weather may have caused the cover material to be mixed with the contaminated soil below. In addition, upward migration of contaminants into the cover material, as a result of capillarity, could have occurred.

A fence around ECC currently limits unauthorized access and direct contact with the contaminants onsite.

Transport of contaminants from onsite soils is also likely through leaching. As water infiltrates through the contaminated soil, it will desorb many compounds and eventually leach into the ground water in the shallow saturated zone. This is presently the case as the ground water samples from the shallow saturated zone were found to be contaminated with volatile organics.

2. Surface Water and Sediments

Both the unnamed ditch and Finley Creek receive ground water discharge and surface water runoff from ECC. Contaminants in the surface water may volatilize, degrade precipitate or adsorb to sediments, or remain in solution and be transported downstream to Eagle Creek and eventually the Eagle Creek Reservoir. Contaminants within the stream sediment may dissociate and reenter solution or may be scoured and resuspended in high flow and carried downstream.

3. Ground Water

Contaminants have migrated downwards to the shallow sand and gravel aquifer. This is evidenced by low-level contamination found in the shallow sand and gravel aquifer onsite. Vertical gradients between the shallow saturated zone and the sand and gravel aquifer currently are upward. However, future excavation at the site could exascerbate ponding of water onsite and reverse the gradient, enabling downward migration of contaminants to the shallow sand and gravel aquifer. In addition, pumping wells placed in the sand and gravel aquifer could reverse the vertical gradient. Some contamination may remain in the cooling pond and may also cause continued contamination of the shallow sand and gravel aquifer.

Evidence of downward migration of contaminants from the shallow sand and gravel and glacial till to the deep confined aquifer was not found and is highly unlikely now or in the future due to the upward vertical gradient.

C. Risk to Receptors at ECC for the No Action Alternative

1. Soil

Because the surface of the ECC site is contaminated, receptors (plants and wildlife, as well as humans) could inhale, ingest, and contact hazardous compounds in the soil directly.

In addition, the heavily contaminated soil below the cap could be a risk to receptor populations since any future excavation might bring higher concentrations of contaminants to the surface.

2. Surface Water and Sediments

Receptors may be exposed to contamination in surface water by wading in the creek, ingesting contaminated water, or ingesting fish which have bioaccumulated contaminants. During low flow periods, contaminated sediments may be exposed along the stream banks and may adhere to hands, clothing or pets and be transported into the home in this manner or as dust, and inadvertently ingested or inhaled.

3. Ground Water

During the RI, five residential wells within one-half mile of ECC were sampled and analyzed for inorganics and organics. No evidence was found that contamination from ECC has migrated to the residential wells. However, receptors could potentially contact or ingest the contaminated ground water if potable wells were to be constructed within the zones of contamination.

IV. Site History - NSL

From aerial photos, it appears that landfill operations began sometime between 1955 and 1962. From 1972 to 1973, numerous operational deficiencies were reported to ISBH inspectors including failure to cover refuse, surface burning, underground fires, leachate and vermin problems. In June 1972 and December 1973, ISBH ordered the owner to cease operations at the landfill. The operation continued into early 1974, which resulted in the State issuing a complaint in May 1974 again ordering operations to cease. In February 1975, a permit was issued to operate the landfill.

In March and September 1978, ISBH noted that unapproved wastes were disposed of at NSL including paint sludges, acids, spent acids and waste oil.

Between 1979 and 1982, portions of the unnamed ditch and Finley Creek were rechanneled by the owner of NSL. Some of these former drainageways were not filled in and are currently evident.

In April 1980, U.S. EPA inspectors reported that leachate from NSL was observed entering the unnamed ditch on the west side of the site. The owner of NSL was ordered to remedy the problem which he attempted to do by applying clay to the affected area.

In November 1980, the owner filed a RCRA Part A application to operate NSL as an existing hazardous waste disposal facility. In February 1981, the owner requested zoning approval from the Boone County Area Planning Commission to expand the landfill east of the existing landfill area. By 1981, NSL had accepted at least 16 million gallons of hazardous substances.

An Agreed Order was signed in July 1981 between the Environmental Management Board (EMB) and NSL whereby NSL was ordered not to accept waste from ECC. This order arose partly from reports that NSL accepted unapproved waste from ECC.

In October 1981, NSL was given conditional approval to receive sewage sludge for disposal, provided that the owner first install a leachate collection system. NSL was issued a Notice of Violation in June 1982, for accepting sludge prior to the completion of the required system.

In March 1982, the owner applied to ISBH for a permit to operate NSL as a hazardous waste landfill. The State refused this application in July 1982, after ground water contamination was observed in a monitoring well located near the southwest corner of the landfill, adjacent to the unnamed ditch. In addition, ISBH required the owner to begin the assessment stage of a RCRA ground water monitoring program.

In September 1983, NSL submitted a RCRA Part B permit application to U.S. EPA. An inspection of the landfill by State inspectors in December 1983, found that leachate seeps were continuing on the north and east sides of the landfill and that the leachate collection tanks were in need of pumping. In November 1985, U.S. EPA denied the RCRA Part B application for NSL.

In April 1983, NSL's Hazardous Waste Operating Permit was denied because of deficiencies in its closure, post-closure and ground water assessment plans. In October 1983, NSL's Solid Waste Operators Permit was denied because of leachate collection problems and acceptance of unapproved waste.

In May 1983, the EMB issued a Notice of Violations, Compliance Order and Hearing to NSL, alleging numerous violations of the Indiana Environmental Management Act and associated rules, and ordered NSL to undertake certain remedial measures. The State was joined in this action by several residents living within 1.5 miles of NSL in September 1983. The hearing began in January 1984, and the hearing officer released his Recommended Final Order in November 1986. In February 1987, the Indiana Solid Waste Management Board (assuming the responsibility of the EMB) adopted the hearing officer's recommended final order. Among the stipulations of this order are:

- NSL shall install and maintain a functioning leachate collection system at the base of the trash around the entire perimeter of the landfill;

- NSL shall install a slurry wall (hydraulic cut-off barrier), or undertake construction utilizing a different technology, with the objective being to prevent contaminated ground water from migrating off-site;

- NSL shall conduct ground water monitoring pursuant to RCRA monitoring protocol;

- NSL shall accept no further solid waste except that amount needed to adequately contour the site.

The NSL site was included on the proposed National Priorities List of September 1983, and was made final in September 1984. The site is currently ranked 237 out of a total of 951 sites.

V. Current Site Status - NSL

As of April 1987, NSL was continuing to operate as a solid waste landfill. The RI revealed contamination in the subsurface soil, surface water and sediment, leachate, and ground water.

A. Hazardous Substances Present at NSL

The contamination found in certain media, such as soil and leachate, is obviously attributable to NSL. However, determining the source of contamination in the surface water and sediments, and ground water is not as straightforward, because of the location of the sites relative to each other. The following presentations for surface water and sediments, and ground water discuss and identify NSL as the potential source of contamination, where possible.

1. Soil

Surface soil samples were taken from the landfill proper and showed no contamination. It is believed that these samples were taken from uncontaminated cover material that was part of the sanitary landfill operation. However, all of the subsurface soil samples, taken from all sides of the landfill, showed contamination. The highest contaminant concentrations were found near the southwest corner of the landfill (Figure 3). The contaminants found in subsurface soil samples include volatile organics, oil and grease, inorganics, and pesticides.

2. Surface Water and Sediments

Surface water sampling was conducted in two phases. The highest concentration of contaminants in the surface water was found in the unnamed ditch between ECC and NSL, and in Finley Creek downstream of ECC and NSL (Figure 3). Contaminants found include inorganics, volatile organics, and base neutrals and acids.

Analysis of sediment samples revealed a wide variety of organic contaminants. The greatest number and the highest concentration of contaminants were detected in Finley Creek below the confluence with unnamed ditch (Figure 3). Inorganic contamination was also found in Finley Creek upstream of the confluence with unnamed ditch. In the sediments of Finley Creek below the confluence with unnamed ditch, and also in a former segment of Finley Creek near the southeast corner of NSL, PCBs were detected. Pesticides were also detected in Finley Creek sediments near the southeast corner of NSL.

3. Leachate

Leachate was sampled and analyzed from a variety of sources on all sides of the landfill. These samples included leachate liquid from the landfill, other liquids observed in ditches immediately adjacent to the landfill, soil at leachate sampling points and in ditches, and the leachate collection tanks. The leachate soils had more compounds and concentrations of contaminants than the liquid. The RI found that the leachate soil samples collected on all sides of the landfill showed contamination. Contaminants found in these soils include organic and inorganic compounds.

Sampling and analysis of the existing leachate collection tanks revealed a variety of volatile organics, base neutrals and acids, and inorganics.

4. Ground Water

The hydrogeologic units beneath NSL are essentially the same as below ECC. From the surface these units are: a zone of glacial till with sand and gravel lenses (also referred to as glacial till water-bearing unit); and a deep confined aquifer consisting of sand and gravel. A large sand and gravel lens was encountered in the glacial till water-bearing unit beneath ECC. In the ECC RI, this unit was referred to as the shallow sand and gravel zone. This sand and gravel zone extends into the southwest corner of NSL.

In the glacial till, contamination was found in the ground water on all sides of the landfill. Analysis of the ground water in the glacial till zone revealed a wide variety of inorganics, semi-volatiles and volatile organics, such as trichloroethene.

Water samples obtained from the sand and gravel lens in the southwest corner of NSL contain semi-volatiles, pesticides, inorganics, and volatile organics including two at concentrations higher than U.S. EPA maximum contaminant limits. These chemicals are benzene and 1,1-dichloroethene.

Ground water from both ECC and NSL converges at the unnamed ditch and/or Finley Creek. Because these surface waters are discharge areas for contaminated ground water from both sites, it is difficult to separate the ground water/surface water contamination in those areas by site.

B. Pathways of Exposure at NSL for the No Action Alternative

1. Soil

Three soil samples taken from the landfill surface did not indicate that the contaminants are present in the surface soil. Samples were not taken below the landfill surface, but soil samples taken in the subsurface around the landfill indicated several areas of contamination. Potential future erosion of the landfill surface could result in exposure and migration of contaminants disposed of in NSL.

2. Surface Water and Sediments

Both the unnamed ditch and Finley Creek receive ground water and surface water runoff from NSL. Contaminants in the surface water may volatilize, degrade, precipitate or adsorb to sediments, or remain in solution and be transported downstream to Eagle Creek and eventually to Eagle Creek Reservoir.

Contaminants within the stream sediment may dissociate and reenter solution or may be scoured and resuspended in high flow and carried downstream.

3. Leachate

Leaching represents a significant transport of contaminants. As water infiltrates through the contaminated soil and debris, it will desorb many compounds and eventually leach into the ground water within the glacial till water-bearing unit. This is presently the case as the ground water samples from the glacial till water-bearing unit were found to be contaminated with inorganics and organics. Leachate also seeps from the side slopes of the landfill and discharges to the unnamed ditch and Finley Creek.

4. Ground Water

Contaminants in the glacial till water-bearing unit migrating downwards contaminate the sand and gravel lenses. Low-level contamination found in the sand and gravel lenses indicate that this has occurred.

Evidence of downward migration of contaminants from the glacial till water-bearing unit to the deep confined aquifer was not found in the ECC RI and is highly unlikely now or in the future due to the upward vertical gradient reported therein.

The hydrogeological investigation conducted during the RI indicated that contamination from the glacial till water-bearing unit and the shallow sand and gravel lenses within that unit migrate to the unnamed ditch and/or Finley Creek.

C. Risk to Receptors at NSL for the No Action Alternative

1. Soil

Heavily contaminated subsurface soil could be a risk to receptor populations since erosion or future excavation might bring contaminants to the surface. Once chemicals are at the surface, receptors (plants, wildlife, and aquatic organisms as well as humans) may inhale, ingest, and contact harmful compounds directly.

2. Surface Water and Sediments

Receptors may be exposed to contamination in surface water by wading in the creek, ingesting contaminated water, or ingestion of fish which have bioaccumulated contaminants.

During the low flow periods, contaminated sediments may be exposed along the stream banks and may adhere to hands, clothing or pets and be transported into the home in this manner or as dust, and inadvertently ingested or inhaled.

3. Leachate

The greatest risk presented by leachate is after it enters another medium.

Once in the ground water, leachate will have the same risk to receptors as the ground water itself; that is, receptors could potentially contact or ingest the contaminated ground water if potable wells were to be constructed within the zones of contamination.

In the surface water, leachate will pose a risk to receptors who may be exposed by wading in the creek, ingesting contaminated water, or ingesting fish which have bioaccumulated contaminants. Further, the leachate may be toxic to fish themselves.

4. Ground Water

During the RI, five residential wells within one-half mile of NSL were sampled and analyzed for inorganics and organics. No evidence was found that contamination from NSL has migrated to the residential wells. However, receptors could potentially contact or ingest the contaminated ground water if potable wells were to be constructed within or immediately adjacent to the zones of contamination.

VI. Combined Action Alternatives Evaluation

Because the ECC and NSL sites are next to each other, it became obvious during the Remedial Investigation for each site that it would be difficult and more costly to implement remedies for the two sites individually. For this reason, it was decided that a separate report, based on the Feasibility Studies, be prepared to discuss a combined remedy for the two sites. This final report was called the "Combined Alternatives Analysis Report, Northside Sanitary Landfill and Environmental Conservation and Chemical Corporation" (CAA). The alternatives developed in the CAA are derived from the alternatives developed for the individual sites and discussed in the ECC and NSL Feasibility Studies. The purpose of combined alternatives for the adjacent sites is to ensure that the remedial actions are compatible with each other, to avoid duplicate remedial actions, and to integrate remedial actions to achieve cost savings.

A. Remedial Action Goals

Remedial action goals were developed and presented in the ECC and NSL FS reports to address each of the site hazards identified for the sites. They were identified for each of the following operable units: soil and landfill contents, landfill leachate, ground water, and surface water and sediment.

1. Remedial Goals for Soil and Landfill Contents

Minimize Direct Contact--Minimize risk to public health and environment from direct contact, inhalation or ingestion of NSL landfill contents, contaminated surface or subsurface soil on ECC and NSL, leachate soils and sediment in the old creek beds of Finley Creek.

2. Remedial Goals for Leachate

Minimize Direct Contact--Minimize risk to public health and environment from direct contact with NSL leachate liquid in the collection system and leachate seeping from the sides of the landfill.

Control Migration to Ground Water--Minimize and mitigate leaching of contaminants from the ECC-contaminated soil or NSL contents into the ground water to adequately protect potential receptors of the ground water at or near the site.

Control Migration to Surface Water--Minimize and mitigate the overland migration of contaminants from leachate seeps to the unnamed ditch and Finley Creek to adequately protect public health and the environment from surface water and sediment contamination, ingestion of contaminated aquatic life, and direct contact with leachate liquid.

3. Remedial Goals for Ground Water

Minimize Direct Contaminant Consumption--Minimize current and possible future risk to public health from direct consumption of contaminated ground water by nearby users.

Control Migration to Surface Water--Manage migration of contaminated ground water to the unnamed ditch and Finley Creek so public health and the environment are adequately protected from surface water and sediment contamination and ingestion of contaminated aquatic life.

4. Remedial Goals for Surface Water and Sediment

Control Migration to Surface Water--Minimize and mitigate the threat to the environment and public health from direct contact, inhalation, and ingestion of contaminants in surface water and sediment resulting from future release of hazardous substances from landfill leachate and ground water discharge.

B. Combined Alternatives Considered

The nine combined remedies developed and presented in the CAA are derived from the alternatives developed for the NSL and ECC sites and presented in detail in the respective FSs. Since each of the NSL or ECC alternatives contains many individual components, the possible combinations far exceed the nine CAA alternatives developed. The CAA alternatives are intended to represent a wide range, both in terms of cost and public health and environmental benefits, of alternatives that meet the remedial action goals.

Alternative 1--No Action

The No Action Alternative is required by the National Contingency Plan and the National Environmental Policy Act to be carried forward. It provides a baseline for comparison of other alternatives.

Alternative 2--Access Restrictions with Soil Cover and Leachate Collection and Treatment

Alternative 2 includes deed restrictions, fencing, a soil cover over the landfill to promote revegetation, a soil cover over the ECC site, disposal of sediment on NSL, rerouting the surface waters, collection and treatment of the leachate seeps, and monitoring of the leachate, ground water, and surface water. This alternative addresses all of the operable unit goals with two exceptions. It would not mitigate or minimize the leaching of contaminants from ECC or NSL to the ground water nor would it manage the migration of contaminated ground water to the surface waters.

The intent was to present a low-cost alternative that offers the lowest level of protection to public health and the environment. If contaminant concentrations in the proposed monitoring wells exceed applicable and relevant and appropriate requirements (ARARs) limits, future remedial actions would be initiated. Alternative 2 is estimated to cost $18.1 million.

Alternative 3--Access Restrictions With RCRA Cap and Leachate Collection and Treatment

Alternative 3 is identical to Alternative 2 with the exception of a RCRA cap over both sites in place of a soil cover. This alternative is intended to provide a greater level of protection by reducing contaminant migration to the ground water through reduction in surface water infiltration while also meeting technical requirements of landfill capping for site closure under RCRA. Monitoring would still be necessary to detect migration of contaminants in the ground water. The quantity of leachate migrating to the ground water will be reduced; however, the continuing contamination of the surface water from ground water discharge remains. As with Alternative 2, if contaminant concentrations in the proposed monitoring wells exceed ARARs, future remedial actions would be initiated. Alternative 3 is estimated to cost $29.9 million.

Alternative 4--Access Restrictions With Soil Cover, Leachate Collection, Ground Water Interception, and Treatment

Alternative 4 is essentially identical to Alternative 2 with the addition of ground water interception and treatment to mitigate the migration of ground water contaminants offsite or to the surface waters. This alternative addresses the ground water and surface water remedial action goals of providing adequate protection of public health and the environment from further contamination of the surface water. Leachate from NSL would continue to migrate to the ground water so collection and treatment would be required indefinitely at NSL. At ECC, soil contaminants which leach to ground water would be removed and treated, though treatment would also likely be required indefinitely (possibly for 100 years or more). Alternative 4 is estimated to cost $20.8 million.

Alternative 5--Access Restrictions with RCRA Cap, Leachate Collection, Ground Water Interception, and Treatment

Alternative 5 includes leachate and ground water interception and treatment with a RCRA cap over the sites. The objective of the cap is to minimize further leaching of soil or landfill contaminants to the ground water. This may eventually allow termination of the ground water collection and treatment system, though leachate collection and treatment would continue to be necessary. The operational period of the collection and treatment system cannot be reliably estimated but could be less than the time required for Alternative 4. Alternative 5 is estimated to cost $33.9 million.

Alternative 6--Access Restrictions With RCRA Cap, Leachate Collection, Ground Water Isolation and Treatment

Alternative 6 employs a ground water collection system intended to lower the water table beneath the contaminated or potentially contaminated zones at both sites. Combined with a RCRA cap the alternative should eventually prevent further contamination of the ground water and result in treatment of leachate only. However, the collection system would be operated indefinitely to maintain the lower water table. This alternative is intended to provide a greater level of protection to the public health and environment by reducing contaminant migration. Alternative 6 is estimated to cost $37.3 million.

Alternative 7--Access Restrictions With RCRA Cap, Leachate Collection, Ground Water Isolation and Treatment, and ECC Soil Vapor Extraction

Alternative 7 incorporates all the components and objectives of

Alternative 6 with the additional treatment of ECC-contaminated soil. Because the alternative includes a RCRA cap over ECC combined with a lowering of the water table, the soil vapor extraction treatment would not likely result in a reduced ground water treatment period relative to Alternative 6. This is because in either alternative leaching of soil contaminants to the ground water is minimized by the cap and the lowering of the water table. The public health risk from direct contact with ECC-contaminated soil in the event of site development would be greatly reduced. Alternative 7 is estimated to cost $39.3 million.

Alternative 8--Access Restrictions With RCRA Cap, Leachate Collection, Ground Water Isolation and Treatment, and ECC Soil Incineration

Alternative 8 incorporates the objectives of Alternative 7. ECC-contaminated soil, however, is treated by onsite incineration. This results in permanent destruction of the organic contaminants. Alternative 8 is estimated to cost $76.1 million.

Alternative 9--Access Restrictions With Onsite RCRA Landfill

Alternative 9 includes deed restrictions, excavation of the landfill contents, peripheral soils, sediments and ECC-contaminated soil and disposal of the waste materials in an onsite RCRA-type facility. This alternative addresses all the operable unit goals and provides the highest level of protection of all the alternatives. However, the risks of exposure during construction and implementation would be greater than any of the other alternatives. Alternative 9 is estimated to cost $109.4 million.

Alternative Combinations Not Included

Several potential combinations of NSL and ECC alternatives were not included since they either did not satisfy the remedial action goals, or other combinations better satisfied the objectives intended. They are discussed below.

- ECC Soil Excavation and Disposal Offsite

  This action was not included in any CAA Alternative since it is costly (30-year present worth of $3,700,000) and does not result in destruction of contaminants.

- Incineration of NSL Landfill Contents and Contaminated Soil

  Incineration of NSL landfill materials and contaminated soils was eliminated as a viable technology in the NSL FS Screening (see NSL FS Chapter 3). Several disadvantages of incinerating the entire NSL landfill are: the risk of exposure to contaminants during excavation, unknown contents of the landfill, lengthy time to implement and incinerate the solids, and the high cost (capital cost is estimated to be $3 billion to $5 billion). Incineration of isolated and heavily contaminated areas within the landfill could be accomplished at a much lower cost if such areas could be effectively located. Risks of exposure or offsite migration of contaminants during excavation would still be important disadvantages.

VII. Recommended Alternative

U.S. EPA's recommended alternative is Alternative 5 (Figure 4). The major components of the alternative are: access restrictions; RCRA-compliant cap and surface controls; monitoring; leachate collection, ground water interception; and treatment.

- Access Restrictions

Deed restrictions will be placed on the landfill property and the ECC site. The restrictions should prevent future development of the land to protect against direct contact with contaminants or further migration that could result from site excavation and development. The deed restrictions should also prohibit use of ground water or installation of wells onsite. Access to the site will be controlled by completing the fencing around the site perimeter and posting signs.

- RCRA-Compliant Cap and Surface Controls

These actions include removal of contaminated sediment, rerouting of creeks, and construction of a multi-layer cap over ECC and NSL. The cap will be designed to comply with RCRA performance-based standards. In addition, the needs for an appropriate gas venting system will be determined during design.

Contaminated leachate soils and sediment in the ditch north of NSL and the old creek beds of Finley Creek would be excavated, dewatered, and disposed of onsite beneath the cap. It was assumed for cost estimating that excavation to a 1-foot depth would be necessary and a total of 4,200 cubic yards would be removed.

The actual volume removed will be dependent on further sampling undertaken as part of final design. The creek beds will be backfilled and a soil cover would be placed over areas not under the cap. Contaminated water resulting from the dewatering of the sediment will be treated in the onsite treatment system.

The unnamed ditch will be rerouted to the west of ECC and portions of Finley Creek will be rechannelized as shown in Figure 4. This will route surface waters farther away from contaminated areas, and increase the space available to construct the French drain system.

Prior to placing the cap, the site will be graded to eliminate sharp grade changes and to provide for drainage. Also the former process building on the ECC site will be demolished. The concrete floor and foundation will remain and the cap placed on top. The cap will be seeded to control erosion and promote evapotranspiration.

- Monitoring

Contaminant migration and remedial action performance will be assessed through a regular leachate, ground water, and surface water monitoring program. Leachate will be sampled at the leachate collection sump as part of the leachate collection and treatment system. Ground water will be monitored during the first year using 15 of the existing wells and an additional 26 new monitoring wells (Figure 4). The 41 monitoring wells will be sampled quarterly the first year and analyzed for the full organic and inorganic priority pollutant list.

Sampling needs may change over time as different types and concentrations of contaminants migrate to the monitoring points. It is estimated that subsequent semiannual sampling will be necessary at 14 wells. Water levels of monitoring wells will be taken at the time of sampling and gradients will be calculated.

Surface water and sediment will be sampled at eight locations semiannually. These samples will be analyzed for volatile organic compounds, base/neutrals, pesticides, PCBs, and inorganics. Depending on surface water results, fish may be occasionally collected from Finley and Eagle Creeks and their tissues analyzed for bioaccumulation of organic contaminants.

- Leachate Collection

The leachate collection system will consist of a French drain encircling the landfill. The drain will be about 4 feet deep and about 6,000 feet in length. Perforated pipe laid in the trench will be used to transport leachate to a sump located near the treatment system in the southwest corner of the site.

The trench will be backfilled with gravel. A 1-foot layer of gravel will also be placed on the sideslopes of the landfill to provide a drainage path for leachate seepage. The multilayer cap will extend over the gravel layer and the drainage trench. The existing leachate collection system will be evaluated to determine its effectiveness. It will be decommissioned and replaced, if necessary.

