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EPA 541-R98-091
November 1998

EPA Superfund
Record of Decision:

Continental Steel Corp.
Kokomo, IN
9/30/1998

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Continental Steel Superfund Site, Kokomo, Howard County, Indiana

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for management of migration, operable unit 1, and source control, operable units 2-6, at the Continental Steel Superfund Site in Kokomo, Howard County, Indiana. The selected remedial action was chosen by the Indiana Department of Environmental Management (IDEM) in accordance with the Indiana State Cleanup Law, Indiana Code 13-25-4 et. seq., the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. This decision is based upon the contents of the Administrative Record for the site.

This decision document also serves as the United States Environmental Protection Agency's (U.S. EPA) concurrence with and adoption of the remedial action decision for the Continental Steel Superfund Site, as approved by IDEM, and pursuant to sections 104(d) of CERCLA, SARA, and to the extent practicable, the NCP. IDEM has provided U.S. EPA with documentation to demonstrate that the State's selection of remedy for the site conforms with the requirements of CERCLA, the NCP to the extent practicable, and Cooperative Agreement V005072-01-7 between U.S. EPA and IDEM.

ASSESSMENT OF THE SELECTED REMEDY

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

DESCRIPTION OF THE SELECTED REMEDY

There are six operable units associated with the Continental Steel Superfund Site (CSSS). The operable units consist of the Site-Wide Groundwater (OU-1), Wastewater Lagoon Treatment Area (OU-2), Kokomo and Wildcat creeks (OU-3), Markland Avenue Quarry (OU-4), Main Plant Property (OU-5), and the Slag Processing Area (OU-6). Each operable unit has a selected remedy, and together, these remedies comprise the final remedial action. The final remedial action addresses soil and groundwater contamination detected during the remedial investigation and several emergency removal actions. The final remedial action addresses the management of migration for groundwater and source control for solid media with the goal of minimization of exposure threats to human health and the environment.

The remedies which comprise in the final remedial action decision are highlighted below by operable unit.

For OU-1 (Side-Wide Groundwater), Alternative MM-5 has been selected and consists of:

- Collect Intermediate and Lower Groundwater at Martin Marietta Quarry to Contain Contaminated Groundwater within Current Boundaries
- Dispose of Collected Groundwater Off-Site at City of Kokomo Wastewater Treatment Plant (WWTP)

- Invoke Technical Impracticability (TI) Waiver for the Intermediate and Lower Groundwater due to no active treatment and over 200 years to attain ARARs through Natural Attenuation
- Collect Shallow Groundwater and Dispose Off-site at WWTP
- Monitor Groundwater until ARARs are attained.
- Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $6,386,000

For OU-2 (Lagoon Area), Alternative SC-4L has been selected and consists of:

- Excavate Contaminated Solids and Consolidate On-Site
- Collect and Contain Shallow Groundwater with Expanded Interception Trench System and Dispose Off-Site at Kokomo WWTP
- RCRA Surface Impoundment Closure
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $44,746,000

For OU-3 (Wildcat & Kokomo creeks), Alternative SC-4C has been selected and consists of:

- Excavate Contaminated Sediment and Consolidate in On-Site CAMU/Landfill
- 30-Yr. Net Present Worth Cost: $12,560,000

For OU-4 (Markland Avenue Quarry), Alternative SC-2.5Q has been selected and consists of:

- Excavate Contaminated Sediment from Quarry Pond
- Backfill Quarry Pond
- Dispose of Quarry Sediment in Lagoon Area CAMU/Landfill
- Cover Contaminated Solids with Common Soil and vegetate
- Contain & Collect Shallow Groundwater & Dispose at WWTP
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $11,163,000

For OU-5 (Main Plant Property), Alternative SC-3.5M has been selected and consists of:

- Elevated VOC Solids Removal and On-Site Disposal in CAMU/Landfill
- Excavate PCB Solids along Kokomo Creek and Dispose On-Site in CAMU/Landfill
- Install Common Soil Cover and vegetate
- Collect & Contain Shallow Groundwater and Dispose Off-Site at WWTP
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $7,747,000

For OU-6 (Slag Processing Area), Alternative SC-3.5S has been selected and consists of:

- Regrade Slag Piles to Level Site
- Install Protective Common Soil Cover Over Contaminated Solids and vegetate
- Deed Restrictions

- Stabilize Creek Bank
- 30-Yr. Net Present Worth Cost: $2,420,000

DECLARATION STATEMENT

The selected remedies are: protective of human health and the environment; comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action except for groundwater cleanup standards for the Intermediate and Lower Aquifers, where a technical impracticability waiver has been granted by U.S. EPA; and, are cost-effective.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for the site. Treatment of the principal threats of the site have been proven to be impracticable, except for shallow groundwater, therefore this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. However, despite the impracticability, extracted contaminated groundwater, particularly those collected from the intermediate and lower aquifers for the containment portion of the remedy, will be treated. There is also a potential for some treatment of some of the soils and sediments, however, the overall size and volume of contaminated solid media and the fact there are no identified on-site hot spots that represent major sources of contamination preclude a remedy in which contaminants could be excavated and treated effectively.

Because hazardous substances will remain at the site above health-based levels, IDEM will conduct a five-year review in accordance with Section 121 of CERCLA to assess whether any other response is necessary and to ensure that the remedies continue to provide adequate protection of human health and the environment.

Based upon the information described above, and in the exercise of the State's authority under an agreement with the U.S. EPA and IDEM pursuant to Section 104(d) of CERCLA, IDEM has developed and presents the final decision for implementation of these final remedies. IDEM also seeks approval of the final decision of the selected remedies for the CSSS.

John M. Hamilton, Commissioner
Indiana Department of Environmental Management

9/30/98
DATE

Based upon the information described above, U.S. EPA concurs with the decision IDEM has made in the exercise of the State's authority in selecting these remedies under an agreement between U.S. EPA and IDEM pursuant to Section 104(d) of CERCLA for implementation of the remedies.

Wm. E. Muno ______________________ 9/30/98 ____________

William E. Muno, Superfund Division Director **DATE**
U.S. Environmental Protection Agency, Region V

SUMMARY FOR THE RECORD OF DECISION

I. Site Name, Location, and Description

The Continental Steel Superfund Site (CSSS) is an uncontrolled hazardous waste site located in Kokomo, Indiana. The Indiana Department of Environmental Management (IDEM) is the lead agency responsible for conducting the Remedial Investigation and Feasibility Study (RI/FS) at the site under a cooperative agreement with the United States Environmental Protection Agency (U.S. EPA) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or commonly known as Superfund.

The Continental Steel Superfund Site (CSSS) is located on West Markland Avenue in the City of Kokomo, Township 23 North, Range 3 East, and Township 24 North, Range 3 East, of Howard County, Indiana. The total site encompasses approximately 183 acres and consists of an abandoned steel manufacturing facility (Main Plant), pickling liquor treatment lagoons (Lagoon Area), a former waste disposal area (Markland Avenue Quarry), and a former waste disposal and slag processing area (Slag Processing Area).

The site is located in a mixed residential, commercial, and industrial area and is mainly zoned for general use. Residential properties lie mostly to the east and southeast of the site. Mixed residential and industrial areas lie to the north and west, and industrial properties are located to the south. The closest residents to the plant are located within 100 feet east of the site, near the property fence line along South Leeds Street, and south of the Main Plant across Kokomo Creek. Highland Park, a public recreation area for area residents, lies to the south of the Main Plant just across Kokomo Creek and immediately adjacent to the CSSS property south of Kokomo Creek.

CSSS is in the Upper Wabash River basin. Kokomo and Wildcat Creeks flow westward through the site to the Wabash River. The confluence of Wildcat Creek and Kokomo Creeks is located southwest of the Main Plant. Howard county is located on the Tipton Till Plain, a nearly flat glacial till plain that slopes gently to the west at a slope of less than one percent. The till plain is underlain by ground moraine and ablation tills. The plain is covered by surficial drift deposits from melting ice, streams, and ice-dammed lakes. Buried deposits of sand and gravel interspersed within the till plain are thicker and more extensive than valley-train and alluvial deposits near the ground surface. Glacial drift deposits in the vicinity of the site range in thickness from zero feet in quarries along Wildcat Creek to more than 200 feet in buried valleys that were eroded in the underlying bedrock. Glacial drift deposits underlying the site are generally less than 20 feet in thickness. Paleozoic bedrock underlies the glacial drift deposits. Bedrock structure is dominated by the Cincinnati Arch in this area of the state. The axis of the Cincinnati Arch plunges to the northwest, at a slope of 4 to 13 feet per mile. The site is located near the axis of the Cincinnati Arch, although bedrock units in the vicinity of the site dip slightly southwest from the axis of the arch.

II. Site History and Enforcement Activities

The Continental Steel Corporation was founded as the Kokomo Fence Machine Company in 1896. In 1899, the Kokomo Fence Machine Company was consolidated with other interests to form the Kokomo Nail & Wire Company. In 1900, the company was reorganized under the name of the Kokomo Steel & Wire Company. Two 75-ton open-hearth furnaces were erected in 1914, and a third open-hearth furnace was placed in service in 1917. In 1927, the Kokomo Steel & Wire Company merged with two other steel companies to form the Continental Steel Corporation. By 1947, the other two steel companies were divested, and the Continental Steel Corporation manufacturing facilities were centered in Kokomo.

In 1969, the Continental Steel Corporation was acquired by New York-based Penn-Dixie Industries, Inc., which officially dropped the Continental Steel name for the Kokomo facility in 1974. Penn-Dixie Industries, Inc. filed for Chapter 11 reorganization bankruptcy in 1980, and emerged from bankruptcy in 1982 as the reorganized Continental Steel Corporation. The main offices were then moved from New York to Kokomo. Continental Steel Corporation filed for Chapter 11 bankruptcy in 1985. The facility closed in February 1986 when the bankruptcy filing was converted to Chapter 7 liquidation. The Main Plant has a covenant on the deed which restricts development to industrial use only.

Throughout its history, the plant produced nails, wire, and wire fence from scrap metal. Operations included reheating, casting, rolling, drawing, pickling, annealing, hot-dip galvanizing, tinning, and oil tempering. The steel manufacturing operations at the plant included the use, handling, storage and disposal of hazardous materials. This section describes these materials and the components of the CSSS called operable units (OUs). The six OUs include (see Appendix A, Figure A):

- OU1 Site-Wide Groundwater;
- OU2 Lagoon Area;
- OU3 Kokomo and Wildcat Creeks;
- OU4 Markland Avenue Quarry;
- OU5 Main Plant; and
- OU6 Slag Processing Area.

The first phase of the 1993 Remedial Investigation generated a significant amount of information about the nature and extent of contamination at the site. In addition, data is available from testing conducted during emergency response actions and other miscellaneous sources. Details of the prior studies and activities at the site can be found in the Focused RI/FS Work Plan.

Phase II of the RI was conducted in 1995. This phase of the RI addressed the Markland Avenue Quarry, the Main Plant, and the Slag Processing Area and generated information to address data gaps for the site-wide groundwater, the Lagoon Area, and the Wildcat and Kokomo creeks.

During June 1996, the Indiana State Department of Health (ISDH) performed environmental radiation surveys in the Slag Processing Area, Lagoon Area, and the former laboratory area in the Main Plant. They concluded that there is no evidence of gross radiological contamination in the areas surveyed. However, ISDH recommended that radiation monitoring be performed on all CSSS materials removed from the site, prior to disposal, as a precautionary health and safety measure.

In response to an IDEM report of contaminated runoff being released from the drum storage area in the Markland Quarry, a Removal Action was initiated on February 2, 1990, by the U.S. EPA Emergency & Enforcement Response Branch (EERB). This removal action began with the construction of a trench within the perimeter of the fence, to prevent further runoff, and the sampling of soils around the drum storage area. About 800 cubic yards of soil from the quarry area was eventually disposed of off-site. In addition, about 200 drums found to contain liquid were overpacked, sampled, and disposed of off-site, with a few hundred empty drums also being crushed and disposed.

An underwater investigation of the quarry pond also revealed the existence of about 1,150 drums and three 4,000-gallon storage tanks in the pond. EERB contracted a diving contractor for removal and disposal of the drums and tanks found in the pond. This action began in June 1991 and was completed in August 1991.

On March 13, 1990, the EERB also conducted a site-assessment of the Continental Steel facility itself. During this visit, and subsequent visits, approximately 700 55-gallon drums were found scattered throughout the facility, as well as 55 tanks, ranging in size from 5,000 to 2 million gallons each, and 33 vats, all of which contain unknown materials. All unknown substances were sampled to determine their potentially hazardous characteristics. Since that time, EERB has arranged for the disposal of about a thousand empty, crushed drums, about 200 drums of product material, about 50 containers of lead cadmium batteries, and about 5,000 gallons of base-neutral liquids. Even beyond this, there is reason to believe that there is an extensive amount of plant area to be investigated.

A review was also conducted of previous reports documenting waste generation/storage at the Continental Steel facility. These reports indicated that TCE sludge was a byproduct of cleaning nails for packaging, and was generated at a rate of about 66 tons annually or about 4 drums per week. This waste TCE sludge was stored on-site, and was purportedly disposed of by others on a periodic basis. It was noted that the facility was in violation, at least once, for the improper storage of this waste, including drums not being properly marked/labeled, improper documentation relative to drum-handling practices, and improper training of employees. In addition, PCB electric transformers and waste were found to be stored in drums (in 1986) in the same building used to store the TCE sludge, with one of the drums found to be leaking.

In reviewing the above information, U.S. EPA requested IDEM (since this has been designated as a State-lead project) that the quarry area and the plant area should be included into the Continental Steel NPL site Fund-financed RI/FS. This decision was based on several factors, including the fact that, with the exception of a small portion of the lagoon area, all of the areas were owned by Continental Steel Corp., and the contamination found there is a part of the same operations/facility with byproducts of the plant manufacturing operations sent to the lagoon and quarry areas for disposal. In fact, similar materials were found in these disposal areas, as well as the Main Plant. Specifically, PCBs and TCE were found in all three of these areas, drums were found in both disposal areas as well as on the Main Plant facility, and slag material was disposed of at both the lagoon and quarry area. In addition, all three areas are situated above the same aquifer, with preliminary studies indicating that the groundwater under all three areas migrating in the same direction and potentially commingling. All three areas would also discharge into the same surface waters. Finally, the areas are within about half a mile of each other and, as such, essentially have the same target population. All of this leads to the need to investigate/evaluate all of the areas to ensure that the cleanup strategy for the site is appropriate relative to all three of the areas. In response to the IDEM request, the U.S. EPA aggregated the Markland Quarry and the Main Plant into the Continental Steel Superfund site in May 1990.

The Lagoon Area was proposed for inclusion on the National Priorities List (NPL) on June 24, 1988. The site was formally placed on the NPL in March 1989. The Markland Avenue Quarry and the Main Plant were proposed for aggregation to the site, and were added in May 1990.

The following sections summarize historical information and the Remedial Investigation/Feasibility Study results for each operable unit.

Site-Wide Groundwater

There are three aquifers under the site. They are differentiated by their water-bearing capacity, which is directly determined by their geologic structure or stratigraphy. They have been classified as the shallow, intermediate, and lower aquifers or water-bearing zones. These aquifers have been further separated into two categories: (1) those underlying source contaminant areas and (2) those NOT underlying source contaminant areas. Site-wide Groundwater (see Appendix A, Figure 1) includes a large area and quantity of affected groundwater from all three water-bearing zones. Groundwater appears to have also received contaminants from the Main Plant, the Markland Avenue Quarry, the Lagoon Area and/or other areas related to the site, and disposal of hazardous materials. CSSS properties alone cover 183 acres.

Groundwater flow is generally to the west; however, groundwater flow within each zone may vary according to localized and regional influences, particularly in the shallow zone. The intermediate and lower water-bearing zones are largely influenced by preferential flow through the fractures in the limestone bedrock underlying the site. These fractures serve as conduits through which groundwater can easily flow. The shallow water-bearing zone is influenced mostly by the surface waters, which mostly consists of the Wildcat and Kokomo creeks. Groundwater flow in the intermediate water-bearing zone on the eastern two-thirds of the site is due west with a horizontal gradient of 0.01. Hydraulic influence from large quantity, groundwater pumping operations at the Martin Marietta Quarry is first observed in the vicinity of the Slag Processing Area where the hydraulic gradient steepens to 0.02.

Most Kokomo residents rely on public water supplies, although there are private wells in the area. The public water supply for the City of Kokomo is provided by a private water company, Indiana-American Water Company. Indiana-American Water Company draws its drinking water supply from a reservoir northeast of Kokomo. The reservoir is upgradient and greater than five miles from the CSSS. There are three non community public water supply wells in the vicinity of the CSSS. They were sampled during the RI and the results were non detect for COPCs.

In 1984, 1985 and 1986, IDEM identified chromium, cadmium, lead and iron in the on-site groundwater. Investigation of the Markland Avenue Quarry and the Main Plant Area confirmed contamination attributable to Continental Steel. The Main Plant includes 74 buildings, many of which are severely deteriorated, with floor areas ranging from 10,000 square feet to 400,000 square feet. Many buildings have basements and pits, most of which are flooded with water due to precipitation and direct connection with groundwater. There are also water-filled tunnels between buildings. A network of underground sewers and utility lines are also located on-site. Due to operations at the Main Plant property, waste materials from the main plant included spent solvents, base solutions, baghouse dust (a listed waste containing chromium and lead), asbestos insulation materials, sludge contaminated with trichloroethene, and PCBs from transformers. Since the facility operated as a secondary steel processor, the Main Plant property was used to store drums of scrap steel material from many sources. Many of these drums were transported to the property containing liquid material (solvents, degreasers, cutting oils, etc.) along with the scrap steel. These drums were stored outside on the ground surface without covers allowing for precipitation to displace the various liquid contents. It was also common practice to dispose of liquid waste materials on the ground.

As part of the RI/FS, a groundwater model was developed to simulate the regional groundwater flow. It was used to simulate and predict the interactions between groundwater and surface water, between the three water-bearing zones, and between localized and regional influences from pumping wells (i.e., domestic wells, industrial wells, groundwater supply wells, the dewatering wells at the Martin Marietta Quarry). The following conclusions were developed:

- Contaminant transport of the intermediate and lower water-bearing zones is controlled by Martin Marietta Quarry pumping and shallow groundwater discharge to Wildcat and Kokomo Creeks;

- Groundwater flow pathways follow the westerly course of Wildcat and Kokomo creeks and do not diverge significantly to the north or south; and
- Capture of contaminated groundwater by wells in a residential subdivision southwest of the site is unlikely whether the quarry pumping is operational or discontinued.

Volatile Organic Compounds (VOCs) were the primary contaminants detected in groundwater. PAHs, PCBs, pesticides and metals were detected, but were limited to point detections at wells and plumes were not generally identified except for a few metals. DNAPL (Dense Non Aqueous Phased Liquid), which is produced when various VOCs become commingled, is also present in all three water-bearing zones. DNAPL is heavier than water and migrates downward until it comes into contact with an impermeable geologic formation. DNAPL is difficult to extract and treat. DNAPL will breakdown naturally, however, it generally takes much longer than its non commingled counterparts.

Contaminant plumes were delineated for the shallow (see Appendix D, Table MM-1S), intermediate (see Appendix D, Table MM-1I), and lower (see Appendix D, Table MM-1L) water-bearing zones for source areas and site-wide groundwater. Some of the source area alternatives address shallow groundwater contamination within a source area and will not be addressed in this section. A Technical Impracticability (TI) waiver for the intermediate and lower water-bearing zones was requested and granted pursuant to 121(d)(4) of CERCLA from the U.S. EPA TI Waiver Committee. The TI Waiver was requested based on groundwater fate and transportation modeling results prepared as part of and presented in the Feasibility Study. The fate and transportation modeling determined that cleanup goals or drinking water standards (MCLs) for these water-bearing zones would not be attained within a reasonable time frame. Groundwater modeling results predict that with or without active remediation attempts, groundwater in the intermediate and lower water-bearing zones will not achieve ARARs in less than 200 years. The TI Waiver was granted.

The basic strategy for side-wide groundwater remediation includes the intermediate and lower water-bearing zones, excluding and leaving the shallow water-bearing zone as part of the remedial strategies for the individual operable units having source areas directly affecting them (OU-2, OU-4, and OU-5). The basic Shallow groundwater strategy has two components: (1) eliminate contaminated groundwater migration from source areas by establishing a collection system for containment of the plumes within their current boundaries and (2) aggressively extract contaminated groundwater to reduce contaminant levels and ultimately attain ARARs as rapidly as possible. Shallow groundwater extracted as part of these source area remedial actions would be pumped to the city of Kokomo sanitary sewer system for treatment through the city's wastewater treatment plant (WWTP). IDEM has a written agreement with the City of Kokomo to provide these services at no cost. Groundwater modeling on the lower and intermediate water-bearing zones was performed applying several different scenarios: (1) no active measures for treatment, (2) active measures for treatment, and (3) aggressive measures for treatment. The outcome of the modeling based upon the geology and the presence of DNAPL predicted a 200-year time frame for attaining ARARs. This data was presented to the EPA TI Committee, which granted the TI Waiver for the lower and intermediate water-bearing zones.

Lagoon Area

The Lagoon Area (see Appendix A, Figure 2) is located approximately 0.3 miles west of the Main Plant along the south side of West Markland Avenue (see Appendix A Figure 2). The area covers approximately 56 acres and includes five polishing lagoons, two acid (hazardous waste storage) lagoons, and three sludge-drying beds. These lagoons were originally permitted as RCRA surface impoundments for treatment of wastewater generated from operations at the Continental Steel Plant. This area contains approximately 788,000 cubic yards of soil, sludge, slag, and clay. A fill area near the lagoon entrance is contaminated with volatile organic compounds (VOCs). The fill may contain drums and slag material. Some of the lagoons contain standing water. The area is bordered on the south and west by Wildcat Creek, on the north by West Markland Avenue, and on the east by the City of Kokomo wastewater treatment plant. A recreational corridor along the creek has been identified. According to flood maps, the Lagoon Area is within a 100-year floodplain. It is assumed that the area on the flood maps will be overrun during a 100-year event. Immediately to the west of Wildcat Creek lies the Haynes International Inc. facility and its RCRA closed landfill.

Structures on this site include an abandoned treatment building and wastewater treatment clarifiers. Trespassers have been known to frequent this area. There are no ecological receptors on-site and no residential areas immediately border the lagoons. This area is primarily designated for commercial/ industrial use since it contains RCRA surface impoundments. Recreational use is limited to the creek corridor.

While in operation, spent pickle liquor (inorganic acid used to remove impurities from metal surfaces) generated at the Main Plant was transferred via a direct pipeline to two hazardous waste storage lagoons. The spent pickle liquor was then pumped to a neutralization and treatment system, and neutralized pickle liquor and sludge (generated by the treatment) were deposited in one of five polishing lagoons. The treated liquid was then discharged to Wildcat Creek and the sludge was placed into the three drying beds.

During 1980, Continental Steel achieved interim status for the facility as a hazardous waste treatment, storage and disposal facility under RCRA. The required RCRA groundwater monitoring of the Lagoon Area indicated that groundwater within the limestone aquifer underlying the lagoons was contaminated with metals and trace concentrations of organic compounds. In addition, sampling indicated that surface water, sediment, and fish in Wildcat Creek had been impacted. During RCRA inspections, drums and waste piles of slag were observed in the Lagoon Area.

Phase I Remedial Investigation (RI) activities included sampling of the lagoon surface water, lagoon sludge, soils underlying and adjacent to the lagoons, waste piles, sludge within the mixing and clarifier tanks at the treatment building, and water in the basement of the treatment building. Phase II RI activities consisted of groundwater sampling and a soil gas survey in the entrance area to assess VOCs in the fill.

The RI results indicated that elevated levels of metals including arsenic, beryllium, cadmium, lead, manganese, and chromium were detected in the soil and sludge. Iron was also identified in the lagoon sludge drying beds and in the shallow water-bearing zone. Methylene chloride, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) were reported in soil and sludge from the east central and southwest lagoon areas and in the sludge drying beds. Waste piles of slag contained mostly metals, including elevated levels of arsenic, beryllium, and chromium. Metals including arsenic, cadmium, copper, lead, manganese, nickel, and zinc were detected in surface water from the acid lagoons. Silver was reported in one sample collected from the polishing lagoons. The results of the soil gas survey at the Lagoon Area entrance indicated that there are several integrated plumes of VOCs. Both soil data and soil gas data were evaluated and identified several areas with elevated VOC solids. The primary VOCs identified were cis-1,2-dichloroethene, trichloroethene, and vinyl chloride.

Elevated VOC solids are defined as those solids having a total VOC concentration greater than 1 mg/kg.

This concentration was defined as the cleanup goal for VOCs in contaminated solids because the fate and transport analysis showed that a VOC soil concentration of 1 mg/kg in solid media will leach at drinking water MCLs into groundwater.

The groundwater underlying the Lagoon Area (see Appendix D, Tables LA-1S, LA-1I, & LA-1L) is impacted primarily by VOCs (trichloroethene and its breakdown constituents: cis-1,2-dichloroethene and vinyl chloride) in the entrance area and to a lesser extent by metals. Within each water-bearing zone (shallow, intermediate, and lower), VOC concentrations are highest in the shallow water-bearing zone at the entrance, in the intermediate water-bearing zone within the Lagoon Area, and in the lower water-bearing zone downgradient. Total VOC concentrations appear to be decreasing in the shallow water-bearing zone, but have remained relatively constant in the intermediate and lower water-bearing zones. In the downgradient well nests for all three water-bearing zones, the same three primary VOCs were detected as in the soil gas survey. The lower water-bearing zone wells at these locations are the most contaminated, indicating that the plume is migrating vertically downward as it moves downgradient. Metals present in the Lagoon Area groundwater include iron, manganese, nickel, chromium, and antimony. Metal contamination is likely due to past treatment practices in the acid lagoon ponds (i.e., metals mobility increases when exposed to significant changes in pH).

DNAPL was noted at the lagoon area entrance, likely the result of near surface releases from drums and releases from the lagoon sediments. DNAPL movement in the Lagoon Area would be through very small cracks and pore spaces in the lagoon sludge or slag and then downward into the highly fractured bedrock below. These bedrock formations are more highly fractured than in other areas of the site, so DNAPL is likely to travel more easily through the intermediate into the lower water-bearing zone. The presence of DNAPL in shallow groundwater may affect the effectiveness of the containment, collection, and treatment of contaminated groundwater. The estimated time frames to attain ARARs are based upon fate and transportation groundwater modeling which requires that certain assumptions be made for the site due to the presence and persistence of DNAPL, effectiveness of the containment, collection, and treatment system, and the variability of the geology. The estimated time frames for groundwater cleanup will change if the assumptions change significantly, especially if residual DNAPL persists in the groundwater following implementation of source control activities. Due to uncertainties, the time frames estimated for groundwater to reach ARARs may likely lengthen (up to 30 years).

The presence of tetrachloroethene in wells southwest of the Lagoon Area in the vicinity of Haynes International and east of the Lagoon Area near the city of Kokomo wastewater treatment plant (WWTP) indicates that a source other than the CSSS has contributed to groundwater contamination.

There are two future use scenarios considered for the Lagoon Area. One is commercial/ industrial use for the area in general. The second is trespasser use for the creek corridor, which is the 50 foot wide bank area along Wildcat Creek.

Closure of the RCRA permitted surface impoundments (lagoons) was included in all alternatives except for the No Action alternative. It was assumed that the lagoon sludge could be closed in-place based on the stabilization testing results from the treatability testing program (U.S. EPA, 1996). These results indicated that contaminants of concern would not leach from the sludge at levels above MCLs. An issue for the RCRA impoundments will be that this area is located within the 100-year floodplain of Wildcat Creek. Closure of the lagoons in-place would necessitate the construction of a capping system with grading/fill to promote runoff of surface water that would extend above existing grades and into the flood storage volume. Compensatory storage would be required.

Closure of the lagoons in-place would be designed to provide a structurally sound subbase upon which to construct and operate an on-site landfill (CAMU or Corrective Action Management Unit) for disposal of excavated materials from all CSSS source areas. The on-site landfill would be constructed in the central/southeast portion of the Lagoon Area and would be the designated disposal location for contaminated solids from all source areas. The central/ southeast corner was selected to isolate the landfill from public view and for access. The CAMU would occupy approximately 40 percent of the Lagoon Area. **Figure 2** (Appendix A) shows the proposed location of the CAMU landfill in the Lagoon Area as well as an area for compensatory storage. Most importantly, siting of the landfill at the Lagoon Area will necessitate remedial actions first occurring at the lagoons to prepare the area for accepting other source area contaminated materials. The CAMU concept was presented to IDEM RCRA for review and comment. Surcharging of the lagoon area was also presented to IDEM RCRA as a recommendation from USEPA's National Remedy Review Board. IDEM RCRA approved the use of the CAMU and expressed reservations for surcharging.

Justification for selecting the Lagoon Area as the on-site landfill location is provided in Appendix B of the FS. Appendix B also includes more detailed discussion of the guidelines for RCRA surface impoundment closure, landfill construction, and landfill operation as part of a CAMU. The landfill design includes a membrane liner and cap system (the membrane bottom liner may be waived since contaminants do not leach above MCLs). The landfill/CAMU design would be finalized during the remedial design and would include the membrane liner and cap system, leachate collection system, and groundwater monitoring systems. Compensatory flood storage would be provided during on-site excavation activities. The details of the RCRA impoundment closure, landfill construction and landfill operation as part of the CAMU will be refined during the remedial design phase. **Figure 2a** shows a conceptual cross-sectional view of the CAMU landfill overlying the consolidated lagoon sludge.

Kokomo and Wildcat Creeks

The Wildcat and Kokomo creeks extend some 20,000 feet within the CSSS (see Appendix A, Figure 3). These creeks have been impacted by direct discharge of material, runoff from the source areas, and upstream industrial sources. The creeks are generally 50 to 100 feet wide, with depths up to four feet. These creeks are designated for recreational use. A recreational corridor extends along most of the banks of the creeks. These two creeks run along the borders of the Main Plant, the Lagoon Area, and the Slag Processing Area. The creeks have received water from the plant's wastewater recycling, treatment and filtration system, neutralized pickle liquor from the Lagoon Area, discharge from site outfalls and storm water runoff from the site in general.

Wildcat and Kokomo creeks are part of the Upper Wabash River basin. Wildcat Creek confluences with the Wabash River in Lafayette, Indiana, nearly 45 miles west of Kokomo. The nearest upgradient public drinking water well is nearly five miles from the site. The nearest downgradient public drinking water well is nearly fifteen miles from of the site and is likely too far south to be considered in the regional groundwater flow path. The nearest surface water extraction point for a public drinking water supply is over eight miles up stream and greater than 40 miles down stream of the site.

Surface water and sediment sampling was performed as part of Phases I and II Remedial Investigation (RI). The Wildcat and Kokomo creeks were subdivided into six testing sections or reaches, with surface water and sediment samples collected from all six. Reaches 1, 2, 3, 5 and 6 correspond to Wildcat Creek and Reach 4 corresponds to Kokomo Creek. Background samples were collected upstream within both creeks to establish a site-specific reference-based cleanup standard by which to judge sampling results from within the Reaches. Shallow groundwater sampling (see Appendix D, Table C-1S) was conducted at monitoring wells adjacent to the creeks. Groundwater results were compared to sediment and stream water results to evaluate whether an interrelationship exists between the creeks and groundwater. The reason is that shallow groundwater at times may flow into the creeks and at other times may be recharged by the creeks. Groundwater is addressed more completely as part of site-wide groundwater.

The analytical results of surface water sampling indicated that elevated levels of lead were detected along all six reaches of the creeks. Copper was detected along Reaches 1 through 5 and zinc was detected along Reach 3. Elevated levels of mercury were detected in samples collected from Reaches 4 and 5. Elevated cobalt concentrations were detected along Reach 6.

Groundwater sampling results showed elevated levels of VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. Elevated levels of nickel and lead were also detected in shallow groundwater adjacent to the creeks. Groundwater contamination observed indicate sources other than the creeks (e.g., lagoons, landfills, and spills) are more significant contributors to groundwater contamination.

The results of sediment sampling indicated that constituents were consistently detected above background and/or benchmark criteria (criteria) in the Wildcat and Kokomo Creeks. Benchmark criteria were taken from the Indiana Water Quality Regulations or the Federal chronic water ambient quality criteria. It was concluded in the preliminary ecological evaluation of the Wildcat and Kokomo Creeks that no critical terrestrial, semi-aquatic, or aquatic habitat is present within the creeks.

VOCs were detected in sediment above criteria in Reach 3. SVOCs and PAHs were detected above criteria in Reaches 3, 4, 5 and 6. PCB Aroclor-1248, Aroclor-1254, and Aroclor-1260, were detected above criteria in samples collected from all six reaches of the creeks. Aroclor-1016 was detected above criteria in samples collected from Reaches 3, 4, 5 and 6. Pesticides that exceeded criteria were typically detected in the same reaches as PCBs. Pesticides were detected above criteria in sediment. 4,4'-DDE, aldrin, and gamma-chlordane were detected in all six Reaches at three to 10 (plus) times the criteria. 4,4'-DDT, 4,4'-DDD, heptachlor, heptachlor epoxide, endrine aldehyde, dieldrin, gamma-BHC, alpha-chlordane, and endosulfan II were detected in various Reaches of the streams at concentrations greater than 10 times the criteria.

Numerous metals were detected above criteria in sediment samples collected along the reaches of the creeks sampled. Cadmium, chromium, copper, nickel, and zinc were detected in Reaches 1, 3 and 4 at concentrations greater than 10 times criteria and in Reaches 2, 5, and 6 at concentrations less than 10 times criteria. Other metals detected up to 10 times criteria include aluminum, arsenic, barium, iron, lead, silver, thallium, mercury, selenium, manganese, antimony, and vanadium.

Fish tissue analyses performed by the Indiana Department of Environmental Management, Water Management, Biological Studies Section, has identified several contaminants, including PCBs, mercury, and the pesticides, at elevated levels prompting a Level Five fish advisory for the Wildcat Creek in the vicinity of the Continental Steel Superfund Site.

Markland Avenue Quarry

This 23-acre area was formerly a limestone quarry, covering nearly the entire area. The quarry was sold to Continental Steel Corporation (CSC) in 1947. It is bordered by Harrison Street to the north, West

Markland Avenue to the south, Courtland Avenue to the east, and Brandon Street to the west (see Appendix A, Figure 4). Review of historical aerial photographs (August 1938 state archive aerial photos) show the original quarry as a large pond spanning the entire block, except for the unexcavated southwest corner and southern border, between Courtland Street and Brandon Street. CSC subsequently backfilled the quarry about 3/4 of the way full with waste material from the CSC operations. More than 1.2 million cubic yards of material from the CSC were deposited in the quarry. The quarry varied in depth from 70-90 feet and includes a pond (4 acres). Continental Steel disposed of waste materials such as drums, slag, refractory brick, pig iron, baghouse wastes, and tanks of oil and solvents at the quarry. According to former employees, the quarry served as a drum reclamation area where drums were dumped directly onto the ground and disposed of in the quarry pond. Previous U.S. EPA investigations (July 1986, May 1988) revealed approximately 400 (mostly empty) drums, an abandoned storage tank, and slag, ash and refractory brick piles in the area. Sediment in the pond contains high concentrations of VOCs and DNAPL (Dense Non-Aqueous Phased Liquid). These sediments are four to seven feet thick and are located below 50 feet of water. The quarry is in a residential area, is an attractive nuisance attracting trespassers, and has no ecological significance. The surface water exhibits a pH of up to 12. The quarry area is zoned for residential use.

This area was also used as drum disposal/staging area, where some drummed wastes were purportedly taken and the contents were dumped into the quarry pond. In a 1986 inspection, approximately 415 drums were found scattered around the surface of the quarry. Samples of the contents of some of the drums revealed elevated levels of benzene, toluene, tetrachloroethane, and benzoic acid. In addition, elevated levels of phenol, di-n-octylphthalate, TCE, and PCB-Aroclor 1248 were found in soil samples taken from around the drum storage area. Previously the U.S. EPA sampled the contents of the drums, surficial sediments, and quarry pond sediments for numerous organic and inorganic contaminants.

Sampling of the quarry pond was performed in 1987, and revealed that the liquid in the pond had a pH of approximately 11.5 for the top samples, and 12.6 for the bottom samples. In addition, low concentrations of copper, zinc, and mercury were present in some of the samples. DCE and TCE were also found to be uniformly present in each of the samples, with higher concentrations of TCE detected in the bottom samples. Finally, very low concentrations of other volatile and semi-volatile organics were detected in the bottom samples, including ethylbenzene, DCA, toluene, methylene chloride, naphthalene, phenol, and phenanthrene. Sediment sampling revealed high concentrations of TCE (>200,000 μg/Kg).

Phase I Remedial Investigation (RI) in the Markland Avenue Quarry included sampling of the quarry pond water and the shallow subsurface soil/fill. Phase II sampling activities performed in the quarry included surface soil (on-site and off-site residential) sampling (see Appendix D, Tables MAQ-3), a soil gas survey (see Appendix D, Table MAQ-5), groundwater screening (see Appendix D, Table MAQ-6), groundwater sampling (see Appendix D, Tables MAQ-7S, MAQ-7I, & MAQ-7L), and quarry pond surface water (see Appendix D, Table MAQ-1) and sediment sampling (see Appendix D, Table MAQ-2).

The soil gas survey detected four areas of elevated VOC solids (previously defined in OU-2) (see Appendix A, Figure 4b). VOC contamination consisted primarily of trichloroethene (TCE) and its degradation products. The vertical extent of the contamination could not be defined. Soil gas measurements were limited to 20 feet in depth, and fill extends from 50 to 70 feet in depth. The area with the highest contaminant concentration is located just north of the abandoned concrete structure in the southwest portion of the site. This area is of concern because of the relatively high concentration of the degradation product vinyl chloride. The other two areas and an area of lesser concentration are located along a line from southwest to northeast that parallels an old rail line that crossed the quarry. Based on historical information, it is assumed that the deeper fill material is the same as the top 20 feet. Historic disposal practices for the Continental Steel Corporation would indicate that surface drum releases and drum burial occurred on the Quarry property and may be the sources of the elevated VOC solids identified within in soil gas results.

Surface soils were collected from the quarry fill area (on-site) and at selected residential properties surrounding the quarry to evaluate the potential risks associated with these soils. Elevated levels of PAHs, PCBs, lead, arsenic, and zinc were detected in the surface soils in the quarry fill area. The PAH and PCB contamination appear primarily in the southern half of the fill area. The lead and arsenic contamination are widespread and the zinc contamination is sporadic. The residential soil samples downwind from the quarry show isolated detections of contaminants. However, no metals (including lead) were detected at levels exceeding IDEM or EPA Action Levels.

The quarry pond sediment is contaminated with VOCs, PAHs, PCBs and metals. DNAPL (mostly from TCE) is also present within the pond sediments and is likely migrating into the less fractured bedrock comprising the intermediate water-bearing zone. Most of the contaminants exceed sediment benchmark screening levels as defined within the Risk Assessment (RA). The sediments are a continuing source of contamination to surface water and to groundwater. The contaminants of concern are the VOCs as they are highly mobile and migrate easily. Trichloroethene is the most prevalent and was detected at the highest concentrations (>200,000 $\mu g/l$)(see Table MAQ-2, Appendix D). Most of the parameters detected in the pond sediment exceed sediment benchmark screening levels, which are based on aquatic toxicity.