- Ground Water Interception

The objective of the ground water collection system is to prevent contaminated ground water from migrating offsite and discharging to surface waters. The collection system described for the recommended alternative will meet this objective based on the information available to date. Further site investigations during final design may alter the design and alignment of the collection system; however, the objective of the ground water interception system will be met.

The ground water collection system will consist of a French drain installed along the southern and southwestern boundaries of the landfill and ECC. The trench will be about an average depth of 25 feet and will include two collection pipes, one set 5 feet below the existing water table and the other set at the bottom of the trench. It is anticipated that an approximate 5-foot overall drawdown of the water table at the collection system will be sufficient to prevent ground water movement past the system. The French drain will include an impermeable barrier on the south wall of the trench to minimize inflow of water from Finley Creek. The barrier consists of an impermeable synthetic membrane and at least 6 inches of compacted clay. It will extend 3 feet into the till below the sand and gravel deposit in the southwest area of the site. The barrier will also extend 75 feet beyond the western end of the drain.

The initial combined flowrate from the leachate and ground water collection systems is estimated to be 100 gpm with 40 gpm from the leachate collection system. Within 5 years, the flow is estimated to decrease to about 65 gpm because of a reduction in leachate generation from infiltration due to the impermeable cap.

- Treatment

Treatment of leachate and ground water will be required to meet effluent discharge limits and conditions to be set in an NPDES permit for discharges to Finley Creek. The limits likely applicable are presented in Table 1. The limits must protect aquatic life and human health from consumption of aquatic organisms and human health from use of the downstream Eagle Creek Reservoir as a drinking water supply.

The onsite treatment system will be capable of meeting the effluent limits. A powdered activated carbon treatment (PACT) system has been assumed as the system for leachate and ground water treatment because it is a system suited to the kinds of characteristics expected in the leachate and ground water. However, the PACT system is not the only system that could be used for treating the combined ground water/leachate flow. Other treatment systems can be used, such as activated sludge or biological contactors followed by activated carbon adsorption. Implementation of other treatment systems may result in different costs. The actual treatment system configuration will be developed through pilot or bench testing during design of the final remedial alternative. During final design, the treatment system will likely be modified based on pilot and bench-scale testing and more detailed evaluations of capital and operation and maintenance costs. The objective of meeting the discharge limits will be attained, however.

Leachate and ground water will be pumped to an onsite treatment plant consisting of precipitation, biological oxidation, and carbon adsorption. The two streams may be combined depending on the results of bench scale and pilot studies, in a 100,000-gallon holding tank. In the treatment system, the waste stream first passes through the precipitation process for removal of metals and other inorganics. Chromium, copper, iron, lead, and zinc were detected in the ground water and leachate samples and can be removed by precipitation. Hydroxide precipitation is used for cost estimating purposes. Flocculation and clarification follow the chemical addition and can be accomplished in one basin. Either flocculation with lamella gravity settlers or solids contact clarifiers could be used. Sludge is removed from the bottom of the basin and can be thickened, dewatered with a filter press, and disposed of in a RCRA landfill, if required.

Effluent from the precipitation process then goes through the PACT system, which is a patented activated carbon enhanced biological treatment system. The PACT system combines biological treatment and carbon adsorption into one process. The system works through the addition of powdered activated carbon to the influent of the activated sludge process. The system consists of carbon feeding equipment, an aeration basin with the necessary appurtenances, a clarifier, and solids handling equipment. Solids would be wasted to an aerobic digester followed by dewatering. Solids would then be disposed of at a RCRA landfill unless they could be delisted as a nonhazardous waste. Spent carbon in the waste solids could be separated and regenerated offsite.

Granular media filtration would be included in the treatment system following either the precipitation system or the PACT system or both. The advantage of having a filter after each unit would be that less metals would carry over into the PACT system and that solids with low settleability would be removed from the biological system effluent. For costing purposes, however, it is assumed that one filter will be used after the PACT system.

- Other Considerations

During recent investigations, an additional area of contamination was discovered to the south and southwest of ECC. The suite of compounds found in this area are similar to those found at the ECC site. This area (shown in Figure 4) will be more fully defined during the pre-design, and will be remediated along with ECC and NSL. The ground water collection system may need to be realigned to capture this contamination.

VII. Compliance with Superfund Amendments and Reauthorization Act (SARA) Cleanup Standards

A. Compliance with SARA §121

1) General Guidelines

Section 121 of SARA dictates cleanup goals and standards for remedial action. These begin with general guidelines for the selection of a remedy. Remedial actions which include treatment which permanently and significantly reduce the volume, toxicity or mobility of hazardous substances, pollutants and contaminants are preferable to those which do not. Offsite transport and disposal of contaminated material without treatment should be the least favored alternative where practicable treatment technologies are available.

Treatment of contaminated soil and refuse in order to permanently and significantly reduce the volume, toxicity or mobility of contaminants at ECC/NSL is not practicable. Treatment of NSL refuse would be nearly impossible because of the variety of materials, large volume, and resulting high cost. Treatment of ECC soils alone would not significantly reduce the amount of contamination at the combined site. Offsite transport of contaminated material is not a part of the remedy.

The remedial action must be protective of human health and the enviroment. Sections III and V of this document summarize the present exposure pathways and risks to human health and the environment. This remedial action will block those exposure pathways and protect human health, welfare, and environment from toxic materials at the sites.

The remedy must be cost effective. Section 300.68(i) of the NCP states the appropriate extent of remedy is defined as a "cost effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment." The FSs for ECC and NSL and the CAA carried out this analysis and determined that the selected remedy is cost effective.

The remedy must be effective in the long term. With proper operation and maintenance, this remedial action should effectively prevent further releases of contaminants and protect human health and the environment over the long term.

The comparison of alternatives must take into account the following factors:

- long-term uncertainties of land disposal;
- goals and objectives of the Solid Waste Disposal Act (RCRA);
- persistance, toxicity, mobility and propensity to bioaccumulate hazardous substances;
- short-and long-term potential for adverse human health effects;
- long-term maintenance costs;

- the potential for future remedial action costs if the chosen remedy were to fail;
- potential threat to human health and the environment associated with excavation, transportation, redisposal or containment.

The Endangerment Assessments, Feasibility Studies and Combined Alternatives Analysis considered all of these factors during screening of alternatives and recommendation of a final remedy.

2) Review of Remedial Action

SARA §121(c) requires that U.S. EPA review remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site no less often than every five years after initiating the remedial action. This review should assess whether the remedial action is truly protective of human health and the environment and determine whether any further action is necessary. Because contaminants will remain on these sites, the remedy must be reviewed every five years.

B. Consistency with National Contingency Plan

SARA requires that remedial actions meet legally applicable or relevant and appropriate requirements of other environment laws. These laws include: the Toxic Substances Control Act, the Solid Waste Disposal Act (RCRA), the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA) and any State law which contains stricter requirements than the corresponding Federal law.

A "legally applicable" requirement is one which would legally apply to the response action if that action were not taken pursuant to §104 or §106 of CERCLA. A "relevant and appropriate" requirement is one that while not "applicable" is designed to apply to problems sufficiently similar that their application is appropriate. Legally applicable and relevant and appropriate requirements are referred to as ARARs.

Following is a description of State and Federal environmental laws which potentially are legally applicable or relevant and appropriate to different components of the remedy, and an explanation of how this remedial action meets those requirements.

1) Soil/Closure Requirements

Final RCRA closure and post-closure requirements are ARARs for NSL and ECC. The State administers closure and post-closure programs which are substantially equivalent to the Federal RCRA requirements.

Indiana's closure and post-closure regulations include performance-based standards which state that the sites be closed in a manner which:

- minimizes the need for further maintenance, and
- controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall or hazardous waste decomposition products to the ground or surface waters or the atmosphere.

These regulations also require that the cap minimize liquid migration, minimize maintenance, promote drainage, accommodate subsidence and have a permeability less than or equal to any bottom liner or natural subsoils. Indiana's closure and post-closure requirements change periodically to reflect the latest Federal RCRA requirements. The more stringent regulations in effect at the time of remediation will be the ARAR.

2) Ground Water and Leachate Collection

The State of Indiana has regulations which establish minimum water quality criteria for all the waters of the State including ground water. In addition, the State has a nondegradation policy which maintains that existing and potential uses of water must be protected. Finally, both RCRA and the Indiana Environmental Management Act require that measures be taken to prevent the release of contaminants into the ground or surface water which would threaten human health and the environment.

Ground water beneath the sites discharges into the unnamed ditch and Finley Creek, which flow into Eagle Creek Reservoir. After remedial construction, the sites will be capped nearly to the edge of the rerouted creek. Contaminated ground water entering Finley Creek potentially affects aquatic life in the creek, people eating fish caught in the creek, and people drinking water from Eagle Creek Reservoir. The French drain system will intercept contaminated ground water before it discharges to Finley Creek. This system will continue to be effective if contaminant concentrations increase. Access restrictions and deed restrictions will prevent installation of water supply wells on the sites upgradient of the creek. It is unlikely that Finley Creek itself will be used as a steady source of drinking water, given its variable flow and the availability of other supplies.

Table 1, which is an updated version of Table 2-4 in the CAA, lists calculated organic and inorganic leachate and ground water contaminant concentrations developed from data collected during the RI. It also lists numeric standards and criteria which are potentially relevant and appropriate to these contaminants under the circumstances:

- 1/10 96 hour LC 50 for aquatic life
- Ambient Water Quality Criteria developed under the Clean Water Act
    - protection of freshwater aquatic life
    - human consumption of contaminated aquatic organisms
    - human consumption of contaminated drinking water
- Maximum Contaminant Levels (MCLs) for public drinking water supplies, developed under the Safe Drinking Water Act
- Maximum Contaminant Level Goals (MCLGs) developed under the Safe Drinking Water Act

The stream criteria shown in Table 1 have been determined to be the major ARARs for ECC/NSL to protect aquatic life in Finley Creek, as specified in the current State of Indiana present use designation - partial body contact, warm water fishery. These four standards include 1/10 of the 96-hour LC 50, from State of Indiana Water Quality Standards, 330 IAC 1-1; and Protection of Aquatic Life, Acute and Chronic, and Consumption of Aquatic Organisms, from the CWA.

Contaminant concentrations at or below 1/10 of the 96 hour LC 50 and ambient water quality criteria for aquatic life will be used to protect aquatic organisms living in Finley Creek. The fourth set of criteria, for water which supports fish that may be eaten, is also an ARAR. Where the four criteria differ for the same chemical, the lowest level has been chosen for the target level to ensure maximum protectiveness. Contaminant concentrations in at least one ground water monitoring well have exceeded these levels. Since, at low flow conditions, the levels in Finley Creek would nearly equal the concentrations in the ground water, the ground water needs to be collected and treated.

These criteria, as ARARs, are consistent with RCRA. The application of the stream standards mentioned above is substantially equivalent to RCRA ACLs. RCRA requirements for corrective action are also considered an ARAR. Under 40 CFR 264.100, a corrective action program (ground water collection system) meets RCRA requirements for corrective action.

The last three sets of numeric criteria on Table 1 (Drinking Water Standards) are ARARs for Finley Creek as a tributary to Eagle Creek Reservoir. Consequently, Finley Creek water should not contain concentrations of contaminants that would result in levels hazardous to human health at the water intake in the reservoir.

In Table 1, the standards and criteria selected by this process are underlined for each contaminant. As remedial action progresses, these benchmark levels must be reviewed because the underlying standards and criteria change over time as scientific knowledge increases.

One last set of standards may be an ARAR for ground water flowing beneath the sites. RCRA ground water protection standards (40 CFR 264.92) and concentration limits (40 CFR 264.94) apply to the ground water at regulated facilities that treated, stored, or disposed of hazardous waste in surface impoundments, waste piles, land treatment units, or landfills, after November 19, 1980.

3) Treatment and Discharge of Collected Ground Water and Leachate

The Clean Water Act limits discharges to navigable waterways. Individual discharges are regulated through National Pollutant Discharge Elimination System (NPDES) permits. The State administers water quality program which is substantially equivalent to the Federal NPDES requirements. The discharge limits established in the NPDES permit are designed to preserve the present use designation of the receiving waters and potential downstream uses. Finley Creek is currently designated as a partial body contact, warm water fishery. The NPDES regulations are an ARAR for effluent from Superfund site treatment plants which discharge offsite. The State permit requirements for constructing a treatment plant are an ARAR. The flow used to determine the discharge limits is the Q7, 10 flow of Finley Creek, which given the limited drainage area is assumed to be 0.0 to 0.1 cfs. Therefore, no mixing zone applies to Finley Creek when calculating discharge limits. Water quality-based NPDES permit limits will be based in part on the stream criteria contained in Table 1 and may include more stringent limits or whole effluent toxicity limits to protect against interactive effects of toxicants. New State regulations have been preliminarily adopted regarding water quality standards and mixing zones. The regulations having the effect of law at the time of the permit application will be utilized.

4) State N-95 Action

In addition to the RCRA closure and post-closure requirements that are an ARAR for the site, Indiana has taken enforcement action against NSL (Cause No. N-95) to close the facility and undertake certain actions which would prevent the release of contaminants from the site. The specific measures that are required include:

- installation and continued operation of a perimeter leachate collection system
- construction of a slurry wall or different technology to prevent off-site migration of contaminated ground water
- long term monitoring

- installation of a perimeter security fence
- construction of run-on and run-off controls

Although the order calling for these actions is presently being litigated, Indiana believes that these should be considered as an ARAR for remediating NSL. The proposed remedy meets or exceeds these requirements.

5) Rerouting Surface Water

The selected remedy will be implemented so as to minimize potential harm and avoid adverse affects to the site in accordance with Executive Order 11988, "Floodplain Management," and Executive Order 11990, "Protection of Wetlands." The natural and beneficial values of floodplains will be enhanced during the implementation of the selected remedy.

Finley Creek will be rerouted along the southern boundary of NSL in order to move the surface water further from the source of the contamination. The rechannelization of Finley Creek will meet permit requirements of the Indiana Department of Natural Resources as stipulated in the Flood Control Act (13-2-22). The rechannelization will be conducted in a manner which will not cause undue restrictions on the capacity of the floodway. The streambed and banks will be rehabilitated.

6) Ground Water Protection

The glacial till water-bearing unit beneath and surrounding ECC/NSL constitutes a Class II aquifer. The ground water from underneath the sites generally flows to the south or southwest and discharges into Finley Creek. The selected remedy will not restore the glacial till unit underneath the sites. However, it will prevent ground water withdrawal onsite as well as preventing contaminants from migrating either into Finley Creek or, however less likely, into the downgradient portion of the glacial till unit. This portion of the glacial till needs to be protected because it is outside the zone of deed and access restrictions and is currently used for drinking water. The zoning in this area would allow the ground water to be further utilized for either industrial or potable drinking purposes. The potential users of this supply would also become potential receptors to contaminants.

The prevention of contaminant migration which is achieved by the proposed remedy is therefore in accordance with U.S. EPA's Ground water Protection Strategy of August 1984. It would also insure that the State's drinking water and industrial water standards would not be jeopardized thus adhering to Indiana's nondegradation policy.

7) Onsite Construction Activities

The onsite construction activities at the site will create a significant amount of fugitive dust. In accordance with State of Indiana Rule 325 IAC 6-4-6, every available precaution will be taken during construction to minimize fugitive dust emissions.

IX. Consistency with National Contingency Plan

The National Contingency Plan, 40 CFR Part 300.68(i)(1), states that the appropriate extent of remedy shall be a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment. The selected remedy will attain or exceed applicable or relevant and appropriate Federal public health and environment requirements that have been identified for ECC and NSL. Based upon the analysis of the options, State and Federal environmental requirements, and the comments received from the public and the State, the recommended option has been determined to be consistent with Section 300.68.

X. Operation and Maintenance

Maintenance will be required for the cap because of erosion, freeze/thaw, and landfill settlement. Regular mowing of grass on the cap is required. Routine inspections of the cap surface and the leachate and ground water collection systems will be required semiannually. Replacement of collection system pumps, cleaning of collection system drains, and refurbishment of monitoring well screens will be undertaken as necessary.

The treatment system will require full-time operators to perform testing and maintenance, to adjust chemical and carbon feed rates, and to ensure that all process units are functioning properly. To provide for regular maintenance or in the event of treatment system failure, a 100,000-gallon holding tank is included. This tank provides a 2-day holding time for untreated leachate and ground water.

XI. Community Relations/Responsiveness Summary

In August 1984, a public meeting was held in Zionsville to familiarize the public with the Superfund process and the work that was to begin during the RI for Northside. A second purpose for that meeting was to explain the surface cleanup and RI work that had been done at Enviro-Chem. After the RIs were completed for both sites, a joint public meeting was held in May 1986 to explain the results of the RIs. All comments that were received after this public meeting were reviewed and considered in the preparation of the FSs. A Fact Sheet updating the progress on the FSs was sent to all groups and individuals on the mailing list in Fall 1986. When the FSs were completed in December 1986, another public meeting was held. A seventy-eight day public comment period was available during which comments on both FSs and the CAA were accepted.

Local residents are extremely concerned that a permanent remedy be implemented as soon as possible at the sites. U.S. EPA has met with a local environmental group to discuss issues related to the sites.

The responsiveness summary is attached.

XII. Deletion from the NPL

Upon implementation of the selected remedy, ECC/NSL will be probably classified as Long Term Response.