The quarry pond surface water is contaminated with VOCs, primarily, TCE. It is likely that VOC contaminants are migrating from the adjacent fill material, DNAPL in the sediments, and groundwater. Three metals were also detected. Pond water exhibited a pH of 11.5 near the surface to a pH of 12.7 at. depth. The high pH indicates there may be a contaminant of a very basic nature which has not yet been identified in the quarry fill. The high pH may affect the degradation of organic constituents in the groundwater.

The primary contaminants in the groundwater are TCE, cis-1,2-dichloroethene, and vinyl chloride. They are highest in the quarry fill area in the shallow water-bearing zone and downgradient of the quarry pond in the intermediate water-bearing zone. The lower water-bearing zone shows the least groundwater impacts. VOC concentrations appear to decrease in the shallow water-bearing zone and increase in the intermediate zone at the quarry. VOCs appear to have migrated to the west side of the site in the intermediate and lower water-bearing zones. Groundwater results indicate that degradation of components in the intermediate zone is well progressed. This is apparent based on the presence of the TCE breakdown compounds (cis-1,2-dichloroethene and vinyl chloride).

The DNAPL in the quarry pond may also migrate vertically and laterally in directions which do not coincide with groundwater flow. Migration from these sediments would likely be into the intermediate water-bearing zone based on the elevation of the quarry sediments. DNAPL may also migrate downward entering the bedrock fractures located below the sediment and on the west and north sides of the quarry pond. However, resuspension of the sediments by disturbing their current state of rest may mobilize DNAPL into the shallow water-bearing zone. Additionally, DNAPL that originates within the quarry fill likely migrates down to the lower portions of the quarry. DNAPL is likely present in fractures in the lower water-bearing zone as well, having migrated through vertical fractures in the bedrock.

Main Plant

The Main Plant property consisted of three tracts of land comprising approximately 100 acres. These three areas include the Main Plant building area (94 acres)(see Appendix A, Figure 5), the equipment storage area located at the southwest corner of Markland Avenue and Park Avenue (0.8 acres), and the former engineering building located north of Markland Avenue between Park Avenue and Syndicate Sales (5 acres). The Superfund designated area of the Main Plant consists of 94 acres bordered by West Markland Avenue to the north, Deffenbaugh Road and private property to the south, Leeds Street to the east and Wildcat Creek to the west. The Main Plant contained most of the steel operations and is deed restricted by the current no asset owner for commercial/industrial use. The Main Plant includes 127 structures, including more than 74 abandoned buildings, many with basements, underground sewers, and utility lines. Industrial operations affected surface soil. There is contaminated soil west of the plant along Wildcat Creek. The plant has numerous visitors/trespassers.

Early investigations found more than 700 oil- and solvent-filled drums, 55 aboveground and underground storage tanks, and 33 vats. The tanks and vats held mostly oil and some chlorinated solvents and acids. Twenty-four electrical transformers, 200 capacitors, electric arc furnace dust (baghouse dust), and exposed asbestos were found in the plant.

The Main Plant buildings themselves are being addressed under an Interim Record of Decision (IROD). The IROD includes the decontamination and demolition of 127 structures and buildings, disposal of solid and liquid hazardous and nonhazardous wastes, and asbestos survey and abatement. The IROD has been approved by EPA. Contractor procurement has been completed and EPA funding granted. Therefore, it is assumed that the buildings will be removed from the site and only foundation elements and utilities shall remain. The south Kokomo city sewer main lines transgress through the CSSS Main Plant property under the original Park Avenue location.

Numerous basements/pits and two CSSS Main Plant process sewer lines (not municipal owned) are considered to be sources of VOCs, PAHs, PCBs, metals, and oils which could impact groundwater. With the exception of VOCs, these contaminants are not mobile in the environment. Although these basements/pits and process sewer lines could potentially impact groundwater, there is not a complete exposure pathway for direct human contact for these sources. The RA did not consider the basements/pits and process sewers as potential risks to human health.

Phase I RI activities included collection of samples from inside (see Appendix D, Table MP-1) and outside the buildings. Since the remediation of the buildings is being completed as a separate action, the buildings will not be discussed herein. Field investigations and previous work by U.S. EPA included sampling of process sewers and soil from stained areas. Phase II RI activities (excluding the buildings) included surface and subsurface soil sampling (see Appendix D, Tables MP-4ss & MP-4sd), groundwater sampling (see Appendix D, Tables MP-5S & MP-5I), process sewer sampling (see Appendix D, Table MP-3), basement water sampling (see Appendix D, Table MP-2), soil gas sampling, adjacent residential surface soil sampling (see Appendix D, Table MP-6), and high volume air sampling.

Phase II results indicate that the Main Plant has likely contributed to elevated metals in the residential area east of the Main Plant. Lead concentrations were highest along plant boundaries. This indicates the plant could be a source for airborne contaminants. Air sampling results also indicate the plant was a source. An Indiana State Department of Health blood lead screening program did not show an exposure. The issue of off-site residential soil contamination is a separate action and will not be discussed further herein.

Numerous surface spills around the site have been identified based on sample analytical results and historical records. These surface spills have resulted in an impact to soils from VOCs, SVOCs and PAHs, PCBs, pesticides, and metals. Most significant of the releases are those involving VOCs as evidenced by the impact to groundwater west of Building 112 (Nail Mill). Other significant surface spills include one in the vicinity of Kokomo Creek where VOCs, PAHs, and lead were detected above initial screening levels and the surface spill at the southeast corner of Building 71B (Wire Galvanizing) where PCBs, pesticides, lead, and zinc were detected above initial screening levels. The area east of Buildings 5 and 42 was observed to have oil saturated soils along with analytical results indicating concentrations of PAHs, PCBs, and lead above screening levels in soils.

The results of soil gas sampling in an area formerly utilized as a waste slag disposal area in the south Main Plant area indicated that VOCs were either not detected or detected at very low levels in the soil gas.

Groundwater results indicate relatively few contaminants detected except in locations where reported spills have occurred or stained soil is present. Therefore, groundwater impact in these areas is likely related to operational practices and spilled chemicals, mostly VOCs. The primary contaminants in groundwater are trichloroethene (TCE), cis-1,2-dichloroethene, and vinyl chloride. Total VOCs were highest in the intermediate water-bearing zone near Wildcat Creek. Specifically, VOC concentrations are highest in the known spill area on the west boundary within the shallow, intermediate and lower water-bearing zones. These results are consistent with the reported spills of TCE in this area.

VOC concentrations appear to be decreasing in all three water-bearing zones, except at Wildcat Creek. TCE concentrations appear to be decreasing, while cis-1,2-dichloroethene and vinyl chloride are increasing. VOC concentrations at Wildcat Creek indicate a plume is migrating downgradient from the Main Plant. The presence of chlorinated VOCs indicates that migration of contaminants in the shallow water-bearing zone can occur under creek beds.

The vertical extent of groundwater contamination in the Main Plant area is not well defined. Contaminants are likely present at higher concentrations and potentially deeper near source areas. The assumed distribution of DNAPL includes residual DNAPL in shallow soils at spill locations and in fractures in the shallow, intermediate and lower water-bearing zones. The DNAPL migration will not necessarily follow groundwater flow directions but rather structural features such as the fractures in the bedrock.

Slag Processing Area

The Slag Processing Area (see Appendix A, Figure 6) contains approximately 208,000 cubic yards of slag material, much of it in stockpiles. The current site disposition includes an open, graded (relatively flat) area with seven piles of slag material, the largest pile having a maximum height of about 45 feet. The piles include a total volume of about 62,000 cubic yards. Historical information indicates that the southwestern quarter of the area was formerly a quarry (Chaffin Quarry), was approximately 30 feet deep, and is now filled with slag. The area is located between Wildcat Creek and Markland Avenue. It is visible to the public and is easily accessed. The Wildcat Creek bank to the west has been subjected to runoff and erosion. The surrounding area is generally residential.

Slag, prevalent throughout various areas of the CSSS, primarily consists of calcium and iron oxides with smaller amounts of aluminum, chromium, lead, manganese, magnesium, and zinc oxides. Slag processing was conducted to reclaim certain metals. The slag may locally be contaminated with oil and solvents depending on location at the CSSS.

A partially decayed drum was discovered protruding from the side of a vertical cut in the slag. Eight drums were observed along the creek bank and on the large slag pile. The observation of these drums combined with the confirmation of drum disposal at other CSSS properties indicates that drum burial was a standard practice. The drums observed in this area were in varying states of decay. The majority appeared crushed or bent indicating these drums may have been empty or near empty at the time of disposal.

Phase II RI activities performed in the Slag Processing Area included surface soil/slag sampling (see Appendix D, Table SP-1), a soil gas survey, and an evaluation of potential impacts to Wildcat Creek. Based on the RA, the slag material poses a direct risk to human health or the environment due to the presence of metals (lead and arsenic). The RI noted a potential pathway for contamination of Wildcat Creek through uncontrolled surface water. Metals identified in the slag stockpiles and surficial solid media during the RI are also contaminants of concern for Wildcat Creek sediment and surface water.

VOCs were not detected in soil gas or surface soil. Additionally, no SVOCs or PCBs were detected in surface soil. These results do not indicate contamination resulting from surface spills or leaking drums buried near the surface.

No VOCs were detected in the shallow water-bearing zone, except at the upgradient well (see Appendix D, Table SP-2S). Several VOCs were detected in the intermediate water-bearing zone (see Appendix D, Table SP-2I) including significant concentrations of trichloroethene, cis-1,2-dichloroethene, and vinyl chloride. Cis-1,2-dichloroethene, 1,1-dichloroethane, and acrylonitrile (150 μg/L) were detected in the lower water-bearing zone (see Appendix D, Table SP-2L). This vertical distribution indicates impact from VOCs likely originates from upgradient sources rather than from the Slag Processing Area. VOC concentrations appear to be decreasing higher within the intermediate zone but may be increasing deeper within the intermediate zone. VOC concentrations appear to be decreasing in the lower water-bearing zone as well.

Groundwater beneath the Slag Processing Area, although identified as containing contaminants of concern above remediation goals, will not be addressed through source control alternatives presented in this section. Source control alternatives for the Slag Processing Area will be evaluated for solid media contamination only. The RI and modeling concluded that groundwater contamination beneath the Slag Processing Area and extending beyond the Slag Processing Area boundaries originates from an off-site source. Therefore, groundwater beneath the Slag Processing Area will be addressed in the management of migration alternatives for site-wide groundwater as presented in Operable Unit 1.

Under an industrial/commercial future use scenario, previously acquired data have not indicated the presence of any contaminants of concern in the solid media above remediation goals. Under a residential future use scenario, however, lead and arsenic are contaminants of both the slag piles and the surficial solids across the majority of the Slag Processing Area. A residential scenario will be utilized for baseline cleanup goals, since this property has adjacent residential properties. The limits of the Slag Processing Area are shown on **Figure 6** (Appendix A).

It is noted that the slag material does not leach constituents at concentrations above ARARs. Therefore, the only health issue is direct contact exposure for metals. The ability to treat slag by incineration is of low effectiveness. Therefore, treatment options were not considered for this site.

III. Community Relations Activities

The public participation requirements of CERCLA Sections 113 (k)(2)(B)(i-v) and 117 of CERCLA have been met in the remedy selection process. This decision document presents the selected remedies for the six operable units of the Continental Steel Superfund site, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. The decision for this site is based on the Administrative Record.

In June 1990, EPA and IDEM held a Public Availability Session to introduce themselves to the Kokomo and Howard County community, explain the ongoing Removal Action activities, and explain the listing of the site on the NPL and the steps of the Superfund process. A fact sheet was prepared and presented to the community.

In September 1990, IDEM released fact sheet regarding Remedial Investigations and ongoing Removal Actions and announcing two Public Availability Sessions for November 14, 1990 to discuss and answer questions concerning these issues.

In December 1992, EPA and IDEM held a Public Availability Session for the purpose of allowing individuals or small groups the opportunity to ask questions and discuss the past and ongoing Removal Action and the Remedial Investigation (RI) of the site. The meeting was announced through the local media and the release of an information fact sheet.

In May 1993, IDEM and EPA held a Public Availability Session and released an information fact sheet to "kick off" the Remedial Investigation/Feasibility Study (RI/FS) and update the community on site Removal Action activities. The community was also informed of their role in the process.

In November 1995, IDEM hosted two informal Public Availability Sessions and released a fact sheet documenting the Remedial Investigation and Removal Action status. At this time, the community was informed of the hiring of a new contractor to complete the RI/FS and the proposed change to a focused RI approach. The Phase I RI data, which had been accumulated by the previous contractor, was also made available to the community at this time.

In February 1996, IDEM held a Public Availability Session and released a fact sheet for the Interim Remedy Proposed Plan. The Interim Remedy was for the decontamination and demolition of the buildings and structures on the Main Plant property of the CSSS. IDEM presented the four alternatives considered by IDEM and EPA, the recommended alternative, and received oral and written comments. The alternatives were (1) No Action, (2) Immediate Decontamination & Demolition of the Buildings and Structures, (3) Immediate Decontamination of the Buildings and Structures, and (4) Securing the Buildings and Structures. Alternative 2 was the recommended alternative. Community participation and acceptance the recommended alternative was high.

In July 1997, IDEM hosted a Public Availability Session and released a fact sheet for the Residential Lead Soil Contamination Non Time Critical Removal Action. This Removal Action was for the removal of lead contamination deposited in the residential neighborhood located directly east of the CSSS Main Plant property. Soil samples collected during the RI indicated the presence of lead contamination in this neighborhood at potentially unacceptable levels. Additional investigations confirmed the presence of the lead contamination. During the session, the three possible actions considered in the EE/CA (Engineering Evaluation/Cost Analysis) and the selected action were presented to the public. The meeting was attended by 38 individuals representing the community, including 2 from local environmental groups, 6 from the media, 1 local governmental official, and 1 political official. This action began in May 1997. Since commencement, dual Public Availability Sessions to update the community and provide for informal discussions have been held by IDEM on May 4, July 9, and August 25.

In March 1997, IDEM hosted a Public Availability Session and released a fact sheet on the final proposed plan for the CSSS. IDEM presented the considered and recommended alternatives for each of the six operable units and accepted written and oral comments from the community at the session. The meeting was attended by 58 individuals representing the community, including 8 from local environmental groups, 6 from the media, 5 local governmental officials, and 6 political officials.

The IDEM CSSS project manager has attended many other local meetings. The project manager has attended meetings held by, but not limited to, Kokomo Against Pollution (KAP), the Business-Labor Alliance, Leadership Kokomo-Howard County Beautification Issues Group, Rotary Club, and the Community Action Committee. Some of these meetings have been held monthly and quarterly.

IV. Scope and Role of Response Action

The purpose of this Record of Decision (ROD) is to select the final remedial action for the Continental Steel Superfund site. This final remedy controls sources and prevents the further migration of contaminants. The final remedy for the six operable units addresses all media and migration pathways that are considered to present an unacceptable risk, including contaminated soils, waste piles, sediments, sludge, and groundwater.

IDEM has determined that collection and treatment of shallow groundwater, collection and containment of intermediate and lower groundwater, on-site disposal of elevated contaminated solids, and placement of common soil cover over source contaminant areas is necessary at the CSSS. This decision is based upon an analysis of the site risks as described below. The decision relies on the results of the Remedial Investigation/Feasibility Study for the Site-Wide Groundwater, Lagoon Area, the Wildcat and Kokomo creeks, Markland Avenue Quarry, Main Plant, and Slag Processing Area.

The elevated VOC solids and elevated PCB contaminated solids will be removed and consolidated on site in the CAMU landfill to be constructed on the Lagoon Area. If these contaminated solids are identified as needing treatment before placement in the CAMU, then the statutory preference for treatment as a principal element of the remedy would be achieved. However, if the excavated solids do not need treatment based on testing for treatability and Toxicity Characteristic Leaching Procedure (TCLP) and because treatment of the additional threats at the site was not found to be practicable, this remedy would not satisfy the statutory preference for treatment as a principal element of the remedy.

The purpose of the contaminated solids remedial action is to address potential continuing sources of contamination to the groundwater and remove those solids posing the greatest threat to human health. There is also a potential for some treatment of some of the excavated soils and sediments.

The threat to human health posed by the groundwater has been initially addressed through sampling of residential drinking water wells, providing of an alternate water supply where an accedence of a drinking water standard has been detected, and continued monitoring. The groundwater contamination will be addressed further by this remedy by: (1) collection, treatment, containment of shallow groundwater; (2) collection and containment of intermediate and lower groundwater, including invoking a Technical

Impracticability Waiver; and (3) use of institutional controls, in the form of deed and groundwater use restrictions. Despite the impracticability, extracted contaminated groundwater, particularly those collected from the intermediate and lower aquifers for the containment portion of the remedy, will also be treated.

Because hazardous substances will remain at the site, IDEM will conduct a five-year review in accordance with Section 121 of CERCLA to assess whether any other source control measures are necessary.

V. Summary of Site Characteristics

The following subsections provide a characterization of each operable unit and present a summary of and the results of the field investigation activities for that operable unit. There are six operable units for the CSSS, four of which are considered source areas. The four source areas include the Main Plant, Markland Avenue Quarry, the Lagoon Area and the Slag Processing Area. The remaining two operable units are Kokomo and Wildcat Creeks and site-wide Groundwater. (see Appendix A for Figures)

On-site work performed during the RI included sampling of soil, groundwater, sediment, and surface water. On-site sources of contamination at the site were also characterized through the review of historical records, well survey, and ex-employee interviews. For each of the industrial facilities, a records search was performed to support or refute the possibility that the facility impacted environmental media in the area of the CSSS. Regulatory records maintained by various local and state agencies were reviewed to identify facility chemical inventories as well as minor to significant industrial spills, leaks and releases. The following items and files were reviewed for information and historical records:

- Sanborn Maps
- Historical Aerial Photographs
- State Spills - IDEM
- UST/LUST - IDEM
- NPDES - IDEM
- RCRA - IDEM
- SARA Title III - IDEM
- TSCA - IDEM
- Indiana State Board of Health
- Kokomo Fire Department
- Howard County Health Department
- Howard County Local Emergency Planning Committee
- Indiana Department of Natural Resources - Division of Fisheries

Site Geology and Hydrogeology

CSSS is located in Howard County, in the Upper Wabash River basin. The Indiana Department of Natural Resources (IDNR) divided the Wabash River basin into three subbasins: an upper basin, a middle basin, and a lower basin. The Upper Wabash River basin extends in area from the northeast portion of the state, westward along the Wabash River, to the city of Lafayette in Tippecanoe County. Kokomo and Wildcat Creeks flow westward through the site to the Wabash River. The confluence of Wildcat Creek and Kokomo Creeks is located southwest of the Main Plant. Wildcat Creek is the last tributary of the Wabash River in the Upper Wabash River basin.

Most physiographic features in the Upper Wabash River basin were formed by glaciers. Howard county is located on the Tipton Till Plain, a nearly flat glacial till plain that covers much of central Indiana. The till plain surface slopes gently to the west at a slope of less than one percent. Till, a mixture of unsorted and unstratified clay, silt, sand, and gravel deposits, is the predominant deposit. According to the "Hydrogeologic Atlas of Aquifers in Indiana" (Fenelon *et al.* 1994), the surface of the till plain is undulating and poorly drained. Incised valleys along Wildcat Creek and Kokomo Creek provide the most prominent topographic features in the vicinity of the site.

The till plain is underlain by ground moraine and ablation tills deposited during several glacial advances during the Pleistocene Epoch (1 million to 10,000 years ago). The plain is covered by surficial drift deposits from melting ice, streams, and ice-dammed lakes. Buried deposits of sand and gravel interspersed within the till plain are thicker and more extensive than valley-train and alluvial deposits near the ground surface.

Glacial drift deposits in the vicinity of the site range in thickness from zero feet in quarries along Wildcat Creek to more than 200 feet in buried valleys that were eroded in the underlying bedrock. Glacial drift deposits underlying the site are generally less than 20 feet in thickness.

Paleozoic bedrock underlies the glacial drift deposits. Bedrock structure is dominated by the Cincinnati Arch in this area of the state (**Figure 8**, Hydrogeologic Atlas of Aquifers in Indiana, Fenelon *et al.* 1994). The axis of the Cincinnati Arch plunges to the northwest, at a slope of 4 to 13 feet per mile. According to the "Hydrogeologic Atlas of Aquifers in Indiana" (Fenelon *et al.* 1994), the Cincinnati Arch, during the Paleozoic Era (225 to 570 million years ago), separated open seas to the northeast and southwest and supported coral reef communities that are now carbonate deposits. The site is located near the axis of the Cincinnati Arch, although bedrock units in the vicinity of the site dip slightly southwest from the axis of the arch.

According to "Water Resources of Wildcat Creek and Deer Creek Basins, Howard and Parts of Adjacent Counties, Indiana, 1979-82" (Smith *et al.* 1985), the predominant feature of the bedrock surface is a valley system cut by streams flowing from east to west. **Figure 3** in "Water Resources of Wildcat Creek and Deer Creek Basins, Howard and Parts of Adjacent Counties, Indiana, 1979-82" (Smith *et al.* 1985) is drawn at a scale of three miles per inch and appears to indicate the presence of a ancient river channel located to the southwest of the site. The presence of an ancient river channel located southwest of the site was also suggested during construction of the groundwater model for the site from residential well logs. Lithologic logs for residential wells located southwest of the site indicate that the top of the bedrock is at depths up to 140 feet, which is significantly deeper than bedrock encountered at the site during the field investigation.

According to references (Smith *et al.* 1985 and Fenelon *et al.* 1994), groundwater flow is primarily through semi-confined sand and gravel deposits within the glacial drift, where these deposits are present, and through open fractures, joints, bedding planes, and solutional channels within the bedrock. Although the principle sources of groundwater are glacial drift aquifers in the Upper Wabash River basin, these aquifers are not present at the site. The Silurian-Devonian carbonate aquifer is the primary bedrock source of groundwater in the site vicinity.

According to "Water Resources of Wildcat Creek and Deer Creek Basins, Howard and Parts of Adjacent Counties, Indiana, 1979-82" (Smith *et al.* 1985), the USGS collected water level measurements from approximated 150 domestic and commercial wells during 1980 and from two continuous-record observation wells from 1966 to 1981 during the study of the Wildcat and Deer Creek basins. According to this study, groundwater flow within the bedrock is generally toward streams; however, reaches of Wildcat Creek near Kokomo are affected by the diversion of surface water, large-quantity groundwater withdrawals, treated wastewater discharges, and the regulation of reservoirs.

Stratigraphy underlying the site has been categorized into three hydrologically significant water-bearing zones: a shallow water-bearing zone; an intermediate water-bearing zone; and a lower water-bearing zone. The shallow water-bearing zone at the site generally includes the overburden and the highly fractured Kokomo limestone and, to a limited extent, the upper Liston Creek limestone. The intermediate water-bearing zone includes the less fractured lower Kokomo and the Liston Creek limestone. The lower water-bearing zone consists of the lower 10 to 20 feet of the Liston Creek limestone and the upper 5 to 20 feet of the Mississinewa shale.

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Groundwater flow and contaminant transport in the intermediate and lower water-bearing zones in the vicinity of the CSSS are largely influenced by preferential flow through the fractured dolomitic limestone bedrock underlying the site.

Based on water levels collected from monitoring wells screened within each of the three water-bearing zones, groundwater flow is generally to the west; however, groundwater flow within each zone may vary according to localized and regional influences. Groundwater flow in the shallow water-bearing zone within the CSSS is locally toward the creeks. The shallow water table generally follows surface topographic features. These generalities are true with the exception of the Lagoon Area where mounding of the water table is present due to surface water recharge from the lagoons. This recharge results in localized northerly flow along the north side of the Lagoon Area.

Groundwater flow in the intermediate water-bearing zone on the eastern two thirds of the site is due west. High groundwater pumping rates at the Martin Marietta Quarry affect large areas of the intermediate and lower water-bearing zones. Hydraulic influence from pumping at the Martin Marietta Quarry located west of the Dixon Road Quarry is first observed in the vicinity of the Slag Processing Area. Groundwater flow in the lower water-bearing zone appears to be to the northwest and west along the structural dip of the bedrock.

A groundwater model was constructed to simulate the regional groundwater flow system in the vicinity of the CSSS. The model was used to simulate interactions between groundwater and surface water and to simulate influences from pumping wells (i.e., domestic wells, industrial wells, groundwater supply wells, and dewatering wells at the Martin Marietta Quarry). The groundwater model was used to develop the following conclusions:

- Contaminant transport of the intermediate and lower water-bearing zones in the vicinity of the

CSSS is controlled by Martin Marietta Quarry pumping and shallow groundwater discharge to surface water in the Wildcat and Kokomo Creeks;

- Groundwater flow pathways are confined to a central contaminant transport pathway following the course of the Wildcat and Kokomo Creeks in the westerly direction. Transport pathways from site source areas do not diverge significantly to the north or south of this main transport pathway; and
- Capture of contaminated groundwater originating on the CSSS by domestic wells in a residential subdivision located southwest of the site is unlikely whether the quarry pumping is operational or whether it is discontinued some time in the future.

Physiography

Topography across the site is generally level with an average ground surface elevation of 800 feet Mean Sea Level (MSL). Along the stream valleys of Kokomo and Wildcat Creeks, surface topography slopes gently or very steeply to an average surface water elevation of 780 feet MSL. In areas disrupted by quarrying activities, typical topographic features are greatly modified. Slopes in the quarries range from near vertical faces to gently sloping floors. The lowest point in the floor of the Dixon quarry is 745 feet MSL. The floor of the Martin Marietta quarry is 680 feet MSL. The Haynes International Inc. facility's landfill rises to an elevation of 830 feet MSL and the Slag Processing Area rises to an elevation of 840 feet MSL.

Hydrology

The Kokomo area is drained by Wildcat and Kokomo Creeks, which are tributaries of the Wabash River. Wildcat Creek flows through the center of the City of Kokomo in a westerly direction, winding through and bordering three of the four properties consisting of the CSSS. The Wildcat borders the Main Plant property to the west, the Lagoon Area to the south and west, and the Slag Processing Area to the south. Kokomo Creek, one of three tributaries of Wildcat Creek, flows in a westerly direction along the south side of the City and discharges to Wildcat Creek along the southwestern corner of the Main Plant (OU5). This creek is confined by banks of 10- to 20-foot deep. The other two tributaries of Wildcat Creek are the Kitty Run Drain, which flows northeasterly toward the southeast corner of the Dixon Road quarry and then northerly along the quarry's eastern boundary, and Shambough Run which flows in a southerly direction between the Slag Processing Area and the Lagoon Area. Kokomo Creek has one tributary in the study area which discharges to an unnamed drain that flows northwesterly and discharges to Kokomo Creek at the old Continental Steel bridge. This unnamed drain is 10 to 15 feet wide and has less than one foot of water during base flow conditions. The Wildcat and Kokomo creeks extend some 20,000 feet within the CSSS. These creeks have been impacted by direct discharge of material, runoff from the source areas, and upstream industrial sources. The creeks are generally 50 to 100 feet wide, with depths up to four feet. These creeks are designated for recreational use. A recreational corridor extends along most of the banks of the creeks.

In the Kokomo area, the mean annual discharge of Kokomo Creek was 21.6 cubic feet per second (cfs), and the mean annual discharge of Wildcat Creek was 230 cfs, according to the 1985 United States Geological Survey. Under normal flow conditions, Kokomo Creek is generally 15 to 20 feet wide and less than two feet deep, and Wildcat Creek is generally 30 to 50 feet wide and approximately 2.5 to five feet deep. From the Phillips Street Bridge to the Markland Avenue Bridge, however, Wildcat Creek is an average of 100 feet wide and three to four feet deep.

The USGS evaluated the hydraulic connection between Kokomo and Wildcat Creek and the underlying aquifer during 1981. Water levels were measured during two time periods for different sections of the two creeks. For the time of the study, the results showed: stream gains for the stretch of Kokomo Creek located south of the Main Plant; stream losses for the stretch of Wildcat Creek located west and north of the Main Plant, and, depending on time, both gains and losses for Wildcat Creek downstream from the influence of Kokomo and Wildcat Creeks. The study attributed losses from Wildcat Creek primarily to large-scale withdrawals for dewatering of quarries and storage in reservoirs in or near Kokomo.

An initial evaluation of the creeks was conducted in May 1992 to identify areas of sediment deposition. For this study, sediment was considered to be material that settled to the bottom of a body of water. Principle constituents were soil particles transported by water or bedrock erosion and organic matter. Little or no sediment was measured in the main channels of the creeks. In these areas, the stream bed consisted of limestone bedrock. Sediment deposition appeared to be primarily along the inside bend of stream meanders (i.e., point bars) and at locations where the stream velocity was slowed due to sudden increase in cross-sectional area or depth.

Wastewater from Continental Steel was discharged through five outfalls, designated CS-01 through CS-05 (ISPCB, 1985). Outfall CS-01, which has not been located, was previously the main processing outfall before the installation of the filter plant. Upon installation of the plant, this outfall was eliminated. Discharge at outfall CS-02 included non-contact cooling water from annealing, galvanizing, and wire tinning; some process water from galvanizing; stormwater; and cooling tower water from the melt shop. In 1984, a lift station was installed which pumped the wastewater from this line to the filter plant. Outfall CS-02 then discharged to Kokomo Creek only during times when excessive quantities of stormwater caused an overflow. Outfall CS-03 was an emergency overflow for untreated wastewater. Outfall CS-04 discharged wastewater from the Lagoon Area. Acid-pickling wastewater was transferred to the Lagoon Area where these wastewaters were neutralized, run through clarifiers and polishing lagoons, and then discharged. Structure CS-05 served as both an outfall and a water intake. As an outfall, CS-05 was the discharge point for filtered, non-contact cooling waters and process waters from rolling, drawing, and annealing operations. As an intake, water was withdrawn daily from Wildcat Creek.

Spill Incident Report records at IDEM indicate that 16 spills have occurred during the last 20 years which resulted in chemical releases to either Kokomo or Wildcat Creek. The chemicals spilled were primarily acid wastewater and oils from either Continental Steel or the Cabot Corporation.

Ecology

The U.S. Fish & Wildlife Services (USFWS) office in Bloomington, Indiana and the Indiana Department of Natural Resources (IDNR) Division of Nature Preserves were contacted for a current listing of occurrences of threatened or endangered species, and areas of critical or sensitive habitat in the vicinity of the site. These trustee organizations identified the potential occurrence of both state- and federally-listed species, as well as, areas of critical or sensitive habitat on or near the CSSS.

Due to the degraded quality and limited areal extent of potential habitats onsite, it is unlikely that threatened or endangered species, or areas of critical or sensitive habitat occur onsite. However, data recently obtained from the IDNR Natural Heritage Data Center indicates there is potential for occurrences of state-endangered bobcat (*Lynx rufus*) and state threatened Butler's garter snake (*Thamnophis butleri*) in the vicinity of the site. In addition, USFWS and IDNR identified the occurrence of federally-listed Indiana bat (*Myotis sodalis*) on Wildcat Creek outside of Howard County downstream from the site. Based on information from IDNR, Wildcat Creek is at the center of this species summer range. Therefore, while there is no record of Indiana bat occurring in the vicinity of the site, there is substantial evidence and trustee support to conclude that this species may occur nearby and could potential migrate to the area under proper conditions.

Technical Impracticability of Groundwater Restoration

Restoration of contaminated groundwater is one of the primary objectives of the Superfund program. Groundwater contamination problems are pervasive; over 85% of Superfund National Priority List (NPL) sites have some degree of groundwater contamination. A major purpose of the Superfund program is protecting human health and the environment from contaminated groundwater and restoring those waters to a quality consistent with their current, or reasonably expected future, uses.

The National Contingency Plan (NCP) provides the regulatory framework for the Superfund program. The NCP states that EPA expects to return usable groundwater to their beneficial uses whenever practicable, within a time frame that is reasonable given the particular circumstances of the site (NCP §300.430(a)(1)(iii)(F)).

Generally, restoration cleanup levels in the Superfund program are established by applicable or relevant and appropriate requirements (ARARs), such as the Federal or State drinking water standards in the case of contaminated groundwater. Cleanup levels protective of human health and the environment are identified and calculated by EPA where specific ARARs for a particular contaminant do not exist.

While the Superfund program has had tremendous success in reducing the immediate threats posed by groundwater contamination, experience since the beginning of Superfund has shown that groundwater restoration to drinking water quality (or other more stringent level) may not always be practicable or possible to achieve. The following factors are used to determine the ability or capability (practicability) for groundwater restoration: (1) Hydrogeologic factors, (2) Contaminant-related factors, and (3) Remediation technology system limitations and inadequacies. Therefore, EPA must evaluate whether groundwater restoration is possible or technically practicable. If EPA determines under Section 121(d)(4) of CERCLA upon evaluating these factors that because of conditions at the site, certain ARARs cannot be achieved (i.e., groundwater ARARs in the intermediate and lower aquifers), then EPA may issue a Technical Impracticability (TI) Wavier.

The determination of the appropriateness of a TI waiver is being discussed for the intermediate and lower water-bearing zones for site-wide groundwater at the CSSS. These groundwater zones describe the bedrock strata which decreasingly fracture at depth. There is evidence of DNAPL in these water-bearing zones in three source areas, the Markland Avenue Quarry, the Lagoon Area, and the Main Plant. Based on hydrogeologic experience and fate and transport analysis, the effectiveness of DNAPL recovery in fractured bedrock is at best on the order of 80 percent recovery of the DNAPL mass, even with an aggressive scheme of groundwater collection. The basic issue for justification of the TI waiver is whether it is technically practical to remediate groundwater within these zones such that groundwater ARARs can be achieved in a reasonable time frame. The reasonable time frame to achieve ARARs has been established by IDEM and EPA at 100 years.

By applying this information for the intermediate and lower groundwater aquifers to the above three factors, it has been demonstrated to EPA and EPA concurs with the greater than 200 years to achieve ARARs qualifies for use of the TI Wavier for these aquifers. The TI Wavier is also discussed in the

Management of Migration (MM) Section, Operable Unit 1.

Nature and Extent of Contamination

Site-Wide Groundwater

Groundwater appears to have received contaminants from the Main Plant, the Markland Avenue Quarry, the Lagoon Area and/or other areas related to the site, including disposal activities (i.e., spills) of hazardous materials. Side-wide groundwater was investigated in two phases.

The objectives of the side-wide groundwater investigation are presented below:

- Characterize groundwater flow, groundwater quality and contamination;
- Delineate horizontal and vertical extent of contamination;
- Document the horizontal and vertical extent of migration farther from the site;
- Determine the various potential sources of contamination;
- Evaluate the interrelationship among the three water-bearing zones; and
- Provide information for the evaluation of appropriate remedial action alternatives if necessary.

During Phase I the local aquifer system was separated into shallow and deep water-bearing zones. As a result of Phase II groundwater investigations, careful examination of well logs, well construction and associated water-level elevations and field determination while drilling, three water-bearing zones were determined and referenced as the shallow (760 feet MSL and up), intermediate (700 to 760 feet MSL), and lower (660 to 700 feet MSL) water-bearing units.

Phase I groundwater investigations involved the installation of 35 monitoring wells in the shallow aquifer. Additionally, eight Westbay MP System™ multi-level monitoring wells were installed, from which discrete samples could be collected from all three water-bearing zones. Two rounds of groundwater sampling were conducted the 1993 Phase I investigation. During the first round (May 1993), 69 locations were sampled and field screened for VOCs and metals. Interpretation of these results provided an initial characterization of shallow water-bearing zone contamination and served as the basis for further sampling. Second round samples were collected in August 1993 at all newly installed and existing monitoring wells (96 locations). Samples collected during the second round were submitted to the U.S. EPA Contract Laboratory Program (CLP) for SVOC, PAH, VOC, PCB, pesticide and metal analysis. This data was used to evaluate the horizontal extent of the groundwater contamination in the shallow water-bearing zone and to determine if contaminants had migrated into the deeper water-bearing zones.

Phase II investigations included installation of ten new and four replacement monitoring wells. Water level measurements, groundwater sample collection and aquifer parameter (hydraulic conductivity) testing were performed at all newly installed monitoring wells. Groundwater elevations were measured at accessible monitoring wells and samples collected from selected wells based on past results. Groundwater results generated during the Phase II investigation are compared to Phase I results for the shallow, intermediate and lower water-bearing zones. Groundwater samples were collected for laboratory analysis from 13 of the newly installed wells and 52 previously installed wells. (See Appendix A, Figure 1b for monitoring well locations)

Lagoon Area

Remedial Investigation of the Lagoon Area was performed in two phases with the first being initiated in 1992. Samples were collected of lagoon surface water, lagoon sludge, soils underlying and adjacent to the lagoons, waste piles, sludge within mixing and clarifier tanks at the treatment building, and water in the basement of the treatment building. The second phase of the RI at the Lagoon Area, which was initiated in 1995, consisted of a soil gas survey in the entrance area and groundwater sampling.

The soil gas sampling and soil sampling (see Appendix A, Figure 2d) was conducted to investigate for potential hot spots of volatile organic compound (VOC) contamination in soils and sludge at the lagoon entrance area. Elevated concentrations of VOCs were detected in a shallow groundwater monitoring well and soil/sludge samples during previous investigations in this area. Soil gas samples were analyzed by GC for the following VOCs: trichloroethene, tetrachloroethene, 1,1-dichloroethene, trans-1,2-dichloroethene, cis-1,2-dichloroethene, 1,1,1-trichloroethane, and vinyl chloride. 87 soil gas samples were collected in the Lagoon Area.

Groundwater was sampled from twelve monitoring wells located upgradient, downgradient, and within the Lagoon Area. Groundwater samples were collected from six monitoring wells screened in the shallow water-bearing zone, four intermediate-water-bearing zone monitoring wells, and three lower water-bearing zone monitoring wells. Groundwater samples were analyzed for VOCs, SVOCs, PAHs, PCBs, pesticides and metals.

Kokomo and Wildcat Creeks

This section documents the Remedial Investigation of the Continental Steel Superfund Site (CSSS) and the impacts the site has imparted on Kokomo and Wildcat creeks (OU3) in Kokomo, Indiana. Phase I of the RI investigated the creeks including a study of creek water, creek sediment and shallow groundwater due to their close proximity to the CSSS Main Plant, Lagoon and Slag Processing Areas. Phase of the RI included sediments and surface water from Kokomo and Wildcat creeks and shallow groundwater from monitoring wells adjacent to the creeks to accomplish the following: confirm previous results; further characterize Kokomo and Wildcat Creeks surface water quality and sediment contaminant concentrations; examine the interrelationship between shallow groundwater quality and creek sediment and surface water; determine the potential impacts from the surrounding properties; and provide information for the evaluation of remedial alternatives if necessary.

Surface water samples for the determination of the presence and extent of contamination within Kokomo and Wildcat creeks surface water was performed via the collection of 27 samples during the Phase II RI. Surface water samples were field screened for temperature, conductivity, turbidity, dissolved oxygen, salinity, and redox potential. Additionally, surface water samples were analyzed for nitrate/nitrite as nitrogen, ammonia, phosphorous, total dissolved solids, total suspended solids, and metals by the U.S. EPA Central Regional Laboratory (CRL).

Sediment samples were collected after surface water sampling at each of the 27 locations (see Appendix A, Figure 3b). Sediments were characterized to confirm existing information, delineate contaminants present, determine the potential impacts from the contiguous properties, and design appropriate remedial actions. Creek sediment samples were analyzed for VOCs, PAHs, PCBs, pesticides and total metals by the U.S. EPA Contract Laboratory Program (CLP).

Groundwater was sampled from 12 shallow water-bearing zone monitoring wells located along Kokomo and Wildcat Creeks to evaluate groundwater quality and the relationship between the shallow groundwater and hydraulically connected Kokomo and Wildcat creeks. Groundwater samples were analyzed by CLP for VOCs, filtered and unfiltered metals, nitrate/nitrite as nitrogen, sulfate, chloride, mercury, alkalinity, total phosphorous, total suspended solids, and total dissolved solids. Several samples were analyzed for PAHs, PCBs, and pesticides.

Markland Avenue Quarry

Contaminant characterization required diverse media sampling for a wide range of contaminants to delineate the extent, quantity, and type of contamination. Investigation objectives for Markland Avenue Quarry were as follows:

- Pond water and sediment sampling to characterize potential groundwater contaminant sources;
- Pond sediment sampling to identify and characterize the presence of dense non-aqueous phase liquids (DNAPL);
- Surficial soil sampling from the backfilled area to evaluate the potential risk of wind blown dust from this source;
- Residential soil sampling based upon quarry surficial sampling results to assist in risk assessment;
- Geoprobe soil gas surveying to pinpoint potential contaminant "hot spots";
- Groundwater screening for confirmation at soil gas survey "hot spots"; and
- Groundwater sampling at existing and newly installed monitoring wells to further characterize possible contaminant migration.

To characterize the contaminants in the quarry pond water, samples were collected for chemical analysis at three depth intervals (labeled A, B and C for shallow, intermediate, and deep, respectively) within the pond water column at three locations. Water column profile results for pH, temperature, dissolved oxygen, and conductivity versus depth using a Grant/YSI Water Quality Monitoring System showed three distinct stratified layers with respect to parameter changes. Samples were collected from each of the three layers using a vertical bottle sampler and analyzed for VOCs, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals. Confirmatory surface water samples were analyzed by the U.S. EPA Contract Laboratory Program (CLP) for VOCs, SVOCs, PCBs, pesticides and target analyte list (TAL) metals.

Characterization of quarry pond bottom sediments was accomplished by collecting and analyzing core samples at nine locations. The non-cohesive nature of the sediment inhibited collection of a shallow and deep sample and composite samples were collected instead. Quarry pond sediment composite samples were analyzed for VOCs, PAHs, PCBs and metals. Confirmatory quarry pond sediment samples were analyzed by the CLP laboratory for VOCs, SVOCs, PCBs, pesticides and Target Analyte List (TAL) metals.

Markland Avenue Quarry surface soil samples were collected at 26 locations (see Appendix A, Figure 4c) and analyzed for PAHs, PCBs and metals. Confirmatory surface soil samples were analyzed by the CLP laboratory for SVOCs, PCBs, pesticides and TAL metals. Surface soil sampling was conducted at 10 residential locations and at two locations (RS-111, RS-112) in a proposed soccer field to determine the presence or absence of surficial contamination resulting from wind borne transport of constituents from the site. Sample results were used to provide input to the risk assessment. Laboratory analysis was identical to that conducted on surface soil samples collected within Markland Avenue Quarry.

A soil gas survey (see Appendix A, Figure 4b) was conducted to delineate the areal extent of potential impact to the subsurface and to identify hot spots indicative of buried drums or pockets of product within the fill. Eighty soil gas sampling locations were proposed in the Work Plan and FSP, utilizing a 100-foot by 100-foot survey grid. A total of 77 soil gas samples were actually collected due to site conditions. Access could not be obtained to seven of the proposed locations which were located southeast of Markland Quarry in the Moore Drugs and Village Pantry parking lots. Eleven additional samples were collected in areas where field gas chromatography (GC) results showed elevated concentrations of VOCs in the soil gas. These samples were collected at 50 foot intervals centered on locations where elevated VOC concentrations were detected to further delineate the hot spots within the Quarry. **Figure 4d** shows the 77 soil gas sampling locations. Soil gas sampling depths ranged from 2 to 10 feet below ground surface. Soil gas samples were analyzed for trans-1,2-dichloroethene, cis-1,2-dichloroethene, trichloroethene, tetrachloroethene, vinyl chloride, 1,1,1-trichloroethane, and 1,1-dichloroethene. Groundwater sampling was attempted at locations showing elevated soil gas contaminant concentrations. Due to the resistance of the backfill (slag), sediment clogging the milled (slotted) rods, hole collapse and the absence of groundwater at many of the selected locations, only 6 of the 23 geoprobe groundwater screening samples were collected. The samples were analyzed for volatile organic compounds (VOCs) by the U.S. EPA Field Analytical Services Program (FASP) laboratory.

One additional downgradient well, LA-101C, was installed at the western margin of the quarry to better characterize the effects of contamination in the quarry on the local aquifer. Through comparison of groundwater elevation and water quality results at the two existing downgradient wells (UA-06 and LA-02) with results for new well LA-101C, the origin, extent, and presence of contamination could be more fully evaluated. Monitoring well LA-101C was screened at the approximate depth of the quarry bottom (78 to 88 feet in depth). Groundwater samples were collected from upgradient wells (LA-01 and UA-01) and from UA-22 in the middle of the quarry (wells within the source area). Well locations are shown on **Figure 4e**.

Main Plant

Main Plant investigations included inside and outside building inspections, confirmatory wipe sampling, basement and sewer sampling, subsurface soil sampling, soil gas sampling, groundwater sampling, residential surface soil sampling, and indoor air and high volume air sampling. All field activities and sample collection were conducted according to the RI/FS Work Plan and Phase II Field Sampling Plan (FSP).

Twenty confirmatory wipe samples of internal roofs, I-beams, floors, and walls were collected to evaluate the effectiveness of the U.S. EPA gross decontamination of the buildings in reducing human health risks to trespassers.

CDM collected indoor air samples with Alpha-1 personal air samplers from Buildings 112B, 11, 42 and 68. Indoor air samples were collected to assess potential inhalation impacts to workers or trespassers in the Main Plant buildings. Additionally, high volume air samples were collected from locations in surrounding residential neighborhoods to assess migration of fugitive dust from the Main Plant.

Basement water and sewer sediment samples were collected throughout the Main Plant area in October and November 1995. Basement sample locations were chosen based on location (proximity to machinery and transformers) and by visual inspection (sheen on water, evidence of submersed waste, debris, etc.). Nineteen samples and three duplicate samples were collected during the field program and 18 samples and the three duplicates were analyzed in the laboratory. Basement samples were analyzed by the Field

Analytical Services Program (FASP) laboratory for volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

Six sewer sediment samples in the Main Plant were collected. The six samples and one duplicate sample were submitted to the FASP laboratory for analysis of VOCs, PAHs, and PCBs. Metals analysis was conducted by the Kemron laboratory. One confirmatory sample was analyzed by the CLP lab for target organics and metals.

Using the results of the U.S. EPA surface soil study, a focused subsurface soil boring investigation was implemented to delineate the vertical extent of impact at these stained locations (see Appendix A, Figure 5c). The boring program was designed to provide the information necessary to estimate the concentrations and volume of contaminated soil. Thirty-three geoprobe soil borings were advanced to bedrock. Samples were collected for VOC, SVOC, PCB, and metal analyses.

Soil gas sampling was conducted in an area formerly utilized as a waste slag disposal area in the south Main Plant (see Appendix A, Figure 5b). The soil gas survey was conducted to identify potential source areas of VOC contamination in the vadose zone and VOCs in shallow groundwater. Soil gas samples were analyzed using a portable gas chromatograph (GC) to provide real-time analysis for the following VOCs: trichloroethene; tetrachloroethene; 1,1-dichloroethene; trans-1,2-dichloroethene; cis-1,2-dichloroethene; 1,1,1-trichloroethane; and vinyl chloride. Due to the inaccessibility of several of the proposed locations and difficulty in penetrating the slag/fill, a total of 49 soil gas samples was collected at the Main Plant.

Groundwater was sampled from ten shallow aquifer monitoring wells located upgradient, downgradient, and within the Main Plant area to evaluate groundwater quality and characterize possible downgradient contaminant migration (see Appendix A, Figure 1b).

Surface soil samples were collected from the residential area located east of the Main Plant and from other areas in the vicinity that may be receptors of airborne contaminants (see Appendix A, Figure 5d). This work was performed to assess the risk to the surrounding residential area from windblown dust. Surface soil samples were collected at 29 residential locations. Soil samples were collected at least 10 to 15 feet from the residences and within the top six inches. Additional soil samples were collected from Highland Park at the following locations: in the sandbox at the playground, from beneath the swing set, and from exposed dirt at second base at the baseball field. Samples were analyzed for SVOCs (including PAHs), PCBs, pesticides and metals.

Slag Processing Area

The investigation of the Slag Processing Area was conducted to characterize the possible contaminants in the slag, to confirm or deny that drums with solvents have been buried in the backfilled area of the quarry, to evaluate the potential impacts to Wildcat Creek and to help determine appropriate remedial action alternatives. Field investigation objectives included performing an active soil gas survey and surficial soil/slag sampling to characterize the areal extent of possible organic impact to subsurface media and to identify potential contaminant hot spots that may indicate buried drums or pockets of product. Slag Processing Area investigations included a soil gas survey, surface soil sampling, a site inspection, and groundwater sampling.

38 soil gas sampling location were identified with 35 locations being sampled. The sampling locations were developed utilizing a 100-foot by 100-foot survey grid. A geoprobe was utilized to perform the soil gas survey. Optimally, the hydraulically operated soil gas probe was driven to a depth of 8 to 10 feet and a

soil gas sample was collected from that depth. However, due to resistance encountered in the slag fill, sampling depths ranged from 2.5 to 9.5 feet in depth.

Surficial soil/slag samples were collected for laboratory analysis to characterize potential impact to surficial soils at the Slag Processing Area. Soil/slag samples were proposed to be collected based upon the results of the site inspection and soil gas survey at areas suspected of having contamination representative of the slag piles. However, ambient air field screening with a photoionization detector (PID) and soil gas survey results showed only one detection of trichloroethene (1 mg/m^3 at SPSG-24). Therefore, surface soil/slag samples were collected at that location and at randomly selected locations spanning the entire area. A total of 10 surface soil/slag samples was collected at depths ranging from 4 to 14 inches.

Selected monitoring wells were sampled to evaluate groundwater quality within the Slag Processing Area. Groundwater samples were collected from two monitoring wells. Samples were collected from the lower, intermediate, and upper water-bearing zones.

Groundwater/Surface Water Contamination:
The primary contaminants detected in groundwater are VOCs. Generally, PAHs, PCBs, pesticides and metals were limited to point detections at individual wells and site-wide plumes were not generally identified except for a few metals. This is expected due to the relatively low mobility of the PAH and PCB constituents and their method of introduction to the subsurface; usually disposal on the ground surface. In 1984, 1985 and 1986, IDEM identified chromium, cadmium, lead and iron in the on-site groundwater.

Site-Wide Groundwater
Potential water quality trends discussed within this section are based on the comparison of data from two sampling events. Tetrachloroethene, trichloroethene, 1,2-dichloroethene and vinyl chloride are the primary VOC constituents of concern identified during the remedial investigation. These compounds can be related to each other through degradation processes.

The groundwater is impacted primarily by VOCs (trichloroethene, cis-1,2-dichloroethene and vinyl chloride) in the Lagoon Area and to a lesser extent by metals. For the Lagoon Area proper, total VOCs were highest at the Lagoon Area entrance in the shallow water bearing zone. This area was identified as a hot spot during the soil gas survey. Within each water-bearing zone, VOC concentrations are highest in the shallow water-bearing zone at the Lagoon Area entrance, in each at the intermediate water-bearing zone wells underlying the Lagoon Area and in lower water-bearing zones at the downgradient well locations. Total VOC concentrations appear to be decreasing significantly in the upper water-bearing zones, but have remained about the same in the intermediate and lower water bearing zones. Trichloroethene, cis-1,2-dichloroethene and vinyl chloride are the primary water quality contaminants in the shallow water-bearing zone. Cis-1,2-dichloroethene is primary water quality contaminant in the intermediate and lower water-bearing zone, although trichloroethene and vinyl chloride are also contaminants of concern in these zones.
VOC concentrations in both the shallow and the intermediate water-bearing zones appear to be quite stable within the Lagoon Area boundary southwest of the lagoon ponds; however, concentrations of degradation products appear to be increasing. This trend would indicate that groundwater contaminants are naturally attenuating with time.

Metals present in the Lagoon Area groundwater that exceed MCLs include iron, manganese, nickel, chromium and antimony. Nickel was detected above MCLs at seven locations within the upper water-bearing zone and at one location within the intermediate zone. The highest nickel concentration was 0.818 mg/L in the well located by the treatment tanks northwest of the lagoon ponds. Antimony was detected in one sample each from the shallow water-bearing zone and from the intermediate water-bearing zone. Chromium was detected for one sample from the shallow water-bearing zone.

The primary contaminants in the groundwater in the vicinity of Markland Avenue Quarry are trichloroethene, cis-1,2-dichloroethene and vinyl chloride. Total VOCs for the Markland Avenue Quarry area were highest in wells finished in the intermediate water-bearing zone downgradient from the quarry pond. Degradation products cis-1,2-dichloroethene and vinyl chloride may be increasing within the intermediate zone downgradient from Markland Avenue Quarry. Within each water-bearing zone, VOC concentrations are highest in backfilled area (UA-22) in the shallow water-bearing zone; highest downgradient of the quarry pond in the intermediate water-bearing zone and highest downgradient of the quarry pond in the lower water-bearing zone. The lower water-bearing zone shows the lowest groundwater impacts. No water quality trends are apparent within the lower water-bearing unit

The primary contaminants in the groundwater in the vicinity of the Main Plant are trichloroethene, cis-1,2-dichloroethene and vinyl chloride. Total VOCs were highest in the Main Plant area in the intermediate water bearing zone downgradient from the Main Plant, near Wildcat Creek. Based on the available information from the Main Plant property groundwater investigations, it appears that total VOC concentrations decreased with time in the shallow, intermediate and deep zones, however, vinyl chloride increased in all three zones at the Main Plant. VOC concentrations are highest near the former spill area on the west property boundary within the shallow, intermediate and lower water-bearing zones. These results are consistent with the reported historical spill of trichloroethene in the vicinity of Building 112 (Nail Mill).

Primary contaminants in the groundwater in the vicinity of the Slag Processing Area are cis-1,2-dichloroethene, and to a lesser extent, trichloroethene, and vinyl chloride. Total VOCs were highest in the Slag Processing Area in the intermediate water-bearing zone (984 µg/L), although total VOC concentrations are generally highest in the upgradient well location. VOC concentrations appear to be decreasing higher within the intermediate zone, increasing deeper within the intermediate zone and decreasing within the lower water-bearing zone. Total VOC concentration were lowest in the shallow water-bearing zone. (See Appendix D, Tables MM-1S, MM-1I, & MM-1L for ranges of contaminants discovered during RI).

Lagoon Area

The soil gas survey results indicate that several coalesced plumes of VOCs in the soil gas originate near the lagoon entrance. Two plumes trend northwest and two plumes displaying lower concentrations are present along the two roads to the south and east of the entrance, respectively. The primary VOCs detected in the soil gas were cis-1,2-dichloroethene, trichloroethene and vinyl chloride. The groundwater data at the entrance showed cis-1,2-dichloroethene (400ppb) and trichloroethene (710 ppb).

The downgradient well nest in the shallow water-bearing zone, in the intermediate water-bearing zone and in the lower water-bearing zone showed detections of the same three primary VOCs as in the soil gas. The proportion of trichloroethene to the two daughter products, cis-1,2-dichloroethene and vinyl chloride decreased as expected likely due to the distance from the source and the age of the source. The lower aquifer well is the most contaminated indicating that the plume is migrating downward as it moves downgradient.

The monitoring well located upgradient from the lagoon entrance also contained cis-1,2-dichloroethene, trichloroethene and vinyl chloride in proportions similar to the soil gas results. The lower aquifer well at this location contained low levels of the degradation products but no trichloroethene. This contamination could be from the Main Plant or it could be indicative of another near surface source in the area.

The shallow water-bearing zone wells were sampled along the west side of the Lagoon Area. These wells contained low levels of TCE degradation products. They are located downgradient from the drum removal area and it is possible that a contaminant plume has already moved through this area and the local source has been removed. The intermediate level wells at this location show significantly higher concentrations of degradation products, however no parent products, such as trichloroethene or tetrachloroethene were detected. This would further support the theory that a plume has moved through and the local source is no longer available to supply parent products to the groundwater. The lower water-bearing zone wells at this location were clean.

Monitoring well EW-18 along the west side of the creek was contaminated, showing almost a part per million of total VOCs. This well may be influenced by Haynes facility rather than the Lagoon Area since it is screened above the stream elevation, has tetrachloroethene present in the well and is upgradient in the shallow water-bearing zone.

The data indicates that no BNAs, PCBs or pesticides were detected in groundwater samples collected. These compounds are present in the lagoon soils and sediments; however, they do not migrate readily from the solids into the groundwater.

There are three metals present in the Lagoon Area groundwater that exceed maximum contaminant levels (MCLs). These metals are nickel, iron and manganese. According to the data for lagoon soils and sediments, iron and manganese were consistently present in the soils at high levels. Nickel, while consistently detected was not present at as high levels, however it may have been disposed in a more soluble form. The other metal that was present consistently was lead. However, lead was not detected in the lagoon groundwater above MCLs. (See Appendix D, Tables LA-1S, LA-1I, & LA-1L for ranges of contaminants discovered during RI).

Kokomo and Wildcat Creeks

Surface water inorganic concentrations are compared to background concentrations and surface water benchmark values taken from Indiana Water Quality Standards (327 I.A.C 2-1-6) and U.S. EPA Ambient Water Quality Criteria (Fresh Chronic Criteria) (U.S. EPA 1992). A detailed discussion of surface water results in comparison to background concentrations and surface water benchmark values is found in the ecological assessment sections of the baseline risk assessment report. Background surface water values were collected at locations upstream from the CSSS on both Kokomo and Wildcat Creeks and from the minor tributaries feeding each creek.

Field filtered samples are defined as dissolved concentrations and unfiltered samples are defined as total concentrations. The following discussion examines surface water results by reach that exceed benchmark values. (See Appendix D, Table C-1S for ranges of contaminants discovered during RI).

Reach 1

Seven dissolved metals and nine total metals were detected above quantitation limits in Reach 1 surface water samples. Only copper and lead exceeded the surface water benchmark criteria.

Reach 2

Eight dissolved metals and eight total metals were detected above quantitation limits in Reach 2 surface water samples. Only one sample contained total copper and lead concentrations slightly above surface water benchmark criteria.

Reach 3

Ten dissolved metals and eleven total metals were detected above quantitation limits in Reach 3 surface water samples. Total copper was detected above surface water benchmark values for all surface water samples collected from Reach 3 of Wildcat Creek. Lead was also detected at a concentration only slightly above surface water benchmark criteria.

Reach 4

Five dissolved metals and ten total metals were detected above quantitation limits in Reach 4 surface water samples. Copper, lead and mercury were detected above surface water benchmark values in Reach 4 of Kokomo Creek.

Reach 5

Ten dissolved metals and eleven total metals were detected above quantitation limits in Reach 5 surface water samples. All surface water samples from Reach 5 contained total copper at concentrations slightly above surface water benchmark criteria. Lead was detected above surface water benchmark values in five of the seven surface water samples. Mercury was detected in only one sample at a concentration in excess of the benchmark criteria.

Reach 6

Six dissolved metals and seven total metals were detected above quantitation limits in Reach 6 surface water samples. Only lead was detected above surface water benchmark values in one-third of the samples collected from Reach 6 of Wildcat Creek.

Copper and lead were detected in excess of benchmark criteria in all reaches of the creeks except Reach 6 where only lead was present. Additionally, mercury was found in excess of the benchmark criteria in Reach 4 and 5. Overall, these detected concentrations were generally at or minimally above the benchmark criteria.

Comparison of Phase II RI with Phase I RI creek surface water sample data produced a good correlation except for several analytes. Phase II surface water total copper results were generally higher in Reaches 2-5 than Phase I copper results (except for Reach 1 where Phase I detected copper and Phase II had a non-detect). Similarly, lead was detected in Phase II Reach 6 samples above the benchmark criteria but was not detected in Phase I Reach 6 samples.

Inorganic and organic concentrations in groundwater collected from shallow water-bearing units around Kokomo and Wildcat Creeks are compared to U.S. EPA MCLs.

Reach 1 and 2

Results show no VOC metal concentrations above the MCLs.

Reach 3

Slightly elevated levels of VOCs were detected at the southwest corner of the Lagoon Area (EW-11) and at the southeast corner of the Haynes facility Deffenbaugh Street Operations (DSO) North landfill (EW-18).

Monitoring well EW-11 contained concentrations of cis-1,2-dichloroethene (19 µg/L) and vinyl chloride (29 µg/L) in excess of the MCLs. This well is located downgradient of the former drum disposal area and it is possible that a contaminant plume has already moved through this area and the local source has been removed. Since the contaminants present are degradation products and no parent products are present, the hypothesis that a local source is no longer available to supply the parent VOCs to the groundwater is further supported. EW-18 groundwater results show elevated levels of tetrachloroethene (350 µg/L), trichloroethene (140 µg/L), cis-1,2-dichloroethene (380 µg/L), 1,1-dichloroethene (7 µg/L) and vinyl chloride (110 µg/L).

Elevated concentrations of nickel were detected at 212 µg/L and 875 µg/L.

Reach 4
No VOCs or metals were detected in excess of MCLs.

Reach 5
VOCs were detected in shallow water-bearing zone monitoring wells UA-32 and UA-24 west of the CSSS Main Plant Area in Reach 5 of Wildcat Creek. Elevated levels of trichloroethene and its degradation products, cis-1,2-dichloroethene and vinyl chloride, were detected in UA-32 and UA-24. 1,2-Dichloroethane was detected in UA-24 at a concentration of 2,000 µg/L. These results are consistent with the reported historical spill of trichloroethene in the vicinity of Building 112B (nail mill) located at the northwest margin of the Main Plant.

UA-11 contained only one metal, lead (17 µg/L), in excess of the MCLs (15 µg/L). No other metals were detected in the groundwater samples collected from the monitoring wells located in Wildcat Creek Reach 5.

Reach 6
VOCs were detected in all three shallow water-bearing unit monitoring wells, UA-28, UA-29 and LA-03A within this Reach of Wildcat Creek. VOCs exceeding the MCLs included tetrachloroethene and its degradation products trichloroethene, cis-1,2-dichloroethene and vinyl chloride. Tetrachloroethene was detected at elevated concentrations in UA-28 (600 µg/L), UA-29 (48 µg/L) and LA-03A (5 µg/L). Trichloroethene was detected in UA-28 and UA-29 at concentrations of 370 µg/L and 14 µg/L, respectively. Cis-1,2-dichloroethene and vinyl chloride were detected at elevated concentrations in all three shallow water-bearing unit monitoring wells.

Groundwater sample analysis did not include SVOCs, PCBs and pesticides. However, shallow water-bearing zone groundwater was sampled for metals and no metals were detected above MCLs along Wildcat Creek Reach 6.

Shallow water-bearing zone monitoring wells located in Wildcat Creek Reaches 3, 5 and 6 contained elevated levels of VOCs due to the industrial activity and documented spills within those areas. Groundwater contamination likely stems from known and suspected surface spills (sources) which migrate through the sediment and into the shallow groundwater, rather than from the seasonally changing hydraulic connection with the creeks.

Markland Avenue Quarry
Upgradient wells UA-03 and UA-27 (see Appendix A, Figure 1b) were unimpacted based on the 1993 data and were not resampled in 1995. The other two upgradient wells, UA-01 and LA-01 were also not

impacted by contaminants from the quarry based on1993 and 1995 sets of data. There were low level detections of pesticides in both wells that are below the groundwater screening criteria. As pesticides were not a contaminant of concern for this area they were not resampled. Low level detections of acrylonitrile in LA-01 in the lower aquifer were discovered. The source of this VOC is unknown.

The groundwater screening samples collected during the soil gas surveys do not provide sufficient coverage to fully evaluate vertical extent of contamination at the source areas. Most locations where sampling was successful were in the central, most impacted area. The groundwater analytical results at this location indicate trichloroethene and cis-1,2-dichloroethene at a depth of 10 feet below ground surface at concentrations up to 3,000 µg/L and 33,000 µg/L, respectively and only ppb (parts per billion) level trichloroethene at depths of 28 and 35 feet below ground surface.

The monitoring wells located within the quarry fill and downgradient contained primarily VOCs, including trichloroethene, cis-1,2-dichloroethene and vinyl chloride. 1993 and 1995 data are consistent, with the prevalence of degradation products increasing in the 1995 samples. This would be expected over time as the degradation of the contaminants progresses.

Groundwater analytical results were collected from shallow depths at sample locations GW-35, GW-52, GW-85, GW-86, GW-87 and GW-88 (see Appendix A, Figure 1b) and indicated trichloroethene, benzene, toluene, ethylbenzene and xylene (BTEX) at concentrations up to 3,000 µg/L (Trichloroethene)(see Appendix D, Table MAQ-7S). The presence of the BTEX compounds within the fill indicate that light petroleum products similar to gasoline were also disposed in the fill area. Shallow groundwater at the central impact area is present at a depth of approximately eight feet.

The intermediate zone (see Appendix D, Table MAQ-7I) appears to be the most contaminated as evidenced by the data from LA-02 at 72 feet and LA-101C at 100 feet. The degradation product cis-1,2-dichloroethene is present at a part per million with ppb levels of trichloroethene, indicating that degradation is well progressed outside of the quarry fill area. The other downgradient well, UA-04, is unimpacted, likely because the well is not screened in a fracture zone as indicated by a slow recharge rate. Furthermore, UA-04 is a shallow well with a depth of only 13 feet. Most contaminants at the site are denser than water and would be expected to be present at greater depths.

It is likely that contamination from the quarry sediment and surface water is migrating into the groundwater and moving downward as it moves to the west with groundwater flow. Any DNAPL that migrates out of the pond would follow preferential flow pathways such as fractures or a confining layer and be influenced more by gravity than by flow direction. The ppm (parts per million) levels of degradation product likely indicate an older slug of contamination moving through the intermediate aquifer just outside the quarry boundary.

The groundwater data is in good agreement with the constituent detected in soil gas, surface water and sediment data. Trichloroethene is the primary contaminant detected in the source areas with degradation products becoming more prevalent with depth and distance from the source. (See Appendix D, Markland Avenue Quarry Tables for ranges of contaminants discovered during RI).

Based on surface water stratification profiling results collected in early November 1995 it appeared the pond was in the process of turnover. The warmest temperatures were observed at depths of 30 to 38 feet in the middle of the water column. These temperature measurements indicate thermal mixing or turnover has occurred. Comparison of samples SW-01B and SW-01C collected November 1, 1995 to SW-01B and

SW-01C collected November 13, 1995 indicate a decrease in concentration at these intervals by an order of magnitude which may be a result of mixing. Stratification of contaminants is more pronounced in the earlier samples which also supports the observation that mixing occurs in the pond. Sample results for SW-01A collected November 1, 1995 at a depth of one foot indicate 59 µg/L of trichloroethene at the pond surface which confirms that volatilization may be occurring from the pond surface. The presence of trichloroethene at the pond surface confirms that mixing or distribution of VOCs occurs in the pond and sample concentrations confirm that contaminants are leaching from the pond sediments or adjacent fill into the pond surface water.

The surface water samples show a distinct pattern of VOC contamination, trending from lower concentrations to higher concentrations with depth. The primary VOC detected was trichloroethene, with low level detections of the degradation product cis-1,2-dichloroethene. VOC contamination in the pond is likely a result of a combination of migration of contaminated groundwater from the adjacent fill area where trichloroethene is the primary VOC detected and dissolution from VOC contamination in the pond sediments. The stratification of contamination is likely due to the nature of the VOCs impacting lower depth of water from the bottom sediments. The detected VOCs have a specific gravity greater than 1 (the specific gravity of water) which results in an accumulation of the VOCs in lowest parts in the pond. As these compounds enter the dissolved phase, they tend to stay near the bottom unless influenced by seasonal turnover in the pond. As the VOCs near the surface, their concentration will be decreased through volatilization and UV (ultraviolet) oxidation from sunlight. Dissolved oxygen and conductivity distributions indicate aerobic degradation is occurring to depths of approximately 30 feet and that aerobic biodegradation is occurring at low rates below 30 feet. Some evidence of biodegradation was observed at depth, but is likely being impeded by the high pH in the pond water.

The pond surface water did not contain any PAHs or PCBs and only three metals were detected but the levels are below the benchmark screening levels for surface water. PAHs and PCBs are relatively insoluble and are not likely to leach into the surface water. The solubility of metals is strongly dependent on pH, redox potential, and the presence of both complexing ligands and adsorbing surfaces. The pH of the Markland Avenue Quarry surface waters was observed to range from 11.4 to 12.6. At a pH range of 11.4 to 12.6, arsenic, barium, chromium, nickel and zinc may form either soluble metal complexes (depending on the environment) or insoluble hydroxides, carbonates, sulfide, sulfates or arsenates. Cadmium, copper and lead will typically form complexes with low solubilities. The presence of arsenic, barium and zinc in the surface water may indicate that some of the soluble complexes of these metals have been formed while lead chromium and copper are likely present in a less soluble form.

Main Plant

VOCs were detected in several samples along the west side of Building 112 and 112B (monitoring wells LA-04, LA-05, UA-12 and UA-24)(see Appendix A, Figure 1b). These VOCs include trichloroethene and its degradation products. 1,2-Dichloroethene was detected in LA-04A at 2,000 µg/kg. Trichloroethene was detected in monitoring wells LA-04, UA-24 and UA-32 at elevated concentrations (2,000 µg/kg). Vinyl chloride was detected from 46-71 µg/kg in samples collected from LA-04, LA-05 and UA-24. These results are consistent with the reported historical spill of trichloroethene in the vicinity of Building 112 (nail mill) and indicate that trichloroethene has entered the bedrock and is migrating along fractures and in groundwater. Concentrations of cis- and trans-1,2-dichloroethene, trichloroethene and vinyl chloride are highest in the shallow water-bearing zone which is consistent with a surface spill source and the observed results for soil boring samples in the vicinity. PCBs were detected in only one groundwater sample (UA-21). Aroclor -1242 was detected at 4.5 µg/L, however, the CLP confirmatory sampling identified Aroclor-1248 at a concentration of 6.4 µg/L. Dissolved metals were not detected above MCLs in groundwater samples collected at the Main Plant. (See Appendix D, Tables MP-5S & MP-5I for ranges of contaminants discovered during RI).

Slag Processing Area

No VOCs were detected in the shallow water-bearing zone with the exception of cis-1,2-dichloroethene (UA-17) at the method detection limit of 1 µg/L. Total VOCs were highest in the intermediate water-bearing zone at 984 µg/L. The VOCs detected included significant concentrations of trichloroethene (140 µg/L), cis-1,2-dichloroethene (800 µg/L) and vinyl chloride (34 µg/L). Low concentrations of cis-1,2-dichloroethene and 1,1-dichloroethane were detected in the lower water-bearing zone as well as acrylonitrile at a concentration of 150 µg/L. VOC concentrations appear to be decreasing higher within the intermediate zone and may be increasing deeper within the intermediate zone. Total VOC concentrations were higher 67 feet deep than 52 feet deep. Total VOC concentration were lowest in the shallow water-bearing zone. This vertical distribution of VOCs indicates impact from VOCs likely originates from upgradient rather than from the immediate vicinity of the well at the Slag Processing Area. VOCs were not detected above screening levels in the shallow water-bearing zone during either Phase I or II sampling events. VOC concentrations appear to be decreasing in the lower water-bearing zone. (See Appendix D, Tables SP-2S, Sp-2I, & SP-2L for ranges of contaminants discovered during RI).

Soil/Sediment Contamination:

Lagoon Area

Trans-1,2-dichloroethene was detected in five soil gas samples collected in the Lagoon Area at concentrations as high as 19 milligram per cubic meter (mg/m^3). Twenty-six soil gas samples contained cis-1,2-dichloroethene, with the highest concentration being 540 mg/m^3. Tetrachloroethene and trichloroethene were detected in 10 and 40 of the Lagoon Area soil gas samples, respectively. Concentrations of tetrachloroethene were as high as 14 mg/m^3 . Trichloroethene was detected at concentrations of 640 mg/m^3. Vinyl chloride was detected at concentrations reaching 510 mg/m^3. One soil gas sample contained 1 mg/m^3 of 1,1,1-trichloroethane. Concentrations of 1,1-dichloroethene were detected in four samples at concentrations reaching 10 mg/m^3. No other VOCs were detected in soil gas samples collected in the Lagoon Area. (See Appendix A, Figure 2d for soil gas sampling locations).

One subsurface soil sample was collected from the Lagoon Area near the entrance. Toluene was detected in this subsurface soil sample at the concentration of 2 µg/kg. No other VOCs were detected. No BNA (SVOC) compounds were detected. Heptachlor epoxide and 4,4'-DDT were detected at concentrations of 2.3 µg/kg and 19 µg/kg, respectively. No other pesticide compounds and no PCBs were detected. Analysis for metals produced the following results. Aluminum, antimony and arsenic were detected at concentrations of 6,600 mg/kg, 8.6 mg/kg and 1.5 mg/kg, respectively. Barium, beryllium and calcium were detected at concentrations of 82.2 mg/kg, 0.65 mg/kg and 171,000 mg/kg, respectively. Chromium, cobalt and copper were detected at concentrations of 2620 mg/kg, 14.3 mg/kg and 200 mg/kg, respectively. Iron, lead and magnesium were detected at concentrations of 170,000 mg/kg, 2.4 mg/kg and 20,700 mg/kg, respectively. Manganese, nickel and silver were detected at concentrations of 34,800 mg/kg, 112 mg/kg and 61.5 mg/kg. Sodium, vanadium and zinc were detected at concentrations of 291 mg/kg, 203 mg/kg and 268 mg/kg, respectively. No other metals were detected in the subsurface soil sample from the Lagoon Area.

An evaluation of the data for the waste piles in the Lagoon Area indicated that four waste piles contained at least one contaminant at elevated levels, for an estimated contaminated material volume of 149 cubic yards. In the lagoons, an estimated total of 641,000 cubic yards of material was determined to contain elevated levels of contaminants. The sludge drying beds have by far the deepest contamination extending 20 feet below the surface. The acid lagoons had elevated levels of contaminants to a depth of about five feet. The polishing lagoons had elevated levels at depth varying typically from 10 feet below surface in the central portion to about five feet in the southern portion. Contamination throughout the lagoons includes, VOCs, PAHs, PCBs, chromium, lead and zinc.

Kokomo and Wildcat Creeks

Kokomo and Wildcat Creeks sediment inorganic and organic concentrations are compared to background concentrations and sediment benchmark values taken from the following sources in order of priority: U.S. EPA SQC (U.S. EPA 1993), Persaud *et al.* (1993), NYSDEC (1993) and NOAA (1994). Prioritization of this list occurred through consultation with U.S. EPA Region V. A detailed discussion of creek sediment results in comparison to background concentrations and sediment benchmark values is found in the ecological assessment sections of the risk assessment report.

The following sections examine the creek sediment concentration accedences of both background and benchmark criteria. Due to the large number of creek sediment samples that exceed the background and benchmark criteria and the importance of denoting the magnitude of each accedence, parameters, in the following discussion, are described as slightly (0 to 3 times), moderately (3 to 10 times), and greatly (> 10 times) exceeding the background and benchmark criteria. VOCs for which no benchmark values are available include: 2-butanone, carbon disulfide, toluene, total 1,2-dichloroethane, trichloroethane, and vinyl chloride. A benchmark value was also not available for thallium. (See Appendix A, Figure 3b for sediment sampling locations).

Reach 1

No VOCs exceed the sediment background or benchmark criteria for Reach 1 of Wildcat Creek. Fluoranthene is the only PAH that slightly exceeds the background sediment value. Aroclor 1248, 1254 and 1260 greatly exceed the background and benchmark criteria for Reach 1 of Wildcat Creek.

The following pesticides greatly exceed the background criteria: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, endrin, endrin aldehyde, gamma-chlordane, heptachlor, and heptaclor epoxide.
4,4'-DDE, 4,4'-DDT, aldrin, gamma-chlordane, heptachlor and heptaclor epoxide greatly exceed the benchmark criteria. 4,4,'-DDD, dieldrin and endrin aldehyde moderately exceed the benchmark criteria. Endrin slightly exceeds benchmark criteria.

The following metals greatly exceed the background criteria: arsenic, cadmium, chromium, cobalt, copper, iron, lead, nickel and zinc. Barium, mercury, selenium, silver and thallium moderately exceed background criteria. Aluminum, beryllium, manganese and vanadium were slightly over the background criteria. Aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, nickel, silver and zinc greatly exceed the benchmark criteria. Mercury and selenium moderately exceed the benchmark criteria. Cobalt and manganese slightly exceed the benchmark criteria.

Reach 2

No VOCs or SVOCs exceed the background and benchmark criteria for Reach 2 of Wildcat Creek. Fluoranthene is the only PAH to slightly exceed the background value and anthracene is the only PAH to slightly exceed the benchmark criteria. Aroclor-1248, 1254 and 1260 greatly exceed both the benchmark criteria and the background criteria.

The following pesticides in Reach 2 greatly exceed both the benchmark and background values: 4,4'-DDE, 4,4'-DDT and aldrin. The concentrations of endrin aldehyde and dieldrin greatly exceed background criteria. The concentrations of gamma-chlordane and heptachlor greatly exceed benchmark criteria. The concentration of gamma-chlordane and heptachlor epoxide moderately exceed the background values. Endrin aldehyde is only slightly higher than the benchmark value.

The following inorganics were found above the benchmark and the background criteria: arsenic, barium, cadmium, chromium, copper, lead, manganese, nickel and zinc. Aluminum and cadmium greatly exceed benchmark criteria. Cadmium, chromium and lead were moderately above the background criteria. Arsenic, barium, copper, manganese, nickel and zinc are only slightly above both background and benchmark criteria. Cobalt, iron and vanadium are slightly above only background criteria. Benchmark criteria are slightly exceeded by chromium, lead and silver.

Reach 3

Toluene slightly exceeds the background criteria for Reach 3. The SVOC, 4-methylphenol, is moderately above the background and greatly above the benchmark criteria.

The following compounds moderately exceed the background limit values for Reach 3: benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (k) fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene. Anthracene, benzo (g,h,i) perylene and indeno (1,2,3-c,d) pyrene slightly exceed the background criteria.

Benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (g,h,i) perylene, benzo (k) fluoranthene, chrysene, dibenzo (a,h) anthracene, indeno (1,2,3-c,d) pyrene and pyrene moderately exceed the benchmark criteria. Acenaphthene, anthracene and phenanthrene slightly exceed the benchmark criteria.

The following PCBs greatly exceed the background criteria for Reach 3: Aroclor-1248, Aroclor-1254 and Aroclor-1260. Aroclor-1016 moderately exceeds the background limit value. The benchmark values were greatly exceeded by Aroclors-1016, 1248, 1254 and 1260.