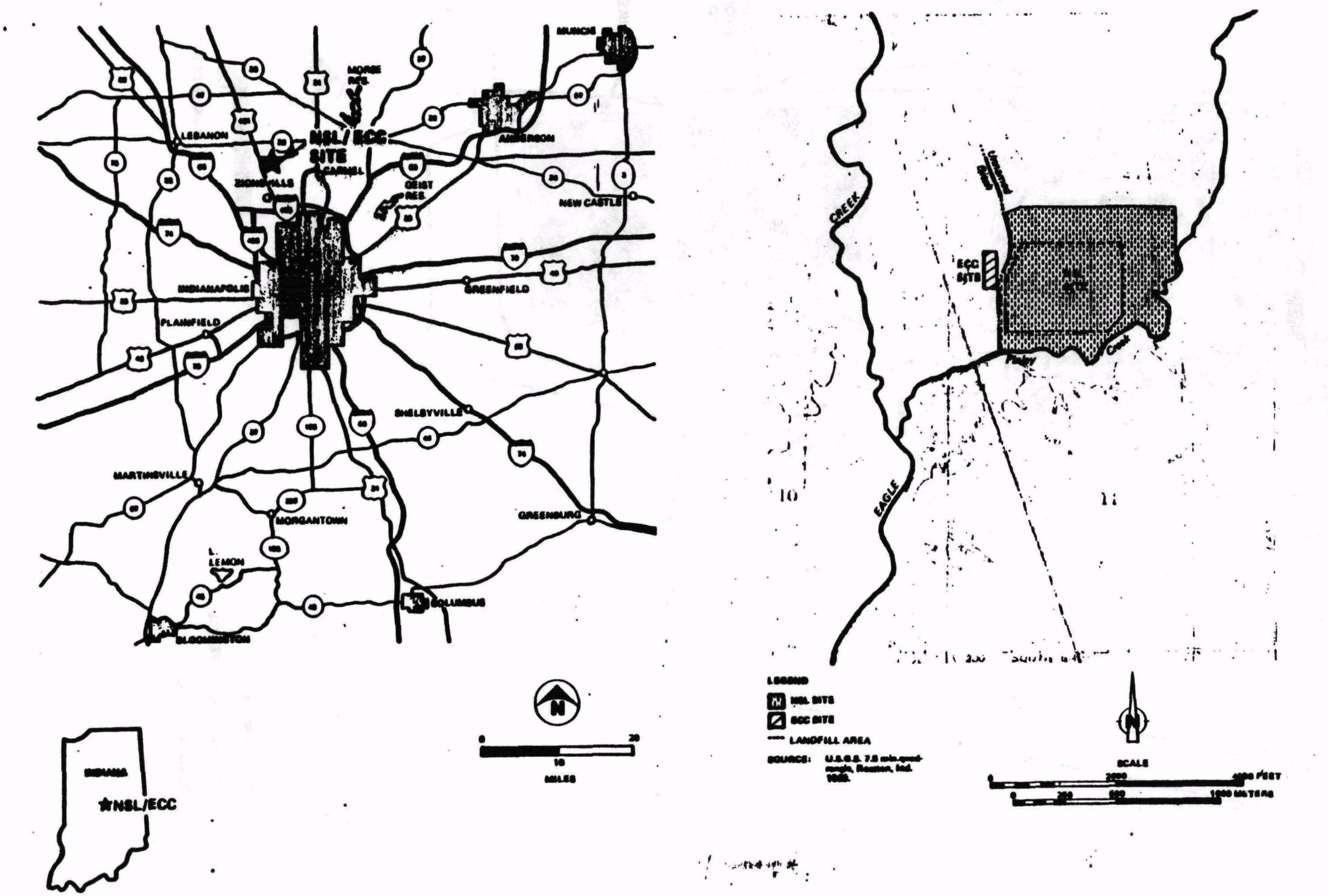


FIGURE 1
ECC/NSL ROD

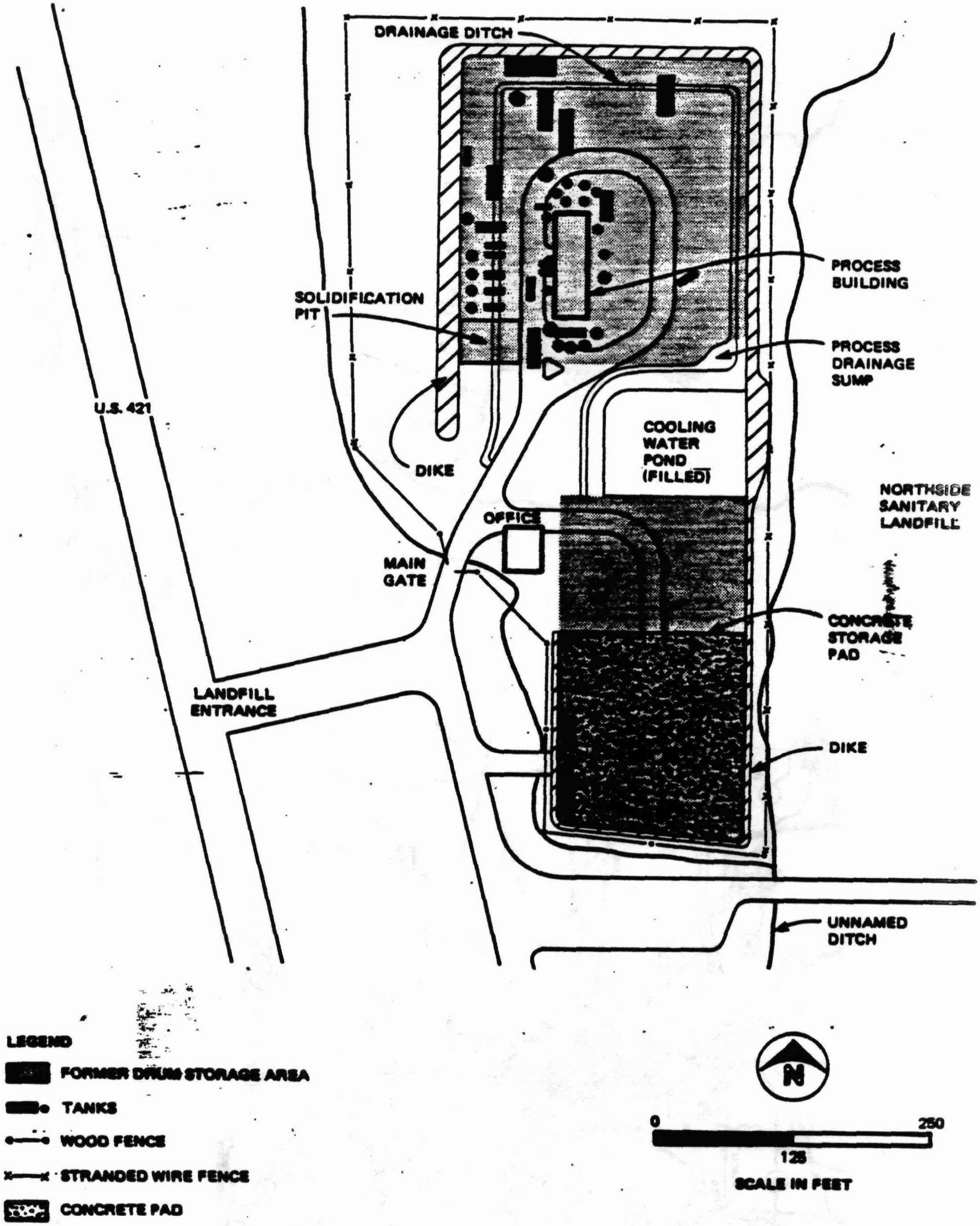


FIGURE 2
ECC/NSL ROD

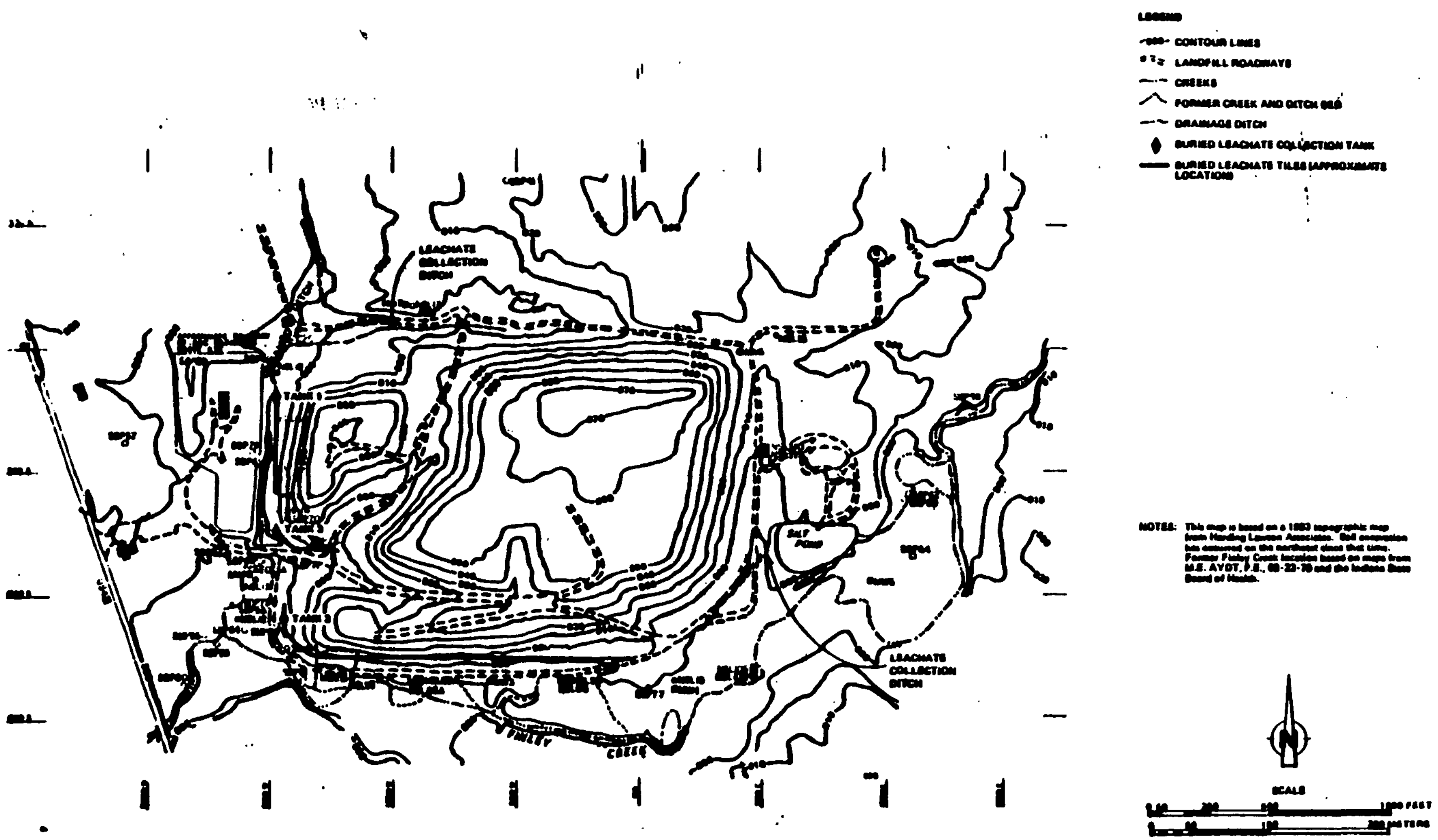


FIGURE 3
ECC/NSL ROD

Table 1

WATER QUALITY CRITERIA APPLICABLE TO TREATED LEACHATE AND GROUND WATER DISCHARGE FOR RECOMMENDED ALTERNATIVE

	Average Leachate Concentration (ug/l)	Average Ground Water[h] Concentration (ug/l)	Stream Criteria (ug/l): One-Tenth 96 hr LC[d]	Stream Criteria (ug/l): Protection of Aquatic Life[e] Acute	Stream Criteria (ug/l): Protection of Aquatic Life[e] Chronic	Stream Criteria (ug/l): Consumption of Aquatic Organisms[e]	Drinking Water Standards (ug/l): Maximum Contaminant Levels[f] (MCLs)	Drinking Water Standards (ug/l): AWQC Drinking Water[g] Only	Drinking Water Standards (ug/l): Maximum Contaminant Level Goals (MCLGs)
1,1,1-Trichloroethane	1	2,300	5,280	18,000•	-	1,030,000[a]	200	19,000[a]	200
1,1,2-Trichloroethane	-	1.5	9,400	18,000•	9,400•	41.8[b]	(-)	0.6[b]	-
Chloroform	-	11	-	28,900•	1,240•	15.7[b]	100[m]	0.19[b]	-
Benzene	106	104[i]	2,440	5,300•	-	40[b]	5	0.67[b]	0
Ethylbenzene	101	350	4,230	32,000•	-	3,280[a]	(-)	2,400[a]	680[j]
Methylene Chloride	1,250	5,900	19,300	-	-	15.7[b]	(-)	0.19[b]	-
1,1-Dichloroethene	3	3[i]	-	30,300[a]	-	1.85[b]	7	0.033[b]	7
Trichloroethene	1	5,800	4,020	45,000•	-	80.7[b]	5	2.8[b]	0
Tetrachloroethene	-	230	1,840	5,280•	840•	8.85[b]	-[n]	0.8[b]	-[n]
Toluene	26	1,800	3,400	17,500	-	424,000	-	15,000[b]	2,000[j]
Phenol	149	4,400	570	10,200	2,560•	769,000[a]	(-)	3,500[a]	-
4-Chloro-3-Methyl Phenol	62	-[i]	1.0	30•	-	-	-	3,000	-
Bis(2-Ethyl Hexyl) Phthalate	181	11	-	P	P	50,000	(-)	21,000[a]	-

	Average Leachate Concentration (ug/l)	Average Ground Water Concentration (ug/l)	Stream Standards: One-Tenth 96 hr LC[d]	Stream Standards: Protection of Aquatic Life[e] Acute	Stream Standards: Protection of Aquatic Life[e] Chronic	Stream Standards: Consumption of Aquatic Organisms	Drinking Water Standards (ug/l): Maximum Contaminant Levels[f] (MCLs)	Drinking Water Standards (ug/l): AWQC Drinking Water[g] Only	Drinking Water Standards (ug/l): Maximum Contaminant Level Goals (MCLGs)
Vinyl Chloride	-	18	-	-	-	525	2	2[b]	0
1,2 - Dichloroethane	-	-	-	48,000	2,000	243	5	0.94[b]	0
Di-n-butyl Phthalate	12	9	-	p	p	154,000[a]	(-)	44,000[a]	-
Diethyl Phthalate	33	7	-	52,100[p]	p	1,800,000[a]	(-)	434,000[a]	-
Dimethyl Phthalate	-	7	-	33,000[p]	p	2,900,000[a]	(-)	350,000[a]	-
Napthalene	20	28[i]	15,000	2,300	620	-	(-)	-	-
Arsenic	6	25	-	360	190	0.0175	50	0.0025[b]	50[j]
Chromium	18	5	-	16	11	3,433,000	50[k]	50	120[k]
Copper	33	4	-	42[c]	26[c]	-	1,000[l]	1,000	1,300[j]
Cyanide	-	15	-	22	5.2	-	-	200[a]	-
Iron	32,600	2,550	-	-	1,000	-	300[l]	-	-
Lead	45	22	-	262[c]	10[c]	-	50	50[a]	20[j]
Nickel	76	71	-	3,700[c]	192[c]	100	-	15.4[a]	-
Zinc	123	31	-	687[c]	47[c]	-	5,000	5,000	-

[a] Based on toxicity concentration.

[b] Based on carcinogenic protection.

[c] Contaminant concentration based on water hardness of 250mg/l $CaCO_3$ equivalent.

[d] Based on published 96-hour median lethal concentration, (Verschueren, 1983). Use of one-tenth of the 96-hour median lethal concentration is based on State of Indiana Water Quality Standards, 330 IAC 1-1.

[e] 1980 Federal Ambient Water Quality Criteria, as revised in 50FR 30784, July 29, 1985.

[f] Parentheses indicate that EPA must promulgate an MCL for that contaminant under the Safe Drinking Water Act Amendments of 1986.

[g] 1980 Federal Ambient Water Quality Criteria.

[h] Average ground water concentration includes projected ground water concentration of selected contaminants in till unit at ECC (see ECC RI Report, Chapter 5 (March 14, 1986) and existing ground water concentrations at NSL perimeter (see NSL FS Report, Appendix A).

[i] Concentration not estimated for ground water beneath ECC. Concentration represents NSL ground water concentrations only.

[j] Proposed Maximum Contaminant Level Goal

[k] Total Chromium

[l] The MCLs for copper and iron are secondary MCLs, based primarily upon aesthetic qualities of water.

[m] The MCL for chloroform is a final MCL for total trihalomethanes.

[n] The MCL and MCLG for tetrachloroethene are expected to be proposed in December 1987 and to become final in June 1988.

[o] These are lowest observed effects levels (LOELs).

[p] The protection of aquatic life criteria for phthalates, as a class, are 940 ug/l (acute LOEL) and 3 ug/l (chronic LOEL).

____ Underline designates the lowest stream criteria.

Responsiveness Summary
Combined Alternatives
Analysis Report
Northside Sanitary Landfill and
Environmental Conservation
and Chemical Corporation
Indiana

WA28-5LH2.0
WA77-5L30.1

September 24, 1987

GLT614/26

CONTENTS

GLT614/27

RESPONSIVENESS SUMMARY
NORTHSIDE SANITARY LANDFILL/ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION, INDIANA

1. INTRODUCTION

The U.S. Environmental Protection Agency (U.S. EPA) has gathered information on the types and extent of contamination, evaluated remedial measures, and recommended remedial actions at the Northside Sanitary Landfill (NSL) and Environmental Conservation and Chemical Corporation (ECC) sites. As part of this process, several public meetings were held to explain the intent of the project, describe the results, and receive comments from the public. Public participation in Superfund projects is required in the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Contingency Plan (NCP). Comments received from the public are considered in the selection of the remedial action for the site. This document summarizes the comments received and describes how they were incorporated into the decisionmaking process.

The responsiveness summary has three sections:

- Section 1. Overview. This section briefly presents the U.S. EPA's recommended alternative for remediation at the Northside Sanitary Landfill (NSL) and Environmental Conservation and Chemical Corporation (ECC).

- Section 2. Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during remedial planning activities at the site.

- Section 3. Summary of Public Comments Received During Public Comment Period and U.S. EPA Responses. Both oral and written comments are grouped by topics. U.S. EPA responses to these comments are also provided.

In addition to the above sections, Appendix A, included as part of this responsiveness summary, identifies the U.S. EPA evaluation of additional information obtained from the Indianapolis Water Company during the public comment period and the results of a site reconnaissance performed in June of 1987.

The detailed transcript of the Feasibility Study public meeting and the written comments are not included in the report. They are available for public inspection from U.S. EPA

Region V in Chicago, Illinois and at the repositories at the Hussey Memorial Library and Zionsville Town Hall.

2. OVERVIEW

During the public comment period, U.S. EPA presented nine alternatives in the Combined Alternatives Analysis (CAA) Report, dated December 5, 1986, to remediate the potential for exposure to contaminants from the NSL/ECC sites and the no action alternative. U.S. EPA recommended the implementation of the alternative that included access and deed restrictions on the NSL and ECC sites; capping of both sites with a RCRA compliant cap to restrict direct contact with contaminated soils, to stabilize and maintain the surface of the landfill, and to minimize infiltration of rainwater and leaching of contaminated soils; continued monitoring of the sites to verify the effectiveness of the implemented alternative; the installation and maintenance of a leachate collection system around the perimeter of the landfill; the installation and maintenance of a groundwater interception system which would collect groundwater coming from the sites before it reaches Finley Creek; the treatment of collected leachate and groundwater to remove contaminants; the rerouting of unnamed ditch to the west of the ECC site, and rerouting of Finley Creek further south of NSL. The U.S. EPA also explained that additional Preliminary Design and Design work will be conducted to aid in implementing the alternative.

Six letters were received expressing support of the U.S. EPA's alternative.

The three Potentially Responsible Party (PRP) Steering Committees, the landfill owner, and 11 other PRP's commented, in essence, that not enough information is available, or not enough of a health threat exists to take any action other than access restrictions, some form of leachate collection, capping of the landfill, and monitoring.

3. COMMUNITY INVOLVEMENT ACTIVITIES

The chronology of community involvement activities in the NSL and ECC sites is as follows:

July 21, 1983--Press release for ECC PRP Settlement.

August 23, 1984--Press release for Northside/ Enviro-Chem Public Meeting Announcement.

August 1984--Fact sheet announcing Northside RI/FS investigation distributed.

August 24, 1984--Press release for update meeting on RI activities.

September 4, 1984--Public meeting to explain planned Remedial Investigations for ECC and NSL.

March 1986--Fact sheet distributed describing results of RI's. Reports sent to information repositories, local officials and concerned citizens.

May 14, 1986--Press release for May 21 public meeting on RI's.

May 21, 1986--Public meeting held to explain RI's and take comments.

June 1986--Community Relations Plan finalized.

September/October 1986--Fact sheet updating RI/FS activities at NSL and ECC distributed.

December 1986--Fact sheet distributed to announce recommended alternative. Fact sheet described alternatives considered.

December 5, 1986--Press release for public meeting December 17, 1986 for FS.

December 17, 1986--Public meeting held to explain FS and take comments.

February 4, 1987--Press release announcing comment period extension for FS's.

February 18, 1987--Public comment period extended at request of State, citizens' groups, and PRP's.

February 28, 1987--Public comment period ends. Comment period lasted 78 days.

Telephone contact was maintained with local officials, citizens' groups, and media throughout the RI/FS. Press releases and fact sheets were distributed to media, local officials, and residents on U.S. EPA's mailing list. Fact sheets and reports were sent to repositories at the Hussey Memorial Library and Zionsville Town Hall. The Indiana Department of Environmental Management (IDEM) participated in the public meetings.

Several PRP's requested that the public comment period be extended by periods ranging from 30 days to 6 months. The comment period was originally set for 55 days after the public meeting on the FS, rather than the required 21 days, to accommodate expected public interest. The ECC and NSL Remedial Investigation (RI) Reports, which were the subject of a public meeting on May 21, 1986, contain the results of sampling activities and the evaluation of potential public health threats and environmental effects. The RI's were available for 278 and 265 days, respectively, prior to the December 17, 1986 public meeting on the FS's. These data were used to develop the FS's. The FS's were available for 5 days prior to the December 17, 1986 public meeting. After the public meeting on the FS's the comment period was extended by an additional 18 days for a total of 78 days. A longer extension was not feasible given the U.S. EPA's commitment to make a decision in the 1987 fiscal year and to move ahead with the remediation of NSL/ECC as quickly as possible.

4. SUMMARY OF PUBLIC COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND U.S. EPA'S RESPONSES

Comments raised during the NSL/ECC Feasibility Studies (FS's) and Combined Alternatives Analysis (CAA) public comment period are summarized. The comments received during the public comment period are categorized by the person, forum or company for whom the comment was prepared.

There were a number of comments submitted on liability for remediation of the sites. These comments are not considered to be germaine to the selection of the remedy and are beyond the scope of this Responsiveness Summary. There were also a number of comments submitted on regulatory requirements and ARAR's. These are specifically addressed in the Record of Decision. A bibliography of comments received is included as Appendix B.

4.1 RELATIONSHIP BETWEEN U.S. EPA AND STATE OF INDIANA EFFORTS

Comment. Has the U.S. EPA worked with the State of Indiana to prepare the FS and CAA reports? Are the alternatives favored by U.S. EPA and the State of Indiana compatible? Does the Indiana Department of Environmental Management (IDEM) now agree with U.S. EPA's findings? (NSL/ECC December 17, 1986 Public Meeting)

U.S. EPA Response. The State of Indiana has reviewed drafts and commented on the FS's and CAA documents and their comments were incorporated. There have also been several meetings between the U.S. EPA and IDEM, and frequent contact between the U.S. EPA and IDEM representatives for the site. The IDEM has been involved in the remedy selection process and believes that the U.S. EPA's Recommended Alternative is a viable option for remediating both sites.

On December 16, 1986, the State of Indiana sent official notification to the U.S. EPA of its concurrence with the remedy.

4.2 STATUS AND RESPONSIBILITIES OF NORTHSIDE SANITARY LANDFILL

Comment. Will NSL continue to operate during construction? Will the landfill be closed? Will the landfill remain in its current location? Why should NSL be included in the plans for remediation? What levels of contamination indicate that NSL should be included in the remediation plans? (NSL/ECC December 17, 1986 Public Meeting)

U.S. EPA Response. Implementing the remedial alternative proposed would necessitate closing of the landfill. The landfill would remain in its present location and be capped with a fence around it and leachate and groundwater collection systems in place. There would also be a treatment plant to treat collected groundwater and leachate.

During the remedial investigations contaminants were found in the monitoring wells at concentrations which exceed criteria for the protection of human health and environment. Concentrations of contaminants were also found in surface water samples which exceed criteria for the protection of human health and the environment.

The concentrations of contaminants found in the monitoring wells and surface water can be found in Appendix Tables A-4, A-7, and A-8 Volume 1 of 2 NSL Final RI.

4.3 TIME-FRAME FOR INITIATING CLEANUP

Comment. How long will it be before the actual site cleanup begins and can the time-frame be expedited? Can the U.S. EPA start the remedy after the Record of Decision (ROD) is signed and before an agreement is reached with PRP's? Is there a time limit on negotiations, after which cleanup will begin? (NSL/ECC December 17, 1986 public meeting)

U.S. EPA Response. Assuming that negotiations with PRP's are completed, the ROD is signed and the design is finished it could take from 1 to 2 years to construct the groundwater interception system and 2 to 5 years to construct the RCRA cap.

As long as the U.S. EPA is still negotiating with the PRP's the implementation (actual construction) of a remedy will not begin. The U.S. EPA will give the PRP's a reasonable opportunity to negotiate a settlement but it is not going to be open ended. The U.S. EPA recognizes the concern about deciding whether the PRP's or the U.S. EPA will do the remediation.

4.4 RESPONSIBILITY FOR PAYING THE COSTS

Comment. After any necessary allocations have been made, the cost attributable to any nonsolvent PRP should be borne by the U.S. EPA.

Who will pay the cost of the cleanup, the potentially responsible parties (PRP's) or the taxpayers? Are the PRP's that previously settled released from liability? Why weren't all PRP's given the chance to settle at that time? (Mersman; NSL/ECC December 17, 1986, public meeting)

U.S. EPA Response. Under the Superfund law the U.S. EPA will take every course available to negotiate settlements. Where need be the U.S. EPA will take enforcement action against PRP's and may draw on the fund set aside by Superfund.

In 1982 the Enviro-Chem site was covered with stacks of drums and tanks containing hazardous waste. The U.S. EPA was focusing on that acute problem so a settlement was reached with the known PRP's for surface cleanup purposes.

Not all of the known PRP's participated in the cost of surface cleanup at Enviro-Chem. The PRP's that did participate in the surface cleanup were released from liability for further surface work, but they are not released from liability for the groundwater problem.

The U.S. EPA found out about other ECC PRP's at later date.

4.5 COMBINING THE SITES

Comment. The application of CERCLA section 104(d)(4) to combine the NSL and ECC sites is inappropriate. It appears that the only groundwater contamination involved is that which is attributable to the NSL site.

Although location of the two sites may be relevant to some circumstances, these are essentially two different sites, and combination is inappropriate.

Groundwater contamination levels are much greater for ECC than NSL, the two areas are vastly different in size, hence the closure of the ECC site should be accomplished separately from the NSL site (Mersman; Ferro Corp.; NSL Steering Committee; ECC Steering Committee).

U.S. EPA Response. The proximity of the two sites to each other is one major reason for combining the sites and implementing an overall remediation for both. A second consideration is the contaminated environmental media are common to both sites, such as groundwater and surface water, and the difficulty of identifying the source (ECC or NSL) of some of the observed groundwater and surface water contamination. Similar chemicals, byproducts, and waste were either stored or disposed of at both sites. Also since both sites had similar status with respect to regulatory permits, remediation needs for both sites are similar and combination of the sites for the purpose of remediation seems reasonable.

A third consideration is that a combined remedy is more cost-effective than two individual remedies for these sites. The monitoring system, the groundwater collection system, and the treatment system are cheaper to design and operate if the sites are combined. The combined remedy will be equally as protective of human health and the environment as two separate remedies.

4.6 REMEDIAL INVESTIGATION DATA

Comment. The detection levels presented in Appendix A of the NSL RI Report dated March 27, 1986, are higher than some of the results reported elsewhere with lower values [sic]. For example, a value of 4 ug/l for benzoic acid was reported when the detection limit is given as 50 ug/l. This is misleading and these types of results should be reported as 4±50 ug/l, so as not to provide a misconception of water quality.

It is truly questionable to consider enforcing minimum levels for constituents found in the groundwater and leachate whose minimum criteria is 151 to 4,000 times lower than the detection limit (NSL, Inc.; Ferro Corp.).

U.S. EPA Response. The detection limits cited in the RI's are contracted for through the U.S. EPA's Contract Laboratory Program. In actuality the more proper name would be contracted quantification limit. The technology exists by which the concentration of a contaminant in water can be quantified down to the nanogram per liter level or roughly part per trillion level or less depending on the compound of concern. Even at these lower levels a compound can be detected and positively identified but the concentration may have to be estimated which is then indicated by a J qualifier in data summary tables. The criteria is based on the observed effects certain compounds have on various organisms or projected effects the compounds could have on humans based on animal laboratory experiments.

Comment. The similar compounds detected in Finley Creek are not supported by the analytical data from ECC monitoring well samples, are not directly related to the ECC site, and do not constitute a valid reason for requiring interception and treatment of groundwater (ECC Steering Committee).

U.S. EPA Response. The similar compounds detected in Finley Creek were found not only in ECC monitoring well samples, but also in ECC subsurface soils and in the contaminated water samples taken from under the concrete pad on the southern end of the ECC site and from the sump in the same location.

Compounds similar to those observed in the NSL monitoring well samples, subsurface soil samples and leachate tank samples are also detected in Finley Creek.

Comment. There are discrepancies in the analytical results due to poor quality control.

All analytical results where field blanks showed substantial contamination should be stricken from the tables in the reports.

Methylene chloride is not present due to the site, but rather is an artifact of the sampling and analytical procedure (Jones, Inc.; TRW Inc.; NSL Steering Committee).

U.S. EPA Response. The analytical results presented in the RI's and FS's have been reviewed and qualified. The specific use of contaminant concentrations with a J qualifier is acceptable. The J qualifier means that the compound was present but that the concentration of the contaminant in the environmental media is estimated. It does not mean that the compound was not present.

The presentation of all reportable data is important so that decision makers and concerned parties have a complete data base from which to form an opinion on remediation needs.

Methylene chloride is listed as a specific waste product disposed of at the NSL site. It is also listed as a frequent laboratory contaminant. In some samples methylene chloride concentrations were an order-of-magnitude higher than would be expected from laboratory contamination. It is difficult to completely discount or verify that methylene chloride in the various environmental media is or is not coming from the site. Therefore, the concentrations of methylene chloride detected in the various environmental media during the RI are reported.

Comment. Considerably more oil and grease was found in surface water sediments upstream of NSL than downstream [sic].

Of 10 downstream surface water sediment samples eight had lower concentrations of lead [sic]; thus, the source of lead cannot be attributed to NSL, simply because it was found at a higher concentration downstream (Tricil).

U.S. EPA Response. During Phase I and II of the RI, sediment sampling point SD001 is located upstream on unnamed ditch and SD002 is upstream on Finley Creek. During Phase I sampling the oil and grease concentration at SD001 was 600 mg/l and the first sampling point downstream on unnamed ditch at SD010 had a concentration of 190 mg/l; hence in Figure 4-28 of the NSL RI it is noted that the concentration of oil and grease in unnamed ditch is not above background. SD001 is an upstream sampling point for unnamed ditch and is not an upstream sampling point for Finley Creek.

The upstream Phase I sampling point in Finley Creek SD002 had an oil and grease concentration of 350 mg/l. All Finley Creek sampling locations adjacent to and downstream of NSL (5 points) had oil and grease concentrations ranging from 400 to 580 mg/l which is a 14 to 66 percent increase over the Finley Creek upstream concentration.

During the Phase II sampling period oil and grease was quantified at one point in Finley Creek above upstream concentrations as was one point in unnamed ditch. This is also shown in Figure 4-28 of the NSL RI.