The following pesticides greatly exceed the background criteria for Reach 3: 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, gamma-chlordane and heptachlor epoxide. Alpha-chlordane, endrin, endrin aldehyde and gamma-BHC (lindane) exceed the background criteria by a moderate amount. The benchmark limit values were greatly exceeded by the following pesticides: 4,4'-DDE, 4,4'-DDT, aldrin, gamma chlordane and heptachlor epoxide. Gamma-BHC (lindane) moderately exceeds the benchmark limit value. Alpha-chlordane and dieldrin slightly exceed the benchmark criteria.

The following metals greatly exceeded the background criteria for Reach 3: cadmium, chromium, copper, iron, lead, nickel and zinc. Cobalt, manganese, and thallium moderately exceed the background criteria. Aluminum, arsenic, barium, beryllium, mercury, selenium and vanadium slightly exceed the background criteria. The benchmark criteria was greatly exceeded by the following metals: aluminum, cadmium, chromium, copper, lead, nickel and zinc. The metals that moderately exceed the benchmark criteria are as follows: arsenic, barium, iron and silver. Manganese, mercury and selenium slightly exceed the benchmark criteria.

Reach 4

Benchmark criteria are greatly exceeded and background criteria moderately exceeded by 2-

methylnapthalene. Bis (2-ethylhexyl) phthalate moderately exceeds the benchmark criteria in Reach 4 of Kokomo Creek. No other SVOCs and no VOCs exceed the background or benchmark criteria.

The following PAHs greatly exceed both sediment background and benchmark criteria for Reach 4: acenapthene, anthracene, benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (g,h,i) perylene, benzo (k) fluroanthene, chrysene, dibenzofuran, fluorene, indeno (1,2,3-cd) pyrene, naphthalene, phenanthrene and pyrene. Carbazole greatly exceeds the background value but a benchmark value is not available. Dibenzo(a,h)anthracene moderately exceeds background criteria and fluoranthene moderately exceeds benchmark criteria.

PCBs that greatly exceed benchmark and background criteria include Aroclor-1016, Aroclor-1248, Aroclor-1254 and Aroclor-1260.

Aldrin and gamma-BHC (lindane) greatly exceed the sediment background criteria for Reach 4. 4,4'-DDE and alpha-chlordane moderately exceed and gamma-chlordane slightly exceeds creek sediment background criteria. Aldrin, endosulfan II and gamma-BHC (lindane) greatly exceed the sediment benchmark criteria. 4,4'-DDE and alpha-chlordane moderately exceed and gamma-chlordane slightly exceeds creek sediment benchmark criteria.

The following metals greatly exceed the sediment background criteria for Reach 4: cadmium, chromium, copper and zinc. Barium, cobalt, iron, lead and nickel moderately exceed the background criteria. Aluminum, manganese, mercury and vanadium slightly exceed the background criteria for Reach 4. Aluminum, cadmium and copper greatly exceed the sediment benchmark criteria for Reach 4. Barium, chromium, lead, nickel and zinc moderately exceed the sediment benchmark criteria. Iron, mercury and manganese only slightly exceed the inorganic benchmark criteria.

Reach 5

Vinyl chloride and total 1,2-dichloroethane greatly exceed the background criteria. Carbon disulfide slightly exceeds the background criteria. Acetone slightly exceeds the benchmark criteria. No other VOCs exceed the background or available benchmark criteria.

4-Methylphenol greatly exceeds benchmark values. Bis (2-ethylhexyl) phthalate and 2-methylnapthalene moderately exceed the benchmark criteria. No other SVOCs exceed the background or benchmark criteria in Reach 5.

Pyrene was the only PAH to greatly exceed the both the background and benchmark criteria in this reach. Phenanthrene greatly exceeds only the background criteria. Benzo (a) anthracene, benzo (b) fluoranthene, chrysene and fluoranthene moderately exceed the background criteria. PAHs slightly exceeding background criteria include: anthracene, benzo (a) pyrene, benzo (k) fluoranthene, carbazole and fluorene. PAHs moderately exceeding benchmark criteria include acenapthene, anthracene, benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, chrysene, and fluorene. Benzo (k) fluoranthene, indeno (1,2,3-cd) pyrene, naphthalene and phenanthrene only slightly exceed the benchmark criteria.

The following PCBs greatly exceed both sediment background and benchmark criteria for Reach 5: Aroclor-1260, Aroclor-1254, Aroclor-1248 and Aroclor-1016.

The following pesticides greatly exceed the background criteria for Reach 5: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, endosulfan II, endrin aldehyde, gamma-BHC (lindane) and gamma-chlordane. The following constituents greatly exceeded the benchmark criteria: 4,4'-DDE, 4,4'-DDT, aldrin, endosulfan II, gamma-chlordane and gamma-BHC (lindane). Alpha-chlordane moderately exceeds background criteria. Endrin aldehyde and 4,4'-DDD moderately exceed the benchmark criteria. Dieldrin and alpha-chlordane slightly exceed the benchmark criteria.

The following metals greatly exceed the background criteria for Reach 5: antimony, cadmium, chromium, copper, iron, lead, mercury, nickel, silver and zinc. The background criteria were moderately exceeded by these metals: arsenic, barium, cobalt, manganese and vanadium. Aluminum and beryllium slightly exceed the background criteria. The following metals greatly exceed the benchmark criteria for Reach 5: aluminum, antimony, barium, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc. Arsenic and iron moderately exceed the benchmark criteria. Manganese slightly exceeds benchmark criteria for Reach 5.

Reach 6

No VOCs exceed the background or benchmark sediment criteria.

Butylbenzyl phthalate moderately exceeds and bis (2-ethylhexyl) phthalate slightly exceeds the benchmark criteria. No other SVOCs exceed the background or benchmark criteria.

Pyrene, a PAHs detected in creek sediments, greatly exceeds background criteria. Benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluroanthene, benzo (k) fluoranthene, fluoranthene, chrysene and phenanthrene moderately exceed background criteria. Anthracene, benzo (g,h,i) perylene, and indeno (1,2,3-c,d) pyrene, slightly exceed background criteria.

Acenapthene, benzo (b) fluoranthene, and pyrene greatly exceed creek sediment benchmark criteria. Benzo (a) anthracene, benzo (a) pyrene, benzo (k) fluoranthene, benzo (g,h,i) perylene, indeno (1,2,3-cd) pyrene and chrysene moderately exceed the benchmark criteria. Anthracene and fluorene slightly exceed the benchmark criteria.

Aroclor-1016, Aroclor-1254 and Aroclor-1260 greatly exceed the PCB background criteria for creek sediments. Aroclor-1248 moderately exceeds background criteria. All of the detected PCBs, Aroclor-1016, Aroclor-1248, Aroclor-1254 and Aroclor-1260, greatly exceed the PCB benchmark values in at least one sample from Reach 6.

The following pesticides, aldrin, alpha-chlordane and gamma-BHC (lindane) greatly exceed the sediment background criteria for Reach 6 of Wildcat Creek. 4,4'-DDE and endrin aldehyde moderately exceed the pesticide background criteria. Gamma-chlordane, endrin, endosulfan II and 4,4'-DDT only slightly exceed the pesticide background criteria. Aldrin, alpha-chlordane, gamma-BHC (lindane) and endosulfan II greatly exceed the sediment benchmark criteria. 4,4'-DDE only moderately exceeds the sediment benchmark criteria and gamma chlordane and 4,4-DDT slightly exceed the criteria.

Copper, lead and cobalt moderately exceed the inorganic background criteria. Aluminum, barium, cadmium, chromium, nickel, vanadium and zinc only slightly exceed the background criteria. Aluminum is the only metal to greatly exceed the sediment benchmark criteria. Barium, cadmium, copper, lead and nickel moderately exceed the benchmark criteria, while chromium and zinc only slightly exceed the criteria.

Markland Avenue Quarry

The soil gas data indicate three areas of elevated VOC contamination, consisting primarily of trichloroethene and its degradation products, cis-1,2-dichloroethene, trans-1,2-dichloroethene and vinyl chloride (See Figure 4b, Appendix A). The area with the highest contaminant concentration is located just north of the abandoned concrete structure in the southwest portion of the site. This area is of particular concern because of the relatively high concentration detected of degradation product vinyl chloride. The other two areas and an area of lesser concentration are located along a line from southwest to northeast that parallels the old rail line. Note that at soil gas location MQSG-35 (**Figure 4b**), resistance was encountered when advancing the rod. The possibility exists that the resistance was a drum as the rod was coated with free product when pulled from the hole.

Although the soil gas survey did not define the vertical extent of VOC contamination, it served as a qualitative screening tool by detecting elevated VOC solids areas. These VOC contaminated areas indicate either a source within the vadose zone (unsaturated zone) or the shallow groundwater. Vadose zone and shallow groundwater VOC contamination in the Markland Avenue Quarry may have resulted from past disposal activities including solvent dumping and drum disposal and burial.

The pond sediment is contaminated at ppm levels with VOCs, PAHs, PCBs and metals. Most of the parameters detected in the sediment exceed sediment benchmark screening levels, which are based on aquatic toxicity. Trichloroethene is the most prevalent VOC and was detected at a concentration of 40,000 µg/L (see Appendix D, Table MAQ-2). Sediment samples were also collected for treatability studies and indicated even higher concentrations of TCE (210,000 µg/L). This is consistent with the surface water and soil gas data collected in the quarry area. Visual observations by the U.S. EPA (during drum removal) confirm that DNAPL pockets exist in the sediment and along the quarry bottom. The presence of contaminants and the DNAPL is likely to be a direct result of past dumping of drums into the pond. Currently, contaminants may be migrating into the pond sediments from the fill either in the dissolved form via groundwater and subsequent sorption or as DNAPL traveling down through the fill and into the pond.

Surface soil samples were collected within the quarry fill boundaries(see Appendix A, Figure 4c) and at selected residences upgradient and downgradient of the quarry area to evaluate the potential risks associated with the surficial soils. The surface soils in the quarry fill area were contaminated primarily with PAHs, the PCB Aroclor-1248 and metals (arsenic, lead and zinc) at elevated levels. The contaminants in the surface soils are wide spread and do not necessarily coincide with the VOC hot spots. The PAH and PCB contamination appear primarily in the southern half of the fill area. Two of the PCB detections are in the soil gas hot spots indicating that the disposal activities in these areas may have included PCBs in addition to the solvents.

The lead and arsenic contamination are widespread and the zinc contamination is sporadic. The distribution of the PAHs and metals in the surface soils is likely not related to drum disposal episodes but is more likely attributable to slag and baghouse dust disposal and filling and potential deposition of emissions from the Main Plant.

The residential soil sampling downgradient from the quarry shows only isolated detections of contaminants. The migration pathway being evaluated using this data is the air migration pathway. The most likely contaminants to migrate are the metals. However, only small metal concentrations were detected. There was one detection of Aroclor-1248 and one detection of dibenzo(a,h)anthracene. Because of the isolated nature of the detections and the industrial nature of the community in this area, it is not possible to attribute these detections to the quarry area with any degree of certainty.

The screening level air dispersion model predicted the off-site impacts for arsenic, barium, cadmium, chromium and lead if they were to migrate via the air pathway. The dispersion model predicted that only lead could exceed the Indiana air toxic's standard. However, lead was detected at only minor levels off-site of Markland Quarry. (See Appendix D, MAQ Tables for ranges of contaminants discovered during RI).

Main Plant

Elevated concentrations of trichloroethene were detected in subsurface soil samples SB-A1S (5,600 µg/kg) and SB-A2D (190 µg/kg) in the vicinity of Building 112 (nail mill)(see Appendix A, Figure 5c for soil boring sample locations). PAHs and observable hydrocarbon product were detected in several samples. While these constituents generally do not migrate as readily as VOCs, they do migrate at lower rates and several PAHs are significant risk drivers. Surface spills evidenced by PAHs and observable hydrocarbon product are limited to three areas at the Main Plant. The scrap storage yard located along the east side of Building 5 (open hearth furnaces), Building 42 (blooming mill) and Building 40 (billet mill) is the area with the most extensive observable hydrocarbon product. Mill filings were piled in this area to allow drainage of cutting and lubricating oils from the filings. This area indicates a confirmed release of hydrocarbons and is considered a chronic source of hydrocarbons and PAHs. Additionally, Aroclor-1242 and Aroclor-1248 were detected in five soil borings. A release has been confirmed in the vicinity of these borings. The second area where a confirmed release of PAHs has occurred is at the south door of Building 20 (main machine shop). It is suspected that hydrocarbons were discarded out this door. The third area where PAHs were observed is north of Kokomo Creek at SB-F2. Elevated concentrations of PAHs (108.7 mg/kg [total]) were detected in the shallow soils as well as in the deep sample (53.2 mg/kg [total]).

PCBs were detected in two soil boring samples in addition to those indicated above. Aroclor-1248 was detected in SB-G1S (9.9 mg/kg) and SB-H3S (30+ mg/kg). A confirmed release is indicated in the vicinity of these borings. Pesticides were detected in seven samples. Aldrin was detected at its highest concentration in SB-H3S (1000 µg/kg).

Lead distribution in the shallow samples is generally in seven areas around the site. The first four are in the vicinity of each of the four borings SB-E1, SB-F2, SB-F5 and SB-F8. The fifth area is in the corridor between Building 5 to the east and Buildings 34 and 37 (vicinity of SB-B3 and SB-B4). The sixth area is between Building 69 to the east and Building 42 to the west (vicinity of SB-C5 SB-C3, SB-C4 and SB-G3. The seventh area with the highest concentrations is south and east of Building 71B (vicinity of SB-H3 and SB-H4). The four deep samples do not correspond to the shallow sample locations with higher lead concentrations with the exception of SB-F2D. The remaining locations are in the vicinity of SB-C2D, SB-E4D and SB-F6D. With the exception of the samples collected in the vicinity of Building 71B (wire galvanizing), the distribution of higher lead concentrations does not readily correlate to known site operations.

Zinc was detected at elevated concentrations in four samples (SB-A1, SB-C2, SB-C4 and SB-H3). Elevated zinc concentrations at SB-A1S and SB-H3S may be attributed to galvanizing operations associated with processes in the adjacent buildings (Buildings 112 [nail mill] and 71B [wire galvanizing]).

TCLP analyses indicate the only metals that exceeded the TCLP criteria for metals were cadmium (SB-B4S) and lead (SB-B4S and SB-F2S). The only VOC that exceeded TCLP criteria was 1,2-dichloroethane (SB-B2S). (See Appendix D, MP Tables for ranges of contaminants discovered during RI).

Slag Processing Area

VOCs were not detected in soil gas samples collected at the Slag Processing Area with the exception of one detection of trichloroethene at the method detection limit. No VOCs were detected in surface soil samples with the exception of methylene chloride which is a common laboratory contaminant. The presence of methylene chloride is probably not a result of site activities. Additionally, no SVOCs or PCBs were detected in surface soil samples analyzed. Although not conclusive, these results give no indication of residual contamination resulting from surface spills or leaking buried drums.

VI. Summary of Site Risks

Based on data collected during the RI, human health and ecological risks associated with contaminants detected in groundwater, soils, surface water, and sediments for the site were assessed. A baseline risk assessment, also known as a baseline screening, was conducted to compare contamination levels at the site with U.S. EPA standards. It considered ways in which people and wildlife could be exposed to site-related contaminants and whether such exposure could increase the incidence of cancer and noncarcinogenic (noncancer related) diseases above the levels that normally occur in the study area or population.

The screening assumed that people could be exposed to site-related contaminants by eating them (ingestion), breathing them (inhalation), or absorbing them through the skin (dermal contact). The contaminants of concern are the VOCs, semi-VOCs, metals and waste-specific compounds found in on-site soil and groundwater.

Current land use and reasonably anticipated future use of the land at NPL sites are important considerations in determining current risks, potential future risks, and appropriate extent of remediation. (See "Land Use in the CERCLA Remedy Selection Process," OSWER Directive No. 9355.7-04, May 25, 1995). Land use assumptions affect the exposure pathways that are evaluated in the risk assessment (RA). The results of the RA aid in determining the degree of remediation necessary to ensure current and long-term protection at the site. The RA considers present use of the site to determine current risks. It may restrict its analysis of future risks to the reasonably anticipated future land use.

The CSSS RA focused on users who would face the greatest exposure to landfill contaminants under current and potential future land use conditions or scenarios. Recreational users and on-site residents are the two groups most likely to be exposed. Also, on-site construction workers, child trespassers, and future on-site workers are also considered.

The RA uses a conservative estimate when evaluating a potential risk. This provides a high level of protection for public health and the environment. For example, some of the risk estimates assume that the site will be developed for future residential land use and that people use or will regularly use contaminated groundwater for drinking and bathing. Therefore, the excess lifetime cancer risk estimates should be regarded as estimates of potential cancer risk rather than actual representations of true cancer risk.

Potential risks to public health for cancer are expressed numerically, i.e. 1×10^{-4} or 1×10^{-6}. Carcinogenic risk expressed as 1×10^{-4} means that 1 out of 10,000 people exposed to contamination over a 70-year lifetime could develop cancer as a result of the exposure. A carcinogenic risk of 1×10^{-6} means that 1 out of 1,000,000 people exposed over a 70-year lifetime could potentially develop cancer as a result of exposure. The U.S. EPA has established a carcinogenic risk range in an attempt to set standards for remediation and protectiveness. In general, as carcinogenic risks increase above one case in a million people exposed over a 70-year lifetime, they become less acceptable. The carcinogenic risk to individuals generally should not exceed one case in 10,000 exposures. Risks are estimated based on both CTE and RME. The former are intended to represent typical exposures at the CSSS, the latter represent exposures well above the average, but still within a possible range. The measure for noncarcinogenic risk is termed a hazard index (HI) and is also expressed numerically. When the HI exceeds 1, there is a potential for adverse health effects.

The data from the Remedial Investigation was reviewed to identify contaminants of potential concern (COPCs) for human health risk evaluation. COPCs were selected for each source area based on the number of times detected, maximum concentration detected, background concentration, potential toxicity, ARARs, and future land use possibilities for the source area. Evaluation of the COPCs also provided the information necessary to develop remedial response objectives for the CSSS. Metals, SVOCs, VOCs, PCBs, and PAHs are COPCs for the CSSS. More detailed descriptions are presented in the CSSS RI, FS, and Baseline Risk Assessment (BRA) Reports.

According to the Agency for Toxic Substance and Disease Registry (ATSDR), exposure to lead can affect almost every organ and system in the body. The most sensitive is the central nervous system, particularly children. Lead also damages the kidneys and the immune system. The effects are the same whether through inhalation or ingestion. Exposure to lead is much more dangerous in young and unborn children. Harmful effects include premature birth, smaller babies, decreased or stunted mental ability, learning difficulties/disorders, and reduced growth. In adults, lead may decrease mental reaction time, cause weakness in joints, cause anemia, and affect memory. It can cause abortion and damage the male reproductive system. Potential risks to public health from lead are evaluated using the IEUBK (Integrated Environmental Uptake BioKenetic) model (U.S. EPA 1994) for children and in adults using a multi-pathway exposure model developed by U.S.EPA (1996). Default parameters or site-specific model input parameters may be used. U.S. EPA considered risks from exposures to lead acceptable if the probability that children may have blood lead levels exceeding 10 µg/dL is less than 5 percent. Adult exposures to lead are evaluated using the interim adult exposure methodology developed by U.S. EPA (1996). The focus of this method is to estimate fetal blood lead levels based on exposure to lead in soil by female workers of childbearing age. Ninety-fifth percentile fetal blood lead concentrations should not exceed 10 µg/dL.

Human Health Risk Assessment and COPCs:

The analytical data compiled in Phases I and II of the RI were reviewed, and contaminants of potential concern (COPCs) were selected for human health risk evaluation. COPCs were selected for each source area based on frequency of detection, maximum concentration detected, background concentration, potential toxicity, ARARs, and the future use scenario of the source area. The COPCs for each source area, media of concern, and exposure scenario are presented below along with the human health risk assessment evaluations. A summary of the human health risk evaluations is presented in the tables in Appendix C.

Site-wide Groundwater

COPCs were selected for site-wide groundwater based on a residential future land use scenario. COPCs selected for groundwater in the shallow water-bearing zone include: manganese, 1,1-dichloroethene, 1,2-dichloroethene (cis- and total), tetrachloroethene, trichloroethene, benzene, chloroform, vinyl chloride, Aroclor-1242, and Aroclor-1248. COPCs selected for groundwater in the intermediate water-bearing zone include: manganese, 1,1-dichloroethene, 1,2-dichloroethene (cis- and total), acrylonitrile, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride. COPCs selected for groundwater in the lower water-bearing zone include: manganese, 1,2-dichloroethene (cis- and total), acrylonitrile, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride.

Several onsite sources, and probably other offsite sources, contribute to groundwater contamination in the vicinity of the four major source areas of the CSSS. As a result of these several sources, groundwater is varyingly contaminated depending on location and depth. These variations result in a range of potential exposures and risks determined by different well locations. To account for this variability, groundwater exposures and risks are assessed on a geographic basis. Geographic presentation provides insight not only into the magnitude of potential risks, but also their spatial distribution. The spatial distribution allows evaluation of potential remedial alternatives that involve such contingencies as groundwater capture, groundwater treatment, institutional use control, bioremediation, etc.

To develop a presentation of risks on a geographic basis, potential exposures and risks from use of groundwater for drinking and other domestic purposes are calculated well by well. Total cancer risks and total hazard indices are then calculated as the sum of individual cancer risks and hazard quotients from each well. These estimates form the basis for mapping of potential groundwater-related risks for CSSS groundwater.

Each hydrologic unit, shallow, intermediate and lower, is assessed separately to allow differentiation of potential risks with depth. Risk scenarios are assessed based on both residential and commercial/industrial use of groundwater. Risks are estimated based on both CTE and RME. The former is intended to represent typical exposures at the CSSS, the latter represent exposures well above the average, but still within a possible range.

Cancer Risk Estimates

Residential Scenario

Shallow Water-Bearing Zone

A large portion of the shallow water-bearing zone is contaminated at levels associated with risks above the lower end of the U.S. EPA risk range (10^{-6}). In fact, the entire area enclosed by the dashed boundary (see Appendix A, Figure 1) can be expected to have sufficient groundwater contamination that residential risk may equal or exceed 10^{-5}.

Several areas beneath the site can be expected to have groundwater contamination sufficient to present a cancer risk of greater than 10^{-4}, the upper end of the U.S. EPA risk range. These areas include the southern portion of the Lagoon Area, the northern edge of the Lagoon Area, the south central portion of the Main Plant, and a wedge shaped area extending west from the Markland Avenue Quarry.

Groundwater may pose extreme risks (above 10^{-3}) for future use of groundwater in a large area beneath the Main Plant and extending west beneath Wildcat Creek and the city's wastewater treatment plant. Two smaller portions of the shallow groundwater plumes also could present extreme threats; a triangular area north of the old Fence Plant, and an area including a small part of the southwest Lagoon Area and extending west under Wildcat Creek. In these areas, major risks are presented by potential exposure to vinyl chloride in groundwater.

Intermediate Water-Bearing Zone

Ranges for risks associated with contaminated groundwater in the intermediate water-bearing zone are similar to those found in the shallow water-bearing zone, but the distribution of risks is significantly different. A large section of the site, extending from the Main Plant to the west, has sufficient contamination to imply potential risk above 10^{-3}. Risks in this area are mainly associated with potential exposure to vinyl chloride.

On the edges of the large highly contaminated zone exist areas associated with risks still above 10^{-4}. These areas include a triangular zone extending west from the Slag Processing Area, a long narrow strip running from the Main Plant west to the southwest corner of the Lagoon Area and another strip running from the Markland Avenue Quarry west and north passed the former Continental Steel Engineering Building and Wildcat Creek.

Lower Water-Bearing Zone

Ranges of risks associated with contaminated groundwater in the lower water-bearing zone are again similar to those found in the shallow zone. Extreme risks (above 10^{-3}) are associated with an area to the north of the Main Plant property extending across Wildcat Creek toward the wastewater treatment plant and another area beneath the Slag Processing Area extending east beneath Wildcat Creek. Some risks are associated with potential exposure to vinyl chloride, however, risk estimates are dominated by exposure to acrylonitrile. This chemical is found in significant concentrations only in the lower water-bearing zone.

A zone extending from the northeast corner of the Lagoon Area and running mainly eastward toward the old Fence Plant is associated with risks in excess of 10^{-4}. A relatively small area in the northern Lagoon Area is associated with risks in the range of 10^{-5} to 10^{-4}.

Commercial/Industrial Scenario

Cancer risks for future commercial/industrial workers on and near CSSS source areas are estimated for ingestion of contaminated groundwater. Potential cancer risks for future commercial/industrial workers from ingestion of contaminated groundwater are much less than those estimated for future residential groundwater users. No risks above the upper end of the U.S. EPA risk range (10^{-4}) are estimated for worker exposures. A large volume of groundwater in all three water-bearing zones is contaminated beneath both source areas and nearby residential, commercial, and industrial areas at the CSSS. Significant areas exist in individual water-bearing zones, however, where groundwater contaminant levels are sufficiently low that little threat is expected from commercial/industrial use of groundwater. In theory, commercial/industrial use of groundwater might be permitted within the portions of the contaminated zone, even though residential use may be prohibited.

Noncancer Risk Estimates

Residential Scenario

Noncancer risks for the residential scenario are calculated on a well by well basis for three exposure pathways, ingestion, dermal contact, and inhalation. Therefore, all Noncancer risk estimates presented are the sum of HIs for all of these pathways.

Shallow Water-Bearing Zone

All of the shallow water-bearing zones included in this assessment are affected at levels associated with an HI greater than the target HI of 1. Groundwater may present extreme risks for Noncancer health effects (hazard indices greater than 10^5) for future use of groundwater in a small area on the western edge of the Lagoon Area. In this area, Noncancer risks are dominated by potential exposure to *cis*-1,2-DCE. Larger areas, where HIs may exceed 10^3, are identified over the western part of the Lagoon Area and extend to the Slag Processing Area, the mid to southern portion of the Lagoon Area, and most of the Main Plant. In most areas, risks are due mainly to potential exposure to manganese in groundwater, although PCE and TCE make significant contributions in some areas.

Hazard indices above 10^2 are predicted for most of the central area of the site including the wastewater treatment plant, much of the Lagoon Area, and for the area including and surrounding the old Fence Plant. Other areas, including parts of the Markland Avenue Quarry and the eastern Main Plant are associated with HIs above 10.

<u>Intermediate Water-Bearing Zone</u>

Ranges for HIs associated with contaminated groundwater in the intermediate water-bearing zone are similar to those found in the shallow water-bearing zone, but the distribution of risks is significantly different. A large section of the site, extending from Markland Avenue Quarry west passed Shambaugh Run to the Dixon Road Quarry including the old Fence Plant, the northern portion of the Main Plant, the wastewater treatment plant, most of the Lagoon Area, and part of the Slag Processing Area, has sufficient contamination to imply potential HIs in the range of 10^2 to 10^3. A small area near Shambaugh Run have associated HIs in the range of 10^3 to 10^4. In general, risks are due mainly to exposure to chlorinated solvents, *cis*-1,2-DCE, total DCE, TCE, and PCE, although significant exposures to manganese are implied at some locations. An adjacent area, and areas near the Continental Steel Engineering Building and north of the Fence Plant area have lower HI estimates, in the range of 10 to 100.

<u>Lower Water-Bearing Zone</u>

Ranges of risks associated with contaminated groundwater in the lower water-bearing zone are again similar to those found in the shallow zone. HIs in the range of 10^2 to 10^3 are estimated in a zone extending from the northeast part of the Main Plant west to the Slag Processing Area. South of this zone, an area with estimated HIs in the range of 10 to 100 is found extending from Markland Avenue Quarry west to the Haynes International facility. Potential exposure to solvents, especially *cis*- and total 1,2-DCE, and to manganese dominate risk estimates. Acrylonitrile is important in a small area sampled in the eastern portion of the Slag Processing Area. A small area including the eastern portion of the Slag Processing Area and some land to the north of Markland Avenue is associated with somewhat smaller HIs, in the range of 1 to 10.

Commercial/Industrial Scenario

Noncancer risks for the commercial/industrial scenario are calculated on a well by well basis only for ingestion of contaminated groundwater. Therefore, all Noncancer risk estimates presented represent hazard indices (HIs) for this single pathway. Potential Noncancer risks for future residential users of contaminated groundwater are generally below the target HI of 1 beneath sources and nearby offsite areas at the CSSS. Highest HIs are predicted for the shallow water-bearing zone beneath the Lagoon Area, parts of the Main Plant, and parts of the old Fence Plant and nearby areas. The major limitation on use of groundwater in commercial/industrial settings appears to be potential cancer risks as discussed above.

Potential exposures to manganese and several chlorinated solvents, especially *cis*- and total 1,2-DCE, are associated with the highest HIs for the site in all three water-bearing zones. However, concentrations of these COPCs are sufficiently high only in the shallow water-bearing zone to suggest exposures above the "safe" level defined by the RfD. DCE is likely a breakdown product of PCE and TCE. Controlling any existing sources of these latter chemicals may be important for gradual reduction in DCE concentrations in shallow groundwater beneath the site. Manganese in groundwater may be a more persistent, since it cannot degrade. Dilution, adsorption or other physical/chemical processes may serve to reduce manganese concentrations in the future, but no attempt is made here to address such issues.

Lagoon Area

COPCs selected for the Lagoon Area were based on an industrial/commercial and trespasser/recreational future land use scenario. COPCs selected for on-site surface soil include: benzo(b) fluoranthene, benzo(a) anthracene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno (1,2,3-cd) pyrene, manganese, Aroclor-1242, Aroclor-1248, beryllium, and lead. COPCs selected for the lagoon sludge include: benzo(a)pyrene, lead, manganese, and beryllium. COPCs selected for the waste piles include: manganese and lead. COPCs selected for the lagoon clarifier tank sludge were manganese and beryllium. In addition, although soil gas results (VOCs) were not used in the RA COPC development (i.e., there are no human health impacts), VOCs are considered COPCs for soil at the entrance area of the Lagoon Area since they may potentially impact groundwater at the CSSS. These COPCs include: 1,1-dichloroethene, 1,2-dichloroethene (cis and trans), trichloroethene, vinyl chloride, tetrachloroethene, and 1,1,1-trichloroethene. COPCs selected for shallow groundwater include 1,1-dichloroethene, 1,2-dichloroethene (total), benzene, chloroform, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride and manganese.

Two groups of receptors are evaluated for potential exposures to contaminants from the Lagoon Area, future onsite commercial/industrial workers and current and future onsite trespassers. These receptors are quantitatively evaluated for incidental ingestion of soil and dermal contact with soil. Trespassers are assumed to be children of ages 6- to 14-years. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 56 acre source area. Cancer and noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates

Carcinogenic risks for the Lagoon area are summarized in Table ES-1 (Appendix C). Risk estimates for current and future onsite trespassers and future onsite commercial/industrial workers are discussed below.

Current and Future Onsite Trespassers

Total cancer risk estimates for incidental ingestion of soil by current and future trespassers onto the Lagoon Area based on average exposure and RME are 8.5E-07 and 5.2E-05, respectively. Estimated cancer risks from dermal exposure to contaminants in soil are 4.9E-07 and 1.2E-04 for average exposure and RME, respectively. Aroclors 1242 and 1248 are the main contributors to these risks. Estimated total cancer risks from incidental dermal contact are 1.3E-06 and 1.7E-04 based on average exposure and RME, respectively. Average risk for the exposure pathway are at the bottom and risks based on RME exceed U.S. EPA's acceptable (1990) risk range.

Future Onsite Commercial/Industrial Workers

Estimated cancer risks for incidental ingestion of soil by future onsite commercial/industrial workers at the Lagoon Area based on average exposure from this pathway are 5.3E-07, and cancer risks based on RME are 1.6E-04. Aroclor 1248 is the main contributor to carcinogenic risks for the commercial/industrial worker scenario. Estimated cancer risks from dermal exposure to are 3.0E-07 and

3.6E-05 for average exposure and RME, respectively. Aroclor 1248 is again the main contributor to these risks. Total cancer risk estimates from incidental dermal contact are 8.4E-07 and 1.9E-04 based on average exposure and RME, respectively. Risks based on average exposure and RME are below and above U.S. EPA's 1990 acceptable range, respectively.

The north central part of the Lagoon Area overlies significant levels of COPCs in soil gas. If soil gas in these areas were to migrate inside buildings, cancer risks and Noncancer health effects from inhalation of VOCs in indoor air could be unacceptably high. For areas with high levels of soil gas, vinyl chloride, a degradation product of PCE and TCE, is a major contributor to possible risks at the site. Construction should not be considered in these areas because of the potential for volatile chemicals to migrate into indoor air spaces. This applies to residential as well as commercial/industrial development.

Noncarcinogenic Hazard Estimates

Noncarcinogenic risks for the Lagoon area are summarized in Table ES-2 (Appendix C). Noncarcinogenic health effects estimates for current and future onsite trespassers and future onsite commercial/industrial workers at the Lagoon Area are discussed below.

Current and Future Onsite Trespassers

HIs for incidental ingestion of soil by current and future onsite trespassers at the Lagoon Area are 0.06 and 3.8 for average exposure and RME, respectively. Because the HQ for Aroclor 1248 exceeds unity, it is not necessary to evaluate HIs based on target organs. The HI for the exposure pathway exceeds unity, indicating potential health risks may be associated with incidental ingestion of soil by trespassers. Estimated HIs from dermal exposure to contaminants in soil for current and future trespassers onto the Lagoon Area are 0.01 and 6.1 for average exposure and RME, respectively. These risks are entirely from exposure to Aroclors 1242 and 1248.

Total noncancer risk estimates from these pathways are 0.07 and 10 based on average exposure and RME, respectively. The total HI based on average exposure is less than unity, however, the HI based on RME exceeds unity, suggesting that contact with contaminated soil at the Lagoon Area may result in adverse Noncancer health effects for current and future onsite trespassers.

Future Onsite Commercial/Industrial Workers

HIs for incidental ingestion of soil by future onsite commercial/industrial workers are 0.03 and 2.9, for average exposure and RME, respectively. The HIs for RME exceed unity, suggesting that there is a potential for adverse health effects from incidental ingestion of soil by future onsite commercial/industrial workers at the Lagoon Area. Estimated HIs from dermal exposure to soil for future onsite construction workers at the Lagoon Area are 0.007 and 0.6 for average exposure and RME, respectively. Based on these estimates, adverse Noncancer health effects from dermal contact with soil at the Lagoon Area are considered unlikely for future onsite commercial/industrial workers.

Total Noncancer risk estimates from these pathways are 0.04 and 3.5 based on average exposure and RME, respectively. Total HI for RME for contact with soil by future onsite commercial/industrial workers of the Lagoon Area exceeds unity, suggesting that adverse effects from contact with soil are possible for these workers.

Risks Associated with Exposure to Lead

Potential exposures to lead in soil at the Lagoon Area are evaluated for current and future onsite trespassers, and future onsite commercial/industrial workers. Trespassers are assumed to be 6- to 7-year-old children. Lead exposure in children is evaluated using the IEUBK model (U.S. EPA 1994), and lead exposure in adults is evaluated using a multi-pathway exposure model developed by U.S.EPA (1996).

The IEUBK model predicts that 11.3 percent of children trespassing onto Lead Exposure Area A (see Appendix A, Figure 2c for Lead Exposure Area identification) of the Lagoon Area may have blood lead concentrations of 10 µg/dL or greater. For children trespassing onto the rest of the exposure areas of the Lagoon Area, 0.73, 0.19, 0.10, 0.29, and 0.49 percent may have blood lead concentrations of 10 µg/dL or greater (see Figure 2c). U.S. EPA (1994) considers risks from exposures to lead unacceptable if the probability that children may have blood lead levels exceeding 10 µg/dL is greater than 5 percent. IEUBK modeling results suggest that significant risk from exposure to lead in soil is not expected for children who may trespass onto any of the exposure areas defined for the Lagoon Area except for Area A.

Adult exposures to lead are evaluated using the interim adult exposure methodology developed by U.S. EPA (1996). The focus of this method is to estimate fetal blood lead levels based on exposure to lead in soil by female workers of child-bearing age. Ninety-fifth percentile fetal blood lead concentrations should not exceed 10 µg/dL (U.S. EPA 1996).

The method predicts 95 percentile fetal blood lead levels in women of childbearing age exposed to lead in soil of 13.73, 8.74, 5.91, 7.26, 6.15, and 8.35 µg/dL for exposure Areas A, B, C, D, and E of the Lagoon Area and in the area to be developed into a CAMU, respectively (see Appendix A, Figure 2c). Predicted blood lead concentrations are less than the "acceptable" fetal blood lead concentration for exposure Areas B, C, D, E, and the CAMU, but exceed the "acceptable" concentration for Area A.

Wildcat and Kokomo Creeks

COPCs selected for sediment in the Wildcat and Kokomo Creeks include: benzo(a)anthracene, benzo(b) fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-c,d)pyrene, benzo(a)pyrene, dibenzo(a,h)anthracene, arsenic, beryllium, Aroclor-1016, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260.

Recreational visitors are evaluated for potential exposures associated with contaminants in Kokomo and Wildcat creeks. Exposure to noncarcinogens is evaluated for young children and exposure to carcinogens for adults. Both CTE and RME exposure point concentrations are derived from data collected in each of six reaches of the creeks.

Cancer Risk Estimates

Carcinogenic risks for recreational visitors to Kokomo and Wildcat creeks are summarized in Table ES-1 (Appendix C). Risks are estimated based on both average exposure and RME. Risks associated with surface water in Kokomo and Wildcat creeks are assessed on a site-wide basis. To evaluate risks from exposure to sediment, Kokomo and Wildcat Creeks are subdivided into six reaches, and each reach is evaluated separately.

Surface Water Ingestion - Recreational Visitors

Recreational visitors to Kokomo and Wildcat Creeks are evaluated for potential risks from incidental ingestion of surface water during recreational activities. Only two carcinogenic COPCs were selected for surface water in the Creeks, TCE and arsenic. Estimated risks for TCE are 1.1E-11 for average exposures and 2.0E-07 for RME. For arsenic, the estimated risk from average exposure is 7.6E-09 and risk from

RME is 1.1E-07. Total cancer risks for the surface water ingestion pathway are 7.6E-09 for average exposure and 3.1E-07 for RME. These risk estimates are considered acceptable based on U.S. EPA's acceptable risk range (U.S. EPA 1990).

Sediment Ingestion and Dermal Contact with Sediment

Recreational visitors to Kokomo and Wildcat creeks are evaluated for incidental ingestion of and dermal contact with sediment. Cancer risk estimates for these pathways are summarized by reach number in Table ES-1 and described below.

Reach 1

Estimated cancer risks from incidental ingestion of sediment by recreational visitors in Reach 1 are 1.8E-06 and 1.6E-04 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure with sediment are 2.7E-06 and 8.6E-04, respectively, and total cancer risk estimates from exposure to sediment are 4.4E-06 and 1.0E-03, respectively. Aroclors 1254 and 1260 are the main contributors to these risks. The risks are within and above U.S. EPA's acceptable range.

Reach 2

For Reach 2, estimated cancer risks from incidental ingestion of sediment by recreational visitors are 1.6E-06 and 3.4E-05 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure with contaminants in sediment are 1.1E-06 and 1.8E-04. Total cancer risk estimates from exposure to sediment are 2.7E-06 and 2.1E-04, respectively. The greatest contribution to these risks is from Aroclor 1248. The risks are within and above U.S. EPA's acceptable range..

Reach 3

Estimated cancer risks from incidental ingestion of sediment by recreational visitors are 1.1E-06 and 1.4E-05 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure to sediment are 1.2E-06 and 7.5E-05, and total cancer risk estimates from exposure to sediment are 2.3E-06 and 8.8E-05, respectively. For Reach 3, the main contributors to the estimates risks are benzo(a)pyrene and Aroclors 1242, 1248, and 1254. Risks for Reach 3 are within U.S. EPA's (1990) acceptable range.

Reach 4

Estimated cancer risks from incidental ingestion of sediment by recreational visitors are 1.2E-06 and 1.2E-03 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure with sediment are 3.0E-06 and 6.8E-03; total cancer risk estimates from exposure to sediment are 4.2E-06 and 8.0E-03, respectively. Aroclors 1016, 1248, and 1254 are the main contributors to these risks. Risks based on average exposure are within U.S. EPA's (1990) acceptable range but risks based on RME exceed it.

Reach 5

Estimated cancer risks from incidental ingestion of sediment by recreational visitors are 1.8E-06 and 1.9E-04 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure to sediment are 1.6E-06 and 1.1E-03, total cancer risk estimates from exposure to sediment are 3.5E-06 and 1.2E-03, respectively. For Reach 5, Aroclor 1016 and 1254 are the greatest contributors to overall risk. Risks based on average exposure are within U.S. EPA's (1990) acceptable range, but risks based on RME exceed it.

Reach 6

Estimated cancer risks from incidental ingestion of sediment by recreational visitors are 8.7E-07 and 7.6E-06 for average exposure and RME, respectively. Estimated cancer risks from dermal exposure to sediment are 1.3E-06 and 4.5E-05. Total cancer risk estimates from exposure to sediment are 2.2E-06 and 5.3E-06, respectively. Benzo(a)pyrene and Aroclors 1016 and 1254 contribute most to these risks. Cancer risks are within U.S. EPA's (1990) acceptable range.

Noncarcinogenic Hazard Estimates

Noncarcinogenic risks for recreational visitors to Kokomo and Wildcat creeks are summarized in Table ES-2 (Appendix C). Noncarcinogenic health effects estimates for the recreational visitor at Kokomo and Wildcat creeks are discussed below.

Surface Water Ingestion - Recreational Visitor

For surface water in Kokomo and Wildcat creeks, the following noncarcinogenic COPCs were selected: TCE, arsenic, barium, manganese, nickel, and zinc. Average estimated HQs for these chemicals ranged from 0.001 to 8.6E-06, and HQs based on RME ranged from 0.03 to 8.9E-05. Total HI estimates for the surface water ingestion pathway are 0.002 and 0.04 for average exposure and RME, respectively. The HIs are less than one, suggesting that adverse noncarcinogenic risks from exposure to surface water are not likely.

Sediment Ingestion - Recreational Visitor

Recreational visitors to Kokomo and Wildcat creeks are evaluated for incidental ingestion of sediment. Noncarcinogenic hazard estimates for this pathway are described below.

Reach 1

HI estimates for incidental ingestion of sediment by recreational visitors to Reach 1 are 0.05 and 21 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.009 and 12. Total health effects estimates for exposure to sediment are 0.06 and 33, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 1.

Reach 2

HI estimates for incidental ingestion of sediment by recreational visitors to Reach 2 are 0.03 and 4.5 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.002 and 2.3, and total health effects estimates for exposure to sediment are 0.03 and 6.9, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 2.

Reach 3

For Reach 3, HI estimates for incidental ingestion of sediment by recreational visitors are 0.02 and 1.6 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.002 and 0.8, and total health effects estimates for exposure to sediment are 0.02 and 2.4, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 3.

Reach 4

HI estimates for incidental ingestion of sediment by recreational visitors are 0.02 and 109 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.004 and 64, and total health effects estimates for exposure to sediment are 0.03 and 173, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 4.

Reach 5

HI estimates for incidental ingestion of sediment by recreational visitors are 0.03 and 15 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.001 and 8.3, and total health effects estimates for exposure to sediment are 0.03 and 23, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to sediment in Reach 5.

Reach 6

HI estimates for incidental ingestion of sediment by recreational visitors are 0.01 and 0.5 based on average exposure and RME, respectively. HIs for dermal exposure with sediment are 0.001 and 0.2, and total health effects estimates for exposure to sediment are 0.01 and 0.8, respectively. HIs for Reach 6 do not exceed unity, indicating that Noncancer health effects from exposure to sediment are unlikely.

Risk Associated from Exposure to Lead

Recreational visitors are evaluated for potential exposures to lead in sediment in Kokomo and Wildcat creeks. Exposure to lead is evaluated for young children who may recreate at the Creeks. 3- to 6-year-old children are considered most likely to play with creek sediment, therefore this age group is evaluated for potential exposures to lead. IEUBK modeling predicts that the probability of children (exposed to lead in sediments in Reaches 1 through 6 of the Creeks) and having blood lead levels exceeding 10 µg/dL is 0.41, 2.39, 0.55, 0.37, 2.87, and 0.73 percent for children, respectively. U.S. EPA (1994b) recommends that young children's blood lead levels in excess of 10 µg/dL does not exceed 5 percent. Based on this evaluation, exposure to lead in sediments at Kokomo and Wildcat creeks is not likely to result in unacceptably high blood lead levels in children.

Markland Avenue Quarry

COPCs selected for the Markland Avenue Quarry were based on a residential future land use scenario. The only COPC selected for surface water is zinc. COPCs selected for on-site surface soil include: benzo(a)pyrene, benzo(a)anthracene, benzo(b&k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, Aroclor-1248, arsenic, and lead. In addition, although soil gas results (VOCs) were not used in the RA COPC development (i.e., there are no human health impacts), VOCs are considered COPCs for the Markland Avenue Quarry since they may potentially impact groundwater at the CSSS. These COPCs include: 1,1-dichloroethene, 1,2-dichloroethene (cis and trans), trichloroethene, and vinyl chloride. COPCs selected for shallow groundwater include 1,1-dichloroethene, 1,2-dichloroethene (total), benzene, chloroform, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride, and manganese.

Five different groups of receptors are evaluated for potential exposures to chemicals associated with the Markland Avenue Quarry: current and future offsite residents, future onsite residents, current and future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. All receptor populations are evaluated for incidental ingestion of and dermal contact with soil. Trespassers are also evaluated for ingestion of surface water and dermal contact with surface water in the quarry. Residential exposures are quantified for 1- to 6-year-old children and adults, and exposures for trespassers are quantified for 6- to 14-year-old children. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 13 acre source area. Cancer and Noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates

Carcinogenic risks for current and future offsite residents, future onsite residents, current and future onsite commercial/industrial workers, construction workers, and current and future onsite trespassers at the Markland Avenue Quarry are summarized in Table ES-1 (Appendix C) and discussed below.

Current and Future Offsite Residents

Current and future offsite residents near the Markland Avenue Quarry (the Quarry) are evaluated for incidental ingestion of soil and dermal contact with soil in their yards. Only two carcinogenic COPCs were selected for offsite soil, dibenzo(a,h)anthracene and arsenic. Total carcinogenic risks from incidental ingestion of these chemicals in soil are 6.0E-06 and 1.1E-04, for average exposure and RME, respectively. Arsenic contributes more than 70 and 90 percent to these risks, respectively. Estimated cancer risks from dermal exposure to COPCs in soil for offsite residents at the Quarry are 1.7E-06 and 2.2E-04 for average exposure and RME, respectively. Dibenz(a,h) anthracene is the only carcinogenic COPC evaluated for this pathway. Total cancer risk estimates for offsite residents near the Quarry from incidental ingestion of soil and dermal contact with soil are 7.7E-06 and 3.3E-04 based on average exposure and RME, respectively. Risks based on RME exceed U.S. EPA's (1990) acceptable range.

Future Onsite Residents

Estimated cancer risks for incidental ingestion of soil and dermal contact with soil by future onsite Quarry residents are summarized in Table ES-1 in Appendix C. Future onsite residents at the Quarry are also evaluated for potential exposures from inhalation of VOCs released from subsurface soil and buried wastes.

Total risks for the soil ingestion pathway are 9.7E-06 and 1.6E-04 for average exposure and RME. Arsenic contributes 86 and 70 percent to these risks, respectively. Benzo(a)pyrene, dibenzo(a,h) anthracene, and Aroclor 1248 together contribute approximately 26 percent to risks based on RME. Estimated cancer risks from dermal exposure to contaminants in soil are 4.9E-06 and 2.9E-04 for average exposure and RME, respectively. Benzo(a)pyrene and dibenz(a,h)anthracene are the main contributors to these risks.

Total cancer risk estimates from exposure to soil are also summarized in Table ES-1 (Appendix C). Estimated total cancer risks are 1.5E-05 and 4.5E-04 based on average exposure and RME, respectively. Total average carcinogenic risks for this scenario are within and risks associated with RME exceed U.S. EPA's (1990) acceptable risk range.

High concentrations of COPCs have been detected in soil gas in several areas of the Quarry and apparently stem from buried wastes and drums. Contaminants in soil gas could theoretically migrate into any buildings constructed in the future at the Quarry. The evaluation of potential risks for future onsite residents shows significant risk may result from inhalation of such contaminants in indoor air.

Current and Future Onsite Commercial/Industrial Workers

Current and future commercial/industrial workers at the Quarry are evaluated for incidental ingestion of soil, dermal contact with soil, and inhalation of VOCs released from buried wastes and drums into indoor air. Potential exposure pathways are thought to be incomplete for current commercial/industrial workers at the Quarry, risk estimates therefore only apply to future onsite commercial/ industrial workers.

Estimated cancer risks from incidental ingestion of soil are 7.0E-06 and 6.8E-05 for average exposure and RME, respectively. Arsenic is the main contributor to these risks. Estimated cancer risks from dermal exposure are 8.2E-07 and 8.0E-06 for average exposure and RME, respectively. Benzo(a)pyrene, dibenz(a,h)anthracene and Aroclor 1248 are the main contributors to these risks.

Total cancer risk estimates from incidental ingestion of soil and dermal contact with soil are presented in Table ES-1 (Appendix C). Estimated total cancer risks from these pathways are 7.9E-06 and 7.6E-05 based on average exposure and RME, respectively. These risks are within U.S. EPA's (1990) acceptable range.

As mentioned above, high concentrations of COPCs have been detected in soil gas due to buried wastes and drums. Contaminants in soil gas could theoretically migrate into any buildings constructed in the future and be inhaled by people living or working in the buildings. Inhalation of indoor air is evaluated on a sitewide basis for residents. The evaluation shows that exposure to contaminants in indoor air may be associated with significant risk for future onsite residents at the quarry. These results can also be applied to the commercial/industrial worker scenario. Even though it would be assumed there would be reduced exposure frequency and duration for commercial/ industrial workers versus residents, risk estimates may still be unacceptably high.

Future Onsite Construction Workers

Future onsite construction workers at the Quarry are evaluated for incidental ingestion of soil and dermal contact with soil. Cancer risk estimates for this scenario are summarized in Table ES-1 in Appendix C.

Estimated cancer risks from incidental ingestion of soil by future onsite construction workers are 5.5E-08 and 1.4E-06 for average exposure and RME, respectively. Arsenic is the main contributor to these risks. Estimated cancer risks for future onsite construction workers from dermal exposure to contaminants in soil are 6.1E-09 and 6.4E-08 for average exposure and RME, respectively.

Total cancer risk estimates for construction workers at the Quarry from incidental ingestion of soil and dermal contact with soil are summarized in Table ES-1. Estimated total cancer risks from these pathways are 6.1E-08 and 1.4E-06 based on average exposure and RME, respectively. Risk estimates for construction workers at the Markland Avenue Quarry are below and at the bottom of U.S. EPA's (1990) acceptable range.

Current and Future Onsite Trespassers

Incremental cancer risk estimates for people who may trespass onto the Quarry currently or in the future are shown in Table ES-1. Trespassers are evaluated for incidental ingestion of soil, dermal contact with soil, incidental ingestion of surface water, and dermal exposure to contaminants in surface water.

Total estimated cancer risks for incidental soil ingestion by trespassers based on average exposure and RME are 5.6E-06 and 2.3E-05, respectively. Arsenic contributes 87 and 68 percent to these risks, respectively. Potential risks for trespassers from incidental ingestion of soil are in the middle of the range that is generally considered acceptable by U.S. EPA. Estimated cancer risks from dermal exposure are 1.3E-06 and 2.8E-05 for average exposure and RME, respectively. Benzo(a)pyrene and dibenz(a,h)anthracene are the main contributors to these risks.

Estimated total cancer risks from exposure to soil for trespassers are 6.9E-06 and 5.1E-05 for average and RME, respectively. These risks are within U.S. EPA's (1990) acceptable risk range.

Since little guidance or site-specific information is available for evaluating potential exposures for trespassers, only RME is evaluated for contact with sediment and surface water. For incidental ingestion of surface water by current and future onsite trespassers, incremental cancer risk based on RME is 2.2E-06. This risk is at the bottom of the acceptable risk range. For dermal contact with surface water at the Markland Avenue Quarry by current and future onsite trespassers, estimated risk based on RME is 3.7E-06 (Table 6-4) indicating that significant risk from this exposure pathway is not expected. Exposure to surface water is not expected given the poor water quality (pH of 12 or greater) and such exposures are only evaluated to provide an indication of the degree of site-related exposure in this medium. Estimated risks from exposure to surface water are therefore not added to other risk estimates in the calculation of total cancer risk for trespassers.

Noncancer Risk Estimates

Noncarcinogenic health effect estimates from exposure to contaminants at the Quarry are estimated for current and future offsite residents, future onsite residents, future onsite commercial/ industrial workers, construction workers, and current and future onsite trespassers. Noncarcinogenic risks at the Markland Avenue Quarry are summarized in Table ES-2 (Appendix C) and discussed below.

Current and Future Offsite Residents

Current and future offsite residents near the Quarry are evaluated for incidental ingestion of soil and dermal contact with soil when working and playing in their yards. Total HIs for soil ingestion by current and future offsite residents near the Quarry are 0.9 and 2.8 for CTE and RME, respectively. The total HI based on RME is greater than 1, suggesting a potential for adverse health effects for this exposure scenario. Since the RME HQ for arsenic (2.7) also exceeds unity, it is not necessary to separately evaluate potential noncancer health effects for different target organs.

Dibenz(a,h)anthracene is the only non-metal COPC selected for offsite residential soil. Noncarcinogenic toxicity criteria are not available for this chemical. Health effects from dermal contact with soil by future offsite residents near the Quarry were therefore not estimated.

Since noncarcinogenic health effects were not evaluated for the dermal exposure pathway these total HIs are identical to those from incidental ingestion of soil. The HI from RME (2.8) exceeds unity, indicating a potential for adverse noncancer health effects from exposure to soil by current and future offsite residents near the Quarry.

Future Onsite Residents

Noncarcinogenic health effects estimates for ingestion of soil by future onsite residents on the Quarry based on CTE and RME are 1.5 and 6.4, respectively. The total HI based on RME exceeds unity, suggesting a potential for adverse health effects from ingestion of soil for future onsite residents. Since the HI for the soil ingestion pathway is greater than one, further evaluation of effects on different target organs is necessary. The RME HQ for arsenic (3.6) exceeds one, which indicates that there is a potential for adverse Noncancer health effects.

Estimated HIs for dermal contact with soil by future onsite residents at the Quarry are 0.03 and 0.8 for average exposure and RME, respectively. Since the HIs are less than unity, adverse health effects from dermal contact with soil is therefore not likely for future onsite residents.

Estimated total HIs from these pathways are 1.5 and 7.1 based on average exposure and RME, respectively. The HIs exceed unity, indicating that there is a potential for adverse Noncancer health effects for future onsite residents who may contact soil at the Quarry.

Soil gas data for the Markland Avenue Quarry indicate that there are significant releases of VOCs in some areas of the Quarry. The evaluation suggests that inhalation of VOCs released to indoor air could result in adverse Noncancer health effects, if development was to occur at the Quarry.

Current and Future Onsite Commercial/Industrial Workers

Current and future commercial/industrial workers at the Quarry are evaluated for incidental ingestion of soil, dermal contact with soil, and inhalation of VOCs released from buried wastes and drums into indoor air. Potential exposure pathways are thought to be incomplete for current commercial/industrial workers at the Markland Avenue Quarry, risk estimates are, however, developed for future workers at the Quarry.

Estimated HIs for incidental ingestion of soil by future onsite commercial/industrial workers at the Quarry are 0.1 and 0.5 for average exposure and RME, respectively. Arsenic is the main contributor to these HIs. Estimated Noncancer health effects for future onsite commercial/industrial workers at the Quarry from dermal exposure to contaminants in soil are 0.006 and 0.02 for average exposure and RME, respectively. The HIs are less than unity, suggesting that adverse health effects from dermal contact with soil are not expected for future onsite commercial/industrial workers. Total Noncancer health effects estimates for commercial industrial workers at the Quarry from incidental ingestion of soil and dermal contact with soil are 0.15 and 0.5, based on average exposure and RME, respectively. The HIs are less than unity, suggesting that adverse Noncancer health effects from exposure to soil are not likely for future onsite commercial/industrial workers at the Markland Avenue Quarry.

Releases of vapors from buried wastes and drums into indoor air is a potentially complete exposure pathway for future onsite commercial/industrial workers. This pathway is evaluated on a sitewide basis. This pathway may result in adverse health effects for commercial/industrial workers, if development took place in areas of the quarry where releases are occurring.

Future Onsite Construction Workers

Future onsite construction workers at the Quarry are evaluated for incidental ingestion of soil and dermal contact with soil. Estimated HIs for incidental ingestion of soil by future onsite construction workers at the Quarry are 0.05 and 0.8 for average exposure and RME, respectively. Arsenic is the main contributor to these estimates. Estimated HIs for future onsite construction workers at the Quarry from dermal exposure to contaminants in soil are 0.002 and 0.01 for average exposure and RME, respectively. Total HI estimates for future onsite construction workers at the Markland Avenue Quarry are 0.05 and 0.8 for average exposure and RME. These estimates are almost entirely from the soil ingestion pathway. Dermal exposure contributes little to overall Noncancer health effects. The HIs are less than unity, suggesting that adverse health effects from contact with soil are unlikely for future onsite construction workers at the Markland Avenue Quarry.

Current and Future Onsite Trespassers

Current and future trespassers at the Markland Avenue Quarry are evaluated for incidental ingestion of soil and surface water, and dermal contact with soil and surface water.

Noncancer health effects estimates for incidental ingestion of soil by current and future onsite trespassers are 0.1 and 0.5 based on average exposure and RME, respectively. Estimated HIs for dermal contact with soil by trespassers onto the Quarry are 0.009 and 0.3 for average exposure and RME, respectively. For trespassers at the Quarry, total estimated HIs for exposure to contaminants in soil are 0.1 and 0.8 for average exposure and RME, respectively. The HIs are less than unity suggesting that adverse health effects from ingestion of soil and dermal contact with soil are not likely to occur for the current and future trespasser.

Exposure to surface water is not likely given the very poor water quality (pH of 12 or greater). However, risks from exposure to quarry water are presented to provide an indication of the degree of site-related contamination in this medium. Estimated HIs from exposure to surface water are therefore not added to other Noncancer health effects estimates for trespassers. Only RME is evaluated for exposure to surface water at the Quarry. The calculated HI for RME for ingestion of quarry water is 0.1. The total HI for RME for dermal contact with quarry water is approximately 0.5. This suggests no significant risk for ingestion or dermal contact of surface water while swimming in the Quarry.

Risks Associated with Exposure to Lead

Potential exposures to lead in soil at the Markland Avenue Quarry are evaluated for current and future onsite trespassers, future onsite residents, and future onsite commercial/industrial workers. Potential exposures to lead by current offsite residents are not evaluated since lead is not considered a COPC for offsite residential soils. Future onsite residential exposures are quantified for infants to 6-year-old children, and worker exposures are quantified for adults. Since the IEUBK model evaluates potential exposures to lead for young children, trespassers are assumed to be 6 to 7 years old.

The IEUBK model results predict that 2.39, 0.77, 0.31, and 0.49 percent of children trespassing onto lead exposure areas A, B, C, and D (see Appendix A, Figure 4a) of the Markland Avenue Quarry may have blood lead concentrations of 10 µg/dL or greater. According to U.S. EPA (1994a) guidelines from exposures to lead, IEUBK results suggest that significant risk from exposure to lead in soil is not expected for children who may trespass onto the Markland Avenue Quarry.

Fetal blood lead levels were 7.88, 6.85, 6.21, and 6.5 µg/dL for pregnant women who may become exposed to lead in soil in the lead exposure areas. Predicted ninety-fifth percentile blood lead concentrations for all exposure areas at the Quarry are less than the "acceptable" fetal blood lead concentration for all exposure areas evaluated.

For the future onsite resident at the Quarry, the IEUBK model was run in the batch mode per U.S. EPA request. This approach uses each lead data point from this source area. The cumulative results of the batch mode run demonstrates that there is a 0.21 percent probability that the blood lead concentrations for children residing at the Quarry may be 10 µg/dL or greater. The cumulative batch mode IEUBK modeling results suggest that significant risk from exposure to lead in soil is not expected for children who may reside at the Markland Avenue Quarry.

Main Plant

COPCs selected for the Main Plaint were based on an industrial/commercial future land use scenario. COPCs selected for on-site surface and subsurface soil include: benzo(a)anthracene, benzo(a)pryene, benzo(b&k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pryene, Aroclor-1242, Aroclor-1248, Aroclor-1254, Aroclor-1260, and lead. In addition, although soil gas results (VOCs) were not used in the

RA COPC development (i.e., there are no human health impacts), VOCs are considered COPCs for the Main Plaint since they may potentially impact groundwater at the CSSS. These COPCs include: 1,2-dichloroethene and trichloroethene. COPCs selected for shallow groundwater include 1,1-dichloroethene, 1,2-dichloroethene (total), benzene, chloroform, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride, Aroclor-1242, Aroclor-1248, and manganese.

Four different receptor groups are evaluated for the Main Plant area, current offsite residents, future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. Residential exposures are quantified for 1- to 6-year-old children and adults, and exposures for trespassers are quantified for 6- to 14-year-old children. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 183 acre source area. Cancer and noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates

Carcinogenic risks for the Main Plant are summarized in Table ES-1 (Appendix C). Risks are estimated based on both CTE and RME. The former are intended to represent typical exposures at the CSSS, the latter represent exposures well above the average, but still within a possible range.

Current Offsite Residents

Current offsite residents near the Main Plant are evaluated for incidental ingestion of soil and dermal contact with soil when working or playing in their yards. Cancer risk estimates for these pathways are summarized in Table ES-1 (Appendix C) and are discussed below. It should be noted that the data for offsite residential areas are only considered screening level. The purpose of the risk assessment is to identify chemicals that may drive potential risks in offsite areas and to determine whether additional characterization of offsite soils may be warranted. The analysis presented is meant to provide a general indication of potential risks that may be associated with contamination in offsite soils.

Arsenic and benzo(b,k)fluoranthene are the only carcinogenic COPCs selected for residential soil near the Main Plant. Estimated risks for these chemicals from incidental ingestion of soil are 5.5E-08 for benzo(b,k)fluoranthene and 5.6E-06 for arsenic for average exposures and risks for RME are 8.4E-07 for benzo(b,k)fluoranthene and 7.5E-05 for arsenic. Total cancer risks for incidental ingestion of soil are 5.7E-06 for average exposure and 7.6E-05 for RME. Average risk for the exposure pathway are below the risk range and risks based on RME are near the top of U.S. EPA's acceptable (1990) risk range.

Dermal exposure to metals in soil is not considered significant and is not evaluated. Benzo(b&k)fluoranthene is the only organic chemical selected as COPC for residential soil. Estimated cancer risk from dermal exposure to this chemical in soil is 2.1E-07 for average exposure and 5.7E-06 for RME.

Total cancer risks from incidental ingestion of soil and dermal contact with soil are 5.9E-06 and 8.2E-05 based on average exposure and RME, respectively. Approximately 96 percent of the risk from RME and 93 percent of the risk from average exposure are from incidental ingestion of soil. Estimated cancer risks for current and future offsite residents near the Main Plant are in the middle and at the top of U.S. EPA's acceptable range.

Future Onsite Commercial/Industrial Workers

Future commercial/industrial workers at the Main Plant are evaluated for incidental ingestion of soil, dermal contact with soil, and inhalation of volatile organics released to indoor air. Carcinogenic risks for these exposure pathways are summarized in Table ES-1 and are discussed below.

Cancer risks from incidental ingestion of soil range from 2.8E-08 for indeno(1,2,3-cd)pyrene to 2.9E-07 for benzo(a)pyrene and dibenz(a,h)anthracene for average exposure. Cancer risks based on RME range from 7.3E-07 for indeno(1,2,3-cd)pyrene to 2.5E-05 for Aroclor 1248. Total carcinogenic risks for incidental soil ingestion are 1.1E-06 and 7.4E-05 for average exposure and RME, respectively. Aroclor 1248 and Aroclor 1254 are the main contributors to carcinogenic risks for this exposure pathway.

Estimated cancer risks from dermal exposure to COPCs in soil are 8.5E-07 and 2.0E-05 for average exposure and RME, respectively. Benzo(a)pyrene, dibenz(a,h)anthracene and the PCBs contribute approximately equally to these risks. Estimated total cancer risks from incidental ingestion of and dermal contact with soil are 2.0E-06 and 9.4E-05 based on average exposure and RME, respectively. Total risks for commercial/ industrial workers from exposure to contaminated soil are at the bottom and at the top of U.S. EPA's acceptable range.

Based on soil gas sampling, the Main Plant does not appear to overlie significant levels of COPCs in soil gas, therefore, significant release of VOCs into indoor air at the Main Plant is not expected. Risks from inhalation of indoor air should be negligible for commercial/industrial workers at the Main Plant.

Future Onsite Construction Workers

Cancer risk estimates for incidental soil ingestion and dermal contact with soil by future onsite construction workers are summarized in Table ES-1.

Carcinogenic risks for average and RME estimates for soil ingestion range from 2.1E-10 for indeno(1,2,3-cd)pyrene to 2.2E-09 for dibenz(a)anthracene and benzo(a)pyrene and from 1.5E-08 for indeno(1,2,3-cd)pyrene to 5.2E-07 for Aroclor 1248. Total carcinogenic risk estimates for average exposure and RME are 8.6E-09 and 1.5E-06, respectively. These risks are less than and at the bottom of U.S. EPA's acceptable range. Estimated cancer risks from dermal exposure to soil are 6.2E-09 and 1.6E-07 for average exposure and RME, respectively. Risks from dermal contact with soil are below U.S. EPA's (1990) acceptable risk range. Estimated total cancer risks (see Table ES-1) are 1.5E-08 and 1.7E-06 based on average exposure and RME, respectively. Total risks associated with exposure to soil are below and at the bottom of U.S. EPA's (1990) acceptable range.

Current and Future Onsite Trespassers

Current and future onsite trespassers at the Main Plant are evaluated for potential exposures from incidental ingestion of soil and dermal contact with soil. Carcinogenic risks for future onsite trespassers are summarized in Table ES-1 and are discussed below.

Average cancer risk estimates for incidental ingestion of soil are highest for dibenz(a,h)anthracene and benzo(a)pyrene at 4.5E-07 in both cases and cancer risks based on RME are highest for Aroclor 1248 at 8.4E-06. Total carcinogenic risks from soil ingestion are 1.8E-06 and 2.5E-05 for average and RME estimates, respectively. Aroclor 1242 and 1254 are the main contributors to risks from RME. Estimated cancer risks for trespassers from dermal exposure to soil at the Main Plant are 1.4E-06 and 6.9E-05 for average exposure and RME, respectively. Total cancer risk estimates for trespassers at the Main Plant from incidental ingestion of soil and dermal contact with soil (see Table ES-1) are 3.2E-06 and 9.4E-05 based on average exposure and RME, respectively. Total average and RME carcinogenic risks for the trespasser scenario are within the 10^{-6} to 10^{-4} range considered acceptable by the U.S. EPA (1990).

Noncarcinogenic Hazard Estimates

Noncarcinogenic risks at the Main Plant are summarized in Table ES-2 (Appendix C). Noncarcinogenic health effects estimates for current offsite residents, future onsite commercial/ industrial workers, future onsite construction workers, and current and future onsite trespassers scenarios are discussed below.

Current Offsite Residents

Noncancer health effects estimates for incidental ingestion of soil by offsite residents range from 5.6E-03 for zinc to 8.5E-01 for arsenic for average exposure and from 9.5E-02 to 2.40 for the same chemicals for RME. Total HIs for average and RME estimates for the soil ingestion pathway are 0.9 and 2.7, respectively. Since almost all of these risks are from exposure to arsenic, potential health risks from this pathway can therefore be evaluated without subtracting effects from chemicals that affect different target organs than arsenic. The HI based on RME exceeds unity for incidental soil ingestion greater than one; potential health risks may therefore be associated with this exposure scenario. No organic noncarcinogenic COPCs were selected for offsite residential soil near the Main Plant. Dermal exposure to soil is therefore not evaluated for current and future offsite residents near the Main Plant.

Total HIs for offsite residents near the Main Plant from incidental ingestion of soil and dermal contact with soil are 0.9 and 2.7 based on average exposure and RME, respectively. Since dermal exposures are not evaluated, these estimates are identical to those from ingestion of soil. Since HIs based on RME exceed unity, there is a potential for adverse health effects associated with exposure to soil by current offsite residents.

Future Onsite Commercial/Industrial Workers

Noncarcinogenic hazard estimates for incidental ingestion of soil by future onsite commercial/ industrial workers are 0.03 and 1.1 for average exposure and RME, respectively. Estimated HIs for dermal contact with soil are 1.1E-02 and 2.3E-01 for average exposure and RME, respectively. These estimates are entirely due to exposure to PCBs. Estimated total HIs from these pathways are 0.04 and 1.3 based on average exposure and RME, respectively. The HI based on RME exceeds unity, suggesting that there is a potential for adverse health effects from exposure to soil by commercial/industrial workers at the Main Plant.

Future Onsite Construction Workers

Estimates of total noncarcinogenic health effects for the future onsite construction workers scenario are 0.009 and 1.6 for average exposure and RME, respectively. Aroclor 1242, 1248, 1254, and 1260 contribute almost entirely to these HIs, separate evaluation of chemicals based on their target organs is, therefore, not necessary. Estimated HIs for dermal contact with soil are 0.004 and 0.1 for average exposure and RME, respectively. Total HIs for future onsite construction workers at the Main Plant from incidental ingestion of soil and dermal contact with soil are 0.01 and 1.7 based on average exposure and RME, respectively. The HI based on RME exceeds unity for this exposure scenario, suggesting that some measure to protect construction workers who may intensively contact soil at the Main Plant may be justified.

Current and Future Onsite Trespassers

Estimates of Noncancer health effects from incidental ingestion of soil by current and future trespassers onto the Main Plant are 0.04 and 1.1 for average exposure and RME, respectively. More than 99 percent of these HI estimates are from the polychlorinated biphenyls (Aroclor 1242, 1248, 1254, and 1260). Estimated HIs for dermal contact with soil are 0.02 and 2.4 for average exposure and RME, respectively. Most of the HI estimate is due to Aroclors 1242 and 1248. Estimated total HIs from these pathways are 0.06 and 3.5 based on average exposure and RME, respectively. Since the HI for RME exceeds unity, the potential exists that exposure to soil by trespassers may result in adverse health effects.

Risks Associated with Exposures to Lead

Potential exposures to lead in soil at the Main Plant are evaluated for onsite trespassers and commercial/industrial workers. Since the IEUBK model was developed to evaluate exposures to lead in young children, trespassers are assumed to be 6 to 7 years old. Offsite residential lead in soil is a potential concern based on sampling results; however, the sampling approach used was not intended to serve as the basis of a numerical risk assessment for the offsite area. U.S. EPA is currently performing an EE/CA for remediation of lead in residential soil near the Main Plant. Lead in offsite residential soil near the Main Plant is therefore not further addressed in this Record of Decision.

Potential exposure to lead in children is evaluated using the IEUBK model (Version 99d). The IEUBK model predicts that 0.77 percent of children trespassing onto Lead Exposure Area A of the Main Plant may have blood lead concentrations of 10 µg/dL or greater (see Figure 5a). 13.64, 1.16, 0.35, 98.67, 7.75, and 0.04 percent of children trespassing onto exposure Areas B, C, D, E, F, and G (see Appendix A, Figure 5a) may have blood lead concentrations of 10 µg/dL or greater. U.S. EPA (1994) considers risks from exposures to lead unacceptable if the probability that children may have blood lead levels exceeding 10 µg/dL is greater than 5 percent. IEUBK modeling results suggest that significant risk from exposure to lead in soil is not expected for children who may trespass onto areas A, C, D, F, and G of the Main Plant. However, trespassing onto Areas B and E may be associated with significant health risk from exposure to lead.

Adult exposures to lead are evaluated using the interim adult exposure methodology developed by U.S. EPA (1996). The focus of this method is to estimate fetal blood lead levels based on exposure to lead in soil by adult workers of child-bearing age. The method predicts 95th percentile fetal blood lead levels of 7.55, 13.07, 8.0, 6.87, 98.07, 11.31 and 5.58 µg/dL for female workers of childbearing age exposed to lead in soil in exposure Areas A, B, C, D, E, F, and G, respectively (see Figure 5a). Ninety-fifth percentile fetal blood lead concentrations should not exceed 10 µg/dL (U.S. EPA 1996). Predicted blood lead concentrations for all exposure areas at the Main Plant are less than the "acceptable" fetal blood lead concentration, except for exposure Areas B, E, and F. In Area E, fetal blood lead levels could theoretically be as high as 98 µg/dL if female workers of childbearing age are exposed to lead in soil.

Slag Processing Area

COPCs were selected for the Slag Processing Area based on a residential future land use scenario. COPCs selected for on-site surface soil in the Slag Processing Area include lead and arsenic.

Potential exposures to contaminants associated with the Slag Processing Area are evaluated for the following receptor groups: future onsite residents, future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. All of these receptors are quantitatively evaluated for incidental ingestion of soil. Residential exposures are quantified for 1- to 6-year-old children and adults; trespassers are assumed to be 6- to 14-year-old children. Worker exposures are quantified for adults. Both the CTE and RME exposure point concentrations are derived from data collected across the entire approximately 9 acre source area. Cancer and Noncancer risk/hazard estimates are based on these values.

Cancer Risk Estimates

Carcinogenic risks for the Slag Processing Area are summarized in Table ES-1 (Appendix C). Carcinogenic risks for the Slag Processing Area are discussed below.

Future Onsite Residents

Future onsite residents at the Slag Processing Area are evaluated for incidental ingestion of soil and dermal contact with soil when working or playing in their yards. Cancer risk estimates for this pathway are summarized in Table ES-1 (Appendix C).

Carcinogenic COPCs selected for residential soil at the Slag Processing Area are methylene chloride and arsenic. For average exposures the estimated risks for these chemicals are 1.0E-09 for methylene chloride and 1.3E-05 for arsenic. Risks for RME are 2.7E-07 and 1.7E-04 for methylene chloride and arsenic, respectively. Total cancer risks for incidental ingestion of soil are 1.3E-05 and 1.7E-04 for average exposure and RME, respectively. Risks for this pathway are in the middle of U.S. EPA's (1990) acceptable range. Estimated cancer risks from dermal exposure to soil are 1.6E-10 and 7.4E-07 for average exposure and RME, respectively. Risks for this pathway are less than U.S. EPA's (1990) acceptable range. Total cancer risk estimates for future onsite residents at the Slag Processing Area are 1.3E-05 and 1.7E-04 based on average exposure and RME, respectively. These risks are almost entirely from incidental ingestion of soil. Total estimated cancer risks for average exposure and RME are in the middle of and above U.S. EPA's (1990) acceptable range.

Future Onsite Commercial/Industrial Workers

Carcinogenic risks from ingestion of soil near the Slag Processing Area by future onsite commercial/industrial workers are 9.5E-06 for average exposures and 7.2E-05 for RME. Estimated cancer risks from dermal exposure to soil are 2.7E-10 and 2.0E-08 for average exposure and RME, respectively. Total cancer risk estimates for future onsite commercial/industrial workers at the Slag Processing Area are 9.5E-06 and 7.2E-05 based on average exposure and RME, respectively. Carcinogenic risks for the future onsite commercial/industrial worker scenario are within U.S. EPA's (1990) acceptable risk range.

Future Onsite Construction Workers

Cancer risk estimates for incidental ingestion of soil and dermal contact with soil by future onsite construction workers are presented in Table ES-1. Estimated cancer risks for incidental ingestion of soil by construction workers are 7.2E-08 for average exposure and 1.5E-06 for RME. Arsenic is the main contributor to these risks. Estimated cancer risks from dermal exposure to soil are 2.0E-12 and 1.6E-10 for average exposure and RME, respectively.

Total cancer risk estimates for future onsite construction workers at the Slag Processing Area from incidental ingestion of soil and dermal contact with soil are 7.2E-08 and 1.5E-06 based on average exposure and RME, respectively. These risks are below and at the bottom of U.S. EPA's (1990) acceptable range.

Current and Future Onsite Trespassers

Carcinogenic risks for current and future onsite trespassers from incidental ingestion of soil at the Slag Processing Area are 1.5E-05 for average exposure and 2.4E-05 for RME. Arsenic is the main contributor to these risks. Estimated cancer risks from dermal exposure to soil are 4.3E-11 and 7.0E-08 for average exposure and RME, respectively. Total cancer risk estimates for trespassers onto the Slag Processing Area are 1.5E-05 and 2.4E-05 based on average exposure and RME, respectively. Total cancer risk estimates are within U.S. EPA's (1990) acceptable range.

Noncarcinogenic Hazard Estimates

Noncarcinogenic risks for the Slag Processing Area are summarized in Table ES-2 (Appendix C). Noncarcinogenic health effects estimates at the Slag Processing Area are presented for future onsite residents, future onsite commercial/industrial workers, future onsite construction workers, and current and future onsite trespassers. Noncancer health effects for these scenarios are discussed below.

Future Onsite Residents

For future onsite residents at the Slag Processing Area estimated HIs for incidental ingestion of soil are 2.3 for average exposure and 8.9 for RME. Most of these risks are due to arsenic. Since the HQ for arsenic and the HI for the RME are greater than 1, potential health risks may be associated with this exposure pathway. Estimated HIs for dermal exposure to contaminants in soil are 2.8E-06 and 0.004 for average exposure and RME, respectively.

Total HIs for future onsite residents at the Slag Processing Area from incidental ingestion of soil and dermal contact with soil are 2.3 and 8.9 based on average exposure and RME, respectively. These risks are almost entirely from incidental ingestion of soil. Risks from dermal contact with soil are negligible. HIs for exposure to soil exceed unity, indicating that there may be a potential for adverse Noncancer effects from exposure to soil for future onsite residents at the Slag Processing Area.

Future Onsite Commercial/Industrial Workers

HI estimates for incidental ingestion of soil by future onsite commercial/industrial workers are 0.2 and 0.7 for average exposure and RME, respectively. Estimated HIs for dermal exposure to contaminants in soil are 1.1E-06 and 1.3E-04 for average exposure and RME, respectively. The HIs for both pathways are less than unity, suggesting that adverse Noncancer health effects from exposure to soil are not likely.