Lead is present in the upstream Phase I sediment samples on both unnamed ditch and Finley Creek at concentrations of 10 and 8.6 mg/kg, respectively. In Phase I, samples taken adjacent to and downstream of the site had lead sediment concentrations ranging from 13 to 31 mg/kg and exceeded the upstream concentrations by 30 to 210 percent. Phase II downstream lead sediment concentrations that range from 23 to 37 mg/kg exceed the upstream concentrations of 16 mg/kg in unnamed ditch and 12 mg/kg in Finley Creek by 50 to 130 percent.

These data suggest that there is a contribution of oil and grease and lead between the sampling locations upstream of NSL and sampling locations adjacent to and downstream of NSL.

Comment. No information is provided regarding the form of cyanide present (in surface water). Cyanides were not found in any other sampling media (at NSL). Therefore, cyanides cannot be attributed to the NSL site, and any EPA identified risks due to its presence are invalid [sic] (NSL Steering Committee).

U.S. EPA Response. The samples were analyzed for total cyanide. Cyanide was found in a sediment sample shown on Figure 4-28 and in groundwater samples shown on Figure 4-34 and 4-84 of the NSL RI. As shown on Figure 4-24 of the NSL RI, cyanide was not detected in surface water samples upstream of the NSL site. The criteria for the protection of aquatic life from acute or chronic effects of cyanide are 22 and 5.2 ug/l, respectively. The surface water concentrations observed in Finley Creek exceed the criteria; therefore, the risks identified are not invalid.

Comment. It is unclear if concentrations of lead, PCB's, or pesticides in soil or sedimentation can be linked directly to the landfill (Tricil).

U.S. EPA Response. Lead does not occur at elevated concentrations in upstream sediment or background soil samples. PCB and pesticide concentrations above detection limits occur only adjacent to and downstream of NSL. This indicates a positive relationship between the landfill and sediment concentrations.

Comment. The (ECC RI) report assumes that the presence of any organic compounds show contamination from the ECC site. No attempt was made to characterize the true background at the site. All historical sample tables must be stricken unless it can be established that the conditions are the same today as they were on the dates of historical sampling. Some samples are almost 8 years old (TRW, Inc.).

U.S. EPA Response. In the ECC RI the chlorinated hydrocarbons found in the groundwater in the shallow saturated zone, shallow sand and gravel zone, ECC soils, unnamed ditch sediments, Finley Creek sediments, and Finley Creek surface water are stated as likely to be from ECC. There is no assumption that the presence of any organic compound offsite shows contamination from ECC.

Table 4-4 ECC RI shows background concentrations for a number of contaminants.

The historical information is presented for site background purposes and historic perspective. The information is not used to describe the nature and extent of contamination at the site as it existed during the remedial investigations. Therefore, there is no need to strike the historical tables.

Comment. The ECC RI Table 3-9 does not indicate depths of monitoring wells for historical data. Depths of residential wells are not indicated (TRW, Inc.).

U.S. EPA Response. The ECC Monitoring well (MW) No. 1 is 70 feet deep and ECC Monitoring well (MW) No. 2 is 36 feet deep. The locations of MW1 and MW2 are shown on Figure 3-5 and the well depths are listed in Table 3-8 of the ECC RI and in Appendix F of the NSL RI. Available residential water well records from adjacent townships around ECC and NSL are also included in Appendix A Technical Memorandum No. 7 Volume 2 of 2 NSL RI. There are also boring logs for the NSL monitoring wells included in Appendix C of Technical Memorandum No. 4 Volume 2 of 2 NSL RI.

Comment. The dilution factor of 20 to 1 on ECC FS page 1-3 is too low and inconsistent with the 1,300 to 1 dilution stated on page 6-12 (Tricil).

U.S. EPA Response. The 20 to 1 ratio is calculated on an areal basis. Finley Creek's watershed is approximately 10 square miles in extent; Eagle Creek Reservoir is fed by a watershed of approximately 170 square miles. Hence 170 to 10 is 17 to 1 or 20:1 rounded off. Water that is already in Finley Creek could be diluted 20 times by the time it reaches Eagle Creek Reservoir.

The 1,300 to 1 dilution ratio is also calculated on an areal basis. The ECC/NSL drainage area is about 0.12 square miles. Eagle Creek Reservoir's drainage area is 160 square miles. Hence 160 to 0.12 is 1,300 to 1 rounded off. Therefore, water that comes from the sites could be diluted 1,300 times by the time it reaches Eagle Creek Reservoir.

Comment. References to ECC soils should be stricken unless U.S. EPA can establish that these soils existed after the 1983-84 remedial work.

All references to site conditions which no longer exist should be stricken.

The inclusion of descriptions of samples taken on the surface of ECC lacks many details. If these samples of soils are not representative then they form an insubstantial base on which to rest the conclusion that an FS is necessary.

The conclusion that there is a source of exposure from the migration of chemicals through the shallow sand and gravel aquifer (at ECC) must be stricken since it is also stated that the alteration of the site characteristics during surface cleanup has made this an unlikely migration pathway presently or in the future.

Results of the ECC RI do not reflect conditions upon which additional remedial action could be based since the RI was conducted over the same time span as initial remedial actions.

The effect of remedial measures already undertaken at ECC have not been evaluated. Thus there is no way of quantifying the current potential risk posed by the site and the need, if any, for additional remedial actions.

The statement that analytical results of the (ECC) RI characterize current site contamination is erroneous in that extensive remedial actions were completed at the site and these have not been taken into account (TRW, Inc.; Tricil).

U.S. EPA Response. The Phase II soil samples were taken after the surface cleanup activities were completed (see page 3-32 of the ECC RI), refer to Soil Investigation Memorandum Subtask 3-4 in Appendix A ECC RI Volume 2.

These data were used to evaluate the nature and extent of contamination and risks attributable to ECC site soils. The soil samples taken during this Phase II of the RI are shown in Figure 4-2 of the RI. Therefore, the contaminated subsurface soils at ECC still exist.

The description of historic site conditions are helpful to the reader to understand past activities which have contributed to the existing contamination on the ECC site, and the past removal activities as outlined on pages 3-32 through 3-37 of the ECC RI.

The samples taken on the surface of ECC during the December 12, 1984, Phase III monitoring well sampling trip were not soil samples but surface water samples of ponded water on top of the cover which was placed on the northern portion of the ECC site when surface cleanup activities were completed in August of 1984. Page 4-60 of the ECC RI gives details of the sampling of ponded water, Figure 4-22 shows the sampling locations, and Tables 4-16 and 4-18 show the analytical results. Because of the presence of chlorinated organic compounds and the location of the ponded water on top of the cover at ECC, the most feasible source would be contaminants in the soils below the ponded water.

U.S. EPA did not conclude that migration through the shallow sand and gravel aquifer is an unlikely migration pathway. Rather, as noted in Table 4-13 and on page 4-55 of the ECC RI, the shallow sand and gravel aquifer (at ECC) is presently contaminated based on samples taken in November and December of 1984 after surface alterations were completed in August of 1984.

U.S. EPA did conclude that migration from the shallow saturated zone to the shallow sand and gravel zone is presently an unlikely migration pathway due to the upward vertical gradient.

The endangerment assessment takes into account the existing conditions at the ECC site which includes initial remedial measures which were completed by August of 1984 (see page 6-10 ECC RI). Therefore, the risks presented are for the no action scenario as of the date of the RI.

In summary the initial remedial measures taken at the ECC site are accounted for and the analytical results used in the RI do characterize the existing nature and extent of contamination at the ECC site.

Comment. It is stated that contaminants in surface water will either volatilize, adsorb to sediments, or experience large dilutions before reaching Eagle Creek Reservoir. Therefore, statements on exposures through these routes should be stricken. There is no basis for the conclusion or assumption that if contaminants reach the reservoir then users of the reservoir would be at risk. No attempt was made to assess the effects of dilution or to determine the risk scientifically [sic]. No contaminants have been found in Eagle Creek (CAA page 1-8). If none are in the creek, none can reach the reservoir (TRW, Inc., Tricil).

U.S. EPA Response. It is true that, once they reach surface water, contaminants can volatilize, adsorb to sediments or be diluted. The exposures noted in the RI's are based not only on projected concentrations but observation of existing concentrations in Finley Creek. The risks identified in Finley Creek are mitigated by implementing the recommended alternative. Mitigation of the identified risks in Finley Creek also protects the drinking water source, Eagle Creek Reservoir.

Comment. Water quality criteria should not be applied to groundwater or leachate directly, but to the receiving stream after dilution. Indiana regulations have been misapplied. "A" mixing zone is defined as: "An area contiguous to a discharge where the discharged wastewater mixes with the receiving waters. Where the quality of the effluent is lower than that of the receiving waters, it may not be possible to attain within the mixing zone all beneficial uses which are attained outside the zone. The mixing zone should not be considered a place where effluents are treated. 330 IAC 1-1-10." Consideration should be given to reclassify Finley Creek for limited use (NSL Steering Committee; Tricil).

U.S. EPA Response. Indiana's present use designation for Finley Creek is partial body contact and warm water fishery. Reclassification of Finley Creek to a lower use designation is against the State of Indiana's nondegradation policy.

A point-discharge of effluents to Finley Creek must meet potential Indiana NPDES requirements which would reflect Finley Creek's periodic low flow (which recurs on the average of every 10 years and lasts for 7 days)--(Q_{7-10}) of zero to 0.1 cubic feet per second. Indiana regulations do not allow a mixing zone under these conditions, so there would be no allowable reductions in the NPDES requirements resulting from dilution in the receiving stream. The criteria which would be applicable for a point-discharge and/or treatment are, therefore, as presented in the ROD Table 1.

Comment. Methylene chloride in the water samples is not present due to the NSL site, but is an artifact of sampling and analysis. Therefore, U.S. EPA should not use the presence of methylene chloride in the water samples to evaluate risk (NSL Steering Committee).

U.S. EPA Response. Table 6-8 of the NSL RI shows that organic contaminants other than methylene chloride exceeded drinking water standards and guidelines, including MCL's, MCLG's, and CWA WQC's for human health (adjusted for drinking water). Table 6-9 of the NSL RI presents assessments of risk associated with drinking groundwater at the NSL site for organic contaminants other than methylene chloride.

Comment. Unless EPA can establish that these soils existed after the 1983-84 remedial work, all reference to these soil sample results must be stricken as irrelevant. Reference to the cooling water pond should be stricken because it was removed in 1983-84 removal work [sic] (TRW, Inc.).

U.S. EPA Response. As stated in the ECC-RI, review of soil laboratory results from samples taken after surface cleanups activities show that inorganic contamination exist to depths of 3 to 5 feet, and organic contamination as detected to a soil depth of 8.5 feet. In spite of the removal of surface soils in 1983-84, there still exists soil contamination onsite. In addition, the "On Scene Coordinator's Report" prepared by Roy F. Weston Inc. (June 14, 1985) explains that the cooling pond was backfilled with contaminated soil excavated from around the process building.

Comment. No attempt was made to characterize what the true background of organics is at the ECC site [sic] (TRW, Inc.).

U.S. EPA Response. The organic compounds detected at the ECC site are man-made, are not naturally occurring, and their presence indicates the impact of man's activities.

Comment. In Table 5-6 of the ECC RI, estimated concentrations of volatiles in Finley Creek, which are indicated to vary with the flowrate, vary by a factor of 10. The flow of Finley Creek varies by a factor of 40. No explanation is given for this discrepancy (Tricil).

U.S. EPA Response. Based on the available data, the flow in Finley Creek varies from less than 0.1 cfs to 4 cfs--which corresponds to a ratio of 40. However, throughout most of the year, the flow ranges from 0.1 cfs to 1 cfs--which corresponds to a ratio of 10. The latter flow range was used to calculate the concentrations in Finley Creek since it provided a more realistic estimate.

4.7 ENDANGERMENT ASSESSMENT

Comment. It is arbitrary and capricious to assume that EPA would not take every effort to prevent the existing conditions at the site (Jones Chemicals, Inc.). EPA would never allow residences to be built on the site nor an occupational use to occur on the site without some sort of remediation (TRW, Inc.). It is unreasonable, arbitrary and capricious to assume that no fencing, deed notices or use restrictions would be placed on this property (Ferro Corp.).

The endangerment assessments are based on unrealistic scenarios. The EPA identified risks associated with offsite surface water, stream sediments, and groundwater are invalid. Although the report speculates that receptors could contact the groundwater if potable wells are constructed within the zones of contamination, the likelihood of that is extremely small. There is no factual basis on which to state that ingestion of fish is an exposure route in this situation (Jones, Inc.; TRW, Inc.; Ferro Corp.; ECC Steering Committee; Tricil; NSL Steering Committee).

U.S. EPA Response. As discussed in the RI and FS reports, the Endangerment Assessment is performed on the No-Action Alternative. That is, the Endangerment Assessment must assume that the site remains as it is at present, and that no remedial actions have been initiated.

The U.S. EPA cannot take any action at a site unless an unacceptable risk to human health and the environment is identified. The site presently has all uses evaluated in the Endangerment Assessment existing either onsite or adjacent to it. The area around the site is also zoned for those uses (ECC RI Figure 6-1 and NSL RI Figure 6-2). The surface water in Finley Creek has a present use designation for partial body contact and warm water fishery which means the general public can wade in the stream and practice recreational fishing which is assumed to include consumption of fish caught. Therefore, it is not arbitrary and capricious to evaluate potential exposure using a residential and occupational scenario.

The ingestion rates used in the Endangerment Assessment for water and fish are published in guidance documents. The ingestion rate for soil averages out to be about 9 ounces a year for the residential scenario and about 1/10 of an ounce a year for the occupational scenario. The ingestion rate for fish averages out to be about 5 pounds a year. None of these ingestion rates can be considered overly conservative nor are they arbitrary or capricious.

The dermal absorption rate used reflects the skin's ability to absorb lipophylic compounds. The rate used was experimentally measured not only by the loss of solute but also by indirect methods such as byproducts in urine and expired air. The presentation of risks from dermal absorption of contaminants in surface water and from bathing is to recognize that this potential exposure route exists and adds to the total potential risks from the site.

Comment. The substantial health concerns and environmental impacts of the proposed alternative have not been addressed nor has the functional equivalent of an environmental impact statement pursuant to NEPA been provided (Jeffboat; Rock Island Refining).

U.S. EPA Response. Remedial actions taken pursuant to Sections 104 and 106 of CERCLA are generally exempt from NEPA requirements because the EPA has determined that these RI's/FS's, are the functional equivalent of an Environmental Impact Statement (EIS).

The U.S. EPA believes that the remedy screening and selection process used in the Feasibility Studies and Combined Alternatives Analysis for the sites meet CERCLA Section 105(3) and Section 300.68 of the NCP satisfy NEPA requirements.

The U.S. EPA believes also that the various press releases, fact sheets, public meetings, and lengthy public comment period satisfy the public involvement requirements of NEPA.

Comment. Does the U.S. EPA believe the following findings from the Northside Landfill FS to be true or false:

- That the current risk from leachate is negligible?
- That current concentrations of contaminants do not suggest a threat to aquatic life in Finley Creek?
- That the groundwater believed to be discharged at Finley Creek presents negligible risk from offsite migration?
- That the surface water near the site does not currently pose a threat to human health?

(NSL/ECC December 17, 1987 Public Meeting)

U.S. EPA Response. The Endangerment Assessment in the NSL RI states: "Comparison of current surface water concentrations to Ambient Water Quality Criteria and 96-hour LC50 values does not indicate any chemicals which exceed those criteria." This statement is made in reference to Table 6-13 NSL RI and is specific to organic chemical criteria as they relate to aquatic life. The table does not reflect what discharge limits of treated effluent would be with respect to NPDES requirements nor are inorganic water quality criteria or water quality criteria for the ingestion of aquatic organisms for the protection of human health presented.

The statement on page 3 of the NSL FS is a summary of the Endangerment Assessment in the NSL RI. The statement: "Discharge of contaminated groundwater, at current concentrations, to surface waters does not present a threat to aquatic organisms..." on page 1-21 is in reference to aquatic life criteria specific to organic chemicals and not inorganic chemicals or human health criteria or ingestion of aquatic organisms.

Table 4-2 of the NSL FS and Table 2-4 of the CAA present potential limits for discharges to Finley Creek for organic and inorganic chemicals for the protection of aquatic life and protection of human health from ingestion of aquatic organisms from Finley Creek.

Comment. The generic Ambient Water Quality Criteria used for polyaromatic hydrocarbons (PAH's) in Table 2-4 of the CAA assumes that phenanthrene and naphthalene are a PAH mixture and that to be conservative the criteria for benzo(a)pyrene is used. In this situation the criteria of 0.0311 ug/l quoted are simply not applicable (NSL, Inc.).

U.S. EPA Response. The U.S. EPA agrees that both phenanthrene and naphthalene are currently not considered carcinogenic polycyclic aromatic hydrocarbons (PAH's). However, the International Agency for Research on Cancer (IARC) has not evaluated the risk to humans associated with oral ingestion or inhalation for naphthalene and there was insufficient evidence of carcinogenic risk to humans for phenanthrene. The U.S. EPA Carcinogen Assessment Group (CAG) considers the evidence for carcinogenicity of phenanthrene and naphthalene to be inadequate and have assigned them to Group D--not classified chemical.

The criteria presented for phenanthrene and naphthalene in Table 2-4 of the CAA are not considered ARAR's which are listed in Table 1 of the ROD. The actual discharge limits will be established during the NPDES process.

Comment. "On page 3-10 of the NSL FS, the reasons for rerouting the unnamed ditch and Finley Creek are that: "This would route the surface waters away from contaminated areas and increase the travel time for contaminants to migrate to surface waters. Relocating the surface waters would also allow monitoring wells to be installed between Finley Creek and the contaminated areas." There are no current U.S. EPA identified risks due to migration of groundwater to surface waters or to direct contact with surface waters. Therefore, rerouting the surface waters is unjustified (NSL Steering Committee).

U.S. EPA Response. Groundwater in some of the existing monitoring wells exceed ARAR's (see ROD Table 1). The discharge of the groundwater to surface waters would also exceed ARAR's (see ROD Table 1). The relocation of unnamed ditch and Finley Creek are necessary to implement Alternative 5 because the monitoring system necessarily has to be installed between the groundwater interception system and Finley Creek to verify the system is performing correctly.

Comment. The U.S. EPA identified risks due to pesticides in leachate sediments, water sediments, subsurface soil, and sand and gravel groundwater in the southwest corner of the landfill are due to the prior use of the NSL area as agricultural land and not to the landfill operation (NSL Steering Committee).

U.S. EPA Response. The NSL site has been a open dump/landfill since sometime between 1955 and 1962 (page 3-9 NSL RI). Agricultural use of the site ceased sometime between 1962 and 1972 based on aerial photographic interpretation. Pesticide concentrations in upstream surface water sediments, upstream soil samples and groundwater samples have consistently shown no pesticides above detection limits. Even if pesticides resulted from prior agricultural uses there are numerous other contaminants observed at the site which are not attributable to agricultural use.

4.8 HYDROGEOLOGY

Comment. A french drain system in the shallow saturated zone at the ECC site is inappropriate because there is no basis for the assumption that the zone is generally contaminated. Several invalid assumptions were made with regard to the french drain system in the ECC FS (ECC Steering Committee; Tricil).

U.S. EPA Response. Contaminants were detected in samples of the soil and groundwater taken from the shallow saturated zone over the extent of the ECC site. The french drain system was proposed in the ECC FS to prevent these contaminants from migrating outside of the site boundaries.

Calculations and assumptions related to the french drain system are presented in Appendix B of the ECC FS. Flows to the drains were estimated from the expected recharge to the soil unit from precipitation and from upward leakage from the underlying sand and gravel unit. Assumptions on aquifer homogeneity, isotropy, and height of water table above the drain were made to estimate drain spacing and not to estimate flow to the drains.

Comment. Groundwater contaminant concentrations projected to result from leaching of soil contaminants at ECC (ECC RI Table 5-5) assume that soil concentrations will not change with time. Therefore, the projected groundwater concentrations are overestimated because the soil contaminants will degrade (ECC Steering Committee).

U.S. EPA Response. Discussions of the degradation of soil contaminants at ECC are presented in Appendix C of the ECC RI, and a summary of environmental behavior of organic compounds in surface soils is presented in Table 5-4 of the ECC RI. This table indicates that some degradation and transformation process are insignificant while others are possible and even significant. Degradation processes depend on site-specific conditions and are difficult to quantify. Therefore, for the purpose of estimating groundwater concentrations resulting from leaching of soil contaminants, it was assumed that degradation of soil contaminants would be insignificant.

Comment. The estimated travel times to surface water of contaminants from ECC are longer than the expected degradation times of the contaminants. Therefore, the projected concentrations in surface water resulting from discharge of contaminated groundwater are overestimated, and do not reflect any degree of imminent hazard from the site (ECC Steering Committee; TRW, Inc.; Tricil.

U.S. EPA Response. The travel time of 300 and 800 years for TCE at ECC are estimates of travel time from the northwestern portion of the site to the unnamed ditch and Finley Creek (ECC RI, page 5-13). The estimated travel time for TCE from the eastern portion of the site to the unnamed ditch ranged from 20 to 100 years. This was based on a hydraulic conductivity of 10^{-5} cm/sec, and would be an order-of-magnitude less using an hydraulic conductivity of 10^{-4} cm/sec. On page 5-13 of the ECC RI, it is acknowledged that TCE will experience some degradation if aerobic conditions exist, but on page C-2-3 of Appendix C it is stated that rates of biodegradation are difficult to estimate on a site-specific basis. Given these considerations, the implied degradation time of 10 years can be considered to be the same order-of-magnitude as the fastest travel-time estimate of 20 years.

It should be recognized that some volatile organic compounds degrade into more conservative, toxic, or carcinogenic compounds. The more conservative degradation products would travel faster to the surface water than the original organic compounds. An example is TCE degrading to vinyl chloride.

Comment. The estimated hydraulic conductivity of 10^{-6} cm/sec for the glacial till at NSL does not agree with other estimates of the till hydraulic conductivity; specifically with estimates of 10^{-8} to 10^{-9} cm/sec by West (cited in the NSL FS, pages 1-11 and B-1). It is not clear why the sand and gravel water bearing unit of NSL has a lower limit of hydraulic conductivity lower than that of the glacial till [sic] (Tricil).

U.S. EPA Response. Measured hydraulic conductivity values are presented in Table B-1 in Appendix B of the NSL FS. The hydraulic conductivities presented in the table are for wells which were screened across various lithologic units. Most of the test zones included some lenses or units of coarse grained soils other than clay or silt till. Therefore, the hydraulic conductivity values for till reported in the NSL FS would be higher than values reported for samples consisting completely of clay or silt till, as were the samples tested by West.

The lowest hydraulic conductivity value reported in NSL FS Table B-1 is 5.8×10^{-5} cm/sec for well 11D (the low end of the range). This is a higher value than the 10^{-6} cm/sec cited in the comment as the hydraulic conductivity of the glacial till.

Comment. No source is given for the effective porosity value of 0.10 used for glacial till (Tricil).

U.S. EPA Response. Davis and DeWiest (Hydrogeology, John Wiley & Sons, 1966) state that most porosities of till fall in the range of 25 to 45 percent (page 409). Accepting this, it is not unreasonable to assume that the effective porosity of a very dense (compact) glacial till would be on the order of 10 percent (0.10).

Comment. No wells were installed upgradient and beyond the influence of the landfill. The absence of background data makes it impossible to quantify the impact of the NSL site (Tricil).

U.S. EPA Response. It is true that there are no wells immediately upgradient of NSL and beyond the influence of the landfill. However, there are wells upgradient of the neighboring ECC site which are beyond the influence of the landfill. Shallow well ECC 1A is located northwest of the ECC site, and shallow well ECC-2A is located at the northeast corner of ECC. Sampling results from these wells may be compared to those from wells downgradient of NSL.

Comment. No attempt has been made to differentiate contaminants commonly found in municipal waste from those which are solely attributable to the hazardous waste allegedly disposed of in NSL. The volumes of hazardous waste received by NSL have been overestimated, and little or none of the hazardous substances may remain in the landfill. Drums have not been placed in NSL since 1983, and the 3 acre oil pond was removed 10 years ago [sic]. There is no evidence that any intact drums containing hazardous waste are buried in the landfill. If drums were disposed of, it is probable that they were ruptured by heavy equipment (NSL, Inc.; Tricil).

U.S. EPA Response. The estimates of hazardous waste received by NSL were the best available at the times of the RI's. It is true that no attempt was made to differentiate contaminants from municipal and hazardous wastes. It is likely that many of the contaminants from hazardous waste would be similar in type to those from municipal waste, which would make their differentiation difficult. Given the site-specific information in the RI reports and in the comments, it is difficult to determine if the 4 to 10 year period cited in the comment is sufficient time for all contaminants from drums and the oil pond to have moved out of the landfill.

Comment. No indication is given as to how estimates of volatile organic concentrations in groundwater at ECC, resulting from the leaching of soil contaminants, compare to actual measured values. Methods used to estimate concentrations should be presented (TRW, Inc.; Tricil).

U.S. EPA Response. Estimated concentrations of volatile organics in groundwater due to leaching from the unsaturated soil are presented in ECC RI Table 5-5, and results of groundwater monitoring are presented in Table 4-13. The estimated average concentration of TCE due to leaching was 200,000 ug/l. TCE was detected in well 11A (completed in the shallow saturated zone adjacent to the south boundary of ECC) at a concentration of 28,000 ug/l. Other volatile organics for which concentrations were estimated were not detected in well 11A. The TCE concentration detected in the well was 15 percent of the estimated average concentration, but this may be due to the location of the well along the site boundary rather than in the middle of the site. Methods used to estimate concentrations are presented in Chapter 5 and Appendix C of the ECC RI, and in Appendix A of the NSL FS.

Comment. Data in the remedial investigation reports do not suggest any present substantial threat from groundwater contamination at NSL (other than in the immediate area of the landfill), nor do the reports show that the landfill has or ever will present a problem. The landfill has been in existence for 20 years, and it is not unreasonable to think that substantial problems should have occurred already. There is no justification presented in the reports for the stated expectation that contaminant levels would increase over time to a maximum level, and that the time period before which concentrations permanently decrease to nonhazardous levels may be 100 years or longer. The landfill may already be in the stage where the concentration levels are decreasing. The nature and extent of the sources of contaminants within the landfill are not well known, nor do the reports describe reasonable mechanisms for future contaminant releases from the landfill (NSL Committee; NSL, Inc.; Tricil; Chrysler).

U.S. EPA Response. Elevated levels of total dissolved solids (TDS) were detected in groundwater monitoring wells screened in sand units at the southwest corner of NSL, and in one well near the southeast corner of NSL. These elevated TDS levels indicate that some leachate has migrated to the groundwater from some portions of the landfill. Also, organic contaminants were detected in some of the monitoring wells downgradient of NSL. As these organic contaminants are not expected to occur in ambient groundwater, their presence is interpreted as an indication of contaminant release from NSL. Refer to Tables A-7 and A-8 in Appendix A of the NSL RI for details of contaminants detected in the monitoring wells.

Analyses of surface water samples from the unnamed ditch adjacent to the west boundary of NSL indicate the presence of contaminants which may have been released from NSL. If these contaminants are from NSL, they would have entered the ditch via a surface water or groundwater pathway. The presence of these contaminants in the ditch may be another indication of leachate migrating to the groundwater or surface water from the landfill.

In the NSL FS (pages 2-3), it is stated that it is not possible to estimate future releases of contaminants from the landfill, and that it is possible that if contaminant types or levels increase, the time period before which concentrations permanently decrease to nonhazardous levels may be 100 years or longer. These statements were not meant to imply that contaminant types or levels in the groundwater will increase. It is true that the nature and extent of contaminant sources within the landfill are not completely known, nor have specific mechanisms been identified for future contaminant releases. It is for these reasons that increases in types or concentrations of contaminants have been presented as possibilities. Similarly, the time period of 100 years is only presented as a possibility and not as a projection.

Many data collected over an extended period of time are needed to determine if contaminant releases from a landfill are increasing or decreasing. These type of data were not available for the NSL RI. Since NSL remains an active site, the possibilities for continued leachate generation and increasing contaminant concentrations remain.

Comment. The former cooling pond at ECC has been dredged and the contaminated soil and sludge has been removed from the pond. Therefore, the cooling pond is no longer a source of contamination. The effects of its removal on contaminant migration were not evaluated. The CAA report states that any contaminated soil or sludge remaining in the cooling pond would have to be excavated. The need for this action is not technically justified, and is an apparent discrepancy with statements that contaminants have been removed from the pond (ECC Steering Committee; TRW, Inc.; Tricil).

U.S. EPA Response. It was reported in June 1985, in the on-scene coordinator report for the immediate removal of ECC by Roy F. Weston, Inc., that the partially dredged pond was backfilled with contaminated soil excavated from around the process building and tank areas. Therefore, the cooling pond remains a potential source of groundwater contamination. The CAA report recommends that the pond area be investigated to determine if it is contaminated, and to remove the contamination if necessary.

Comment. It is possible to distinguish between contaminants from ECC at NSL both in terms of onsite and offsite contamination. The volumes of groundwater, levels and types of contaminants from ECC and NSL are different. A greater proportion of organic contamination is from the ECC site (ECC Steering Committee; NSL, Inc.).

U.S. EPA Response. It is to be expected, based on what is known about the contaminant sources at ECC and NSL, that organics will constitute a relatively greater portion of the contaminants from ECC than from NSL. However, it is not unreasonable to expect organic contamination to be released from NSL. Most of the landfill volume consists of refuse and municipal waste, which has been observed to release organic contaminants to the environment at this and other landfills. There is also some additional volume of hazardous substances within NSL, including the former oil separation lagoon.

While differences in concentrations and types of organic and inorganic contaminants from ECC and NSL may be distinguishable for portions of the sites, total contaminant mass contributions from each site cannot be compared. Estimates of total groundwater discharge from each site are needed to calculate contaminant mass contributions, and estimates of total groundwater discharge were not generated as part of the RI's or FS's.

Based on the geology and hydrogeology of the NSL and ECC sites, it is expected that groundwater contaminants detected within the ECC site and adjacent to the south and west boundaries of the site are from ECC. Similarly, it is expected that groundwater contaminants detected along the south boundary and at the southwest corner of the landfill are from NSL. It is more difficult to distinguish the source of groundwater contaminants found along the unnamed ditch, or of surface water contaminants found in unnamed ditch and in Finley Creek downstream of its confluence with the ditch.

Comment. The shallow saturated zone (till) beneath ECC is not an aquifer, nor is the underlying sand and gravel lens. The glacial till unit beneath NSL does not constitute an aquifer. It is not reasonable to expect that drinking water wells would be completed in these formations, nor between the sites and the groundwater discharge areas. The justification for considering these units as aquifers is not presented (ECC Steering Committee; NSL Steering Committee; TRW, Inc.; Tricil).

U.S. EPA Response. The publication entitled "Water Resources of Boone County with Emphasis on Groundwater Availability (W.J. Steen, et al., Department of Natural Resources, State of Indiana, Division of Water, 1977) describes the area of ECC and NSL as one in which well yields from 5 to 150 gpm can be developed. It states that well supplies are predominantly obtained from sand and gravel aquifers within the glacial drift at depths ranging from 30 to over 300 feet. The intertill sand and gravel aquifers are extensively used.

It is unlikely that the glacial till beneath NSL or the shallow saturated zone beneath ECC would be used for drinking water due to their low transmissivities and recharge potential. An estimate of well yield for the sand and gravel lens beneath ECC is given in comments prepared by the ECC Steering Committee. They estimate a potential yield of 1 gpm (1,440 gpd) at a drawdown of approximately 2 feet below the static groundwater level. This would be sufficient yield for a domestic water supply well.

Comment. The extent of groundwater contaminants in the shallow saturated zone (till) beneath ECC cannot be established based on the one valid groundwater sample from that zone (ECC Steering Committee).

U.S. EPA Response. It is true that only one or two groundwater monitoring points existed in the shallow saturated zone. However, contamination of the shallow saturated zone at ECC was assessed using data from the monitoring wells, and also from groundwater concentrations predicted using results from analyses of soil samples collected from the zone. Details of the prediction methods are presented in Chapter 5 and Appendix C of the ECC RI, and in Appendix A of the ECC FS.

Comment. To estimate travel times of contaminants, a distance from monitoring wells to the surface waters was arbitrarily chosen as 50 feet. If the distances between the wells and surface waters were increased, travel times may be long enough to allow implementation of remedial actions after monitoring (NSL Steering Committee).

U.S. EPA Response. The distance between the landfill perimeter and Finley Creek varies from approximately 10 to 200 feet, based on maps presented in the reports. Therefore, a contaminant travel distance of 50 feet to the creek is a presently existing condition of the site. Contaminant travel times would be increased if monitoring wells were further than 50 feet from the creek. Increased separations between monitoring wells and surface water could be achieved by moving the creek and/or the landfill perimeter. However, the comments do not establish that, even with increased separation, there will be adequate time to react to increasing contaminant levels in monitoring wells.

Comment. The possible reduction in leachate generation at NSL is inadequate justification for a RCRA cap. A reduction in the quantity of leachate to be collected and treated would not necessarily make an alternative with a RCRA cap more reliable (Tricil; Ferro Corp.).

U.S. EPA Response. Placing a RCRA cap on the landfill would decrease the rate of leachate generation, as compared to the site with a soil cover, by the mere fact of reducing the amount of percolation through the landfill surface.

In the CAA report (page 2-15) it is stated that operation and maintenance of the treatment system in Alternative 5 (including a RCRA cap) will be less than with Alternative 4 (without a RCRA cap) because of the lower flowrate resulting from decreased leachate generation.

If an alternative including a RCRA cap is more reliable than one without a RCRA cap, it is because a properly maintained RCRA cap will be effective in almost eliminating leachate generation, which will reduce the loading of contaminants to the groundwater and ultimately to the collection and treatment system. In the CAA report, any comparisons of reliability between Alternatives 4 and 5 on this basis were made assuming that Alternative 4 included a soil cover that prevented direct contact with the landfill surface, but did not necessarily reduce the rate of leachate generation.

Comment. The proposed groundwater monitoring system is unnecessarily complex considering the low levels of contamination that occur today. No additional wells are needed; the existing wells should be sufficient. The monitoring program needs careful review (NSL, Inc.; Tricil).

U.S. EPA Response. The proposed groundwater monitoring program for Alternative 5 in the CAA report is to assure that the alternative is functioning properly and not necessarily to monitor trends in contaminant levels at the site. Therefore, the monitoring program was designed on the basis of the anticipated response of the groundwater system to the alternative and not on the basis of presently observed contaminant levels.

The conceptual design of the monitoring program will be reviewed and revised as necessary during design efforts at the site. It will also be possible to modify the monitoring program pending the outcome of the preliminary monitoring results. Modifications may involve either upgrading or downsizing the magnitude of the proposed monitoring program.

Comment. The CAA report incorrectly concludes that insufficient time for implementation of remedial actions is available if major increases of contamination show up in the southwest corner of the landfill. Existing wells could be pumped if contaminant levels increase, and additional wells could be drilled on short notice if needed (NSL, Inc.).

U.S. EPA Response. The comments provided no analyses of a groundwater pumping system incorporating existing wells. Therefore, this use of existing wells cannot be evaluated. Pumping of existing wells to extract contaminated groundwater is believed to be technically infeasible since these wells were installed as monitoring wells for sampling purposes and were not designed for long-term pumping use.

Comment. The sand lens beneath the ECC site and the sand and gravel zone along the unnamed ditch are distinctly different units. The sand and gravel zone in the unnamed ditch area begins at the ground surface and has a surface layer of topsoil. It is not overlain by glacial till as is the sand lens beneath ECC. The two sand units do intersect each other (NSL, Inc.).

U.S. EPA Response. Geologic cross sections in the NSL FS (Figures 1-12 and 1-13) show that deposits of sand and gravel do extend from Finley Creek and unnamed ditch to the southwest corner of the NSL site and ECC. The sand deposits are shown as having different lithologies, which may be due to differences in origin (deposited immediately after glaciation versus recently as a result of stream action). However, the fact that the sand units intersect each other supports the interpretation in the CAA report that the sand and gravel lens beneath the ECC site and the southwest corner of the NSL site forms a pathway for contaminated groundwater to discharge directly to the creek.

Comment. A groundwater interception rate of 60 gpm from beneath NSL is too high. This is equivalent to a 73 percent infiltration of precipitation over the 70 acre landfill area (NSL, Inc.).

U.S. EPA Response. Estimates of groundwater collection rates are presented in Appendix B of the NSL FS. The estimated rate of groundwater collection takes into consideration the need to lower the water table at the collection system to an elevation below that of Finley Creek. By doing this, the collection system rather than the creek will constitute the area of groundwater discharge.

The comment assumes that the recharge area for groundwater flow beneath NSL is limited to the area of the landfill. The recharge area for this subregional groundwater flow system may exceed the 70 acre landfill, in which case the equivalent infiltration would be less than 73 percent of precipitation.

An estimated groundwater collection rate of 60 gpm was used for Alternative 5 in the CAA report. This included the estimates of flow to a groundwater collection system along the south boundary of NSL, and of flow to a collection system south and southwest of the ECC site in the area of the relatively large sand and gravel lens. The estimated flow to a subsurface drain along the south boundary of the NSL site was 23 gpm (NSL FS, Appendix B, page B-11).

Comment. Calculations or references supporting the estimate of leachate production at NSL are not provided. The estimates are too high for a landfill covered with a silty clay till soil. A rate of 40 gpm is excessive for annual precipitation of 38 inches on a landfill covered with clay and having a sloping land surface. Based on collection rates in the existing leachate collection system, a high estimate for leachate generation would be 1 gpm (NSL Steering Committee; NSL, Inc.).

U.S. EPA Response. Estimates of leachate generation are presented in Appendix B of the NSL FS. A percolation rate of 10 in/year was used for a soil cover on the landfill surface. This does not represent an estimate of actual percolation based on soil conditions, soil moisture balance modeling, or records of leachate collection. It was assumed that the purpose of the soil cover was to prevent direct contact with the landfill surface and not to reduce percolation. Therefore, it was not assumed that the cover would necessarily consist of silty clay till soil. If the soil cover did consist of compacted silty clay till of sufficient thickness, it is reasonable to expect that percolation would be less than 10 in/year. It would also be reasonable to assume that the percolation rate would be no larger than that rate which is occurring now, if it could be adequately determined.

A percolation rate of 1.5 in/year was used for a RCRA cap on the landfill surface. This does not represent an estimate of actual percolation based on moisture balance modeling or evaluations of RCRA cap performance.

Comment. In 1982, the only well determined to be polluted at NSL was MW1 located near the southwest corner of the landfill. By 1983, the southwest corner of the landfill had been removed and emergency response actions had been undertaken at ECC. Concentrations of both total organics and chlorinated organics have decreased in MW1 since 1983, and these reductions have, for the most part, been sustained. Because refuse is no longer in contact with the sand deposit at the southwest corner of MW1, the chloride concentration in MW1 will continue to decrease with time (NSL, Inc.).

U.S. EPA Response. The apparent reduction in concentrations of organic and inorganic contaminants in MW1 may be due to the removal of the local source. The refuse (source) was dug up and reburied in the landfill further away from MW1. The trends presented in the comments for organic and inorganic parameters in MW1 are conflicting, in that inorganic concentrations increase as organic concentrations decrease. It is possible that the data are insufficient to establish trends that could be used to predict future concentrations at MW1.

MW1 may have been the only polluted well in 1982, but other polluted wells were identified during the subsequent RI's. The period of time over which MW1 has been monitored is short relative to the age of the landfill, and any trends of decreasing concentration which may be established using data from MW1 would be characteristic of the southwest corner of the landfill and not necessarily of the entire landfill boundary.

Comment. Contaminants in Finley Creek are from a source other than ECC or NSL (ECC Steering Committee; Mersman).

U.S. EPA Response. Information and field data collected subsequent to the ECC and NSL remedial investigations indicate that sources of contamination may exist in areas which were not specifically investigated during the RI's. If these sources do in fact exist, they would contribute to the contamination observed in Finley Creek downstream of ECC and NSL. However, sampling of Finley Creek, the unnamed ditch, and monitoring wells adjacent to the creek and ditch indicate that contaminants in the creek and ditch are being contributed by ECC and/or NSL.

Comment. The geology of the NSL site presented in the remedial investigation report was reinterpreted in the feasibility study. The reinterpreted geology, which included the identification of discontinuous lenses of sand

and gravel within the till beneath the landfill, makes migration of groundwater contaminants from NSL less likely (NSL, Inc.).

U.S. EPA Response. The geological interpretations presented in the NSL RI were refined to include subsurface geological information which became available during preparation of the NSL FS. The revised interpretation of the site geology indicates lenses of water-bearing sand and gravel within the glacial till beneath the landfill. These lenses may occur at or near the original ground surface beneath the refuse, and may act as conduits for movement of groundwater and contaminants from beneath the landfill. The west boundary of the landfill is above or near a relatively large lens of sand and gravel which extends to the area occupied by Finley Creek and the unnamed ditch.

Comment. The method selected for calculating groundwater contamination from NSL yields unrealistically high results (as presented in column 2 of Table 2-4 in the CAA report). The values for noncontaminated samples are discarded and do not reduce the average as they should (NSL, Inc.).

U.S. EPA Response. The average concentrations presented in the tables are averages of the samples in which the contaminants were detected, and do not account for the samples in which the contaminants were not detected. The average of detected contaminants were presented for conceptual treatment plant sizing and costing purposes and not to completely characterize groundwater contamination from NSL.

Comment. The groundwater moving away from the landfill proper should never be of poorer quality than leachate [sic]. Minimal contamination was found in leachate liquids. It is impossible for organic contaminant levels to increase in the groundwater adjacent to the landfill without inputs from ECC (NSL, Inc.; Tricil).

U.S. EPA Response. It is true that, on a mass balance basis, groundwater contaminated with leachate should have lower concentrations than the leachate due to its dilution in groundwater. The dilution ratio will depend on the ratio of leachate generation to groundwater underflow. No leachate springs or seeps were sampled during the RI's, but samples were taken from the onsite leachate tanks, and from ditches adjacent to the north and east sides of the landfill. It is reasonable to expect that leachate coming out of the north and east sides of the landfill could enter the ditches.

Samples from the leachate tanks and ditches were found to be contaminated. Summaries of the detected contaminants are presented on pages 1-13 and 1-14 of the NSL FS.

Comment. Data are not presented to support the interpretation that groundwater discharges to Finley Creek and the unnamed ditch (NSL, Inc.; TRW, Inc.).

U.S. EPA Response. Interpretations of the site hydrogeology are presented on pages 1-9 to 1-11 in the NSL FS. Groundwater levels in wells adjacent to Finley Creek and the unnamed ditch were higher than the elevation of the adjacent surface water, indicating an upward hydraulic gradient. Flow occurs in the creek and ditch during times of no-rainfall, which indicates some degree of base flow groundwater discharge. Seeps have also been observed along the banks of the creek and ditch during periods of low flow. These data have been interpreted to indicate that groundwater at the shallow and intermediate depths investigated by the RI monitoring wells discharges to the surface water.

Comment. No information was presented to support the contention that the impermeable membrane to be installed in the subsurface drain of CAA Alternative 5 is technically feasible. CAA Alternative 4 is more likely to be technically feasible since it substitutes wells for the subsurface drain (Jeffboat).

U.S. EPA Response. Installation of the impermeable membrane is considered to be technically feasible. Details of the impermeable membrane proposed for the section of subsurface drain south of ECC and southwest of NSL are presented on page 2-15 of the CAA report. The membrane would be constructed in place as the drain trench was backfilled. Synthetic membrane would be placed along the trench wall, and the clay barrier would be constructed in layers by hand, or by the placement of premanufactured clay panels. Estimated costs for construction of the membrane are presented in Appendix A of the CAA report.

Comment. The quantity of dewatering for CAA Alternative 4, which includes wells in the sand and gravel unit south of ECC and southwest of NSL, will be less than for CAA Alternative 5, which includes a subsurface drain in this area (Jeffboat).

U.S. EPA Response. It is true that the subsurface drain will require more construction dewatering than the installation of wells. The drain could, however, result in lower long-term pumping rates because of the opportunity to install an impermeable membrane on the downgradient side of the trench, and thereby minimize inflow from surface water. The drain will also allow the groundwater interception system to be converted to a groundwater isolation system, as in CAA Alternative 6. The advantages of this flexibility are discussed in Chapter 2 of the CAA report.

Comment. In the CAA Alternative 5 groundwater collection system, water will be pumped from a drain at a depth of 5 feet below the existing water table. This will not eliminate the possibility of contaminated groundwater moving under the drain and offsite. The design depth of the pipe should be carefully reviewed (Jeffboat; NSL, Inc.).

U.S. EPA Response. The subsurface drain in the groundwater collection system will be designed to lower the water level to the point that contaminated groundwater flow into the drain and not to the adjacent surface water. Hydrologic analyses conducted for the FS's indicate that lowering the water table 5 feet may be sufficient to achieve this goal. Groundwater may go beneath the drain, but based on the results of the RI's, this groundwater is not expected to be contaminated. Detailed calculations of drain geometry are presented in Appendix B of the NSL FS. The actual depth at which the drain will be installed will be determined as part of the design process for the alternative.

Comment. A significant potential for dewatering problems most likely would occur during construction of the groundwater collection system. Sloughing of sandy materials in the southwest area of NSL and south of ECC could present significant problems. No provisions were made for managing the quantities of dewatering (Jeffboat).

U.S. EPA Response. Dewatering would be required during construction of the subsurface drain, as would slope stability of the trench walls. Construction dewatering would have to be handled and treated at either an onsite or offsite facility. Costs for excavation, shoring and bracing, and dewatering were developed for alternatives in both the NSL FS and CAA reports. Refer to Tables D-9 and D-13 in Appendix D of the NSL FS, and to tables A-9 and A-13 in the CAA report. No specific costs were developed for handling and treatment of construction dewatering.

Design of lateral support systems for subsurface drains or construction dewatering systems are not done as part of a feasibility study. Therefore, costs presented for these systems in the FS and CAA reports are estimates only. Estimates of construction dewatering will be developed as part of the design process for the alternative.

Comment. A perimeter slurry wall should be proposed around NSL so that the corrective action will be consistent with requirements as determined in cause N-95 by the Indiana Solid Waste Management Board on January 21, 1987. The slurry wall should not be rejected unless it can be clearly shown that it will be ineffective. The use of a slurry wall should have been seriously considered by the FS and CAA reports. The assertion that the impermeable liner in the

CAA Alternative 5 groundwater collection system would minimize inflow from Finley Creek is inconsistent with the reluctance to accept a slurry wall. The sand and gravel unit in the southwestern area of the landfill extends to a depth of approximately 30 feet, and a slurry wall could be placed to this depth in that area. The likelihood of groundwater movement across a slurry wall would be extremely remote (Rock Island Refining; Jeffboat; Chrysler).

U.S. EPA Response. The use of a slurry wall at NSL was proposed on the basis of the site geology presented in the NSL RI. In this report, the site geology was described as including a layer of sand underlain by glacial till. The purpose of a slurry wall would have been to block the flow of groundwater in the sand unit to prevent it from discharging to surface waters. This would have been achieved by placing the wall through the sand unit and into the top of the underlying glacial till. It is true that there would be little groundwater movement through a slurry wall, so that regional groundwater flow moving toward the surface water discharge areas would tend to pile up behind the slurry wall. Some pumping of the upgradient side of the slurry wall would have been required to prevent the groundwater from overtopping or flowing around the ends of the slurry wall.

The interpretation of the NSL site geology was refined in the NSL FS. In this report, the site geology was described as including discontinuous lenses of sand and gravel within the glacial till beneath the site. The degree of hydraulic interconnection between lenses at different locations and different elevations is not known. There is no identifiable impermeable soil unit beneath all of the lenses into which the bottom of a slurry wall can be placed, and the possibility remains for groundwater from beneath the landfill to move beneath a slurry wall through a series of interconnected lenses.

The impermeable liner in the CAA Alternative 5 groundwater collection system is not intended to prevent groundwater discharge to surface water in the absence of the subsurface drain. Pumping of water levels in the drain to an elevation below that of the creek will cause groundwater in the upper portion of the water bearing unit to discharge to the drain rather than the creek. The purpose of the impermeable barrier on the downgradient side of the drain trench is simply to minimize inflow from the creek. It is anticipated that some surface water will move beneath the barrier and into the subsurface drain.

Alternative 5 in the CAA report includes an impermeable barrier on the downgradient side of the subsurface drain trench in the area of the relatively large sand and gravel lens southwest of the landfill and south of ECC. This barrier will extend into the glacial till beneath the sand lens, and for this reason will essentially act as a slurry wall. The need for groundwater pumping on the upgradient side of the barrier to prevent groundwater from overtopping or moving around the barrier will be achieved as the subsurface drain is operated to collect contaminated groundwater.

Comment. A cap on NSL consisting of compacted glacial till soils which surround (and underlie) the site would meet RCRA cap requirements with respect to percolation of incident precipitation. A compacted till cap would substantially reduce the quantity of leachate generation, and there would be no significant degree of difference in the potential for the migration of contaminants to groundwater between this cap and a soil-synthetic membrane-clay cap. The failure to consider glacial till as a capping material is a major omission in the analyses (NSL Steering Committee; Tricil).

U.S. EPA Response. The soil cap proposed in the reports was intended to prevent contact with surface soils, and not necessarily to reduce percolation rates. It is true that a cap of compacted native glacial till could significantly reduce percolation through the landfill and thereby reduce generation of leachate. Local soils would have to be investigated to determine if they are adequate for use as a cap. It would take some time for the reduction in percolation to manifest itself as reduced leachate generation; in the reports this was assumed to be 5 years.