Total HIs for future onsite commercial/industrial workers at the Slag Processing Area from incidental ingestion of soil and dermal contact with soil are 0.2 and 0.7 based on average exposure and RME, respectively. These risks are almost entirely from incidental ingestion of soil. Risks from dermal contact with soil are negligible. The HIs are less than unity, suggesting that adverse Noncancer health effects from exposure to soil are not likely for future onsite commercial/industrial workers at the Slag Processing Area.

Future Onsite Construction Workers

Total noncarcinogenic HIs for incidental ingestion of soil by future onsite construction workers are 0.08 for average exposure and 1.1 for RME. Since the HI based on RME exceeds unity, adverse noncarcinogenic health effects may therefore be associated with this pathway. Estimated HIs for dermal exposure to contaminants in soil are 1.9E-07 and 7.6E-05 for average exposure and RME, respectively. The HIs for dermal exposure are less than unity, suggesting that adverse Noncancer health effects from exposure to soil are not likely for future onsite construction workers at the Slag Processing Area.

Total HIs from incidental ingestion of soil and dermal contact with soil for future onsite construction workers at the Slag Processing Area are 0.08 and 1.1 based on average exposure and RME, respectively. The HI for the RME for the combined pathways exceeds unity, suggesting a potential for adverse health effects.

Current and Future Onsite Trespassers

HI estimates for incidental ingestion of soil by onsite trespassers are 0.3 and 0.8 for average exposure and RME. Almost all of these health effects are from exposure to arsenic. Estimated HIs for dermal exposure to contaminants in soil are 8.4E-07 and 0.001 for average exposure and RME, respectively. Since HIs for these pathways are less than unity, adverse Noncancer health effects are not expected for trespassers onto the Slag Processing Area.

Total HIs from incidental ingestion of soil and dermal contact with soil for trespassers onto the Slag Processing Area are 0.3 and 0.8 based on average exposure and RME, respectively. Since HIs for this pathway are less than unity, adverse Noncancer health effects are not expected for trespassers onto the Slag Processing Area.

Risks Associated with Exposure to Lead

The Slag Processing Area has mixed land use and is designated for residential and commercial/ industrial exposures. Receptors evaluated for potential exposure to lead in this source area are child residents, child trespassers, and adult workers.

The IEUBK model predicts that the risk of trespassers onto the Slag Processing Area having a blood lead level in excess of 10 µg/dL is 2.11 percent. This suggest that risks from exposure to lead at the Slag Processing Area are not likely for trespassers.

Adult exposure methodology predicts a 95 percentile fetal blood lead level of 7.74 µg/dL in women of childbearing age exposed to lead in soil at the Slag Processing Area. Predicted fetal blood lead concentrations in female workers of childbearing age exposed to lead at the Slag Processing Area are less than the acceptable blood lead concentration. Excess risk for female workers at the Slag Processing Area is therefore not expected.

For future onsite residents at the Slag Processing Area, the IEUBK model was run in the batch mode. This approach uses each lead data point from this source area. The cumulative results of the batch mode run demonstrates that there is a 38.16 percent probability that the blood lead concentrations for children residing at the Slag Processing Area may be 10 µg/dL or greater. The cumulative batch mode IEUBK modeling results suggest that significant risk from exposure to lead in soil is expected for children who may reside at the Slag Processing Area.

Ecological Assessment:

Lagoon Area

Risks to ecological receptors in the Lagoon Area are principally from chemical stressors; however, the ecology in this source area also shows signs of physical stress from the presence of slag materials in soil and sediment. Significant impacts from this physical stressor occur at the community-level among vegetation and the quality of potential terrestrial, semiaquatic and aquatic habitat in this source area is diminished as a result. The major contributors of risk from chemical stressors for sediment and sludge are acenaphthene, ethylbenzene, manganese, copper, lead, mercury, nickel and barium. Chromium and copper are major contributors of risk in surface soil in the Lagoon Area waste piles. Lead and zinc are major contributors of risk in surface water. Copper, lead, and mercury in sediment (sludge) are major contributors of risk to aquatic receptors and great blue heron.

Kokomo & Wildcat creeks

PCBs in creek sediment are the major contributors of risk to aquatic receptors, mink, and Indiana bat. Zinc and cadmium also pose significant risk to aquatic receptors exposed to sediment; however PCB contamination of creek sediment causes the greatest risk to these receptors and Indiana bat, which is an endangered species. Lead and zinc in stream water in the Creeks are contributors of risk to aquatic receptors, mink, and Indiana bat.

Markland Avenue Quarry

Risks to ecological receptors in Markland Avenue Quarry are principally from chemical stressors. However, the aquatic ecology of sediment and surface water is expected to be impacted by the high alkalinity (pH 12) of the waterbody. The major contributors of risk for surface soil in Markland Avenue Quarry are copper, chromium, and zinc. These COPCs in surface soil have low contributions from background and represent HIGH risk to American robin with HQs of 33,523 (copper), 12,906 (chromium), and 9,449 (zinc). Risks to robin were HIGH to MODERATE for lead (HQ=827) and nickel (HQ=502), while the background contribution to COPC risk was 2, 14, 86, 43, and 49% (respectively) for these COPCs. Cadmium, barium, and arsenic also shows significant risk to robin, but background contributions are 86, 43, and 49% to these risks. Semi-quantitative risk estimates to generic wildlife receptors using surface soil to benchmark comparisons showed MODERATE risks from zinc, PAHs, copper and chromium; however, only copper and chromium (HQ=11) had low contributions from background.

Main Plant

Ecological risks in the Main Plant source area are due to chemical stressors identified in surface soil, but slag materials in soil also produce significant physical stress on the vegetation. Major contributors of risk for surface soil in the Main Plant are copper and PCBs (mostly Aroclor 1242). Other contributors include zinc, lead, PAHs, cadmium, copper, and chromium

Slag Processing Area

Ecological risks in the Slag Processing Area source area are due to chemical stressors identified in surface soil, however, slag materials in soil are also a significant physical stressor on vegetation. Nine contaminants of potential concern (COPCs) were identified in surface soil from the Slag Processing Area including 1 volatile and 8 inorganics (metals). Major contributors of risk for surface soil in the Slag Processing Area are chromium, zinc, and copper. These COPCs have relatively low background contributions, and represent HIGH risks to American Robin with Hazard Quotients (HQ) of 21,664 (for chromium), 15,441 (zinc), and 12,800 (copper). Risks to robin were also HIGH for lead (HQ = 2,343), however, it is not a major contributor to risk. With the exception of zinc which has 16 percent background contributions to COPC risk, risks from the COPCs are principally site-related. The estimated risk to the robin from cadmium is also significant, but contributions from background are 42 percent.

VII. Description of Alternatives

Remedial Response Objectives

The remedial response objectives for each source area at the CSSS are based on exposure levels and associated risks posed by contamination within a source area and by contamination that may migrate from the source areas via site-wide groundwater. The results of the final RA identified the potential contaminants of concern and the affected media for each source area which pose unacceptable risk to human health and the environment. The remedial response objectives for the CSSS site are as follows by media:

Groundwater:
Prevent the public from ingestion of shallow groundwater containing contamination in excess of federal and state drinking water standards or criteria, or which poses a threat to human health.

Prevent the migration of contaminants from the source areas that would result in continued degradation of site-wide groundwater, to the extent practicable.

Prevent the public from dermal contact with groundwater containing contamination in excess of federal and state standards or criteria, or which poses a threat to human health.

Surface Water:
Prevent the migration of contaminants from the source areas that would result in continued degradation of site-wide surface water, to the extent practicable.

Prevent the public from incidental ingestion and direct contact with surface water containing contamination in excess of federal and state standards or criteria, or which pose a threat to human health.

Prevent surface water impacts to the ecological environment.

Soils, Sludges, & Waste Piles:
Prevent the public from incidental ingestion and direct contact with sludge, soil, and waste piles containing contamination in excess of federal and state soil standards or criteria, or which pose a threat to human health.

Prevent the public from inhalation of airborne contaminants (from disturbed soil) in excess of federal and state air standards or criteria, or which pose a threat to human health.

Sediments:
Prevent the public from direct contact with contaminated sediments in excess of federal and state standards or criteria, or which pose a threat to human health.

Prevent the public from incidental ingestion of sediment containing contamination in excess of federal and state standards or criteria, or which pose a threat to human health.

Prevent creek sediment impacts to ecological environment.

Restore creek sediments to levels which are protective of human health and the environment, to the extent practicable, while minimizing adverse impact to the wetlands and minimizing the potential for sediment to become suspended in the surface water column.

Other:
Prevent the public from ingestion of potentially contaminated fish from the creeks which may present

a health risk; a fish advisory has already been posted.

The BRA performed for the CSSS addresses potential human health risks posed by the site in the absence of cleanup actions. The areas evaluated for human health risks include the four source areas (Main Plant, Markland Avenue Quarry, Lagoon Area, and Slag Processing Area) and the two non-source exposure areas (site-wide groundwater and Kokomo and Wildcat Creeks). The exposure hazards or human health risks for each area are summarized in the Considered & Selected Alternatives Sections presented below. More detailed descriptions of the risks are presented in the CSSS RI, FS, and BRA Reports available at the Kokomo/Howard County Public Library (the Library) in the information repository and Administrative Record.

Remedial Measures

A description of the retained remedial measures are listed below.

- Institutional Controls - deed restrictions, groundwater use restrictions, fencing, and monitoring to limit future site usage to activities following the future use scenario and/or the site restrictions and lessen the chance for exposure of local populations to site contaminants.

- Surface Controls - slope stabilization, erosion control, enhancement of existing vegetation.

- Containment - involves isolating areas of contaminated media through physical or hydraulic controls. Containment technology types include capping, horizontal barriers, and vertical barriers.

- Vegetated Soil Cover - replace existing poorly vegetated as well as other vegetated areas with a new soil layer and vegetation.

- Common Soil Cover (horizontal barrier) - replace or cover the existing surface with a common soil layer and vegetation.

- Vertical Barriers (recovery wells or interception trenches) - control of horizontal migration of contamination. Vertical barriers can be physical (e.g., slurry walls or HDPE-lined trenches) or hydraulic (e.g., interception trenches or line of collection wells). Vertical barriers are constructed to contain and prevent the migration of contaminated groundwater or leachate originating from contaminated solids.

- Excavation - removal of contaminated soils within a specified area.

- Stabilization - the conversion of a solid material to a more chemically stable and less leachable form by mixing them with a stabilizing agent; improves the strength and handling characteristics of soil, wastes, sediments and sludges. Solidification/stabilization can be implemented either in situ or aboveground.

- Biological treatment - processes that use contaminant-utilizing microbes to destroy organic hazardous constituents and form less toxic products.

- Aerobic Ex-Situ Biodegradation - This technology utilizes excavation and on-site treatment or excavation and bioreactor treatment where the bacteria and nutrients are introduced into the waste material after excavation. In each of these cases, biodegradation may be enhanced by optimizing environmental conditions (soil moisture content, temperature, oxidation-reduction potential, pH and salinity) for contaminant degrading microorganisms. Ambient environmental conditions are more easily maintained in a bioreactor unit than in situ. Aerobic degradation occurs with an absence or minimal amount of air.

- Immobilization - processes implemented to inhibit migration of contaminants from contaminated solids through fixation.
- Vacuum Extraction Ex-Situ - aboveground treatment technique in which the soil gas within the unsaturated zone is pumped out of the pore spaces via an applied vacuum
- Thermal - Technologies that involve driving organics out of solid material through heating.
- Thermal Desorption - a solids drying process whereby heat is applied to contaminated solids at temperatures in the range of 300 to 1,000°F to drive off water and organic contaminants, resulting in a clean dry solid matrix.
- Consolidation - minimize waste distribution by relocating wastes or excavated soils within a limited area designed to contain the waste.
- Off-site Disposal - transfer waste or excavated soils to an approved off-site landfill.
- On-site Disposal - transfer waste or excavated soils to an approved on-site landfill.
- Groundwater Decontamination - use of extraction wells to contain and remove mass contaminants from groundwater flow. Determining when to shut the extraction well system down will require an evaluation of the contamination remaining in groundwater to determine if there are accedences of federal and state standards and/or deviations from the acceptable cumulative Hazard Index.

The retained remedial measures are then combined to form site-wide remedial alternatives. The alternatives evaluated are listed below.

Summaries of Remedial Alternatives Considered

For OU1:

Common Actions to the OU1 Alternatives, except No Action
♦ Groundwater Use Restrictions
♦ Collect Shallow Groundwater and Dispose Off-site at Kokomo Wastewater Treatment Plant

Alternative MM-1:

- **No Action**

Time to Complete Construction:	0 months
Monitoring Requirements (only):	200+ yrs. monitoring
Capital Cost:	$0
First Year O&M:	$0
30-Yr. Net Present Worth Cost:	$0

Alternative MM-2:

- **Natural Attenuation of Intermediate and Lower Groundwater**

Time to Complete Construction:	12 to 18 months
Groundwater Monitoring & Collection Requirements:	200+ yrs.
Capital Cost:	$3,873,000
First Year O&M:	$223,000
30-Yr. Net Present Worth Cost:	$5,532,000

Alternative MM-3:

- **Collect Intermediate and Lower Groundwater and Dispose Off-Site at WWTP**

Time to Complete Construction:	18 to 24 months
Groundwater Monitoring & Collection Requirements:	200+ yrs.
Capital Cost:	$1,431,000
First Year O&M:	$244000
30-Yr. Net Present Worth Cost:	$13,204,000

Alternative MM-4:

- **Collect Intermediate and Lower Groundwater and Dispose Off-Site at Wildcat Creek**

Time to Complete Construction:	18 to 24 months
Groundwater Monitoring & Collection Requirements:	200+ yrs.
Capital Cost:	$10,611,000
First Year O&M:	$244,000
30-Yr. Net Present Worth Cost:	$13,384,000

Alternative MM-5:

- **Collect Intermediate and Lower Groundwater at Martin Marietta Quarry to Contain**

Contaminant within Current Boundaries

- **Dispose of Collected Groundwater Off-Site at WWTP**
- **Natural Attenuation**
- **Technical Impracticability (TI) Waiver Invoked**

Time to Complete Construction:	**18 to 24 months**
Groundwater Monitoring &	
Collection Requirements:	**200+ yrs.**
Capital Cost:	**$,013,000**
First Year O&M:	**$244000**
30-Yr. Net Present Worth Cost:	**$6,386,000**

<u>**For OU2**</u>**:**

Common Actions to the OU2 Alternatives, except No Action
♦ **Deed & Groundwater Use Restrictions**
♦ **RCRA Surface Impoundment Closure**

Alternative SC-1L:

- **No Action**

Time to Complete Construction:	**0 months**
Groundwater Requirements:	
for Monitoring	**0 years**
for Collection/Treatment	**0 years**
Capital Cost:	**$0**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$0**

Alternative SC-2L:

- **Cap Elevated VOC Solids Areas**

Time to Complete Construction:	**2 to 3 years**
Groundwater Requirements:	
for Monitoring	**30 years**
for Collection	**0 years**
Capital Cost:	**$29,039,000**
First Year O&M:	**$61,600**
30-Yr. Net Present Worth Cost:	**$29,967,000**

Alternative SC-3L:

- **Cap Contaminated Solids**
- **Elevated VOC Solids Removal**
- **Collect and Contain Shallow Groundwater with Interception Trench System and Dispose Off-Site at WWTP**

Time to Complete Construction:	**2 to 3 years**
Groundwater Requirements:	
for Monitoring	**30 years**
for Collection	**30 years**
Capital Cost:	**$35,787,000**
First Year O&M:	**$96,000**
30-Yr. Net Present Worth Cost:	**$36,812,000**

Alternative SC-4L:

- **Excavate Contaminated Solids and Consolidate On-Site**
- **Collect and Contain Shallow Groundwater with Expanded Interception Trench System and Dispose Off-Site at WWTP**

Time to Complete Construction:	**2 to 3 years**
Groundwater Requirements:	
for Monitoring	**30 years**
for Collection	**30 years**
Capital Cost:	**$43,919,000**
First Year O&M:	**$146,600**
30-Yr. Net Present Worth Cost:	**$44,746,000**

For OU3:

There are NO Common Actions to the OU3 Alternatives.

Alternative SC-1C:

- **No Action**

Time to Complete:	**0 months**
Capital Cost:	**$0**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$0**

Alternative SC-2C:

- **Restricted Access by fencing and sign postage**

Time to Complete:	**12 months**
Capital Cost:	**$460,000**
First Year O&M:	**$96,000**
30-Yr. Net Present Worth Cost:	**$1,147,000**

Alternative SC-3C:

- **Contain Contaminated Sediment In-Place**

Time to Complete:	**18 months**
Capital Cost:	**$7,062,000**
First Year O&M:	**$103,000**
30-Yr. Net Present Worth Cost:	**$7,890,000**

Alternative SC-4C:

- **Excavate Contaminated Sediment and Consolidate On-Site**

Time to Complete:	**18 months**
Capital Cost:	**$12,312,000**
First Year O&M:	**$20,000**
30-Yr. Net Present Worth Cost:	**$12,560,000**

<u>For OU4</u>:

Common Actions to the OU4 Alternatives, except No Action
♦ **Groundwater Use Restrictions**
♦ **Excavate Contaminated Sediment from Quarry Pond**
♦ **Backfill Quarry Pond**

Alternative SC-1Q:

- **No Action**

Time to Complete:	**0 years**
Capital Cost:	**$0**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$0**

Alternative SC-2Q:

- **Cap Contaminated Solids/Dispose of Quarry Sediment at Off-Site Landfill**
- **Deed Restrictions**

Time to Complete Construction:	**12 to 18 months**
Time to Attain MCLs:	**30 years**
Capital Cost:	**$16,519,000**
First Year O&M:	**$130,000**
30-Yr. Net Present Worth Cost:	**$17,281,000**

Alternative SC-2.5Q:

- **Cover Contaminated Solids with Common Soil**
- **Dispose of Quarry Sediment in Lagoon Area CAMU**
- **Contain & Collect Shallow Groundwater & Dispose at WWTP**
- **Deed Restrictions**

Time to Complete Construction:	**24 to 36 months**
Time to Attain MCLs:	**10 to 15 years**
Capital Cost:	**$10,234,000**
First Year O&M:	**$168,000**
30-Yr. Net Present Worth Cost:	**$11,163,000**

Alternative SC-3Q:

- **Cap Contaminated Solids/Removal of Elevated VOC Solids**
- **Dispose of Contaminated Sediment at Off-Site Landfill**
- **Contain and Collect Shallow Groundwater and Dispose Off-Site at WWTP**
- **Deed Restrictions**

Time to Complete Construction:	**24 to 36 months**
Time to Attain MCLs:	**10 to 15 years**
Capital Cost:	**$30,679,000**
First Year O&M:	**$168,000**
30-Yr. Net Present Worth Cost:	**$31,608,000**

Alternative SC-4Q:

- **Excavate Contaminated Solids and Dispose Off-Site**
- **Collect and Contain Shallow Groundwater and Dispose Off-Site at WWTP**

Time to Complete Construction:	**3 to 4 years**
Time to Attain MCLs:	**10 to 15 years**
Capital Cost:	**$350,528,000**
First Year O&M:	**$162,000**
30-Yr. Net Present Worth Cost:	**$351,272,000**

For OU5:

Common Actions to the OU5 Alternatives, except No Action
♦ **Groundwater Use Restrictions**
♦ **Elevated VOC Solids Removal and On-Site Disposal**

Alternative SC-1M:

- **No Action**

Time to Complete:	**0 years**
Capital Cost:	**$0**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$0**

Alternative SC-2M:

- **Deed Restrictions**

Time to Complete:	**15 years**
Capital Cost:	**$1,460,000**
First Year O&M:	**$108,000**
30-Yr. Net Present Worth Cost:	**$2,145,000**

Alternative SC-3M:

- **Cap Contaminated Solids**
- **Collect & Contain Shallow Groundwater and Dispose Off-Site at WWTP**
- **Deed Restrictions**

Time to Complete:	**15 years**
Capital Cost:	**$4,312,000**
First Year O&M:	**$108,000**
30-Yr. Net Present Worth Cost:	**$4,818,000**

Alternative SC-3.5M:

- **Excavate PCB Solids along Kokomo Creek and Dispose On-Site**
- **Install Common Soil Cover**
- **Collect & Contain Shallow Groundwater and Dispose Off-Site at WWTP**
- **Deed Restrictions**

Time to Complete:	**15 years**
Capital Cost:	**$7,000,000**
First Year O&M:	**$36,000**
30-Yr. Net Present Worth Cost:	**$7,747,000**

Alternative SC-4M:

- **Excavate Contaminated Solids and Consolidate On-Site**
- **Collect & Contain Shallow Groundwater and Dispose Off-Site at WWTP**

Time to Complete:	**15 years**
Capital Cost:	**$19,606,000**
First Year O&M:	**$151,000**
30-Yr. Net Present Worth Cost:	**$20,334,000**

For OU6:

There are NO Common Actions to the OU6 Alternatives.

Alternative SC-1S:

- No Action

Time to Complete:	**0 months**
Capital Cost:	**$ 0**
First Year O&M:	**$ 0**
30-Yr. Net Present Worth Cost:	**$ 0**

Alternative SC-2S:

- **Regrade Piles**
- **Stabilize Creek Bank**
- **Deed Restrictions**

Time to Complete:	**12 to 18 months**
Capital Cost:	**$ 2,622,000**
First Year O&M:	**$ 0**
30-Yr. Net Present Worth Cost:	**$ 2,622,000**

Alternative SC-3S:

- **Cap Contaminated Solids**
- **Deed Restrictions**
- **Stabilize Creek Bank**

Time to Complete:	**12 to 18 months**
Capital Cost:	**$ 3,045,000**
First Year O&M:	**$ 0**
30-Yr. Net Present Worth Cost:	**$ 3,045,000**

Alternative SC-3.5S:

- **Regrade Slag Pile to Level Site**
- **Install Protective Common Soil Cover Over Contaminated Solids**
- **Deed Restrictions**
- **Stabilize Creek Bank**

Time to Complete:	**12 to 18 months**
Capital Cost:	**$2,420,000**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$2,420,000**

Alternative SC-4S:

- **Excavate Contaminated Solids and Consolidate On-Site**

Time to Complete:	**12 to 18 months**
Capital Cost:	**$ 25,622,000**
First Year O&M:	**$ 20,000**
30-Yr. Net Present Worth Cost:	**$ 25,622,000**

VIII. Summary of the Comparative Analysis of Alternatives

The National Contingency Plan (NCP), Section 300.430 (f)(I), requires that the alternatives considered for the final remedy be evaluated on the basis of the nine evaluation criteria.

In order to minimize the potential or prevent the exposure to hazardous materials, IDEM and EPA is proposing the cleanup of the source areas associated with the CSSS. In addition, the groundwater underlying the CSSS has been identified as a threat to human health. The considered cleanup alternatives for each source area and the side-wide groundwater have been summarized above. The Feasibility Study (FS) Report (available in the Administrative Record of the information repository) contains a more complete and detailed description and evaluation of the cleanup alternatives considered. The purpose of the detailed evaluation of alternatives is to provide enough relevant information of each alternative so that each may be evaluated against the nine criteria specified by the NCP. The alternatives are then compared against each other to identify the advantages and disadvantages and identify a preferred cleanup alternative for the source areas and site-wide groundwater. The detailed analysis of the alternatives includes the following steps:

- Further define each alternative with respect to the volumes or areas of contaminated media to be addressed, the technologies to be used, site specific application of the technologies, and any performance requirements associated with those technologies; and

- Create a summary profile of each alternative, and assess the alternative against the evaluation criteria specified in the NCP.

The evaluation criteria for this analysis include (1) Overall protection of human health and the environment; (2) Compliance with Applicable or Relevant and Appropriate Requirements; (3) Long-term effectiveness and permanence; (4) Reduction of contaminant toxicity, mobility, or volume through treatment; (5) Short-term effectiveness; (6) Implementability; (7) Costs; (8) Support Agency Acceptance; and (9) Community Acceptance. Two of the nine criteria - support agency acceptance and community acceptance - are modifying criteria. The remaining seven criteria are divided into two groups - the threshold criteria and the balancing criteria. The nine criteria are described below. A comparison of the alternatives with regard to the nine criteria follows their description. The tables in Appendix B also present the analysis and comparison of the alternatives for the six operable units.

Threshold Criteria

The threshold criteria relate to statutory requirements that each alternative must satisfy in order to be eligible for selection. These criteria are as follows:

1. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with ARARs** addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of Federal and State environmental statutes and/or provides grounds for invoking a waiver.

Balancing Criteria

The balancing criteria are the technical criteria that are considered during the analysis. These criteria are described as follows:

3. **Long-Term Effectiveness and Permanence** refer to the amount of risk remaining at a site and the ability of a new remedy to maintain reliable protection of human health and the environment, over time, once cleanup goals have been met. Factors that will be considered, as appropriate, include the following:

   - Magnitude of residual risk from untreated waste or treatment residuals remaining at the completion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

   - Adequacy and reliability of controls, such as containment systems and institutional controls, that are necessary to manage treatment residuals and untreated waste. This factor addresses, in particular, the uncertainties associated with land disposal, with respect to providing long-term protection from residuals; the assessment of the potential needs to replace technical components of the alternative, such as a cap, extraction wells, or treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

4. **Reduction of Toxicity, Mobility, or Volume through Treatment** is the degree to which alternatives employ recycling or treatment to reduce the toxicity, mobility, or volume of contamination, including how treatment is used to address the principal threats posed by the site. Factors that will be considered, as appropriate, include the following:

   - The treatment or recycling processes the alternatives employ and the materials they will treat;
   - The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled;
   - The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling, and the specification of which reduction(s) are occurring;
   - The degree to which the treatment is irreversible;
   - The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents; and
   - The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

5. **Short-Term Effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

6. **Implementability** is the technical and administrative ease or difficulty of implementing the cleanup alternatives. The following types of factors are analyzed:

   - Technical feasibility, which includes technical difficulties and unknowns associated with the construction and operation of the technology; the reliability of the technology; the ease with which additional remedial actions may be undertaken; and the degree to which the effectiveness of the remedy can be monitored;

- Administrative feasibility, including activities needed to coordinate with other offices and agencies; and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions and wetland impacts); and
- Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and the availability of prospective technologies.

7. **Cost addresses the following:**

- Capital costs, including both direct and indirect costs;
- Annual operation and maintenance costs (O&M);
- Cost of periodic replacement of system components; and
- Net present value of capital and O&M costs based on the estimated time for the remedial action to achieve cleanup goals.

Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs. Direct costs include expenditures for the equipment, labor, and materials necessary to install remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities, but are required to complete the installation of remedial alternatives.

Annual O&M costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. Periodic replacement costs are necessary when the anticipated duration of the remediation exceeds the design life of the system component or components (i.e., groundwater extraction pumps).

A present worth analysis is used to evaluate expenditures that occur over different time periods, by discounting all future costs to a common base year, usually the current year. Though the U.S. EPA FS guidance (U.S. EPA, 1988) suggests a maximum time frame of 30 years, IDEM has requested that these costs reflect the predicted duration of the remedial alternative, which may exceed 30 years in some cases. EPA has agreed with this approach. A discount rate of 7 percent was used for the present worth analysis. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money, if invested in the first year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned lifetime.

Modifying Criteria

The following are used to assess support agency and community acceptance to the alternatives.

8. **Support Agency Acceptance** is the criterion used to consider whether the support agency agrees with the lead agency's analyses and recommendations of the RI/FS and the Proposed Plan.

9. **Community Acceptance** is the criterion used to evaluate the public comments and will be addressed in the Record of Decision (ROD). The ROD will include a responsiveness summary that presents public comments and the lead agency's responses to those comments. Acceptance of the recommended alternative(s) will be evaluated after the public comment period.

Comparison of the alternatives with regard to the nine criteria

Site-Wide Groundwater (Operable Unit 1)

The relative performance of each of the management of migration remedial alternatives for site-wide groundwater is summarized in **Table 1a** in **Appendix C**. Each of these alternatives is discussed in greater detail in the following subsections:

Alternative MM-1:

This alternative would not be protective of human health or the environment. Contaminated groundwater would be allowed to continue uncontrolled migration away from the CSSS. This alternative would not attain ARARs for groundwater contaminants in any of the three water-bearing zones (shallow, intermediate, or lower) except via natural attenuation. Because there are no containment, collection, or treatment operations as part of Alternative MM-1, this alternative would not provide long-term effectiveness or permanence. No reductions in toxicity, mobility, or volume would result through implementation. No short-term risks exist. Since no remedial actions would take place, this alternative would be easily implemented. The total costs would be zero for this site-wide groundwater management of migration alternative.

Alternative MM-2:

Alternative MM-2 would afford an appropriate level of protection to human health and the environment. Reductions in exposure potential to site-wide groundwater contaminants and the extent of shallow groundwater plumes above MCLs would be reduced through groundwater extraction and institutional controls for groundwater use. Shallow groundwater for VOCs is fully addressed by the source area capture zones and groundwater use restrictions that rely on natural attenuation for a period of up to 40 years. The intermediate and lower water-bearing zone would be allowed to naturally attenuate over a period of 200 years and be collected by the Martin Marietta Quarry while it is in operation. It would operate probably for another 30 to 50 years. The extent of groundwater above ARARs is predicted to extend to the west of the quarry once operations cease. ARARs would eventually be attained for the shallow water-bearing zone, and a TI waiver would be applied to the intermediate and lower zones for the DNAPL where it is not practical to recover from fractured bedrock. Long-term effectiveness would be afforded for the shallow water-bearing zone only, assuming that source controls would be employed at the identified CSSS groundwater source areas. Through implementation of the shallow water-bearing zone extraction system, volume, mobility, and toxicity of shallow groundwater contaminants would be significantly reduced. Short-term risks to workers would result during groundwater extraction system installation and monitoring. This alternative would be moderately easy to implement, and the associated total cost would be low to moderate relative to the remaining site-wide groundwater remedial alternatives. This alternative attempts to reduce the extent of groundwater above MCLs until ARARs are achieved by natural attenuation, which would not occur for at least 200 years. It also builds upon the fate and transport results that impacts to site-wide groundwater from the source areas are not significant relative to groundwater discharge concentrations to surface water.

Alternative MM-3:

Alternative MM-3 would afford an appropriate level of protection to human health and the environment similarly to Alternative MM-2. Through extraction and off-site disposal of groundwater from all three water-bearing zones, the potential exposure pathways would be affected though with marginal effectiveness in the fractured bedrock. This alternative would provide a long-term solution to site-wide groundwater contamination in conjunction with use restrictions until ARARs are achieved. Volume, mobility, and toxicity would be eventually reduced through the extraction and off-site disposal processes.

groundwater contamination in conjunction with use restrictions until ARARs are achieved. Volume, mobility, and toxicity would be eventually reduced through the extraction and off-site disposal processes. However, the time to achieve cleanup would not be significantly shorter than other alternatives. For this alternative, the time to achieve ARARs would again exceed 200 years. Short-term risks to workers would result during groundwater extraction system installation and monitoring. This alternative would be technically easy to implement though logistics of pipelines could be cumbersome, and the associated total cost would be moderate to high relative to the remaining site-wide groundwater remedial alternatives. This alternative attempts to collect contaminated groundwater/DNAPL from the less fractured bedrock with marginal effectiveness and no real improvement to site-wide groundwater quality or attainment of ARARs.

Alternative MM-4:
Similarly to Alternative MM-3, Alternative MM-4 would afford an appropriate level of protection to human health and the environment. The main difference is that extracted groundwater from the intermediate and lower water-bearing zones would be discharged directly to the creeks under an NPDES permit. Provided that permitted discharge levels of contaminants are not exceeded with pretreatment if needed, the environmental threat would be minimal. Through extraction and off-site disposal/direct discharge of groundwater from all three water-bearing zones, the potential exposure pathways would be effectively eliminated. This alternative would provide a long-term solution to site-wide groundwater contamination in conjunction with use restrictions until ARARs are achieved. Volume, mobility, and toxicity would be reduced through the extraction and off-site disposal processes. However, the time to achieve cleanup would not be significantly shorter than other alternatives. For this alternative, ARARs would not be achieved for at least 200 years. Short-term risks to workers would result during groundwater extraction system installation and monitoring. This alternative would be technically easy to implement, and the associated total cost would be moderate to high relative to the remaining site-wide groundwater remedial alternative, although the difference in cost is negligible as compared to the companion remedy, Alternative MM-3. This alternative attempts to collect contaminated groundwater/DNAPL from the less fractured bedrock with marginal effectiveness and no real improvement to site-wide groundwater quality or attainment of ARARs. This alternative may be logistically easier to implement than Alternative MM-3, but would include meeting substantive requirements of a surface water discharge permit.

Alternative MM-5:
IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative received complete and total community acceptance from the public comment period of the Proposed Plan. EPA has also given approval of this alternative. Alternative MM-5 would afford an appropriate level of protection to human health and the environment, similar to the other considered alternatives except alternative MM-1, which would provide no protective measures. Potential exposure pathways in all three water-bearing zones would be minimized through extraction and off-site disposal (shallow zone) and collection at the Martin Marietta Quarry (containment and institutional controls for the intermediate and lower zones). This alternative would be very similar from an effectiveness and residual risk standpoint as Alternative MM-4, in that intermediate and lower groundwater would be directly discharged to the creeks under an NPDES permit. This alternative would provide for containment of contaminated groundwater/DNAPL within its current boundaries, minimizing or eliminating migration to additional receptors. Coupled with the groundwater use restrictions within these boundaries, protection of human health in the short and long-term is greatly improved and relatively certain and controllable. Volume, mobility, and toxicity would be reduced (significantly in the shallow zone) through the extraction and disposal processes. The time to achieve cleanup for the lower and intermediate zones would not be significantly shorter than the other alternatives. Short-term risks to workers would result during

groundwater extraction system installation and monitoring. However, these risks can be minimized through implementation of proper health and safety protocols. This alternative could provide a logistical challenge for implementation due to assuming operation of the quarry beyond its operational life (likely in excess of 200 years) and the need for a permitted discharge of up to 3,200 gpm, yet it is still readily implementable. The associated total cost would be cost effective, relative to the remaining site-wide groundwater remedial alternatives. ARARs would not be achieved for at least 200 years. The result being a Technical Impracticability Waiver being granted and invoked for the intermediate and lower water-bearing zones. This alternative relies on the Martin Marietta Quarry to collect deeper groundwater without the use of intermediate extraction wells. Since the predicted operational life of the Martin Marietta Quarry is 50 years, IDEM would then assume operation and maintenance of the pumping station until ARARs are achieved.

Lagoon Area (Operable Unit 2)

The relative performance of each of the source control remedial alternatives for the Lagoon Area is summarized in **Table 2a in Appendix B**. Each of these alternatives is discussed in greater detail in the following subsections. Within the total cost for alternatives SC-2L to SC-4L is the base cost for the RCRA impoundment closure at approximately $27.6 million. Therefore, the large range of cost difference between the No Action and the other alternatives is due largely to the RCRA impoundment closure. Each of these alternatives is discussed in greater detail in the following subsections:

Alternative SC-1L:

No action would be taken at the site for this alternative. This alternative would provide no additional protection to human health or the environment for solid media and groundwater contaminants in the Lagoon Area. Contaminated groundwater within the shallow water-bearing zone would continue to migrate away from the source area with contaminant concentrations reduced to acceptable levels only through natural attenuation and dispersion mechanisms. The fill area near the entrance could continue to leach VOCs to groundwater, the DNAPL would not be addressed, and potentially buried drums if not already leaking to groundwater would eventually.

Solid media contamination would not be addressed, and the potential exposure pathways with unacceptable risks would remain until contaminant concentrations are reduced through natural attenuation mechanisms. This pertains to all solid media in the Lagoon Area and creek corridor, including solid materials within the impoundments, as well as contaminated soils and waste piles outside the impoundments.

It is expected that the groundwater and solid media contamination would persist under this alternative and ARARs would not be met for a significant period of time. Because there are no treatment options involved with this alternative, there would be no reductions in toxicity, mobility, or volume of contaminants, except through dispersion and natural attenuation mechanisms for groundwater. This alternative would be easily implemented, with no associated costs to implement.

Alternative SC-2L:

This alternative would provide an appropriate level of protection to human health and the environment for solid media and groundwater contaminants in the Lagoon Area. Contaminated groundwater within the shallow water-bearing zone would continue to migrate away from the area until contaminant concentrations are reduced to acceptable levels through natural attenuation and dispersion mechanisms. However, groundwater use restrictions would prevent the likelihood of ingestion of contaminated groundwater in the Lagoon Area vicinity and the area where MCLs are exceeded. Capping of the elevated VOC solids areas will reduce the impact of VOCs to groundwater through a reduction of infiltration and natural soil washing. Most Lagoon Area and all the creek corridor solid media contamination would not be addressed, and the potential exposure pathways would remain until contaminant concentrations are reduced through natural attenuation mechanisms. Site restrictions would need to be implemented and maintained in the long-term to be effective. Solid media within the surface impoundments, however, would be addressed through the RCRA surface impoundment closure and solidification of sludge, thereby eliminating the potential for direct.contact with these materials as well as addressing mobility through in-place closure. It is expected that shallow groundwater and a large portion of solid media contamination would persist under implementation of this alternative and ARARs would not be met for approximately 10 years, primarily due to DNAPL and VOCs within the fill at the lagoon entrance. This time would increase if buried drums were present and leaked in the future. Source control would be addressed through capping of the elevated VOC solids areas. This would further reduce migration of VOCs via stormwater infiltration and natural soil washing through the contaminated soils and into groundwater. Costs for this alternative would be significantly higher than those associated with Alternative SC-1L, chiefly due to the RCRA impoundment closure.

Alternative SC-3L:

This alternative would provide a high degree of protection to human health and the environment for solid media and groundwater contaminants in the Lagoon Area. Containment and collection of shallow groundwater via interception trenches would reduce the likelihood of shallow water-bearing zone contaminant migration away from the site. Lagoon Area contaminated solid media would be addressed through a combination of solidification and capping (RCRA impoundment closure), through removal and on-site landfill disposal (elevated VOC solids areas), and through capping (PAH, PCB and metal contaminated areas outside of the lagoons), thereby more permanently eliminating direct contact potential routes of exposure and mobility. Access restrictions would no longer be needed for long-term effectiveness, though groundwater use restrictions and deed restrictions would still be required. Overall, this alternative would be moderately difficult to implement. Costs would be higher than those associated with Alternative SC-2L. However, these additional costs provide more permanent effectiveness for solid media, and the collection of shallow groundwater to reduce the extent of plume above VOC MCLs in this area. Compliance with ARARs would be attained in approximately 6 years.