Percolation through a soil-synthetic membrane-clay (S-SM-C) cap would be less than through a compacted till cap, if the synthetic membrane was properly installed and remained intact. While percolation rates through both types of caps may be small, the rate through a compacted till cap may still be twice or more of that through a S-SM-C cap. This would result in twice or more as much leachate to collect and treat. However, it is reasonable to expect that the difference in percolation through a S-SM-C cap and a properly designed and installed compacted till cap would be small with respect to estimated total groundwater flowrates to the proposed groundwater collection system.

Comment. The principal reference for alternatives in the CAA report was the NSL FS. The discussions in the CAA report on groundwater collection, cap technology, and groundwater treatment differ significantly from those presented in the ECC FS (ECC Steering Committee).

U.S. EPA Response. Many aspects of the alternatives presented in the CAA report are similar to those in the NSL FS. The 6-acre ECC site is small compared to the 70-acre

NSL site, so that when the sites are combined, as they were for the CAA report, remedial actions addressing the NSL site dominate those for the ECC site. For example, only small modifications would have to be made to a groundwater collection system around NSL to include the ECC site. Certain technologies proposed in the ECC FS were not presented in the CAA report because while applicable to ECC, they are not reasonable to apply to the combined sites. An example is removal of contamination in the near surface soils at ECC, which could continue to be a source of groundwater contamination. This technology was not presented in the CAA report. If it had been, similar types of source removals would had to have been proposed for NSL. These could have included removal of residues from the former oil pond.

Comment. Groundwater extraction wells are not appropriate for consideration to remove contaminated groundwater from the sand and gravel aquifer beneath ECC (ECC Steering Committee).

U.S. EPA Response. A subsurface drain rather than wells is included in the proposed CAA Alternative 5. The purpose of groundwater collection from the sand and gravel unit beneath ECC is to prevent migration of contaminated groundwater to surface water. Groundwater in the unit was found during the remedial investigations to be contaminated, and based on observed groundwater levels it is expected that the groundwater discharges to the unnamed ditch and/or Finley Creek. Contaminated sludge and soil was removed from the ECC cooling pond during initial remedial actions, but the on scene coordinators report for that activity (by Roy F. Weston, Inc., June 1985) states that the pond was backfilled with contaminated soil from the ECC site. The pond may, therefore, continue to be a source of contamination for the sand and gravel unit.

Comment. Assumptions of no dilution of groundwater as it enters Finley Creek is very conservative. Neglected is the fact that when the creek is under low flow conditions and groundwater contributions stop, it is likely that leachate flow would also stop. No calculations are given to support the factors given on page 6-48 of the NSL RI for dilution of volatile organic compounds in groundwater after discharge to surface water (NSL, Inc.; Tricil).

U.S. EPA Response. It is true that, as flow in the creek decreases as a result of decreasing groundwater discharge, the discharge to the creek of contaminants in groundwater will also decrease. However, it is not unreasonable to anticipate that the rate of leachate generation would remain relatively constant since it is a result of average long-term percolation of water through the landfill surface.

Therefore, under these conditions it would be expected that leachate would constitute a greater proportion of discharge to the creek than under high flow conditions.

Dilution factors presented on page 6-48 of the NSL RI are based on the discussions of groundwater and surface water flow on pages 5-11 through 5-13 of the NSL RI.

Comment. The degree of accuracy of hydraulic conductivity estimates made from grain size analyses of the sand unit beneath ECC is not given. No data are available to indicate that the hydraulic conductivity is as high as 10^{-2} cm/sec, nor to indicate that the unit is homogenous and isotropic in this regard. Estimates of 10^{-3} to 10^{-4} cm/sec were made for the sands beneath NSL (Tricil).

U.S. EPA Response. A range of 10^{-2} to 10^{-3} cm/sec was given for the hydraulic conductivity of the sand and gravel unit beneath ECC (ECC RI, page 4-42). Grain size distributions of soil samples collected at ECC are presented in Appendix D of the Technical Memorandum for Subtask 3-1, all in Appendix A of the ECC RI.

Hydraulic conductivities at NSL were estimated from slug tests in monitoring wells. Results of these tests are presented in Table B-1 of NSL FS Appendix B. The test zones yielding estimated values of 10^{-3} to 10^{-4} cm/sec usually included units of clay or silt till, silty fine sand, or fill along with clean sand and gravel. The grain size analyses used to estimate hydraulic conductivity of the sand beneath ECC were of samples consisting of clean sand without lenses of finer grained soils.

Comment. Minor upgrading of the existing glacial till cap at NSL would result in a cap with an effectiveness, relative to percolation, equal to that of a so called RCRA cap (Tricil).

U.S. EPA Response. It is true that a cap of compacted glacial till could significantly reduce percolation through the landfill surface. Percolation through a RCRA cap would be less than through a compacted till cap, if the synthetic membrane in the RCRA cap was properly installed and remained intact, but it is reasonable to expect that the difference in the percolation rates would be small. The degree to which the existing glacial till "cap" on the landfill would have to be upgraded to be as effective as a RCRA cap was unknown at the time of the FS's, and remains unknown.

Comment. The rates of groundwater movement beneath NSL have never been determined. Rates presented in the reports appear to be high. Calculations are not presented in the reports (TRW, Inc.; Tricil).

U.S. EPA Response. Rate of groundwater movement beneath the NSL site is discussed on pages B-20 and B-21 of Appendix B of the NSL FS. Difficulties of estimating movement rates beneath NSL are discussed therein. Estimates of groundwater velocities beneath NSL were generated, but were not presented in the report because of the difficulties involved in making such estimates. These estimates were provided to interested parties who made a FOIA request.

Comment. No estimate is given of the volume of contaminated sediment [sic] which remains at the ECC site. Therefore, potential future harm cannot be adequately addressed (TRW, Inc.).

U.S. EPA Response. On page A-1 of Appendix A of the ECC FS, it is stated that "an estimated 11,500 cubic yards of soil with contaminant concentrations having a calculated excess lifetime risk of 10^{-6} or greater for residents ingesting soil" would need to be excavated from ECC. Estimates of volumetric weighted average soil concentrations used in the analysis of groundwater leachate interactions at ECC are presented on page 1 of Attachment 2 of Appendix A of the ECC FS.

Comment. Migration of contaminants to the nearest residential wells was not indicated by the RI data. Therefore, residential wells are not threatened by ECC (TRW, Inc.).

U.S. EPA Response. The deep confined aquifer below the ECC site was not found to be contaminated during the RI, and future migration of contaminants to this aquifer is highly unlikely due to the upward vertical hydraulic gradient. Therefore, it was not unexpected that residential walls completed in the deep confined aquifer were not contaminated. It is expected that migration of contaminants in groundwater will be limited to shallow sand and gravel units (ECC RI, page 5-5).

Comment. No estimate is given for the volume of groundwater discharging to surface water from ECC, nor as to whether the effects of the clay surface on groundwater discharge was considered (Tricil).

U.S. EPA Response. Details of groundwater discharge estimates from ECC are presented in Chapter 5 and Appendix C of the ECC RI, and in Appendix A of the ECC FS. It is stated on page 2 of Attachment 2 of Appendix A in the ECC FS that estimations of recharge at ECC were made assuming that no cap was present.

Comment. The clay soils placed on the ECC site during the initial remedial actions will discourage leaching of soil contaminants and migration to groundwater. The effect of the clay layer on the leaching of soil contaminants to groundwater was not considered by the RI's or FS's, nor was it taken into account in the estimates of groundwater and surface water concentrations resulting from leaching. In Appendix A of the ECC, it is assumed that no cap exists on the ECC site and that the recharge rate is 7.8 in/yr. A more reasonable rate of recharge through the clay soils would be 0.1 in/yr (TRW, Inc.; Tricil).

U.S. EPA Response. It is true that clay soils were placed over the ECC site as part of the initial remedial action, but how well this material would act as a "cap" has never been evaluated and is therefore unknown. For this reason, soil contaminant leaching at ECC was evaluated as if the clay soils did not exist.

If the clay soils do act to some degree as a "cap," the recharge of 7.8 in/year could be unreasonably high. But 0.1 in/year seems unreasonably low for any kind of clay soils which could be present on the ECC surface. If the hydraulic conductivity of any clay soils on the ECC site were in the range of 10^{-6} to 10^{-7} cm/sec, then recharge would range from as much as 12 to 1.2 in/year, depending on the degree of saturation of the surface soils.

Comment. It is impossible to evaluate the accuracy of the contaminant transport and fate calculations without details of the model used. The factors applied to conclude that there were certain mobilities and persistence of contaminants need to be clarified. The wide range of variations of transport and fate properties of indicator chemicals make assessments of future conditions to appear as no more than a guess (TRW, Inc.; Tricil).

U.S. EPA Response. Contaminant fate and migration at NSL is discussed in Chapter 5 of the NSL RI, and summaries of environmental behavior of indicator organic compounds and metals are presented in Table 5-3 and 5-4, respectively. Environmental profiles of contaminants at NSL are presented in Appendix B of the NSL FS. Similarly, contaminant fate and migration at ECC is discussed in Chapter 5 of the ECC RI, environmental behavior of indicator chemicals are summarized in Table 5-4, and discussions of contaminant transport and fate are presented in Appendix C.

The ranges of travel times for contaminants at ECC, shown on page 5-13 of the ECC RI, are due to ranges in values for soil properties, hydraulic conductivities, and travel distances. Details of these travel time calculations are presented in Chapter 5 and Appendix C of the ECC RI.

Comment. Values of hydraulic conductivity for ECC would be erroneously high, as would estimated rates of groundwater movement, if corrections in the analyses were not made to account for the sand pack around the monitoring well screens (Tricil).

U.S. EPA Response. Estimates of hydraulic conductivity for ECC were made from grain size analyses and not from well tests. Therefore, corrections for the sand packs were not needed.

Comment. It is not clear in CAA Alternative 4 if the flow of 140 gpm is from ECC alone or from ECC and NSL combined. A combined flow of 140 gpm would not be needed [sic] if soil contaminants at ECC, which would leach to groundwater, were removed and treated (Mersman).

U.S. EPA Response. The estimated flows for CAA Alternative 4 are broken down on page 2-13 of the CAA report. The ECC underdrain would contribute an estimated 8 gpm, the subsurface drain around NSL would contribute 25 gpm, and the six extraction wells south of ECC and southwest of NSL would contribute 65 gpm. The leachate collection system around NSL would contribute 40 gpm.

The ECC underdrains in Alternative 4 could be eliminated if soil contaminants were removed. If, however, the ECC underdrains were eliminated, the flow to the subsurface drains, extraction wells, and leachate collection system would be reduced by only 8 gpm. Page C-1 of appendix C of the CAA report states that the groundwater collection system for CAA Alternative 4 would be similar to that for Alternative 4 in the NSL FS, as would the flowrates.

Comment. The contamination in the shallow sand and gravel below ECC has not been fully attributed to any hazardous waste disposal at the surface level. Contamination was from the cooling pond. The evidence with regards to any contaminants at the ECC site below a mere shallow contaminated zone is not at this time attributable to any contaminants in that shallow zone [sic] (Mersman).

U.S. EPA Response. On page 4-59 of the ECC RI, it is stated that contamination of the shallow sand and gravel unit beneath ECC may have occurred either via migration through the silty clay till onsite or through contaminated water and sediment in the former cooling water pond, which intersected the shallow sand and gravel unit.

It is true that hydraulic gradients from the unit are now vertically upward, so that downward migration of surface contaminants would not be expected in the future. But it is not known if past activities at ECC could in fact have caused a reversal of this gradient and allowed downward migration of contaminants.

Comment. No information is given regarding the drilling contamination problems at ECC well 4A. It is questionable if drilling contamination could have occurred at other wells (Tricil).

U.S. EPA Response. The drilling of ECC well 4A is discussed on page 4 of the Hydrogeologic Study Technical Memorandum in Appendix A of the ECC RI. Drilling problems similar to those at well 4A would have been described if they had occurred.

Comment. There is no evidence presented to confirm the suggestion in the NSL RI that the water table within the landfill is mounded (Tricil).

U.S. EPA Response. Interpretations of mounding within the landfill were modified for the NSL FS. On page 1-11 of the NSL FS, it is stated that the groundwater in the glacial till beneath the landfill may be mounded, but that there could only be localized contact between groundwater and the landfill refuse. Detailed discussions of mounding are in Appendix B of the NSL FS.

Comment. The benefit of a leachate collection system more than 1 mile in length cannot be considered to be cost-effective for the collection of the 5 gpm of leachate expected to be produced after NSL is capped (Tricil).

U.S. EPA Response. A leachate generation rate of 5 gpm is equivalent to approximately 7,000 gallons of leachate generation per day, and 2,600,000 gallons over the course of a year. If this leachate is not collected, it will enter groundwater or surface water adjacent to the site.

Comment. There is no evidence that the sand and gravel unit beneath ECC is a discrete water bearing unit and does not in fact occur as discontinuous lenses [sic] (Tricil).

U.S. EPA Response. Geologic cross sections through the ECC site are shown in Figures 1-12 and 1-13 in the NSL FS. The continuity of the sand and gravel unit was interpreted on the basis of the thickness of the unit encountered in the test borings, and the relative locations of the borings in which the unit was encountered. On page 1-4 of the CAA report, it is stated that because the thickness and continuity of the lens beneath ECC is greater than other sand and gravel lenses encountered in the test borings, this lens has been considered as a discrete unit within the glacial till.

Comment. The effect of temperature, soil organic content, and oxidation reduction potential on reducing contaminant levels at NSL were not assessed (Tricil).

U.S. EPA Response. The specific contents of the landfill are unknown. Much information exists on generation and migration of leachate (for example, in J.C.S. Lu, et al., Leachate from Municipal Landfills, Noyes Publications, 1985), but it would be difficult to quantify the effects of physical-chemical features of the site on generation and migration of leachate without a more thorough knowledge of the nature and extent of municipal and hazardous wastes within the landfill.

Comment. The increase in contaminant concentrations at NSL (if it ever occurs) is expected to be very gradual. A monitoring system could be carefully developed to measure groundwater quality close to the landfill which would detect any significant increase in contaminants, should that occur. The concern about insufficient time to implement remedial actions once previously undetected contaminants or increased levels of contaminants are detected has no basis and is highly questionable due to the slow rate of groundwater movement. A much larger span of time will be made available by observing a correlation of groundwater contaminant increase with time. An upward or downward trend would be gradual with respect to contaminant levels, and there would in fact be sufficient time for the implementation of remedial measures. An additional safety factor is provided by the low contaminant levels described in the reports. A considerable increase would, therefore, be necessary for an increase in risk. If levels of contamination are found through monitoring to be rising, the additional action could be implemented (NSL Steering Committee; NSL, Inc.; Tricil; Chrysler; Ferro Corp.).

U.S. EPA Response. Calculations of estimated groundwater velocities in sand and gravel lenses at NSL were provided in response to various FOIA requests. The estimated velocities ranged from approximately 0.2 to 17 feet/day. Differences in the estimates were due to variations in estimated hydraulic conductivity values, in measured hydraulic gradients, and in assumed values of effective porosity. Contaminant velocities would be less than the groundwater velocity, depending on the retardation factor of the contaminant. For some of the indicator contaminants at NSL, these factors ranged from 1.1 to 2.4.

The range of estimated velocities indicates the degree of uncertainty that would be inherent in designing a groundwater monitoring program that would allow enough time to react to increasing contaminant levels in groundwater. An adequate monitoring program would have sufficient distance between the point of monitoring and surface water to allow enough time to react to increasing contaminant levels. At certain locations along the site perimeter, sufficient distance may only be obtainable by moving surface water courses and/or the landfill perimeter itself. It would also have to be assured that no sources of contamination exist between the line of monitoring points and the surface water. It may be technically infeasible to develop sufficient distance between monitoring points and surface water, and the cost of doing so may be high compared to the cost of implementing CAA Alternative 5. CERCLA does not permit U.S. EPA to implement an alternative which allows offsite migration of contaminants.

Comment. The conclusion that groundwater monitoring will not allow sufficient time to implement remedial action is unjustified for the ECC site. Travel times from the site to the unnamed ditch vary between 20 and 800 years, and the ECC RI states that most of the volatile compounds will degrade to below the 10^{-6} cancer risk level within 10 years (pages 5 to 11). For the foreseeable future, contaminated groundwater would have no impact on surface water, and monitoring would suffice as protection (ECC Steering Committee; TRW, Inc.).

U.S. EPA Response. A difficulty with monitoring at the ECC site is the relative proximity of the eastern boundary of the site to the unnamed ditch. Once contaminants were detected in monitoring wells adjacent to the east boundary of the site, only short travel distances would be needed to reach the ditch. While contaminant transport rates in the shallow saturated zone may be slow, they may still be fast enough to travel the distances to the ditch before remedial actions can be undertaken. A groundwater velocity of 2.6 feet/year was estimated for the shallow saturated zone (till) beneath ECC, and of 100 to 1,000 feet/year for the underlying sand and gravel unit (ECC RI, pages 5-8 to 5-11).

4.9 TECHNOLOGIES AND COSTING METHODS

Capping

Comment. EPA's recommendation to place a soil-synthetic membrane-clay cap over both ECC and NSL is unwarranted because:

- o It offers no significant benefit over a soil-clay cap
- o It is technically infeasible
- o A simpler, less expensive cap could be used and still meet RCRA requirements

(ECC Steering Committee; NSL Steering Committee; Jeffboat; Rock Island Refining; Tricil; Jones, Inc.; Thermoset; Ferro Corp.; Mersman).

U.S. EPA Response. The selected alternative must comply with all applicable, relevant and appropriate requirements. Since ECC and NSL had interim status under RCRA, both sites must be capped with a RCRA compliant cap. (Please refer to the Record of Decision (ROD).) The soil-synthetic membrane-clay cap meets the RCRA requirements and is technically feasible to implement. During design the cap ultimately used at the site may be refined to reduce costs. However, it would still need to meet the RCRA requirements to minimize liquid migration and maintenance, promote drainage, accommodate subsidence, and have a permeability less than or equal to any bottom liner or natural subsoils.

EPA has invited the PRP's to develop an alternate cap design that is in compliance with RCRA.

Comment. The soil-synthetic membrane-clay cap presented in the FS's and CAA would not be as effective as a glacial till cap since it is subject to ripping or cracking from differential settlement (Tricil).

U.S. EPA Response. The soil-synthetic membrane-clay cap proposed in the FS's and CAA would be more effective than a glacial till cap because it incorporates the flexibility of the membrane and the "self-healing" capabilities of clay. If differential settlement of the landfill over time was sufficient to cause ripping or cracking of the membrane, the cap would still be more effective than a glacial till cap due to the clay layer. However, the amount of differential settlement necessary to rip a membrane would typically create a noticeable disjunction at the landfill surface.

The caps presented in the FS's and CAA are conceptual and are used to present a range of cost and reliability. The final design of the cap for the site will need to consider the possibility of damage to the membrane from differential settlement and the cost and complexity of repairs.

Comment. The recommendations for a soil-synthetic membrane-clay cap on the ECC site is unwarranted since the effectiveness of the existing clay cap and concrete pad have not been evaluated (Tricil; ECC Steering Committee).

U.S. EPA Response. The integrity of the existing cap is in question because water samples taken from the ponded surface water were found to be contaminated. The contamination may have occurred from upward migration of VOC's from the underlying contaminated soils or from mixing of cover material with underlying soil. The concrete pad on the southwestern portion of the site is not an adequate cap over the long-term because it is subject to cracking from freeze/ thaw conditions.

Comment. Placing a cap over the ECC site would be counter productive since it would eliminate volatilization which is one of the major transport routes for contaminants. If a cap were placed over the area, this route would be blocked and the only transport would be via groundwater (NSL, Inc.).

U.S. EPA Response. The intent of capping the ECC site is to eliminate direct contact with contaminants and to minimize the mobility of the contaminants by reducing infiltration and volatilization and preventing transport via surface runoff. The release of contaminants to surface water or the air could pose additional threats to public health.

Comment. What is U.S. EPA's previous experience with soil caps versus soil-synthetic membrane-clay caps and is the latter worth the extra $13 million? (NSL Steering Committee; NSL/ECC Public Hearing December 17, 1986).

U.S. EPA Response. No data is available for a side-by-side comparison of the performance of soil caps and soil-synthetic membrane-clay caps over time. A soil cap is used to eliminate direct contact with contaminated soil or debris and to enhance the growth of vegetation for erosion control and increased evapotranspiration. A soil-synthetic membrane-clay cap performs these functions and, in addition, minimizes infiltration into the landfill. The benefit is a reduction in the quantity of leachate that is migrating to the groundwater. Theoretically, this will result in cost savings by reducing the time period over which the leachate and groundwater need to be collected and treated.

Comment. The relocation of the unnamed ditch is unwarranted and inappropriate for the ECC site (ECC Steering Committee).

U.S. EPA Response. EPA considers ECC and NSL to be one site (see comments on COMBINATION OF SITES). The unnamed ditch was rerouted to the western side of the ECC site to allow placement of a continuous cap across the combined site, and to minimize the length of the collection system and groundwater monitoring system.

Cooling Pond Sludge

Comment. Removal of the soil (sludge) from the bottom of the former cooling pond is unwarranted since the pond was previously dredged and no data exists to indicate that the existing soil is contaminated. The removal of this material would provide only minimal benefit to groundwater protection (ECC Steering Committee; Tricil).

U.S. EPA Response. During removal of the contaminated sludge from the cooling pond, significant dewatering problems were encountered and all the contaminated sludge may not have been removed. As a result, the cooling pond is still a potential source of contamination. The selected alternative included further investigation of the pond contents and removal, if necessary. In response to comments and further evaluation U.S. EPA believes that even if the pond contents are contaminated, removal would provide minimal benefit since offsite migration of contaminants would be prevented by the cap and the groundwater collection and treatment system included in the recommended alternative.

Groundwater Treatment

Comments. No data were presented to substantiate that there is sufficient BOD or biodegradable COD in the leachate and groundwater to sustain a biological treatment system (NSL Steering Committee).

U.S. EPA Response. As mentioned in the NSL-FS and the CAA, the treatment system was developed with only limited data. Pilot studies and additional sampling are necessary to determine if the proposed treatment system is the most cost-effective system. The powdered activated carbon treatment (PACT) system was chosen for the purpose of cost estimating because it is a viable alternative and it offers a large degree of flexibility. The PACT system has been shown to operate effectively with influent BOD and COD concentrations as low as 50 mg/l and 100 mg/l, respectively (Zimpro Inc. Technical Bulletin). Historical data from the monitoring wells at NSL indicated a range of COD concentrations from 1 mg/l to 300 mg/l. The COD concentrations in the leachate are expected to be much higher based on typical concentrations reported in municipal landfill leachate[1]. Additional data and testing are necessary to define the characteristics of the leachate and groundwater before a treatment system can be designed.

Comment. The groundwater treatment system selected for the ECC site is inconsistent with the system selected for both sites (ECC Steering Committee).

U.S. EPA Response. The CAA states that additional sampling and pilot studies are necessary to determine the most cost-effective treatment system for the leachate and groundwater from the combined sites. The system selected in

[1]Tchobanoglous, Theisen, and Eliassen Solid Wastes. New York: McGraw-Hill, Inc., 1977. p. 332.

the ECC-FS for ECC site alone would not be appropriate for the combined sites because the leachate from NSL is expected to have a much higher BOD with a significant portion in the form of nonhazardous organic matter. Since activated carbon will not preferentially remove the hazardous organics, the organic matter will quickly saturate the carbon bed necessitating frequent replacement and resulting in high operational costs. As mentioned in the NSL-FS, the organic matter must be treated prior to activated carbon adsorption. The NSL-FS presented two treatment options--biological treatment followed by activated carbon adsorption and activated carbon enhanced biological treatment (PACT).

In addition, the NSL-FS and CAA proposed a precipitation system be added to the treatment facility for removal of metals detected in the leachate from NSL.

Comment. The concentrations of heavy metals are too low for effective removal by chemical precipitation (NSL Steering Committee).

U.S. EPA Response. The NSL-FS and CAA state that pilot and bench-scale testing are necessary to refine the treatment system. Additional sampling must be performed to better define the heavy metal concentrations in the groundwater and leachate. Pilot and bench-scale testing will then determine which system is the most cost-effective for meeting the discharge limits. The chemical precipitation was selected for cost estimating purposes and is a viable alternative.

Comment. EPA has not addressed adverse health impacts associated with the use of carbon adsorption. Contaminants will be removed from the surface or groundwater only to be released to the environment elsewhere. Carbon adsorption could even pollute the wastewaters being treated. The presence of metals and other potentially toxic materials in carbon, particularly regenerated carbon, may pollute the treated waters (Jeffboat and Rock Island Refining).

U.S. EPA Response. Activated carbon adsorption is a well established technology widely used throughout the world for treatment of drinking water as well as wastewater. The comment that carbon may actually pollute the water being treated is unsubstantiated. More specific information is necessary to better address this comment.