Alternative SC-4L:

IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative received acceptance from the public and approval by EPA. This alternative provides a high degree of protection to human health and the environment for solid media and groundwater contaminants. Containment and collection by use of the interception trenches would rapidly reduce shallow groundwater contaminant concentrations and minimize the potential for contaminant migration. Lagoon Area contaminated solid media would be addressed through a combination of solidification and capping (RCRA impoundment closure) procedures with excavation and on-site landfill disposal (elevated VOC solids and other contaminated areas outside of the lagoons), thereby permanently eliminating potential routes of direct contact and the potential for migration. This alternative would also avoid potential transportation risks that are associated with off-site disposal. This alternative would require design approval from the IDEM RCRA program for the on-site landfill under the CAMU process. IDEM RCRA has granted approval for the use the CAMU concept over the use of surcharging. The location of the landfill/CAMU would be designed to maximize construction of compensatory floodplain storage and the reuse potential of the property. The site use restrictions would still be required, but would be less extensive to allow for some excavation activities in those areas bordering West Markland Avenue. Source control options associated with RCRA impoundment closure and solid media excavation/disposal would be implemented. Overall, this alternative would be moderately difficult to implement since the use of the CAMU landfill will necessitate remedial actions first occurring at the lagoons to prepare the area for accepting other source area contaminated materials. Through proper Remedial Design, planning, and scheduling, implementation difficulties can be minimized. Costs would be highest for the source control alternatives for the Lagoon Area. The incremental costs associated with these actions would permanently isolate solid media. Compliance with cleanup goals or drinking water standards (ARARs) may be attained in approximately 3 to 5 years, assuming that source areas and DNAPL are no longer present in the shallow water-bearing zone. Also, groundwater collection costs were calculated for 30 years for planning and cost-estimation purposes. This is also consistent with RCRA post-closure groundwater monitoring requirements and compensates for the potential existence of unknown contaminant source areas and undiscovered pockets of DNAPL.

Wildcat and Kokomo Creeks (Operable Unit 3)

The relative performance of each source control remedial alternative for Wildcat and Kokomo Creeks is summarized in **Table 3a** in **Appendix B**. Each of these alternatives is discussed in greater detail in the following subsections.

Alternative SC-1C:

This alternative would provide no additional protection to the environment for sediment contaminants in Wildcat and Kokomo Creeks for the two miles of reach affected directly by CSSS operations and runoff. In general, there is not a health issue for humans for sediment unless recreational use or trespassing would occur. This alternative would not afford any protection to the environment in terms of aquatic species over this portion of the creeks. This would have a local effect on the individual species as compared to the general population in the creeks. Alternative SC-1C would not comply with the ARARs for contaminated sediments, and may result in temporary noncompliance with surface water criteria if sediment becomes suspended in the water column. Since there is no containment, removal, or treatment of sediment, the long-term effectiveness of this alternative is low. In addition, the sediment may be transported downstream via hydraulic transport during storm events. Continued contamination from upstream reaches would also be an issue. There would be no reduction in toxicity, mobility, or volume of sediment contaminants because there would be no treatment actions in this alternative. Since no remedial actions would be taken, there would be no short-term risks to the community or the environment. Alternative SC-1C would have no actions to implement, and the total cost would be zero.

Alternative SC-2C:

This alternative would provide limited additional protection to humans relative to sediment contaminants in Wildcat and Kokomo Creeks for these two miles of creeks. Fence installation and sign posting may deter trespassing and use of the creeks for recreational purposes. However, since the security fence around the Main Plant property has proven only marginally affective as a deterrent to trespassers, it would be reasonable to believe that a security fence encompassing a normally recreational area would be less affective. Long-term effectiveness of fencing would also be marginal considering this is a floodway where floods would likely destroy the fencing and create a hardship for maintenance and repair. This alternative would not afford any additional protection to the environment in terms of aquatic species over this portion of the creeks. This would have a local effect on the individual species as compared to the general population in the creeks. Alternative SC-2C would not comply with the ARARs for contaminated sediments, and may result in temporary noncompliance with surface water criteria. Since there is no containment, removal, or treatment of sediment, the long-term effectiveness of this alternative is low. In addition, the sediment may be carried downstream via hydraulic transport during storm events. There would be no reduction in toxicity, mobility, or volume of sediment contaminants because there would be no treatment actions in this alternative. Since no remedial actions would be taken, there would be no short-term risks to the community or the environment, but only to workers during environmental monitoring procedures and fence installation.

Alternative SC-3C:
This alternative would provide an appropriate degree of protection to humans and the environment from contaminated sediment in Wildcat and Kokomo Creeks. Installation of an articulated concrete matting cover would prevent direct contact with contaminated sediment and prevent potential future transport. The results of treatability testing of the creek sediment indicate that if left in-place, leaching of contaminants to groundwater should not pose a problem. Alternative SC-3C would comply with ARARs for contaminated sediments, although the contaminated media would remain in-place over the long-term, with only the exposure pathways eliminated. The long-term effectiveness of this alternative is medium to high since recontamination from existing upgradient sediment transport over the matting is an issue. Installation of a matting would reduce the mobility of sediment-bound contaminants, and the likelihood of downstream migration via hydraulic transport would be significantly reduced. Short-term risks to workers would be present during cap and fence installation, as well as during monitoring events and the aquatic habitat would be greatly disturbed. Alternative SC-3C would be implementable, but Army Corps permits would be needed for the floodway, to fill creeks, and for impacts to aquatic habitat.

Alternative SC-4C:
IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative received complete acceptance from the public, including the local environmental group provided they were given the opportunity to supply input on the design and implementation. EPA also approved of this alternative. This alternative would provide the highest protection to humans and the environment from sediment contaminants in Wildcat and Kokomo creeks. Removal of contaminated sediment and disposal in an on-site landfill would eliminate existing exposure pathways. This alternative would comply with ARARs for contaminated sediments. The long-term effectiveness of this alternative is high. Removing the sediment would eliminate any possibility of downstream migration of sediment contaminants through hydraulic transport. Significant aquatic habitat disruption would occur during implementation. Alternative SC-4C would be technically more difficult to implement due to special design considerations for removal, but meeting the substantive requirements of the necessary permits would be less cumbersome. This alternative also requires that the Lagoon Area CAMU /landfill be completed to the point for acceptance of sediments before this alternative can be implemented. Through appropriate design development, design implementation, and timely funding, the landfill would be prepared to accept the sediments without difficulty. The total cost for this alternative would be the highest (>$4.5M) of the four alternatives, however, the level of protection to human health and the environment is much greater and more permanent than the other alternatives.

Markland Avenue Quarry (Operable Unit 4)

The relative performance of each of the source control remedial alternatives for the Markland Avenue Quarry is summarized in **Table 4a in Appendix B**. Each of these alternatives is discussed in greater detail in the following subsections:

Alternative SC-1Q:

This alternative would provide no additional protection to human health or the environment for sediment media at the Markland Avenue Quarry. Alternative SC-1Q would not comply with the ARARs for contaminated solids, groundwater, or surface water. Since there is no containment, removal, or treatment of contaminated media, the long-term effectiveness of this alternative is low. There would be no reduction in toxicity, mobility, or volume of contaminants because there would be no treatment actions in this alternative. Since no remedial actions would be taken, there would be no short-term risks to the community or the environment. Alternative SC-1Q would be technically easy to implement, and no cost would be associated with this remedial alternative for the Markland Avenue Quarry.

Alternative SC-2Q:

This alternative would provide an appropriate level of protection to human health and the environment. Alternative SC-2Q would comply with the ARARs for some contaminated solids and surface water only through some capping, sediment removal, and access restrictions that require long-term enforcement and maintenance. ARARs for shallow groundwater would be achieved in approximately 30 years by natural attenuation mechanisms. The long-term effectiveness of this alternative is low to moderate, based on the premise that the surface water and contaminated solids exposure pathways are either eliminated or reduced, but the surface soil capping is not permanent nor complete. The quarry pond would be filled in. Likewise, VOC capping and pond sediment removal would limit or eliminate the mobility of solid media contaminants. Short-term risks to workers and the environment would be present during capping and filling of the quarry pond. Alternative SC-2Q would be technically easy to implement, although the total cost would be higher than Alternative SC-1Q. A key benefit is utilizing the city of Kokomo WWTP with no cost for disposal of collected groundwater.

Alternative SC-2.5Q:

IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative was widely accepted by the public and gained approval from EPA. This alternative would provide a high level of protection in the short and long-term due to heavily contaminated sediment removal and collection/containment of shallow groundwater. In addition to attaining ARARs for surface water and solid media; ARARs would eventually be attained for the shallow water-bearing zone in approximately 15 to 20 years. The long-term effectiveness of this alternative is high. Surface water would be eliminated as an exposure pathway. The volume, mobility and toxicity of shallow water-bearing zone groundwater would be reduced. The volume, mobility and toxicity of the Quarry pond sediments through the removal, dewatering, stabilization and placement in the on-site CAMU would also be reduced. Exposure to contaminated solids, particularly the elevated VOC solids, would be eliminated through the cover system and the deed restrictions on the property. Alternative SC-2.5Q would be similar to the implementability of Alternative SC-2Q particularly with collected shallow groundwater being pumped directly to the city sanitary sewer lines for treatment with sanitary wastes at the Kokomo WWTP. A big bonus would be the total cost being significantly lower than Alternative SC-2Q, 3Q and 4Q. A key benefit is utilizing the City of Kokomo WWTP at no cost for the disposal of collected groundwater.

Alternative SC-3Q:

This alternative would provide a level of protection similar to that afforded by Alternative SC-2Q, with additional protection from groundwater contaminants through elevated VOC solids removal and collection of shallow groundwater. Groundwater would be collected from the shallow water-bearing zone through installation of a series of extraction wells, then disposed off-site. In addition to attaining ARARs for surface water and solid media, ARARs would eventually be attained for the shallow water-bearing zone in approximately 20 years. The long-term effectiveness of this alternative is medium to high given the capping, though the integrity of the cap must be retained through site restrictions and institutional controls. In addition to eliminating surface water and reducing the mobility of solid media contaminants, volume, mobility and toxicity of shallow water-bearing zone groundwater would be reduced. Short-term risks to workers would be present during sediment removal, filling of the quarry pond, capping, elevated VOC solids removal, installation of a groundwater containment system, as well as during monitoring events. Alternative SC-3Q would be more difficult to implement from a technical standpoint. A key benefit is utilizing the city of Kokomo WWTP with no cost for disposal of collected groundwater.

Alternative SC-4Q:

This alternative would provide the highest protection to human health and the environment from contaminants at the Markland Avenue Quarry, but at the highest cost. The issue is what additional degree of protection does this cost provide. The fate and transport analysis indicated that site-wide groundwater discharge concentrations or time to achieve ARARs would not be significantly improved even with all these additional actions. Therefore, though time to attain ARARs may decrease to 10 to 15 years for the shallow groundwater, the added degree of protection may not be required based on calculated risk.

Both surface water and contaminated solid media would be eliminated from the site. As with Alternative SC-4Q, groundwater within the shallow water-bearing zone would be collected and disposed off-site. In addition to attaining ARARs for surface water and solid media, ARARs would be attained for the shallow water-bearing zone in approximately 10 years. The long-term effectiveness of this alternative is high. In addition to eliminating surface water, the mobility of solid media contaminants would be eliminated by placement in a landfill, and the volume, toxicity, and mobility of shallow water-bearing zone groundwater would be reduced. Short-term risks to workers would be present during filling of the quarry pond, excavation and disposal of contaminated solids, installation of a groundwater collection system, as well as during monitoring events. Alternative SC-4Q would be difficult to implement from a technical standpoint. Although the level of protection afforded by this alternative would be the highest of the Markland Avenue Quarry alternatives, the total cost would also be the highest, primarily as a result of off-site disposal costs for contaminated solids.

Main Plant (Operable Unit 5)

The relative performance of each of the source control remedial alternatives for the Main Plant is summarized in **Table 5a** in **Appendix B**. Each of these alternatives is discussed in greater detail in the following subsections:

Alternative SC-1M:

This alternative would provide no additional protection to human health or the environment for solid media or groundwater at the Main Plant. Alternative SC-1M would not comply with ARARs for contaminated solids or groundwater. Since there is no containment, removal, or treatment of contaminated media, the long-term effectiveness of this alternative is low. There would be no reduction in toxicity, mobility, or volume of contaminants because there would be no treatment actions in this alternative. Since no remedial actions would be taken, there would be no short-term risks to the community or the environment. Alternative SC-1M would have nothing to implement, and therefore, the total cost would be zero for this remedial alternative for the Main Plant.

Alternative SC-2M:

This alternative would provide an appropriate level of protection to human health and the environment. Alternative SC-2M would comply with ARARs for contaminated solids through elimination of exposure pathways via access restrictions. These require long-term enforcement and management. Groundwater at the Main Plant would not attain ARARs, but the source of VOC contaminants in shallow groundwater would be removed. Attainment of ARARs would be shallow water-bearing zone would be achieved in approximately 40 years through natural attenuation. The long-term effectiveness of this alternative is low, based on the premise that the groundwater and contaminated solids exposure pathways are neither eliminated or reduced (with the exception of the VOC hot spot areas). Toxicity, mobility, and volume would be largely unaffected under this alternative, with the exception of the VOC hot spots. Direct exposure to VOC contaminated solids would be significantly reduced. Short-term risks to workers and the environment would be present during VOC hot spot removal, fence installation, and environmental monitoring procedures. Alternative SC-2M would be technically easy to implement, and the total cost would be higher than Alternative SC-1M.

Alternative SC-3M:

This alternative would provide additional protection to human health and the environment from contaminants at the Main Plant. Capping the contaminated solids would eliminate the route of direct exposure though the long-term integrity must be protected. In addition, removal of VOC hot spots would reduce the impact of source material from affecting groundwater quality in the vicinity of the Main Plant. Also, collection of groundwater from the shallow water-bearing zone would reduce potential migration of groundwater contaminants away from the Main Plant area. ARARs would be attained for contaminated solids and eventually for the shallow water-bearing zone groundwater in approximately 15 years. Although capping the contaminated solids would eliminate routes of human exposure, the contaminants would remain in-place, and the potential for leaching would persist though at levels below MCLs. The mobility of contaminated solids would be reduced through capping and removal, although the toxicity and volume would be essentially unaffected. Volume, mobility, and toxicity of shallow water-bearing zone groundwater would be reduced through collection and off-site disposal. Short-term risks to workers would be associated with VOC hot spot removal, cap placement, groundwater collection trench installation, and monitoring. Alternative SC-3M would be technically effective and moderate difficult to implement. Although the level of protection would be high under this alternative, the corresponding total implementation costs would also be higher than the previous alternatives. This alternative builds on the fate and transport conclusion that the VOC contaminated groundwater in the shallow water-bearing zone (fractured bedrock and overburden soil) can be addressed via collection.

Alternative SC-3.5M:

IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative received great acceptance from the public along approval from EPA. This alternative would provide a high level of protection to human health and the environment from contaminants at the Main Plant. Covering the contaminated solids would eliminate the route of direct exposure though the long-term integrity must be protected, which would be achieved through the placing of use restrictions on the Main Plant property. The removal of elevated VOC solids would reduce the volume of contaminants present and the impact of source material from affecting groundwater quality in the vicinity of the Main Plant. Also, collection of groundwater from the shallow water-bearing zone would reduce potential migration of groundwater contaminants away from the Main Plant area. ARARs would be attained for contaminated solids and eventually for the shallow water-bearing zone groundwater in approximately 15 years. Volume, mobility, and toxicity of shallow groundwater would be reduced through collection and off-site disposal. Short-term risks to workers would be associated with VOC and PCB solids removal, cover system installation, groundwater collection trench installation, and monitoring. These risks would be minimized by implementing proper health and safety protocols. Alternative SC-3.5M would be technically effective and moderately difficult to implement, yet achievable.

Alternative SC-4M:

This alternative would provide a high level of protection to human health and the environment from contaminants at the Main Plant. Under Alternative SC-4M, human exposure pathways to contaminated solids would be eliminated though excavation and on-site landfill disposal. In addition, shallow water-bearing zone groundwater would be remediated in the same fashion as for Alternative SC-3M and SC-3.5M. ARARs would be attained for contaminated solids and eventually for shallow water-bearing zone groundwater in approximately 10 years. In addition to attaining ARARs for solid media contamination, this alternative would result in removal of the solid media contaminants from the site, further lessening the potential for leaching of those contaminants into groundwater. Long-term effectiveness and permanence of this alternative for solids would be high. Mobility of solid media contaminants would be reduced through excavation and on-site disposal. In addition, volume, mobility, and toxicity of shallow water-bearing contaminants would be reduced with limited effectiveness due to fractured bedrock. Short-term risks to workers and the community may be realized during solids removal, trench installation, and monitoring procedures. Alternative SC-4M would be moderately difficult to implement from a technical standpoint. The associated implementation costs would also be the highest. The fate and transport analysis concluded that the additional cost may not provide a significant or warranted reduction to site-wide groundwater risk.

Slag Processing Area (Operable Unit 6)

The relative performance of each of the source control remedial alternatives for the Slag Processing Area is summarized in **Table 6a** in **Appendix B**. Each of these alternatives is discussed in greater detail in the following subsections:

Alternative SC-1S:

This alternative would not be protective of human health or the environment. Under a residential future use scenario, all potential exposure pathways would remain, including erosion to creeks. Alternative SC-1S would not comply with the ARARs for contaminated solids. Since there is no containment, removal, or treatment of contaminated media, the long-term effectiveness of this alternative is low. There would be no reduction in toxicity, mobility, or volume of contaminants because there would be no treatment actions in this alternative. Since no remedial actions would be taken, there would be no short-term risks to the community, on-site workers, or the environment. Being a no action alternative, Alternative SC-1S would be technically easy to implement and there would be no cost associated with its implementation.

Alternative SC-2S:

This scenario for the Slag Processing Area would include regrading of the slag piles for use as fill in other industrial/commercial areas on the site to eliminate a potential pathway of concern, and the placement of riprap along the creek bank to prevent further erosion of slag material to the creek. Deed restrictions would be necessary to minimize potential exposure to the remaining slag material. This alternative would have a high degree of long-term effectiveness provided access restrictions controlled site access and slag remained on-site. Rip-rap would prevent erosion of slag to the creeks. There would be some reduction in mobility of Slag Processing Area solid media contaminants. There would be some short-term risks associated with pile regrading. Alternative SC-2S would also be technically easy to implement, but at a somewhat higher total cost than Alternative SC-1S. This action is protective of groundwater since slag does not leach.

Alternative SC-3S:

Under this alternative, pathways for human exposure would be significantly reduced. ARARs would be attained through covering of the contaminated solids. The cap would afford long-term protection from exposure to solid media contaminants provided it is maintained. An issue will be how to integrate the construction of homes and excavating potential slag material without recontaminating the surface soil. This may prove difficult, and a property use restriction may be warranted. Mobility of solid media contaminants would also be reduced though the capping process and rip rap protection, although toxicity and volume would be essentially unaffected. Short-term risks to the community and on-site workers would be present due to the potential for dust emissions and direct contact during cap installation. This alternative would also be technically easy to implement, and the costs would be somewhat higher than Alternatives SC-1S and SC-2S.

Alternative SC-3.5S:

IDEM selects this alternative because it provides the best balance of the nine criteria. This alternative received complete public acceptance from the public and gained approval from EPA. Under this alternative, pathways for human exposure would be significantly reduced. ARARs would be attained through covering of the contaminated solids. The cover system would afford long-term protection from exposure to solid media contaminants provided it is maintained. An issue will be how to integrate the construction of homes and excavating potential slag material without recontaminating the surface soil. This may prove difficult, and a property use restriction is anticipated. Mobility of solid media contaminants would also be reduced with the covering system and rip rap protection along the creek. This alternative would be technically easy to implement, and the costs would be somewhat lower than Alternatives SC-2S and SC-3S.

Alternative SC-4S:

This alternative would provide the highest level of protection to human health and the environment from contaminants at the Slag Processing Area. Under Alternative SC-4S, human exposure pathways to contaminated solids would be eliminated though excavation and on-site landfill disposal. ARARs would be attained for contaminated solids. In addition to attaining ARARs for solid media contamination, this alternative would result in removal of the solid media contaminants from the site, further lessening the potential for leaching of those contaminants into groundwater and essentially eliminating the possibility of future direct human contact. Long-term effectiveness and permanence of this alternative would be high. Mobility of solid media contaminants would be reduced through excavation and on-site disposal. Short-term risks to workers and the community may be realized during solids removal and disposal procedures. Although Alternative SC-4S would provide the highest level of protection and remain easy to implement from a technical standpoint provided the CAMU approach is approved by U.S. EPA. The associated implementation costs are the highest by two orders of magnitude. Consideration must weigh the cost of remediation with the need to develop the property. Since slag does not leach, Alternative SC-2S satisfies ARARs. Capping allows site development but may prove difficult to maintain if construction occurs. This alternative allows construction but provides no significant degree of added protection to the environment or human health as compared to either Alternatives SC-2S or SC-3S.

IX. The Selected Remedies

Site-Wide Groundwater (Operable Unit 1)

Remedial Alternative MM-5 is selected and consists of the following:

- Collect Intermediate and Lower Groundwater at Martin Marietta Quarry to Contain Contaminant within Current Boundaries
- Dispose of Collected Martin Marietta Quarry Groundwater Off-Site
- Collect Shallow Groundwater and Dispose Off-site at Kokomo Wastewater Treatment Plant
- Natural Attenuation
- Technical Impracticability (TI) Waiver Invoked
- Groundwater Use Restrictions

Time to Complete Construction:	**18 to 24 months**
Groundwater Monitoring & Collection Requirements:	**200+ yrs.**
Capital Cost:	**$,013,000**
First Year O&M:	**$244000**
30-Yr. Net Present Worth Cost:	**$6,386,000**

Alternative MM-5 consists of the collection of the shallow groundwater by extraction wells installed along the creeks or within the groundwater contamination plumes. Extracted shallow groundwater would be discharged via underground piping directly to the city sanitary sewer system for off-site treatment and disposal at the Kokomo Wastewater Treatment Plant (WWTP). Shallow groundwater is covered in more detail within each of the source control operable units. The intermediate and lower water-bearing zones would be addressed through continued operation of the Martin Marietta Quarry, instead of installing separate extraction wells (up to 300 wells) to address the deeper portions of the plumes. Alternative MM-5 is shown on Figure 1 in Appendix A.

The TI waiver would be invoked as part of Alternative MM-5, since active remediation would not be a part of this alternative. Based on modeling predictions, it would be no more effective to aggressively collect and treat (as presented in Alternative MM-4) the intermediate and lower water-bearing zone groundwater than to allow nature to take its course. Therefore, the intermediate and lower groundwater would be allowed to naturally attenuate or breakdown. Collection of the intermediate and lower groundwater by the Martin Marietta Quarry pump station would continue in order to maintain the contaminants within their current boundaries (containment only). The predicted operational life of the Martin Marietta Quarry is 50 years. Beyond its operational life, IDEM would assume operation of the pumping station until ARARs are achieved. In order to provide for a more complete and protective alternative, natural attenuation must be in combination with groundwater use restrictions. Groundwater use restrictions would include the placement of an Environmental Notice to the deeds for those properties within the current boundary of the contamination. It should be noted that these properties are not utilizing groundwater at this time and the entire area where the use restriction would be placed has public drinking water available. The key would be to maintain the plume within its current boundary, since downgradient public drinking water supply is not available at this time. On-site source control would be addressed through remedial actions at each of the CSSS source areas. This would be performed to reduce or eliminate potential future migration of shallow, on-site contaminants into site-wide groundwater. The complete justification for the TI Waiver is provided in Section 6.5 of the Feasibility Study report.

Both shallow and intermediate/lower water-bearing zone remedies would continue until contamination is below acceptable levels. The groundwater model predicts that the area of groundwater above drinking water standards will stay within existing boundaries, thus controlling and containing contaminant migration. As part of addressing the shallow zone, groundwater use restrictions will be required for the source areas and for off-site areas where existing groundwater contamination extends downgradient of treatment/containment system capture zones that would be established by the source control groundwater alternatives. Based on modeling results, the groundwater use restrictions for the downgradient contaminated groundwater areas would be required for a period of approximately 40 years, until the off-site and downgradient groundwater was allowed to naturally attenuate. It is important to note that the time for the intermediate and lower groundwater to achieve ARARs is predicted to be over 200 years whether the groundwater is allowed to naturally attenuate, migrate to the quarry for collection, or whether active collection is proposed. DNAPL recovery from porous, fractured bedrock historically has a poor success rate (National Research Council, 1994).

The quarry extraction flow rate is currently about 3,200 gpm. Hydraulic flow limitations to the WWTP most likely would require the construction and operation of an on-site treatment system at the quarry to allow discharge to Wildcat Creek. However, groundwater modeling results suggest that discharge concentrations may be below drinking water standards, surface water quality standards, and background quality, so no treatment would be needed for the extracted and discharged water. Several factors in determining the lack of necessity for treatment of the collected intermediate and lower groundwater are: (1) distance contaminated groundwater must travel from source and plume areas, (2) radius of influence Martin-Marietta Quarry collection well (extraction of large amount of clean groundwater resulting in dilution), (3) the location of the Martin Marietta Quarry collection well at the leading edge of the contaminant plume, and (4) dispersion tendencies of contaminants from source and plume areas, which involves the gradual migration of contaminants downgradient at less than plume or source area concentrations. The intermediate and lower groundwater would be discharged directly to Wildcat Creek under a regulated discharge permit. The main purpose of the collection of the intermediate and lower groundwater is to prevent its migration outside its current boundaries.

Groundwater use restrictions would be necessary for the period of time required for operation of the two systems. Groundwater would be monitored quarterly for two years, semi-annually for the following two years, and annually thereafter for an indefinite period or until compliance with ARARs is attained. A total of 30 new wells would be installed to compliment the existing site-wide groundwater wells. Additional domestic drinking water well sampling may be performed during Remedial Design to evaluate continued monitoring during the Remedial Action

Lagoon Area (Operable Unit 2)

Remedial Alternative SC-4L is selected and consists of the following:

- RCRA Surface Impoundment Closure
- Excavate Contaminated Solids and Consolidate On-Site
- Collect and Contain Shallow Groundwater with Expanded Interception Trench System and Dispose Off-Site
- Deed & Groundwater Use Restrictions

Time to Complete Construction:	**2 to 3 years**
Groundwater Requirements:	
for Monitoring	**30 years**
for Collection	**30 years**
Capital Cost:	**$43,919,000**
First Year O&M:	**$146,600**
30-Yr. Net Present Worth Cost:	**$44,746,000**

Alternative SC-4L consists of RCRA impoundment closure and construction of a groundwater interceptor trench. It provides for more protective contaminated solids excavation with disposal in the on-site landfill. It also provides aggressive shallow groundwater collection to shorten the time for shallow groundwater to reach cleanup goals or drinking water standards. The schematic layouts for Alternative SC-4L are shown on Figure 2a and 2b of Appendix A, respectively.

All of the contaminated solids outside the lagoon impoundments would be excavated and disposed in an on-site landfill or CAMU (Corrective Action Management Unit), which is a RCRA Hazardous Waste disposal unit. This includes the excavation, to depths of four to 10 feet across the site, of approximately 93,000 cubic yards of material. This material includes waste piles, elevated VOC solids, and contaminated solids outside the RCRA surface impoundment closure footprint. The majority of the PAH, PCB, and metals-contaminated solids fall within the RCRA impoundment confines and would be addressed through the RCRA closure and solidification. Excavated areas would be backfilled to existing grades, except were floodway compensatory storage depressions are constructed, with clean soil.

The lagoons were operated under an interim RCRA permit which established guidelines for final closure of the surface impoundments. RCRA guidelines for lagoon closure require an impermeable cap, post-closure monitoring of potential leachate and groundwater quality, and post-closure care of the facility. Waivers from some of these closure elements are anticipated given this material would be solidified to increase its compressive strength and does not leach at levels above MCLs based upon treatability testing results from the EPA START laboratory. The consolidation of sludge and soil from the various lagoons into one larger lagoon would reduce costs by decreasing the total surface area requiring an impermeable cap, the extent of leachate controls, and the extent of post closure monitoring requirements.

Once it was determined that in-place closure was appropriate, consideration was given to combining the RCRA surface impoundment closure with construction of the on-site landfill under the CAMU process. Since closure of a surface impoundment requires many of the same long-term monitoring components as a landfill and the impoundment closure precludes further site development, the ability to situate waste containment from the other CSSS source areas on top of the impoundment closure would provide cost savings to the remedial process by eliminating duplicative areas for waste containment, liner costs, and monitoring costs.

Construction of a landfill and establishment of a CAMU would lower the remedial costs associated with the overall site cleanup since proposed remedial activities could be performed in a more efficient manner. The solidification of waste, which decreases the permeability of the material, could serve as the bottom for the CAMU landfill or a separate RCRA cap may be required based upon testing results. The RCRA cap, if required, could serve as the bottom liner since it could be placed beneath the CAMU material. It is assumed that the lagoon waste will be consolidated within the proposed footprint of the CAMU to maximize benefits. Since, the lagoons will have monitoring wells; the lagoon sludge does not leach constituents at levels of concern according to the treatability study; and the material managed under the CAMU will be capped, placed above the water table, and will likely not leach at levels above groundwater standards; a bottom liner to the CAMU landfill may not be necessary.

The general concept of the combined CAMU and RCRA closure would first consolidate the lagoon sludge within the CAMU footprint. This results in 5 to 10 feet of solidified sludge being placed as the base layer within the CAMU. Part of the sludge removal would result in the penetration of the Wildcat Creek floodplain by approximately four feet. The floodway would not be directly penetrated. The areas where sludge would be excavated from the floodway to the southwest would be utilized to construct compensatory storage depressions, which would greatly minimize the impact of a 100-year flood event on the CAMU/landfill. Damage control measures would also be incorporated in the CAMU design to minimize impacts of a 100-year flood event. The final location of the CAMU/landfill on the Lagoon Area will be determined by the remedial design for this operable unit based upon final quantities of contaminated material needing on-site disposal with the intent of maximizing compensatory floodway storage and reuse options for the property and minimizing the impacts of a 100-year flood event on the CAMU/landfill.

The landfill would be designed consistent with RCRA guidance; however, waivers could be sought for certain RCRA guidelines (e.g., located outside of floodplain, bottom liner if groundwater controls implemented or solidified sludge shown to have adequate permeability) since this is a CERCLA site. The design of the landfill would be based on characterization of the waste materials for conformance with RCRA and/or TSCA requirements and guidelines. RCRA guidelines suggest the use of the following components: double liner base, a low permeability cap, a leachate detection, collection and treatment system, and a groundwater monitoring system. During the remedial design, 40 CFR 264.18(b) and 40 CFR 270.14(b)(11)(iv) on the construction of a CAMU in a 100-year floodplain will be reviewed and observed. It would be necessary to meet TSCA requirements for PCBs above 50 ppm.

The corridor adjacent to Wildcat Creek has elevated contaminant concentrations. Drums, debris and fill material were noted in this area. These areas would be excavated to depths of two to four feet and disposed in the CAMU.

VOC-contaminated shallow groundwater within the Lagoon Area would be collected via a trench collection system. The trench system would be installed to a depth of about 45 feet (the bottom of the shallow water-bearing zone) in a "U"-shape around the downgradient boundary of the VOC groundwater plume. The interceptor trench for the Lagoon Area would be about 3,000 linear feet in length, with a total of six collection locations. An interior bisecting trench installed in an east-west direction would provide for more aggressive groundwater collection. A total flow rate of about 35 to 40 gpm would be expected.

The modeling results for the more aggressive collection system of this alternative show that cleanup goals or MCLs for shallow groundwater may be reached in 3 to 6 years. Shallow groundwater outside the source areas may reach desired cleanup levels in the time frame predicted by the modeling, however, due to the presence of residual DNAPL and other VOC contaminant sources and groundwater collection system limitations to extract downgradient contaminated shallow groundwater, source area shallow groundwater collection systems may need to continue operating, up to 30 years, to contain and treat these remaining source materials in the shallow aquifer.

Collected shallow groundwater would be pumped via a buried pipeline directly to the city sanitary sewer system. At this point, the collected and discharged contaminated shallow groundwater would be mixed with untreated domestic sewage, which would result in an exemption from hazardous waste disposal requirements (40 CFR 261.4(a)(1)(ii)). The mixed waste stream would be treated and disposed at the WWTP per a written agreement provided by the City of Kokomo. Sewer system capacity limitations during storm events may necessitate periodic short-term pump station shutdown. The effects of these shutdowns on the trench system performance are expected to be minimal. Costs were based on groundwater collection for 30 years in order to be consistent with RCRA post-closure groundwater monitoring requirements and compensate for the potential existence of unknown source areas and continued presence of pockets of DNAPL.

Groundwater use restrictions would be required both on-site and off-site until cleanup goals or MCLs are reached. Groundwater would be monitored consistent with RCRA post closure groundwater monitoring requirements. Installation of additional monitoring wells would also be a part of this alternative.

Wildcat and Kokomo Creeks (Operable Unit 3)

Remedial Alternative SC-4C is selected and consists of the following:

- Excavate Contaminated Creek Sediment and Consolidate in On-Site CAMU Landfill

Time to Complete:	**18 months**
Capital Cost:	**$12,312,000**
First Year O&M:	**$20,000**
30-Yr. Net Present Worth Cost:	**$12,560,000**

Alternative SC-4C would involve the removal of the contaminated sediment from two miles of the creeks. The removed material would be dewatered of liquids per RCRA requirements and placed within the on-site landfill/CAMU at the Lagoon Area (see Figure 2a/b in Appendix A). This alternative more easily complies with floodway ARARs than the other alternatives. The construction activities for this alternative will be performed consistent with ARARs for wetlands.

During removal of the sediment, care would have to be taken to control the resuspension of sediment within the water column. Turbidity control barriers would need to be incorporated into the sediment removal process as appropriate. Excavation could either occur through dredging methods, if the creek is to remain flowing, or the creek flow could be bypassed or diverted and excavation can proceed in the dry with conventional earth moving equipment. An allowance of cost has been included for these activities.

Dredging methods would include mechanical methods (i.e., clamshell bucket, draglines) or hydraulic methods (i.e., suction dredge, auger dredge). Mechanical methods would disturb the sediment more than hydraulic methods. Hydraulic methods would remove large quantities of water along with the sediment and would require settling basins to allow the sediment to settle out. The water may require treatment prior to discharge into the creeks or to an off-site treatment facility or WWTP. Conventional earth moving equipment for excavation in the dry is the preferred method. Conventional wide tracked earth moving equipment should be able to excavate the sediment quite readily from the creeks according to probe testing in the sediments. Some of the sediment to be removed is sandy and gravelly and is adequate to support equipment wheel loads. In areas where the sediment is soft, the underlying materials are more competent and no severe impact to equipment operation is anticipated.

After the sediment is excavated from the creeks, the fine-grained sediment and organics will likely be saturated and soft. The more coarse grained material can be gravity dewatered. It may be necessary to dewater the fine-grained sediment and/or improve the compressive strength of the sediment through solidification. Once the material characteristics are suitable for landfilling based on RCRA liquid restriction requirements and compressive strength testing, it would be placed within the on-site cells at the lagoon/CAMU. Up to 51,000 cubic yards of material would require permanent landfilling (based on dewatering of 61,000 cu. yds. of the in-place sediment). The material would then be capped to prevent future exposure to the environment. The landfill would include operational controls for leachate collection, groundwater monitoring, and cap maintenance.

Since alternative SC-4C would remove the contaminated sediment from the creeks, no future sampling of surface water or sediment would be required in the creeks. No restrictions would be required for the creeks and there would be no future impacts to the aquatic habitat.

Markland Avenue Quarry (Operable Unit 4)

Remedial Alternative SC-2.5Q is selected and consists of the following:

- Cover Contaminated Solids with Common Soil
- Dispose of Quarry Sediment in Lagoon Area CAMU
- Contain & Collect Shallow Groundwater & Dispose at WWTP
- Excavate Contaminated Sediment from Quarry Pond
- Backfill Quarry Pond with alternative fill material
- Deed and Groundwater Use Restrictions

Time to Complete Construction:	**24 to 36 months**
Time to Attain MCLs:	**10 to 15 years**
Capital Cost:	**$10,234,000**
First Year O&M:	**$168,000**
30-Yr. Net Present Worth Cost:	**$11,163,000**

This modified alternative is presented due to significant differences from the other alternatives presented in the approved FS Report. These differences were brought about by additional intra-agency evaluations prior to presentation to the NRRB and due to recommendations from the NRRB. This modified alternative will include deed and groundwater use restrictions to restrict site access and the use of contaminated groundwater. Shallow groundwater would be collected along the west and north boundaries of the site and pumped directly via a buried pipeline to the city sanitary sewer system. It would also include installation of a common soil cover to eliminate potential exposure to and direct contact with contaminated solids. Removing contaminated sediment from and backfilling of the quarry pond is also part of this alternative. A diagram of Modified Alternative SC-2.5Q is shown on **Figure 4**.

The 1.28 million cubic yards of solid (fill) material within the quarry would remain in-place with a cover consisting of a warning barrier and two feet of permeable common soil. This cover system provides a warning mechanism in the event of future excavation and eliminates direct contact to the contaminated media. The protective cover would be graded and grassed to facilitate drainage, minimize erosion, and provide for recreational use.

The sediment in the pond would be excavated and dewatered; solidified as necessary; treated off-site if necessary for VOCs, SVOCs, metals and PCBs; and disposed in the Lagoon Area (OU-2) landfill/ CAMU. The pond would be backfilled with appropriate material through creative management practices. Use restrictions would be implemented to protect the cover and prevent the use of groundwater.

This alternative would also include shallow groundwater collection and containment in the immediate vicinity of the Quarry. The RI data indicate that shallow groundwater contamination is in the process of biodegradation and downward migration. The time to attain cleanup goals through natural attenuation is estimated at 30 years.

Through active collection, groundwater modeling predicts that cleanup goals or MCLs for shallow groundwater may be reached in 15 to 20 years. Shallow groundwater outside the source areas may reach desired cleanup levels in the time frame predicted by the modeling, however, due to the presence of residual DNAPL and other VOC contaminant sources and groundwater collection system limitations to extract downgradient contaminated shallow groundwater, source area shallow groundwater collection systems may need to continue operating, up to 30 years, to contain and treat these remaining source materials in the shallow aquifer.

Collected shallow groundwater would be pumped via a buried pipeline directly to the city sanitary sewer system. At this point, the collected and discharged contaminated shallow groundwater would be mixed with untreated domestic sewage, which would result in an exemption from hazardous waste disposal requirements (40 CFR 261.4(a)(1)(ii)). The mixed waste stream would be treated and disposed at the WWTP per a written agreement provided by the City of Kokomo provided contaminant levels are within pretreatment requirements. Sewer system capacity limitations during storm events may necessitate periodic short-term shut down of the extraction pumps. Short-term shut downs would have no significant effect on the trench system performance. Costs were based on groundwater collection for 30 years in order to remain consistent with RCRA post-closure groundwater monitoring requirements and compensate for the potential existence of unknown contaminant source areas and continued presence of DNAPL.

Groundwater would be monitored quarterly for two years, semiannually for the following two years, and annually thereafter until compliance with cleanup goals or drinking water standards is attained. Groundwater monitoring wells would be installed in and around the Markland Avenue Quarry. Five clusters of three wells each would be installed with screened intervals across each water-bearing zone (shallow, intermediate, and lower). An additional sample of effluent from the groundwater collection system would be obtained for each sampling round.

Main Plant (Operable Unit 5)

Remedial Alternative SC-3.5M is selected and consists of the following:

- Excavate PCB Solids along Kokomo Creek and Dispose On-Site
- Install Common Soil Cover
- Collect & Contain Shallow Groundwater and Dispose Off-Site
- Elevated VOC Solids Removal and On-Site Disposal
- Deed and Groundwater Use Restrictions

Time to Complete:	**15 years**
Capital Cost:	**$7,000,000**
First Year O&M:	**$36,000**
30-Yr. Net Present Worth Cost:	**$7,747,000**

Alternative SC-3M has been modified and is presented as Alternative SC-3.5M. The modified alternative would focus on the elimination of direct contact risk, reduced stormwater infiltration, limited soil removal, and control of shallow groundwater to achieve cleanup goals. It includes the installation of a common soil cover over the contaminated solids (incorporated NRRB recommended modification), collection of contaminated groundwater for treatment and disposal at the city of Kokomo WWTP, and the removal of VOC and PCB contaminated soil in two locations along the creeks. Other measures would include groundwater monitoring and deed restrictions. Alternative SC-3.5M is shown on Figure 5 in Appendix A.