The system proposed in the FS's and CAA would use new or "virgin" carbon. The saturated or "spent" carbon would be incinerated or disposed of properly in a RCRA landfill.

Comment. The treatment system proposed would not be capable of treating and reducing chloride, total dissolved solids, sodium, or other similar components found in landfill leachate (Jeffboat and Rock Island Refining).

U.S. EPA Response. Although the proposed treatment system is not specifically designed for removal of these constituents, some reduction is expected to occur. The discharge limits for the conventional pollutants and hazardous substances will be established in the NPDES permit. If additional treatment processes are necessary to reduce chloride, total dissolved solids, sodium or other constituents, they will be included in the final design.

Comment. The proposed groundwater treatment system is not currently needed based on the statement in the CAA that "failure of the...treatment system is not likely to pose a risk to public health or environment over the short-term at present contaminant levels" (Chrysler).

U.S. EPA Response. At the current contaminant levels, the risk to public health or environment is based on long-term exposure. Failure of the treatment system for a short period of time would not pose additional risk. If concentrations increase, then even short-term exposure may increase the risk to public health or the environment (see comments under Endangerment Assessment for further information).

Comment. The ultra-conservative approach to various elements of design is additive yielding an unnecessarily expensive design (NSL, Inc.).

U.S. EPA Response. The combination of total flows and loadings which could occur were used for conceptual design purposes. EPA recognizes the proposed treatment system is based on conservative assumptions. Additional sampling and pilot ~~and~~-bench-scale testing will be performed to better define the wastewater characteristics and to develop the most cost-effective treatment system.

Comment. EPA failed to consider energy consumption in their analysis of alternatives, i.e., pumping costs for groundwater collection and use of coal for activated carbon (Jeffboat and Rock Island Refining).

U.S. EPA Response. Neither the amount of energy consumption nor the utilization of resources is of such a magnitude as to discount any of the alternatives.

Comment. EPA has not provided for the treatment of water from construction of the groundwater collection trench. Offsite transport of this waster for treatment would substantially increase the cost of (CAA) Alternative 5 (Jeffboat).

U.S. EPA Response. The quantity of water requiring storage and treatment from dewatering during construction will be estimated during the predesign phase. The onsite treatment system will be designed and installed to handle this water.

Comment. EPA has not considered the impact on the schedule for completing the corrective action if it were required to install the wastewater treatment system for use in treating waters resulting from dewatering during the installation of the groundwater interceptions system (Jeffboat).

U.S. EPA Response. The schedule for completing the corrective action will be developed in the predesign phase. Storage and treatment of the water from dewatering will be taken into account. It is not expected to take any longer then the installation of the cap and the groundwater collection system.

POTW Treatment

Comment. The exclusion of POTW treatment based on uncertainty of operational costs and whether or not approval to discharge would be granted is arbitrary and capricious (Tricil).

U.S. EPA Response. Treatment at the Indianapolis POTW was excluded based on the following reasons:

- The City of Indianapolis may refuse to accept CERCLA wastes.

- The City of Indianapolis has required, in the past, that the discharge of wastes from a groundwater extraction site have no organic contamination above the detection limits. Subsequently, an onsite treatment system would be required.

- An increased sewer fee would be imposed based on the inorganic priority pollutants in the wastewater. This could substantially increase the operational costs.

- The 27-inch sanitary sewer at 86th Street to which the flows from the site would be discharged has historically surcharged during wet weather (rainfall of 1/2-inch or greater) and bypasses occur 50 percent of the time. Thus, if flows from the site were to be piped to the sewer system in Indianapolis, additional onsite holding capacity would be required during wet weather.

In-Stream Aeration

Comment. In-stream aeration has been arbitrarily eliminated because of "low removals of methylene chloride," (a substance frequently acknowledged as being the result of laboratory contamination) and because "aquatic life in the unnamed ditch would experience extreme detrimental effects." Aeration could in fact be beneficial by increasing the dissolved oxygen content of the water (Tricil).

U.S. EPA Response. The concentrations of methylene chloride used for determining removal efficiencies of the in-stream aeration system were the projected future concentrations based on actual soil sample data and estimated leaching rates.

In-stream aeration was eliminated for the potential detrimental effects to public health and environment in addition to the poor methylene chloride removal efficiency. The system would have no means of controlling emissions and the volatilization of contaminants could pose a risk to public health. The detrimental effects to the aquatic environment from basin construction and turbulence of the aerators during operation outweigh any benefit from increased dissolved oxygen in the stream. The creek would also have to be reclassified (see response to stream reclassification in Section 4.6 REMEDIAL INVESTIGATION DATA).

Soil Vapor Extraction

Comment. Since the material detected in the soil on the ECC side does not represent a significant risk to offsite receptors [sic] the operation of a soil vapor extraction system would not constitute a significant or cost-effective mitigation for the site [sic]. EPA stated that most of the compounds would decay to levels below the 10^{-6} cancer risk within 10 years, and the benefits of the system for groundwater collection and treatment are minimal (ECC Steering Committee).

U.S. EPA Response. The U.S. EPA does not consider the advantages of the soil vapor extraction system to outweigh the costs. The reasons are stated on page 4-4 of the CAA:

> "Because a public health threat would remain in the event of future ECC site development and because removal of VOC's from the unsaturated zone is not expected to affect groundwater collection and treatment, the advantages of soil vapor extraction are not considered great. The expenditure of $2,000,000 in present worth for ECC soil vapor extraction for the marginal reduction in health threat is not considered cost-effective. Alternative 7 is not recommended by EPA."

Comment. Soil vapor extraction is technologically infeasible and unreliable for the reason that it is "conceptual in nature" at this time. EPA explicitly states that a pilot treatability study would have to be performed even before a design can be undertaken (Jeffboat and Rock Island Refining).

U.S. EPA Response. The statement in the ECC-FS that the soil vapor extraction system is "conceptual in nature" refers to the particular layout and sizing of the system. The technology is feasible and reliable and has been used in numerous applications similar to the one proposed for ECC. The ECC-FS states that pilot tests are necessary to further assess the feasibility for use on onsite soils and to accurately design the number of wells required, the amount of piping, and the size of the compressors. This alternative was not selected by the U.S. EPA because of its cost.

Incineration

Comment. Incineration of ECC soils is technically infeasible and unreliable because air emissions likely resulting from the incineration could present health and environmental risks equal to or greater than those risks allegedly posed by the ECC contaminated soils (Jeffboat and Rock Island Refining).

U.S. EPA Response. Incineration of the contaminated soils at ECC is technically feasible and reliable and has been used in similar situations. The design of the incinerator would include air emissions control equipment so that the emissions would be in compliance with the appropriate regulations. The process of permitting an incineration facility is very extensive and the potential for risks to public health or environment would be assessed in detail. This alternative was not selected by U.S. EPA.

Onsite RCRA Landfill

Comment. Construction of an onsite RCRA landfill is technically infeasible and unreasonable for the reasons that excavation of the waste materials could present significant health and environmental threats. Also, such a corrective action could delay significantly the time in which corrective action would be undertaken at the site, allowing the site to be uncorrected during a period when it could pose its greatest threats to the public health and environment (Jeffboat and Rock Island Refining).

U.S. EPA Response. On page 4-5 of the CAA, it states that an onsite RCRA landfill "is not considered cost-effective by EPA when the hazards induced by site excavation are considered and...a lower cost alternative with a similar level of protection for public health and environment" is available. The reasons for discounting the onsite RCRA landfill, however, do not make it technically infeasible. This alternative was not selected by U.S. EPA.

Comment. Tables 5-6 to 5-11 of the NSL-FS show inconsistency in the use of multipliers to estimate total capital costs for each alternative (NSL Steering Committee).

U.S. EPA Response. Specific items in Tables 5-6 through 5-11 were estimated based on a percentage of the estimated construction costs. These percentages were modified for some alternatives to better reflect the level of effort. For example, the engineering design costs for Alternative 2 were estimated to be about 5 percent of the total implementation cost or $400,000. Alternative 3 would require more level of effort to design the RCRA cap and the design cost was estimated as $450,000 which is approximately 2 percent of the total implementation cost. Assuming 5 percent would have resulted in an excessive design cost of $1,000,000.

Comment. The cost estimate for the water treatment system are particularly suspect because there is no basis for assuming the limitations to be imposed upon discharges (Jeffboat and Rock Island Refining).

U.S. EPA Response. The NPDES permit for the discharge of the onsite wastewater treatment system has not been established yet. In order to prepare a cost estimate, assumptions had to be made concerning the level of treatment. Those assumptions are stated in the FS's and CAA. The costs could vary significantly if the discharge limits are substantially different than those assumed.

4.10 REMEDIAL ALTERNATIVE PREFERENCES

Comment. The Hoosier Chapter of the Sierra Club supports the EPA proposal to contain the contaminants coming out of the site.

The Citizens Environmental Council, Inc. thought that the proposal recommended by the EPA as the preferred remedy seems quite acceptable but do not favor onsite treatment of wastewater. However, they stated that most or all of their requisites are addressed by the EPA's remedies. They also hoped that site closure and the start of cleanup effort be underway as soon as possible.

Dee Fox, a private citizen, thought that the EPA's Alternative 5 is a good one and favored the EPA's plan to treat leachate and groundwater to remove contaminants rather than the state's plan to just wall them in and urged that the job be done "as quickly and thoroughly as possible!"

Richard and Elizabeth Idler, private citizens, strongly encouraged proceeding with institution of Alternative 5 to eliminate this "environmental menace" because it covers the site, limits access and future development, minimizes leachate, intercepts and treats potentially contaminated groundwater, and provides for monitoring of the underlying aquifer.

The Toxic Action Project stated that any plan short of the one chosen by the EPA would be a disservice to the community of Zionsville. They also presented their belief that Congress, EPA, and research organizations have stated that land disposal of hazardous waste is the least desirable alternative for handling waste streams and that waste reduction should be the national policy.

U.S. EPA Response. The U.S. EPA appreciates the public's support of the Recommended Alternative and concern that remediation efforts at the site proceed as soon as possible. The U.S. EPA is presently performing Preliminary Design investigations as a prelude to design, which includes testing of treatment plant performance for removing contaminants from collected groundwater and leachate. The U.S. EPA is also continuing negotiations with Potentially Responsible Parties (PRP's) concerning U.S. EPA's selected remedy in order to assess the degree of participation anticipated from each PRP in remediation of the site.

Comment. The only appropriate alternative identified by U.S. EPA for Enviro-Chem is the ECC FS Alternative 2 (ECC Steering Committee).

The U.S. EPA identified risks that were not shown to be invalid [sic] are effectively mitigated by a modified Alternative 2 in the NSL FS which would delete the soil cover, removal of creek and leachate sediments, and rerouting of unnamed ditch and Finley Creek [sic] (NSL Steering Committee).

Based on the lack of a current health threat and absence of data on future health threats, the recommendation that installation of a cap on the site to minimize future migration of contaminants, maintenance of the leachate collection system, and careful monitoring of surface and groundwater to confirm that the site continues to pose no health risk should have been made [sic] (Chrysler).

U.S. EPA Response. To date none of the risks identified have been shown to be invalid. The information presented in the FS's and CAA justifies the combination of the sites and the implementation of an alternative that protects not only human health but also the environment from existing and future threats.

U.S. EPA's recommended Alternative 5 in the CAA meets the objectives of protecting human health and the environment and remedial action goals and is the most cost-effective alternative.

Comment. Orchard and Sunnen endorse the remedial action plan set forth in the adopted final order of the IDEM Board on January 21, 1987, with the understanding that it is substantially similar to U.S. EPA alternative No. 3 with the addition of a slurry wall (Orchard Corp.; Sunnen Co.).

In lieu of its Alternative 5, the U.S. EPA should adopt a corrective action that is similar to Alternative 2 with the exception that a slurry barrier wall, consistent with the state requirements as determined in Cause N-95 adopted by the Indiana Solid Waste Management Board on January 21, 1987, be installed or alternatively a groundwater collection system such as that described in Alternative 4.

U.S. EPA Response. The objective of a groundwater interception system is to prevent contaminated groundwater from migrating offsite. The objective of a slurry wall is essentially the same with the exception that something must be done with the rainfall that ultimately infiltrates into the ground and which could build up behind a slurry wall. The U.S. EPA selected the more active option of collecting groundwater to achieve the objective because of potential infiltration and the added benefit that contaminants can then be removed from the groundwater in the treatment process. The State of Indiana believes the U.S. EPA's alternative is at least as protective as a slurry wall.

Comment. If one assumes that something must be done then the most logical choice would be the low cost access restriction and monitoring alternative identified in the CAA as Alternative 2. Ferro submits that "no action" Alternative 1 should be selected for NSL and if that is rejected Alternative 2 should provide adequate protection and if that is rejected Alternative 4 is the least objectionable of the remaining seven alternatives (Ferro Corp.).

U.S. EPA Response. The U.S. EPA has found that to protect human health and the environment from existing and future threats remediation of the site is necessary. This would include the interception and treatment of contaminated groundwater and the installation of a cap that meets the requirements of RCRA.

Comment. Why can't the Northside site just be monitored for now since studies show that contamination levels are decreasing? (NSL/ECC December 17, 1986 Public Meeting.)

If the distances between the wells and surface waters were increased, travel times may be long enough to allow implementation of remedial actions after monitoring (NSL Steering Committee).

U.S. EPA Response. For results on existing monitoring please refer to responses in Section 4.8 Hydrogeology. The U.S. EPA has looked at the contamination at Enviro-Chem and Northside and at the results in the remedial investigation reports. The U.S. EPA feels the results justify action. The U.S. EPA does not feel that the remedial action goals of protecting human health, welfare and the environment at Northside and Enviro-Chem are met by Alternative 1, Alternative 2 or Alternative 3. CERCLA does not permit U.S. EPA to implement an alternative which allows offsite migration of contaminants. A proposed adequate early warning monitoring system which can be implemented has not been presented to the U.S. EPA.

Comment. Alternative 9, the RCRA landfill, is located on the north side of the Northside site. Since RCRA sites are only placed in those geological locations best equipped to control landfills is the U.S. EPA saying that that area is a good site to put a RCRA landfill (NSL/ECC December 17, 1987 Public Meeting).

U.S. EPA Response. The onsite RCRA landfill was presented in the FS and CAA to expand the range of remediation alternatives. It was proposed for onsite because offsite transportation cost would have made the alternative very expensive. When material at a Superfund site is disposed onsite it must comply with RCRA requirements. What is presented is a Superfund alternative that disposes the material from Northside in an onsite RCRA landfill. The conceptual design of a RCRA landfill includes an expensive, double-lined floor with several feet of clay in addition to the geologic material below it, which is enough to locate the facility as shown in Alternative 9. The existing NSL does not have a bottom liner.

Comment. The misconstruction and improper application of Section 121 of CERCLA requirements has resulted in the rejection of alternatives consistent with the NCP and the recommendation of an alternative which is not cost-effective.

The comparison of leachate and groundwater contaminant concentrations to Indiana Water Quality Standards is not applicable and was improperly applied (Tricil; NSL Steering Committee).

U.S. EPA Response. CERCLA as amended by SARA Section 121 dictates cleanup goals and standards. The treatment of contaminated soils, refuse, leachate, and groundwater in order to permanently and significantly reduce the volume, toxicity, or mobility of contaminants at the NSL/ECC site is preferred. However, the treatment of NSL soils and refuse would be nearly impossible because of the large volume and variety of materials present and the associated high cost. Treatment of ECC soils alone would not significantly reduce the amount of contamination at the combined site.

Since contaminated surface and groundwaters presently are discharging from the site to Finley Creek, contaminant concentrations in leachate and groundwater are of concern. The published criteria are ARAR's which are protective of warm water aquatic life and human health for ingestion of aquatic organisms.

Comment. Parts of Alternative 5 should be implemented as the need arises, while groundwater monitoring continues with time (NSL Steering Committee).

U.S. EPA Response. There is presently the need for capping the landfill and for collecting leachate. Alternative 5 includes groundwater monitoring for the purpose of remedy performance. Concentrations of contaminants in groundwater along the west and south boundaries of the landfill presently exceed ARAR's, so it must be collected and treated.

Comment. The selected EPA Alternative 5 is a complex remedial action (NSL, Inc.).

U.S. EPA Response. The selected alternative for the NSL site effectively mitigates and minimizes threats to, and provides adequate protection of, public health and welfare and the environment. The selected alternative was technically evaluated on the bases of performance, reliability, implementability, and safety, and was determined to be acceptable. Complexity of an alternative is not evaluated outside of the above considerations.

GLT6[illegible]

Appendix A

Appendix A
EVALUATION OF INDIANAPOLIS WATER COMPANY DATA

Since December of 1983, the Indianapolis Water Company (IWC) has periodically collected water samples in Eagle Creek Reservoir watershed, including Finley Creek upstream of the Highway 421 bridge. The samples were analyzed for volatile organic compound content. In this appendix, the total VOC concentrations of the samples taken at the Highway 421 bridge are compared to the estimated streamflow at the site (based on data from the nearest USGS gauge).

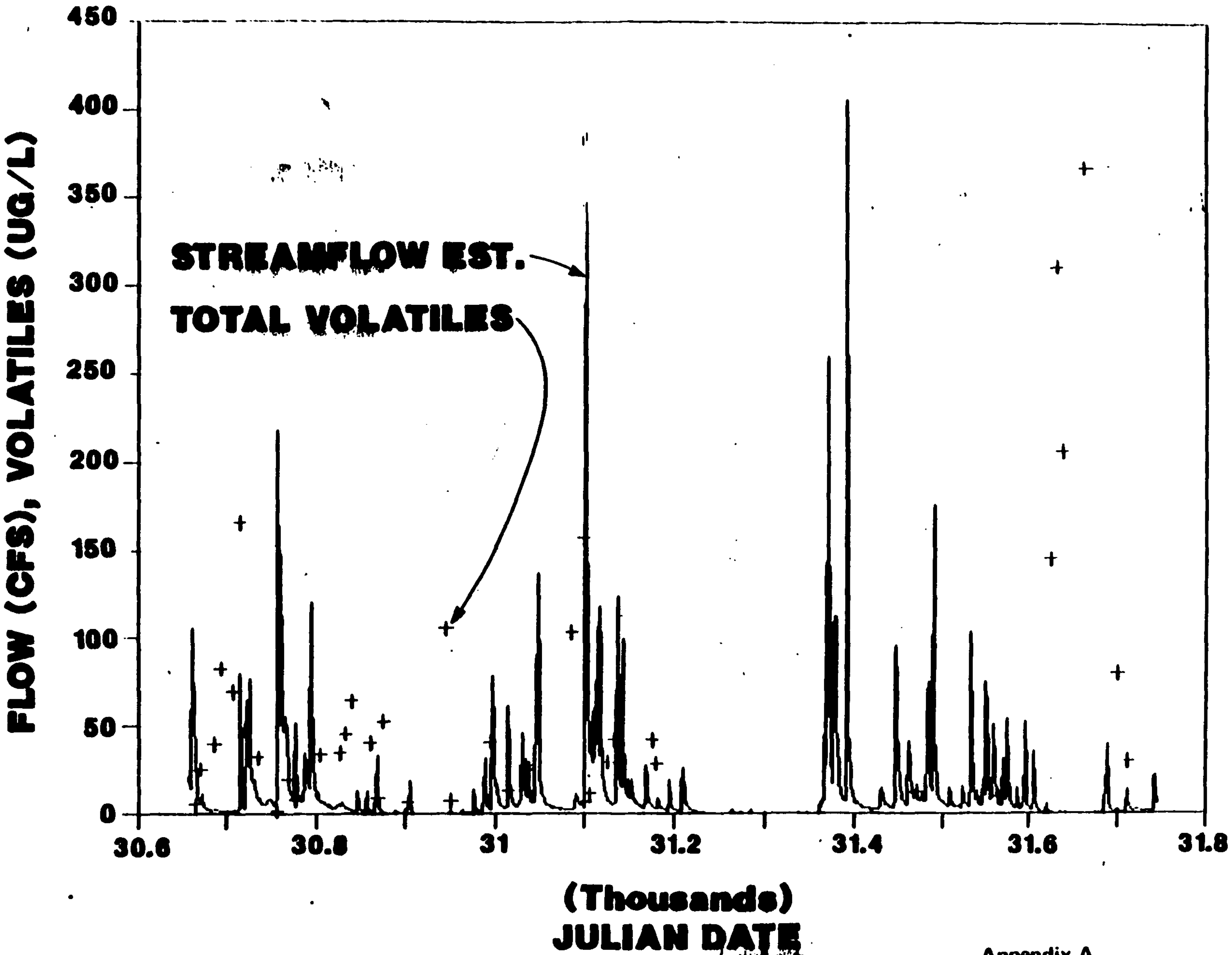
Figure 1 shows the plot of the total VOC's versus time. It also shows the streamflow for each day during the period of December 14, 1986, (Julian Date = 30664) through October 27, 1986, (Julian Date = 31712). The plot shows that the samples were collected during a variety of flow conditions, and higher VOC concentrations tend to be associated with lower flows.

In Figure 2 the stream data has been sorted from highest (left side) to lowest (right side) flow and plotted against the percent of time each flow has been exceeded. The VOC concentrations observed when each flow occurred is plotted at the same horizontal plotting position. As shown in Figure 2, the higher VOC concentrations occur when the flows are low.

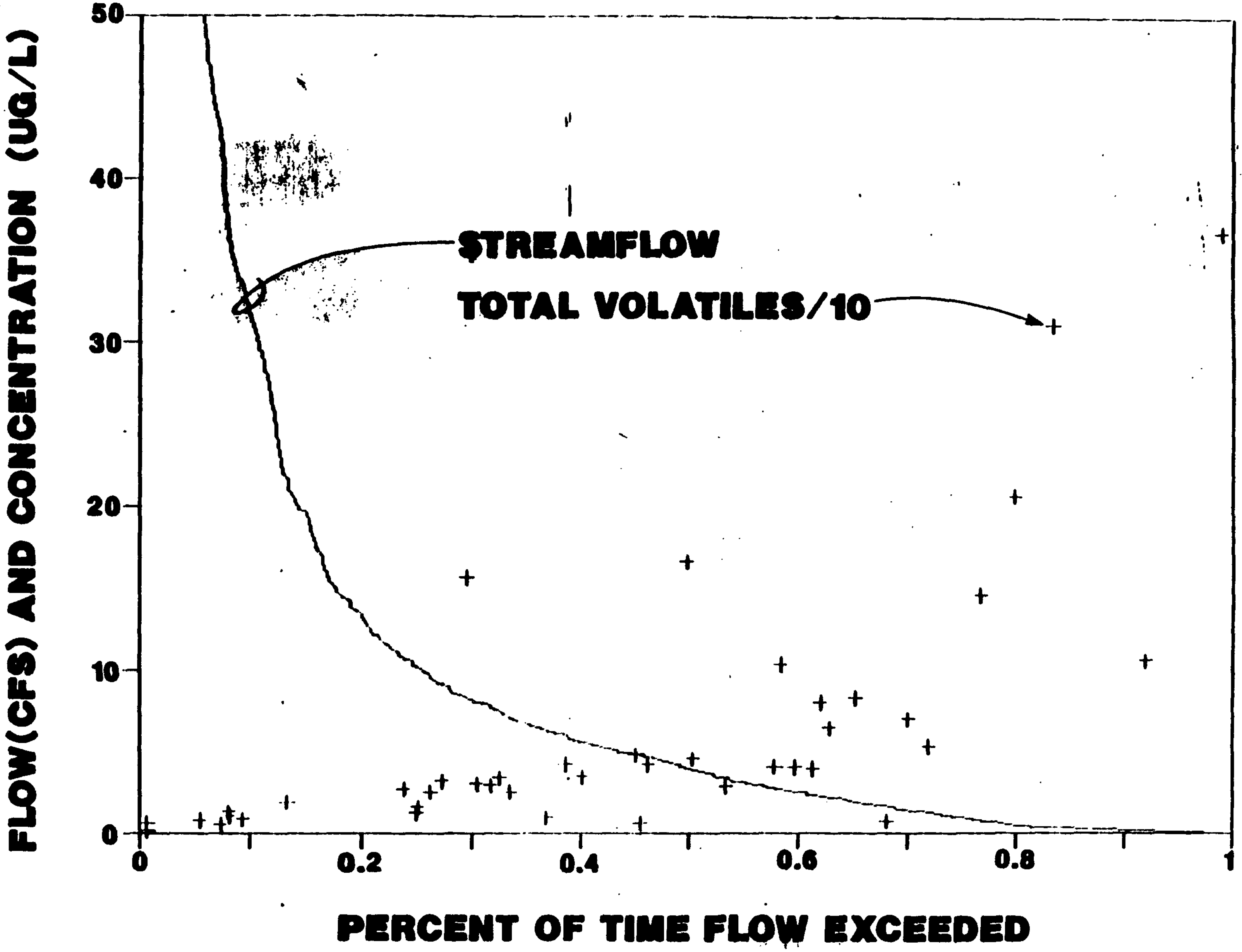
The strength of this observed relationship was statistically evaluated for 1,1,1-tetrachloroethane (1,1,1-TCA). As shown on Figure 3, 1,1,1-TCA was found to relate linearly with the log of the flow with a coefficient of variation of 0.64. This can be interpreted to mean 64 percent of the variation in the 1,1,1-TCA concentration can be directly related to the variation in streamflow.

If the source of the VOC's, and 1,1,1-TCA in particular, were a constant discharge such as from a leaking drum or a point source discharge, then the concentrations should decrease linearly as flow increased and the coefficient in the regression equation would be -1.0 rather than -0.57. If the source were surface runoff, the coefficient would approach 0.0 since concentration would be more independent of flow. The -0.57 indicates some dilution at higher flows. Consequently, the source appears to be affected by factors affecting natural streamflow. The -0.57 coefficient is consistent with that expected of a contaminant transported to the stream through the groundwater--the source quantity varies with streamflow but does not vary as rapidly as surface flow.

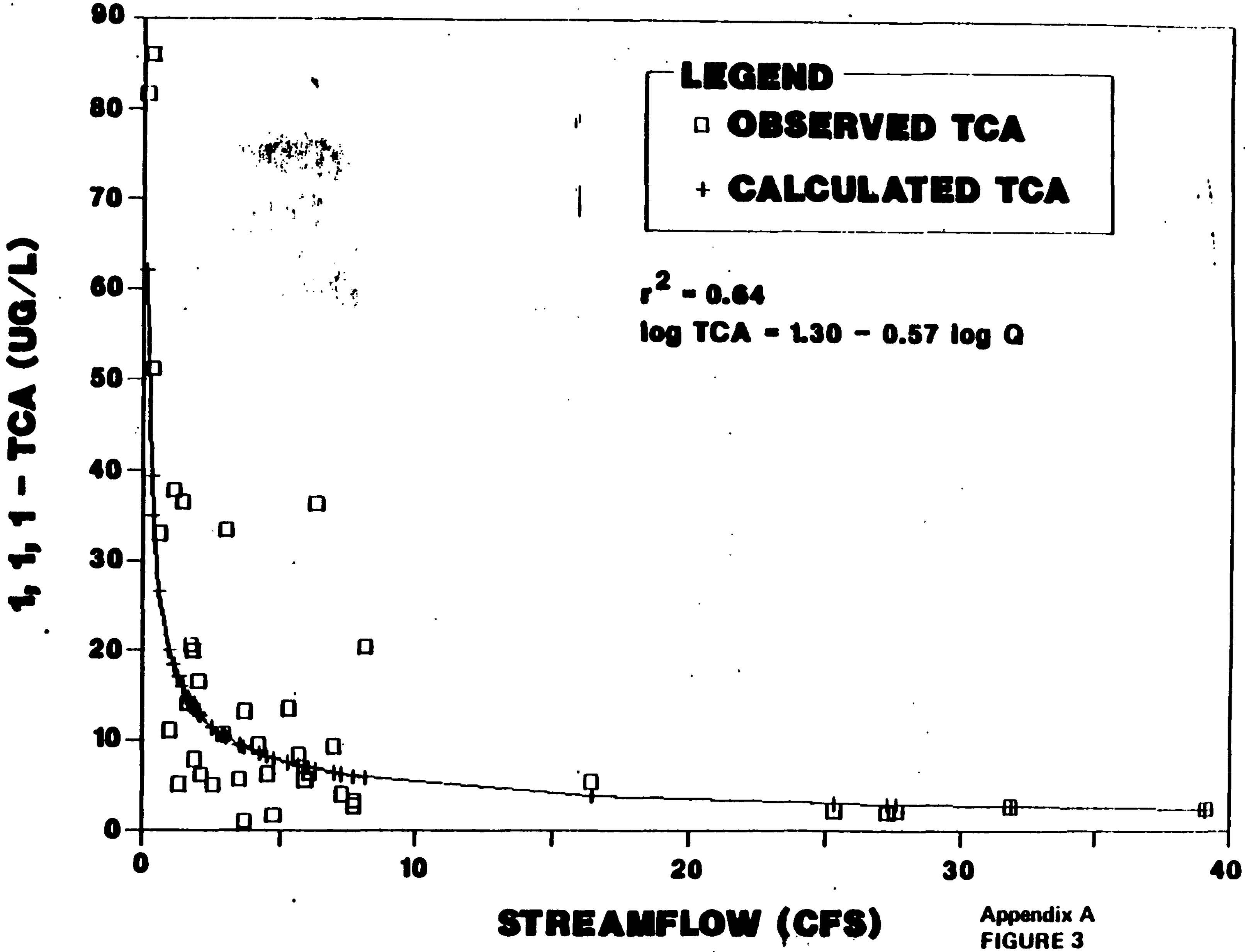
Table A-1 is a summary of the IWC data showing the sampling dates, compounds observed, and concentrations. The table also presents potential risk associated with recreational use of



Appendix A
FIGURE 1
INDIANAPOLIS WATER COMPANY (IWC)
DATA SUMMARY
FLOW AND TOTAL VOLATILES
NSL/ECC RS



Appendix A
FIGURE 2
INDIANAPOLIS WATER COMPANY (IWC)
FLOW FREQUENCY AND TOTAL V TILES
NSL/ECC RS



Appendix A
FIGURE 3
INDIANAPOLIS WATER COMPANY (IWC)
DATA SUMMARY
1,1,1-TRICHLOROETHANE (TCA)
VERSUS TOTAL STREAMFLOW
NSL/ECC RS

APPENDIX TABLE A1
INDIANAPOLIS WATER COMPANY DATA FROM 1984 TO 1986 IN MICROGRAMS PER LITER
RESPONSIVENESS SUMMARY

DATE	1,1,1-TCA	1,1-DCA	CIS-1,2-DCE	TCE	PCE	CHLOROFORM	1,1-DCE	DCM	VC	CHLOROETHANE	TOTAL	DETECTED AT EAGLE CREEK INTAKE
14-Dec-83 **	2.8			2.2	0.5						5.5	
20-Dec-83 **	13.6			11.2	0.5						25.3	
05-Jan-84	20			19 (2.2)	0.8						39.8	
12-Jan-84	36.5			44.6	1.7						82.8	
26-Jan-84	37.8			30.4 (1.0)	1.7 (1.1)						69.9	* TCE 1 ug/l
02-Feb-84	33.4		107.2	25.6 (3.0)							166.2	* TCE 0.8 ug/l
09-Feb-84	13.3		27.4 (16.0)	7.6							48.3	
23-Feb-84	9.4		18.5	4.5							32.4	
16-Mar-84	2										2.0	
29-Mar-84	5.5		10.9	3							19.4	
05-Apr-84	2.6		4.9	0.9							8.4	
03-May-84	0.5		30.9	2.6							34.0	
24-May-84	9.7		22.9	2.3							34.9	
31-May-84	10.8		33	2							45.8	
07-Jun-84	14.2		48.2	2.3							64.7	
28-Jun-84	8		30.8	1.9							40.7	
05-Jul-84	2.3		6.8								9.1	
12-Jul-84	11.2		39.9	2.1							53.2	
08-Aug-84	1.1		5.4								6.5	
20-Sep-84	81.7	0.5	0.5	14.7	0.9	6.6	0.5				105.4	
25-Sep-84	5.2	0.5	0.5	1.5							7.7	
08-Nov-84	6.2	2.7	29.9	1.2		0.9					40.9	
29-Nov-84	2.2	1.1	10.2								13.5	* chloroform 1.1 ug/l
19-Dec-84 ***	20.5							7.1			27.6	
20-Dec-84	4.1	1.0	19.3	1.3							25.5	
07-Feb-85	16.6	6.6	73.4 (1.3)	4.6	0.5	1.5 (0.5)		0.5			103.7	* chloroform 0.5 ug/l
21-Feb-85	36.4	6.0	54.0 (0.5)	9.5	1.3 (0.5)			40 (0.5)			156.8	
22-Feb-85	1.0		1.0	0.5				2.6 (0.5)			6.7	
28-Feb-85	2	0.5	8	0.5							11.0	
21-Mar-85	5.7		19.0	1.2			1.4	0.5	0.5		29.1	* DCM 1.7 ug/l
28-Mar-85	6.3	1.9	31.6	0.5		0.5		0.5		0.5	41.8	* DCM 0.5 ug/l and cis -1,2-DCE 0.5 ug/l
12-Apr-85	3.4	0.5	11.5	0.5							15.9	* DCM 0.5 ug/l
08-May-85	5.6	1.5	33.6	0.5					0.5		42.1	
13-May-85 ***	5.1	1.3	7.1	3.3				5	7		28.8	
20-Feb-86	2.0		6.0	4.0							12.4	* cis -1,2-DCE 1 ug/l
02-Jun-86	1.7	0.5	7.2						0.5		9.9	* cis -1,2-DCE 0.5 ug/l
30-Jul-86	33	10.9	99.9	1.9							145.7	
05-Aug-86	86	23.0	196 (0.9)	6.1					4.2		311.1	
12-Aug-86	51.2	13.1	138	2.1					2.2		206.6	
05-Sep-86	176	32.2	138	3			2.2	0.5	11.1		363.0	
15-Oct-86	28.7	5	52.2						0.5	1.8	88.2	
27-Oct-86	6.4	1.1	22.7								30.2	
Average	19.6	6.0	38.2	6.4	1.0	2.4	1.4	8.1	3.3	1.2	62.0	

* Indicates surface water sampling data at Eagle Creek Reservoir intake.
** Indicates surface water sampling data from ECC RI location SW004.
*** Indicates surface water sampling data from NRL RI location SW008.
() Indicates concentrations observed in Eagle Creek at 86th Street.
Note: Compounds detected in trace amounts are entered in the table as 0.5 ug/l for reporting purposes.
Compounds observed only once:
Pentachloroethane detected in Finley Creek at HWY 421 on 9/5/86 at 3.0 ug/l.
Chloroethane detected in Finley Creek at HWY 421 on 9/20/86 at trace levels (recorded as 0.5 ug/l).
Bromoform detected in Finley Creek at HWY 421 on 3/20/86 at trace levels (recorded as 0.5 ug/l).
1,1,2-TCA detected in Finley Creek at HWY 421 on 9/5/86 at 1 ug/l.

CARCINOGENIC RISKS ATTRIBUTABLE TO AVERAGE CONCENTRATIONS

	1,1,1-TCA	1,1-DCA	CIS-1,2-DCE	TCE	PCE	CHLOROFORM	1,1-DCE	DCM	VC	CHLOROETHANE	TOTAL CARCINOGENIC RISK
INGESTION OF FISH	NA	NA	NA	6.5E-08	1.4E-07	6.3E-08	4.0E-07	2.7E-08	7.0E-07	NA	1E-06
INGESTION OF WATER DURING SWIMMING	NA	NA	NA	1.0E-09	7.6E-10	2.9E-09	1.8E-08	9.1E-10	1.1E-07	NA	1E-07
DERMAL ABSORPTION DURING WADING	NA	NA	NA	2.4E-08	1.7E-08	6.5E-08	2.0E-07	2.1E-08	2.6E-06	NA	3E-06
TOTAL				9E-08	2E-07	1E-07	7E-07	5E-08	3E-06		5E-06

Finley Creek upstream of Hwy 421 bridge due to the calculated average concentration of the various VOC's observed.

Table A-2 is the presentation of sampling results from a June 8 and 9, 1987, reconnaissance of Finley Creek and unnamed ditch. The sampling locations correspond to those shown in Figure 4.

GLT614/30

APPENDIX TABLE A2
USL/ECC SURFACE WATER DATA
RECONNAISSANCE SAMPLING TRIP
RESPONSIVENESS SUMMARY

Sample Point:	SW-1	SW-2	SW-3	SW-3	SW-3	SW-4	SW-12	SW-30	SW-5	SW-5	SW-9	SW-10	SW-14
Sample Location:	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/DWN	FC/UP	FC/UP	FC/BACKGR
Sample Number:	SW101-01	SW102-01	SW103-01	SW103-02	SW103-03	SW104-01	SW112-01	SW130-01	SW105-01	SW105-02	SW109-01	SW110-01	SW114-01
Date Sampled:	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87	6-8-87
Control Number:	C2257	C2258	C2259	C2260	C2261	C2263	C2264	C2265	C2266	C2267	C2272	C2273	C2277
ORGANIC COMPOUNDS (ug/l)													
VOLATILES													
ENE								1 J					
YLBENZENE								10.2					
OROBENZENE								41					
-DICHLOROBENZENE	0.5 *	0.5 *	0.5 *	0.5 *	1.3 J	0.5 *		31					
OROETHANE	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *		109					
1-DICHLOROETHANE	1.6 J	1.5 J	1.6 J	1.6 J	1.5 J	1 J		149					
2-DICHLOROETHANE								0.5 *					
1,1-TRICHLOROETHANE	5	5.5	5.4	6.0	6.3	4.9		100					
1,2-TRICHLOROETHANE													
-DICHLOROETHENE	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *		7.1					
IS-1,2-DICHLOROETHENE	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *		12.4					
1,2-DICHLOROETHENE	19	21	21	22	23	10		164					
CHLOROETHENE	0.5 *	0.5 *	0.5 *	0.5 *	0.5 *			16.4					
ACHLOROETHENE								6.1					
OROETHANE													
YLENE CHLORIDE (DCM)													
ENE								9					
L CHLORIDE	1.6 J	1.5 J	1.5 J	1.6 J	1.6 J	1.6 J		59					
ONE													
TANONE (MEK)													
THYL-2-PENTANONE (MIBK)													
ENE													
AHYDROFURAN								45					
OWN COMPOUND													
LENE								76					
L VOLATILES	20.3	32	32	34.5	35.7	20.5	0	930.7	0	0	0	0	0
UCTIVITY (umhos/cm2)	502	544	576	576	576	520	560	1200	576	576	576	469	544
RATURE (C)	25	25	25	25	25	26	27	26	28	28	27.5	26	25

FOOTNOTES:
* - Indicates compound positively indetified , concentration is estimated to be less than 1 ug/l (0.5 entered in table for reporting purposes).
J - Indicates compound positively identified , concentration is estimated.

APPENDIX TABLE A2
USL/ECC SURFACE WATER DATA
RECONNAISSANCE SAMPLING TRIP
RESPONSIVENESS SUMMARY

Sample Point:	SW-11	SW-6	SW-7	SW-8	SW-13	SW-13	SW-31	SW-31	SW-15	SW-16	SW-32	SW-32	SW-32
Sample Location:	PC/BACKGR	UD/DNR	UD/DNR	UD/DNR	UD/DNR	UD/DNR	ECC SUMP	ECC SUMP	UD/UR/ECC	UD/BACKGR	USL SEEP	USL SEEP	USL SEEP
Sample Number:	SW111-01	SW106-01	SW107-01	SW108-01	SW113-01	SW113-02	SW131-01	SW131-02	SW115-01	SW116-01	SW132-01	SW132-02	SW132-03
Date Sampled:	8-8-87	8-8-87	8-8-87	8-8-87	8-8-87	8-8-87	8-9-87	8-9-87	8-9-87	8-9-87	8-9-87	8-9-87	8-9-87
Control Number:	C2276	C2268	C2270	C2271	C2274	C2275	C2280	C2281	C2278	C2279	C2282	C2283	C2284
ORGANIC COMPOUNDS (ug/l)													
VOLATILES													
ZENE		0.5 *					3.8	4.2					
HYLBENZENE							36	42					
LOROBENZENE							1.8 J	1.6 J					
2-DICHLOROBENZENE							34	38					
LOROETHANE		60	2.1	5.8	12.8	16.4	180	200			12.1	9.2	
1-DICHLOROETHANE		27	0.5 *	0.5 *	2.2	2.5	6450	5000				0.5 *	
2-DICHLOROETHANE		0.5 *					59	49					
1,1-TRICHLOROETHANE		0.5 *	0.5 *	0.5 *	0.5 *	0.5 *	8100	6050				0.5 *	
1,2-TRICHLOROETHANE							71	77					
1-DICHLOROETHENE							1100	1150					
ANS-1, 2-DICHLOROETHENE		0.5 *					220	200					
S-1, 2-DICHLOROETHENE		24	0.5 *	0.5 *	1 J	1,2 J	17500	15200				0.5 *	
ICHLOROETHENE		0.5 *					112	120					
TRACHLOROETHENE							56	61					
LOROMETHANE											22	10	
METHYLENE CHLORIDE (DCM)													
LUENE							1290	1020					
NYL CHLORIDE		15			0.5 *	0.5 *	500	600			1.2 J/1.4 J	1.2 J	
ETONE		124	101	113	97	113	420	450	110				
BUTANONE (MEK)		80	73	80	80	83	820	800	96				
METHYL-2-PENTANONE (MIBK)							212	226					
FREON							3.2	3.1					
TRAHYDROFURAN											95	90	
KNOWN COMPOUND													10 - 50
XYLENE							375	420					
TAL VOLATILES	0	346.5	177.6	206.3	202.1	227.1	37624.9	33532.5	206	0	130.3 / 130.5	111.9	10 - 50
DUCTIVITY (umhos/cm2)	560	967	840	864	840	840	560	560	880	786	1966	1966	1966
MPERATURE (C)	24.5	20	28	28	26	26	23	23	24	23	22	22	22

FOOTNOTES:

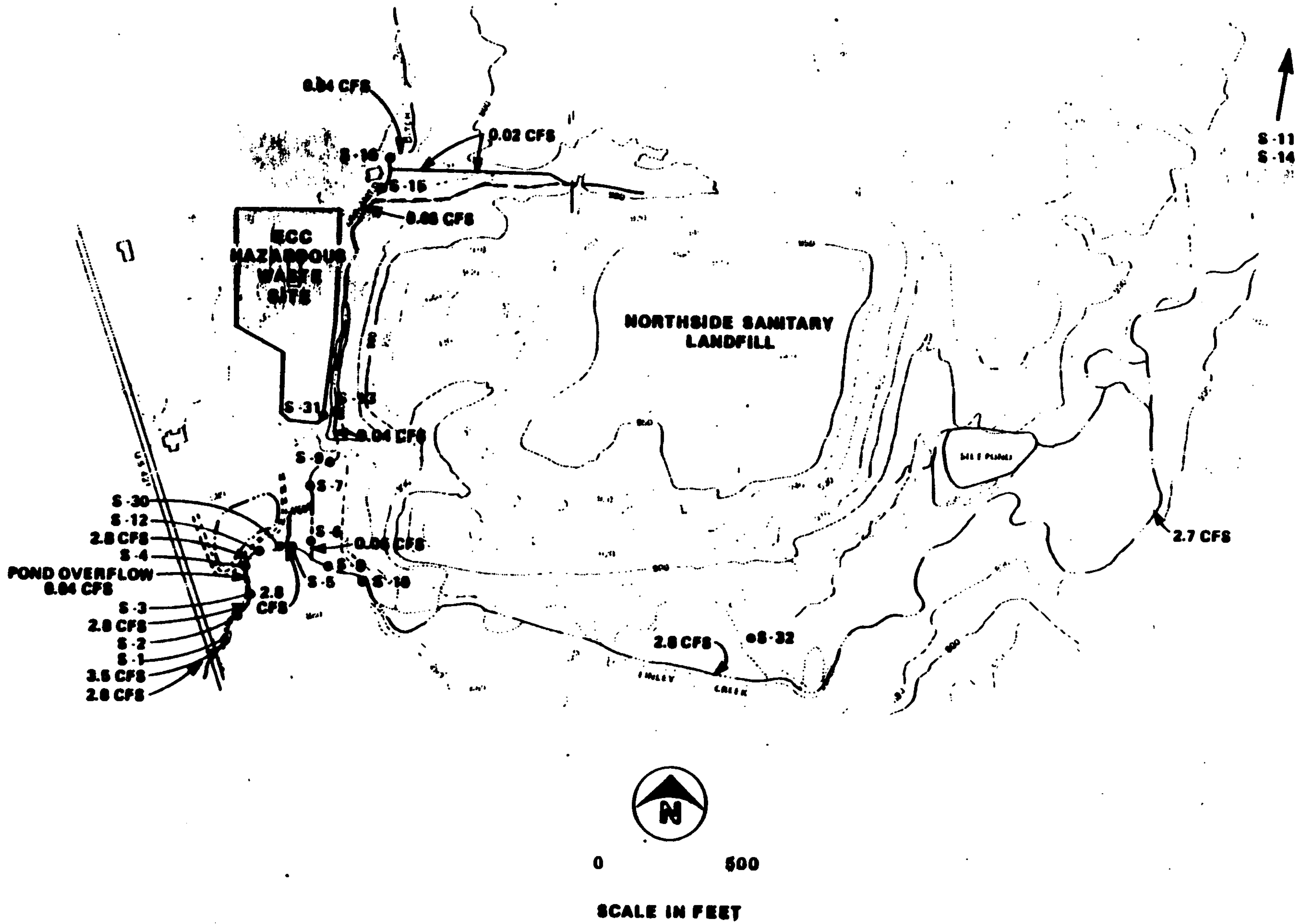
* - Indicates compound positively indetified , concentration is estimated to be less than 1 ug/l (0.5 entered in table for reporting purposes).

J - Indicates compound positively identified , concentration is estimated.

APPENDIX TABLE A2
NSL/ECC SURFACE WATER DATA
RECONNAISSANCE SAMPLING TRIP
RESPONSIVENESS SUMMARY

Sample Point:		
Sample Location:	BLANK	BLANK
Sample Number:	BLANK	BLANK
Date Sampled:	6-8-87	6-8-87
Control Number:	C2262	C2269
ORGANIC COMPOUNDS (ug/l)		
VOLATILES		
BENZENE		
ETHYLBENZENE		
CHLOROBENZENE		
1,2-DICHLOROBENZENE		
CHLOROETHANE		
1,1-DICHLOROETHANE		
1,2-DICHLOROETHANE		
1,1,1-TRICHLOROETHANE		
1,1,2-TRICHLOROETHANE		
1,1-DICHLOROETHENE		
TRANS-1,2-DICHLOROETHENE		
CIS-1,2-DICHLOROETHENE		
TRICHLOROETHENE		
TETRACHLOROETHENE		
CHLOROMETHANE		
METHYLENE CHLORIDE (DCM)		
TOLUENE		
VINYL CHLORIDE		
ACETONE		
2-BUTANONE (MEK)		
4-METHYL-2-PENTANONE (MIBK)		
STYRENE		
TETRAHYDROFURAN		
UNKNOWN COMPOUND		
o-XYLENE		
TOTAL VOLATILES	0	0
CONDUCTIVITY (umhos/cm2)	N/A	N/A
TEMPERATURE (C)	N/A	N/A

FOOTNOTES:



Appendix A
FIGURE 4
JUNE 1987
SAMPLING LO IONS
NSL/ECC RS

Appendix B

Appendix B
INDEX OF COMMENTS RECEIVED

Representing	Site	Date	By
ECC Technical Steering Committee	ECC	2/12/87 & 2/27/87	ECC Technical Committee ERM
NSL Technical Steering Committee	NSL	2/28/87	Barnes & Thornburg ERM
Jeffboat	NSL/ECC	2/27/87	Baker & Daniels ETS
Rock Island Refining Corp.	NSL/ECC	2/27/87	Baker & Daniels ETS
NSL, Inc.	NSL	2/28/87	Parr, Richey, Obremskey & Morton West
TRW, Inc.	NSL/ECC	2/27/87	TRW
Tricil Environmental Services, Inc.	NSL/ECC	2/27/87	Mishkin, Cromer, Eaglesfield & Maher P.A. Geraghty & Miller
Hersman Waldron Comfort Tables	ECC	2/27/87	Dunlevey, Mahan & Furry
Orchard Corp.	ECC	2/12/87	Orchard Corp.
Sunnen Products Co.	ECC	2/23/87	Sunnen Products Co.
City of Indianapolis	NSL	2/27/87	City of Indianapolis
Jones Chemicals, Inc.	NSL/ECC	2/27/87	Nixon, Hargrave, Devans & Doyle
Chrysler Motors Corp.	NSL	2/25/87 & 3/2/87	Chrysler Motors Corp.
Thermoset Plastics, Inc.	NSL/ECC	12/31/87	Thermoset Plastics, Inc.
Ferro Corp.	NSL	2/26/87	Squire, Sanders & Dempsey
Metalworking Lubricants Co.	NSL/ECC	2/27/87	Metalworking Lubricants Co.
Sierra Club, Hoosier Chapter	NSL/ECC	2/14/87	Garelick, Cohen & Fishman
Citizens Environmental Council	NSL/ECC	2/10/87 & 2/24/87	Douglas F. Johnstone, M.D.
Themselves	NSL/ECC	1/12/87	Richard and M. Elizabeth Idler
Herself	NSL/ECC	1/28/87	Dee Fox
Toxic Action Project	NSL/ECC	None	Grant Smith, Coordinator