The cover would be constructed of common soils. A two-foot soil cover would prevent direct contact and would be graded and seeded to promote runoff and reduce erosion and infiltration. Prior to placement of the soil cover, the Main Plant property would be graded with a warning barrier (i.e., orange snow fencing) to be installed. This provides a warning mechanism in the event of future excavation signifying the contact with contaminated materials.

VOC and PCB contaminated soil removal would be performed. VOC contaminated solids along Wildcat Creek would be excavated from shallow (zero to four feet below grade) and deep (four to 12 feet below grade) soil intervals and transportation to the on-site landfill (CAMU) for disposal. PCB contaminated soils along Kokomo Creek would be excavated vertically and horizontally until cleanup goals are reached and transported to the on-site landfill. Excavated areas would be backfilled with clean soil.

Contaminated shallow groundwater would be collected via a trench collection system installed along the Main Plant western boundary adjacent to Park Avenue and Wildcat Creek. The trench system would be installed to a depth of about 30 feet and remove groundwater at a rate of 10-15 gallons per minute. Collected shallow groundwater would be pumped via a buried pipeline directly to the city sanitary sewer system. At this point, the collected and discharged contaminated shallow groundwater would be mixed with untreated domestic sewage, which would result in an exemption from hazardous waste disposal requirements (40 CFR 261.4(a)(1)(ii)). The mixed waste stream would be treated and disposed at the WWTP per a written agreement provided by the City of Kokomo provided contaminant levels are within pretreatment requirements. The groundwater model predicts cleanup goals would be achieved in shallow groundwater in 15 years. Shallow groundwater outside the source areas may reach desired cleanup levels in the time frame predicted by the modeling, however, due to the presence of residual DNAPL and other VOC contaminant sources and groundwater collection system limitations to extract downgradient contaminated shallow groundwater, source area shallow groundwater collection systems may need to continue operating, up to 30 years, to contain and treat these remaining source materials in the shallow aquifer.

Soil excavated for site grading could be used as fill if there was no leaching potential or, if necessary, transported to the Lagoon Area for on-site disposal.

Groundwater would be monitored until compliance with ARARs is attained. Eighteen additional monitoring wells would be installed in and around the main plant area. Two would be screened within the shallow water-bearing zone, eight screened within the intermediate water-bearing zone, and eight screened within the lower water-bearing zone. In addition, samples would be collected from the interceptor trench effluent.

Slag Processing Area (Operable Unit 6)

Remedial Alternative SC-3.5S is selected and consists of the following:

- Regrade Slag Pile to Level Site
- Install Protective Common Soil Cover Over Contaminated Solids
- Deed Restrictions
- Stabilize Creek Bank

Time to Complete:	**12 to 18 months**
Capital Cost:	**$2,420,000**
First Year O&M:	**$0**
30-Yr. Net Present Worth Cost:	**$2,420,000**

Alternative SC-3S has been modified and is presented as Alternative SC-3.5S. This alternative is based on the assumption that the future use of the property will be residential, due to its location and the absence of property use restrictions.

The primary remedial action component would be a cover across the entire Slag Processing Area. The limits of the Slag Processing Area are shown on Figure 6 in Appendix A. The cover would simply be two-feet of common fill and topsoil. The surface of the cover would be seeded to minimize erosion. Prior to placement of the soil cover, a warning barrier (i.e., orange snow fencing) would be installed. This provides a warning mechanism in the event of future excavation. Supplementary erosion control (rip-rap and filter fabric) would be installed along Wildcat Creek to minimize the potential for slag entering the creek.

Prior to cap placement, the slag piles could be spread evenly across the rest of the relatively flat surface area of the site. Due to the large volume contained in these stockpiles, estimates predict that regrading would raise the surface elevation over the entire nine acres by more than six feet on average including the cap. This difference might hamper future development of the property. The slag materials may be used as backfill material in other areas of the CSSS according to regulatory guidelines.

Deed restrictions would be necessary to minimize potential exposure to the remaining slag material under the cover. These restrictions would call for special procedures during future residential construction.

X. Statutory Determination

The selected remedies must satisfy the requirements of Section 121 of CERCLA by protecting human health and the environment and complying with ARARs. CERCLA Section 121 also requires that the selected remedial action be cost effective; utilize permanent solutions and alternative treatment technologies to the extent practicable; and satisfy the preference for treatment as a principal element of the remedy, or provide an explanation as to why the preference is not satisfied. The following is a brief description of how the selected remedies meet the statutory requirements of Section 121 of CERCLA.

Protection of Human Health and the Environment.

The IDEM preferred and selected alternatives are believed to provide the best balance of trade-offs among the proposed alternatives for each operable unit with respect to the criteria used to evaluate remedies. Current and potential future risks to human health and the environment from contaminated groundwater will be significantly reduced provided that the common soil covers remain intact, the groundwater collection, containment, and treatment systems are maintained, and site access and use and deed restrictions are strictly enforced. All the contamination sources would remain on-site, but the mobility, toxicity, and volume would be reduced by the common soil covers, on-site disposal of the most contaminated materials in the CAMU landfill, and active groundwater collection, containment, and treatment systems. Implementation of the selected remedies will reduce human health risks to within the acceptable U.S. EPA excess cancer range of 1×10^{-4} to 1×10^{-6} and the hazard indices for the noncarcinogens will be less than unity (1). Institutional control measures to restrict access to groundwater in the impacted area and prevent excavation of common soil covers will also provide for reduced human health exposure risk. No unacceptable short-term risks or cross-media impacts will be caused by implementation of the selected remedies.

Compliance with ARARs.

The remedies for the CSSS are subject to Applicable or Relevant and Appropriate federal Regulations (ARARs) and any more stringent state regulations. The determination of ARARs has been made in accordance with 121(d)(2) of CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA) of 1986. These ARARs are also consistent with the National Contingency Plan (NCP) 40 CFR Part 300; Amended March 8, 1990. ARARs are federal, or more stringent state requirements, that the remedial alternative(s) must achieve, that are legally applicable to the substance or relevant and appropriate under the circumstances.

All on-site remedial activities would not require a permit, however, these activities would rather be required to meet the substantive requirements that would be part of a permit. Ordinarily the boundary of a site expands to include the areas necessary to cover the full extent that a contaminant release expands. Offsite activities as part of the remedy would be subject to any and all applicable permitting requirements and would require a permit.

The ARARs for the Continental Steel Superfund Site are presented in Appendix

Cost Effectiveness.

Cost effectiveness is determined by evaluating the overall effectiveness proportionate to costs, such that the selected remedy represents a reasonable value for the money to be spent. Section 300.430(f)(ii)(D) of the NCP requires the assessment of cost-effectiveness by evaluating all alternatives which satisfy the threshold criteria: protection of human health and the environment and compliance with ARARs, with three additional balancing criteria : long-term effectiveness and permanence; reduction of toxicity, mobility, and volume achieved through treatment; and short-term effectiveness, to determine overall cost-effectiveness. IDEM believes that the selected remedies comply with ARARs to extent practicable and are cost effective in mitigating the risks posed by contaminated groundwater and solid media.

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

IDEM believes that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost effective manner for the Continental Steel Superfund Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, IDEM has determined that the selected remedies provide the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction of toxicity, mobility, mobility, and volume achieved through treatment; short-term effectiveness; implementability; and cost.

Preference for Treatment as a Principal Element.
As stated previously, the elevated VOC solids and elevated PCB contaminated solids will be removed and consolidated on site in the CAMU landfill to be constructed on the Lagoon Area. If these contaminated solids are identified as needing treatment before placement in the CAMU, then the statutory preference for treatment as a principal element of the remedy would be achieved. However, if the excavated solids do not need treatment based on testing for treatability and Toxicity Characteristic Leaching Procedure (TCLP), or treatment of the additional threats at the site was not found to be practicable, this remedy would not satisfy the statutory preference for treatment as a principal element of the remedy.

The selected remedy for groundwater contamination includes the following: (1) collection, treatment, containment of shallow groundwater; (2) collection and containment of intermediate and deep groundwater, including invoking a Technical Impracticability Waiver; and (3) use of institutional controls, in the form of deed and groundwater use restrictions. The remedy for shallow groundwater will meet the statutory preference for treatment as a principal element. The remedy for the intermediate and lower groundwater will not meet the statutory preference for treatment as a principal element due to the type of contamination (DNAPL) and geology (infrequently fractured bedrock) present, thus the request and approval pursuant to 121(d)(4) of CERCLA of the TI Waiver for these two groundwater zones. However, despite the impracticability, extracted contaminated groundwater, particularly those collected from the intermediate and lower aquifers for the containment portion of the remedy, will be treated.

Based on the information available at this time, IDEM believes the preferred alternatives would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Documentation of Significant Changes

IDEM determined that no significant changes to the remedy, as it was identified in the Proposed Plan, are necessary.

Responsiveness Summary is presented in Appendix E.

APPENDIX A

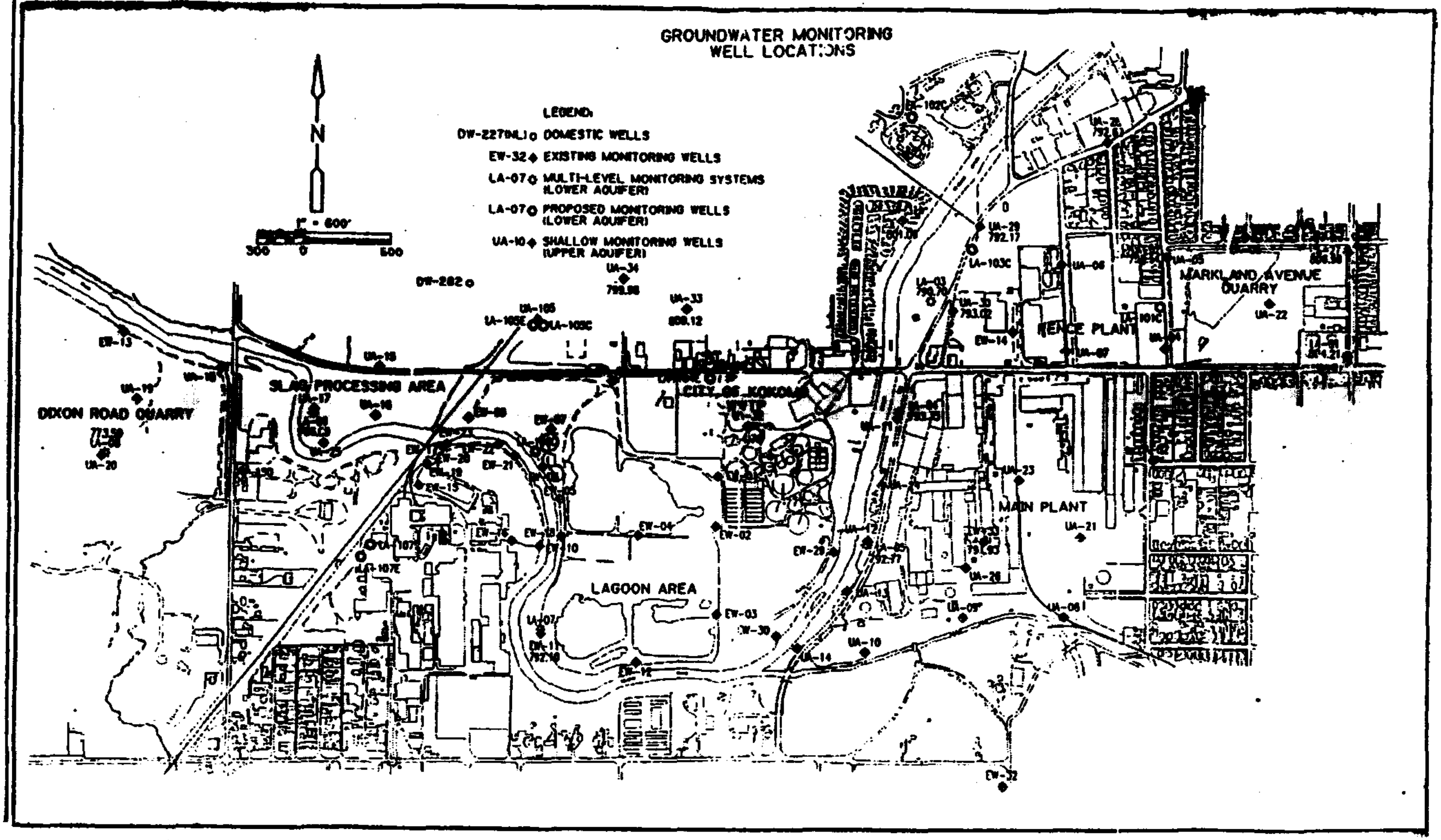
Figures and Drawings

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	CONTINENTAL		
DOC ID #	75504		
DESCRIPTION OF ITEM(S)	MAPS		
REASON WHY UNSCANNABLE	_X_ ILLEGIBLE	or	___FORMAT OVERSIZED
DATE OF ITEM(S)	11-01-1998		
NO. OF ITEMS	2		
PHASE	___ Remedial _X_ Removal ___ Deletion Docket _X_ AR Enf. Volume _1_ of _1_ ___ Original _X_ Update # _4_		
O.U.			
LOCATION	Box # _1_ Folder # _6_		

COMMENTS

Figure 1b



GROUNDWATER MONITORING
WELL LOCATIONS
LEGEND:
DOMESTIC WELLS
EXISTING MONITORING WELLS
MULTI-LEVEL MONITORING SYSTEMS (LOWER AQUIFER)
PROPOSED MONITORING WELLS (LOWER AQUIFER)
SHALLOW MONITORING WELLS (UPPER AQUIFER)
N
DIXON ROAD QUARRY
SLAG PROCESSING AREA
CITY OF KOKOMO WWTP
LAGOON AREA
MAIN PLANT
FENCE PLANT
MARKLAND AVENUE QUARRY

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	CONTINENTAL
DOC ID #	75504
DESCRIPTION OF ITEM(S)	MAPS
REASON WHY UNSCANNABLE	_X_ ILLEGIBLE or ___FORMAT OVERSIZED
DATE OF ITEM(S)	NONE
NO. OF ITEMS	2
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O.U.	
LOCATION	Box # _1_ Folder # _6_
COMMENTS	

FIGURE 2c
Lagoon Area - Operable Unit 2
Exposure Areas

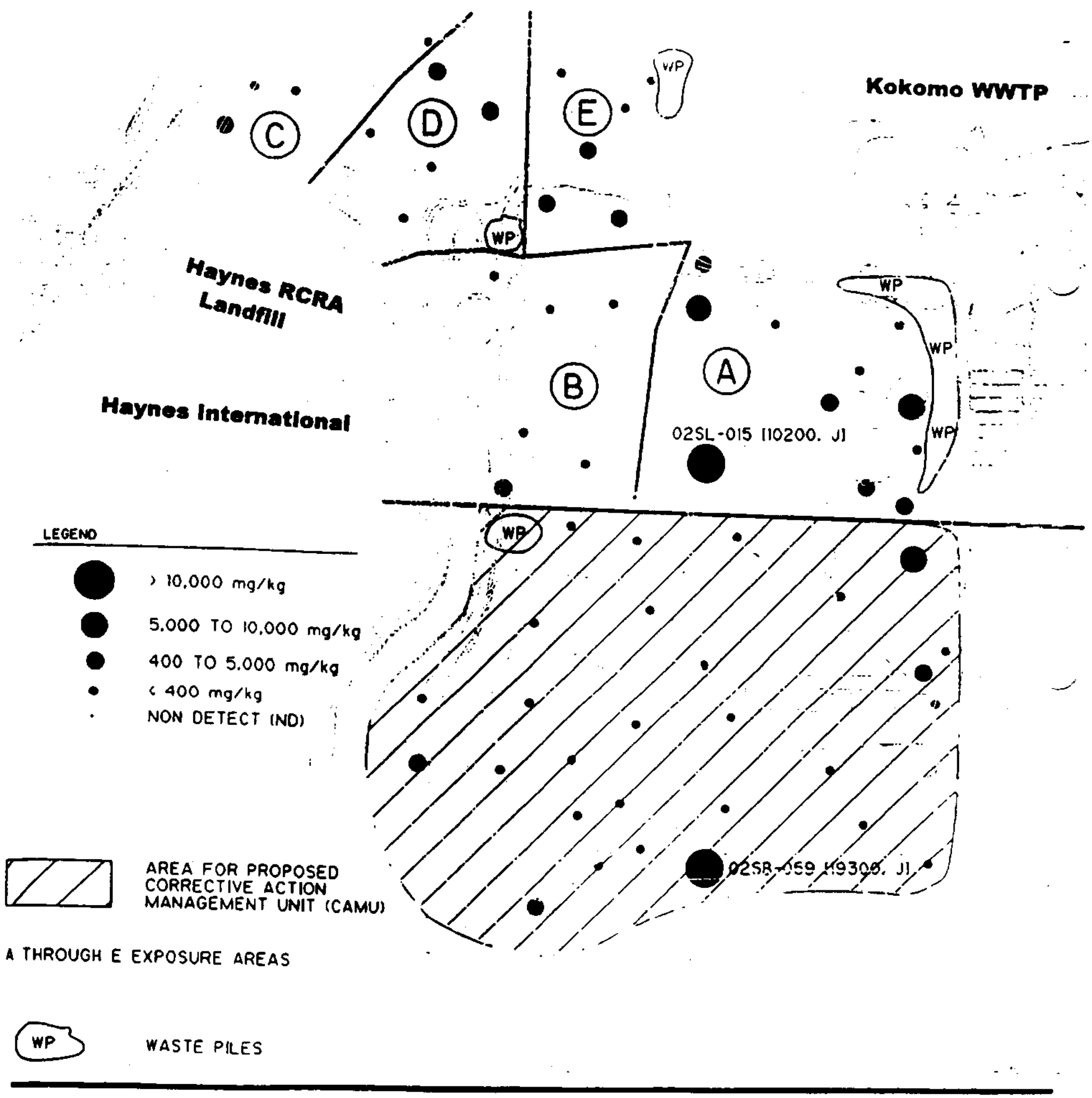


Figure 2d

LAGOON AREA
SOIL GAS AND SOIL BORING
SAMPLE LOCATIONS

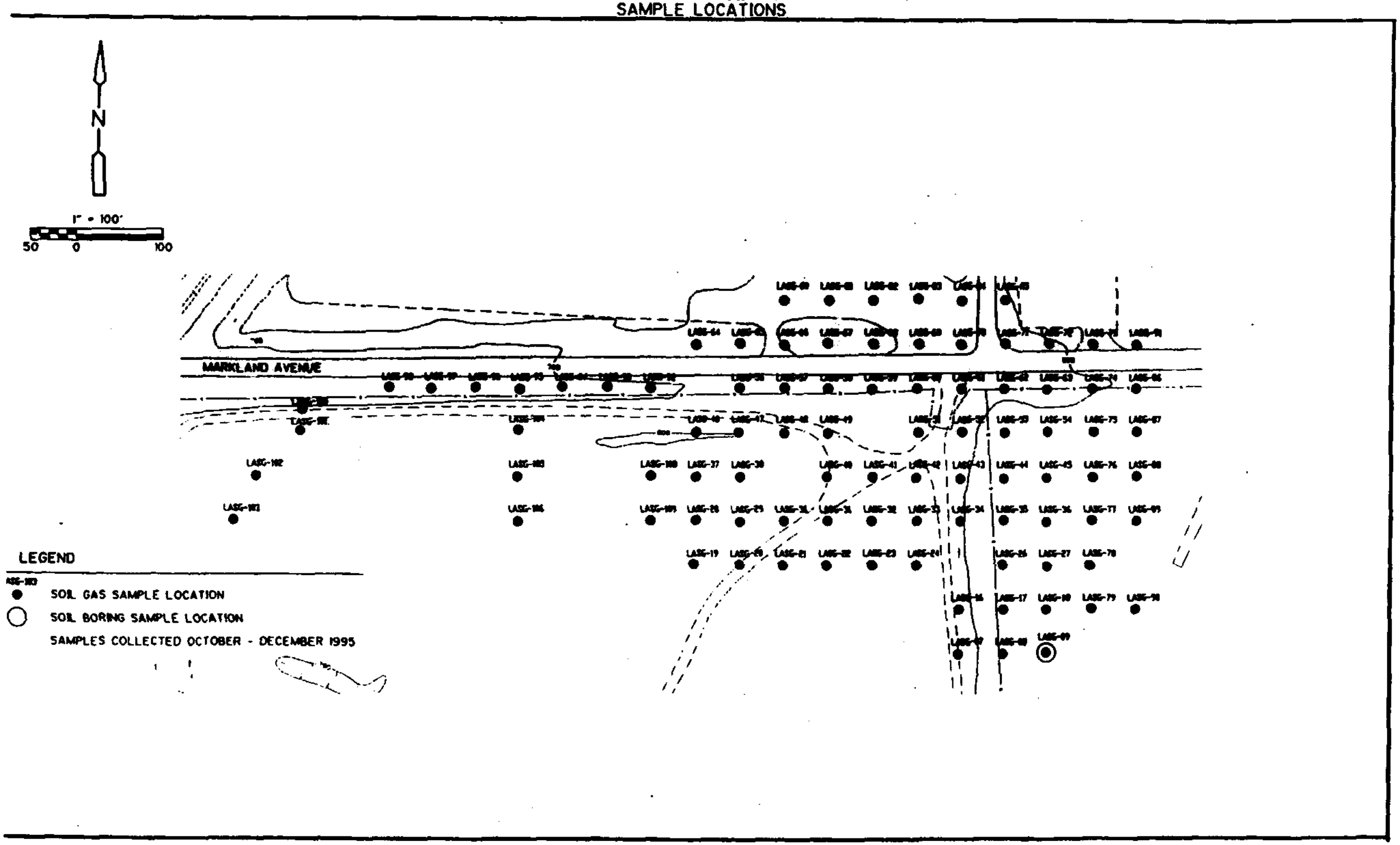
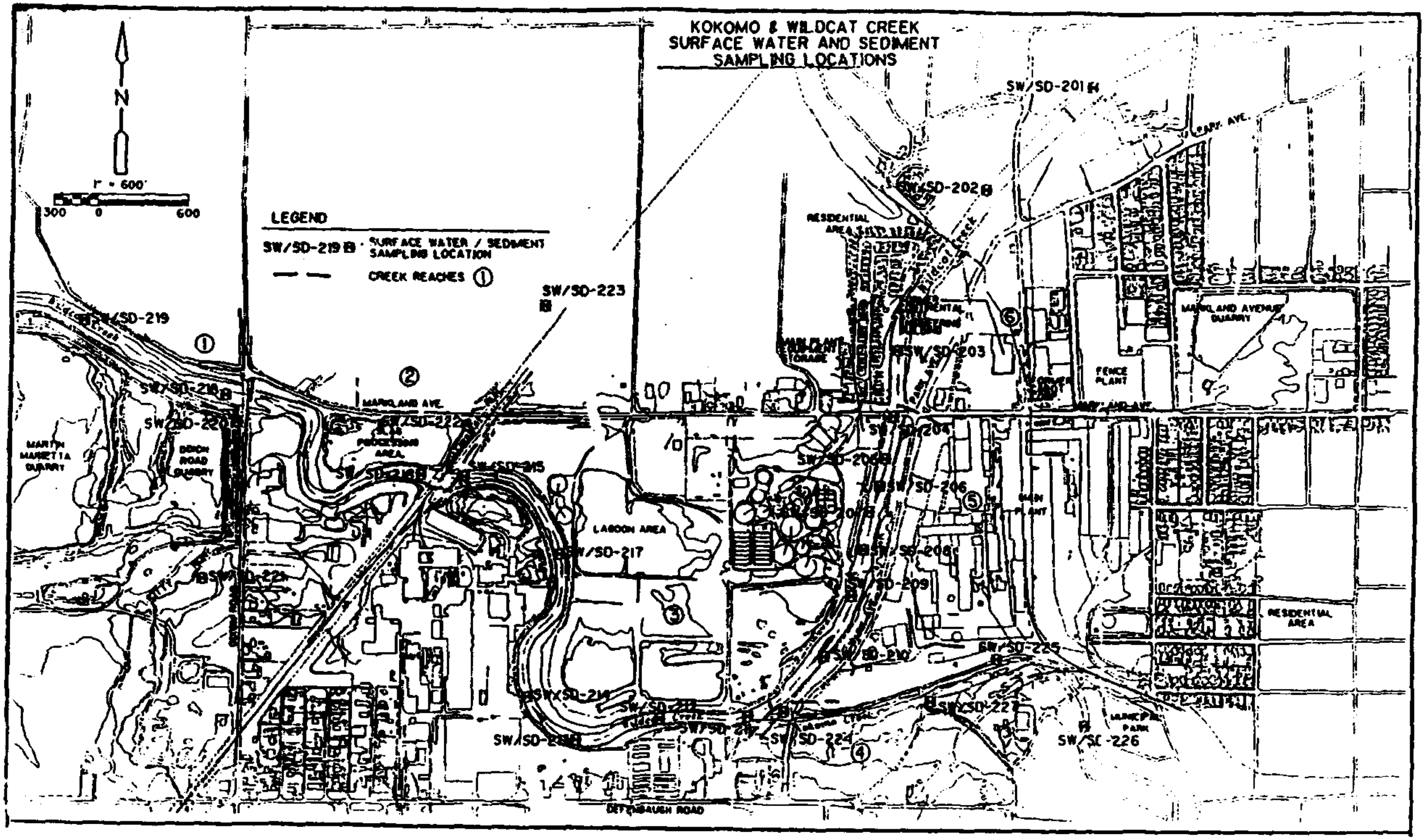


Figure 3b



KOKOMO & WILDCAT CREEK
SURFACE WATER AND SEDIMENT
SAMPLING LOCATIONS
N
1" = 600'
300 0 600
LEGEND
SW/SD-219 SURFACE WATER / SEDIMENT SAMPLING LOCATION
CREEK REACHES ①
SW/SD-201
SW/SD-202
SW/SD-203
SW/SD-217
SW/SD-219
SW/SD-223
SW/SD-225
SW/SD-226
SW/SD-224
RESIDENTIAL AREA
MARKLAND AVENUE QUARRY
FENCE PLANT
MARKLAND AVE.
LAGOON AREA
MAIN PLANT
MUNICIPAL PARK
MARTIN MARIETTA QUARRY
DEFENBAUGH ROAD

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	CONTINENTAL		
DOC ID #	75504		
DESCRIPTION OF ITEM(S)	MAPS		
REASON WHY UNSCANNABLE	_X_ ILLEGIBLE	or	___ FORMAT OVERSIZED
DATE OF ITEM(S)	NONE		
NO. OF ITEMS	2		
PHASE	___ Remedial _X_ Removal ___ Deletion Docket _X_ AR Enf. Volume _1_ of _1_ ___ Original _X_ Update # _4_		
O.U.			
LOCATION	Box # _1_ Folder # _6_		

COMMENTS

FIGURE 4a

Markland Avenue Quarry - Lead Exposure Areas

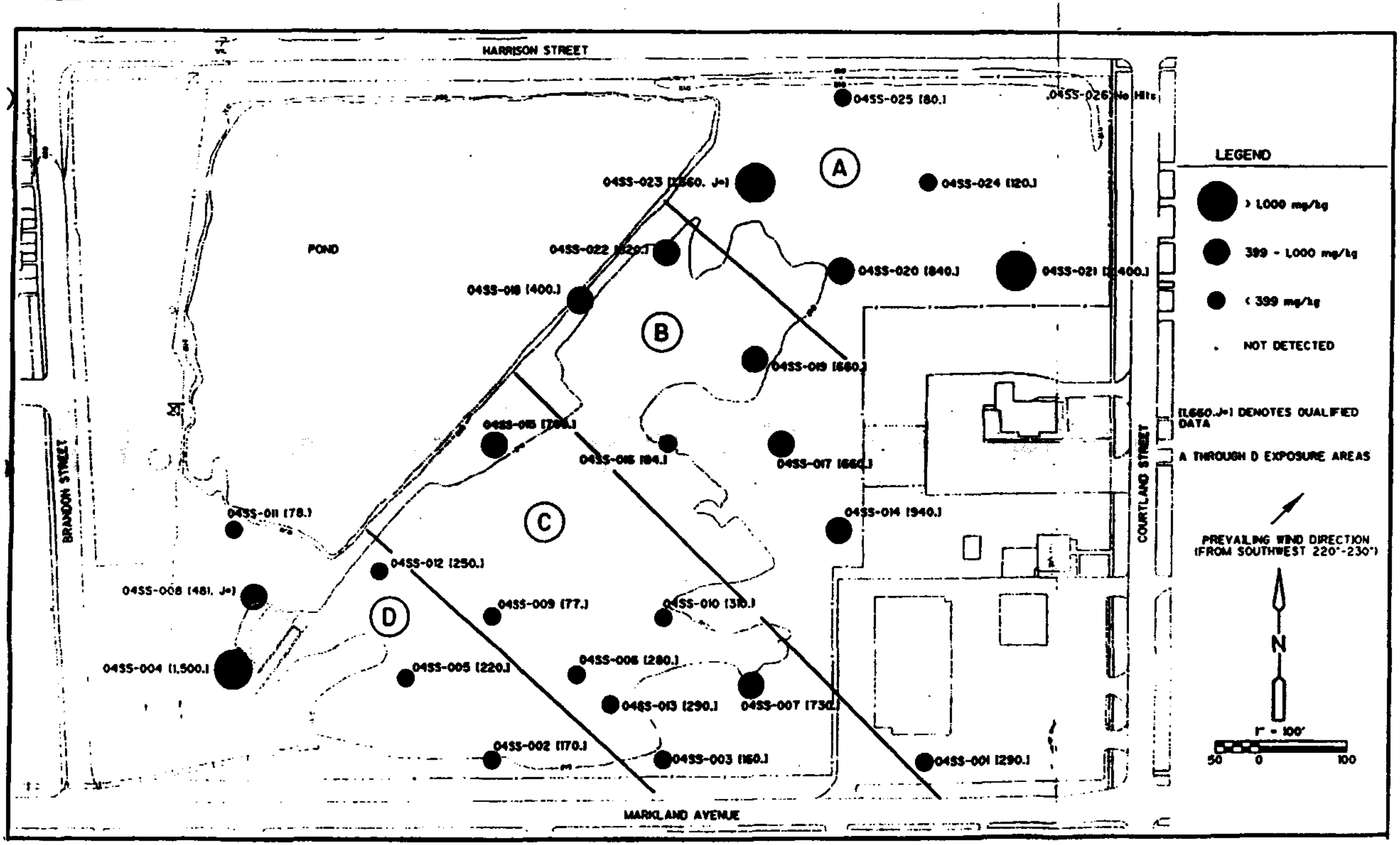


Figure 4b

MARKLAND AVENUE QUARRY
SOIL GAS AND GROUNDWATER
SCREENING SAMPLE LOCATIONS

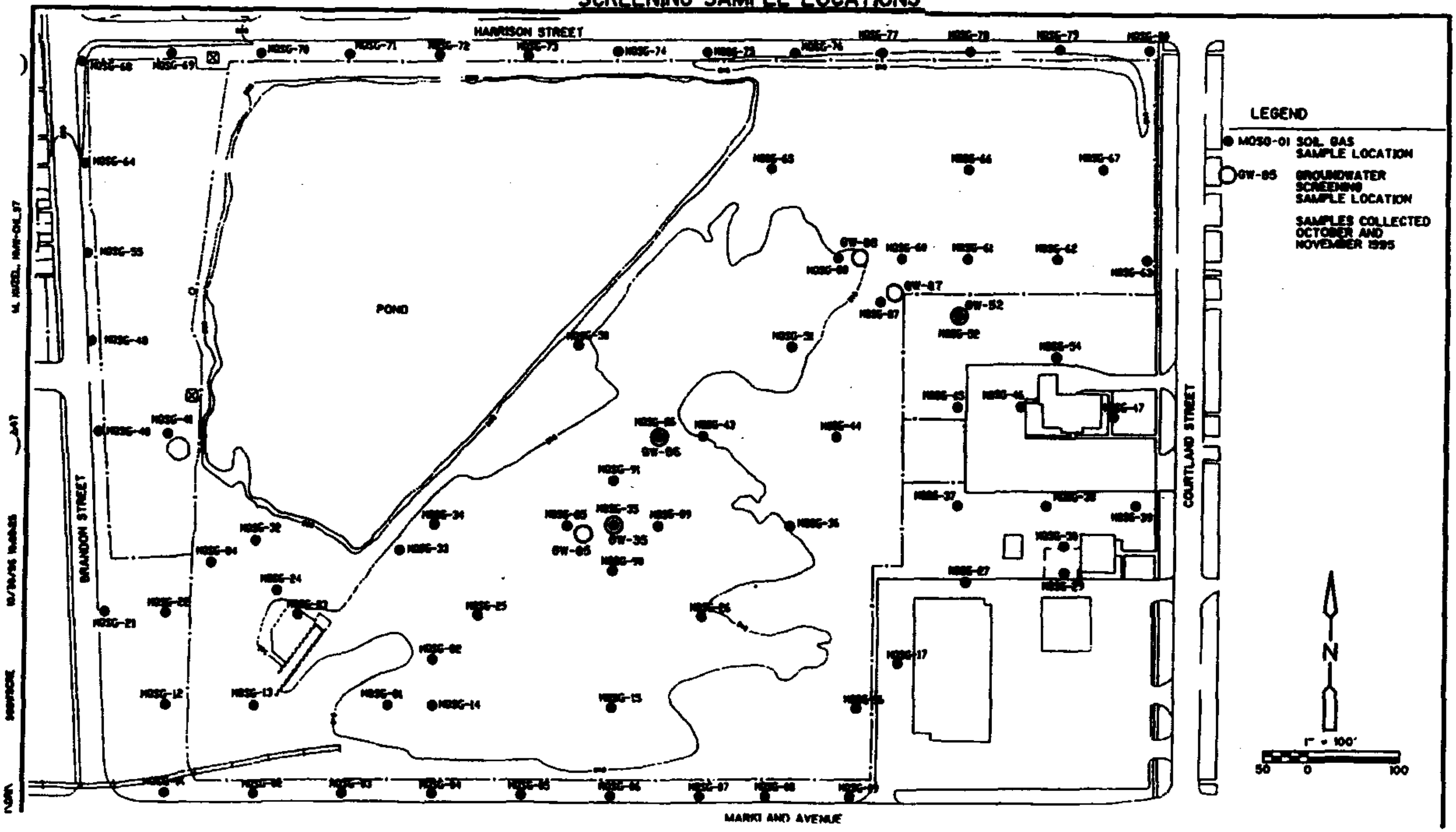
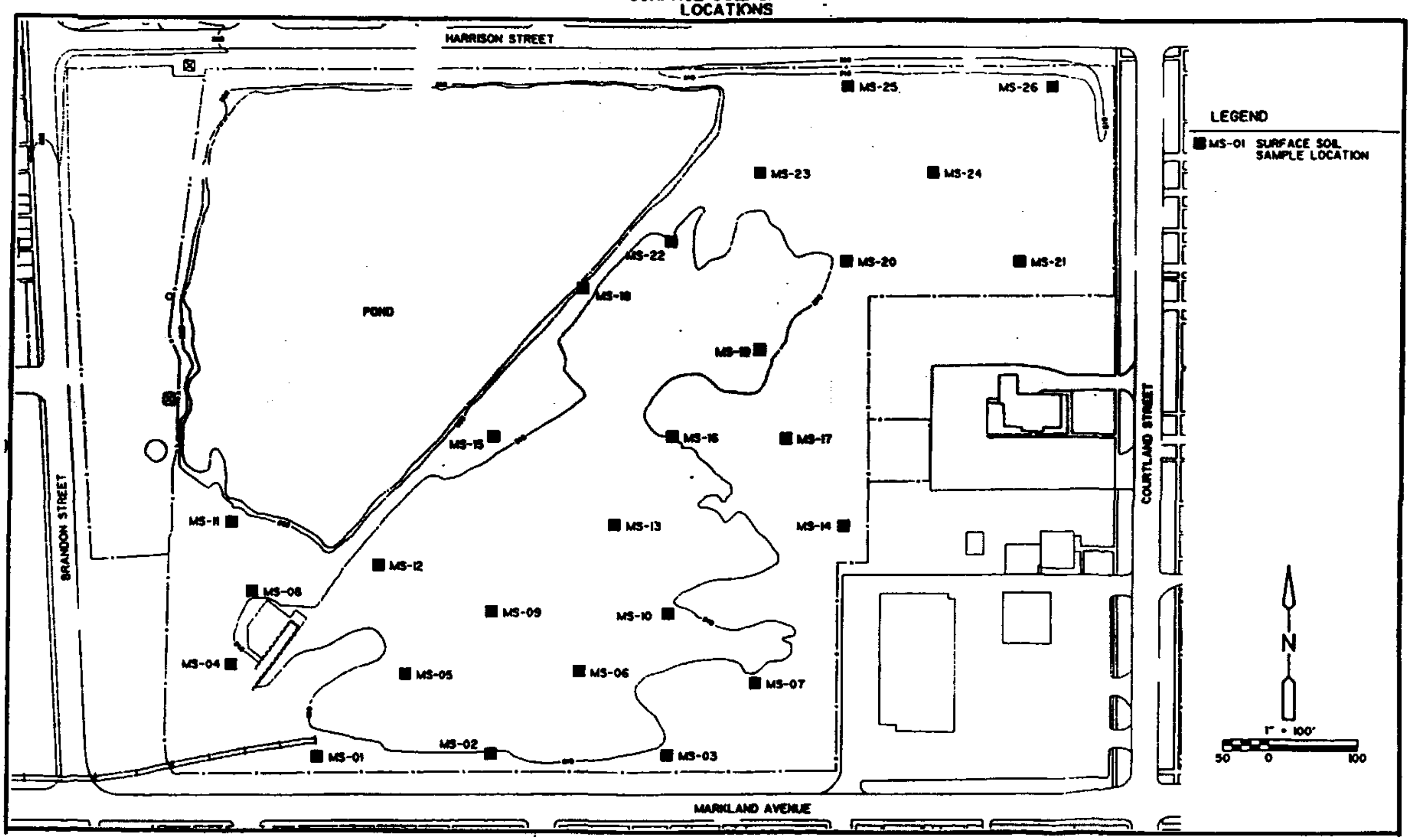


Figure 4c

MARKLAND AVENUE QUARRY
SURFACE SOIL SAMPLE
LOCATIONS



SDMS ADMINISTRATIVE RECORD

IMAGERY INSERT FORM

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REASON WHY UNSCANNABLE	X ILLEGIBLE OR ___ FORMAT
DATE OF ITEM(S)	UNDATED
NO. OF ITEMS	1
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PRP	
PHASE (AR DOCUMENTS ONLY)	___ Remedial X Removal ___ Deletion Docket ___ Original X Update # 4 Volume 1 of 1
O.U.	
LOCATION	Box # 1 Folder # 6 Subsection ___
COMMENT(S)	

FIGURE 5a

Main Plant (OU-5) Lead Exposure Areas

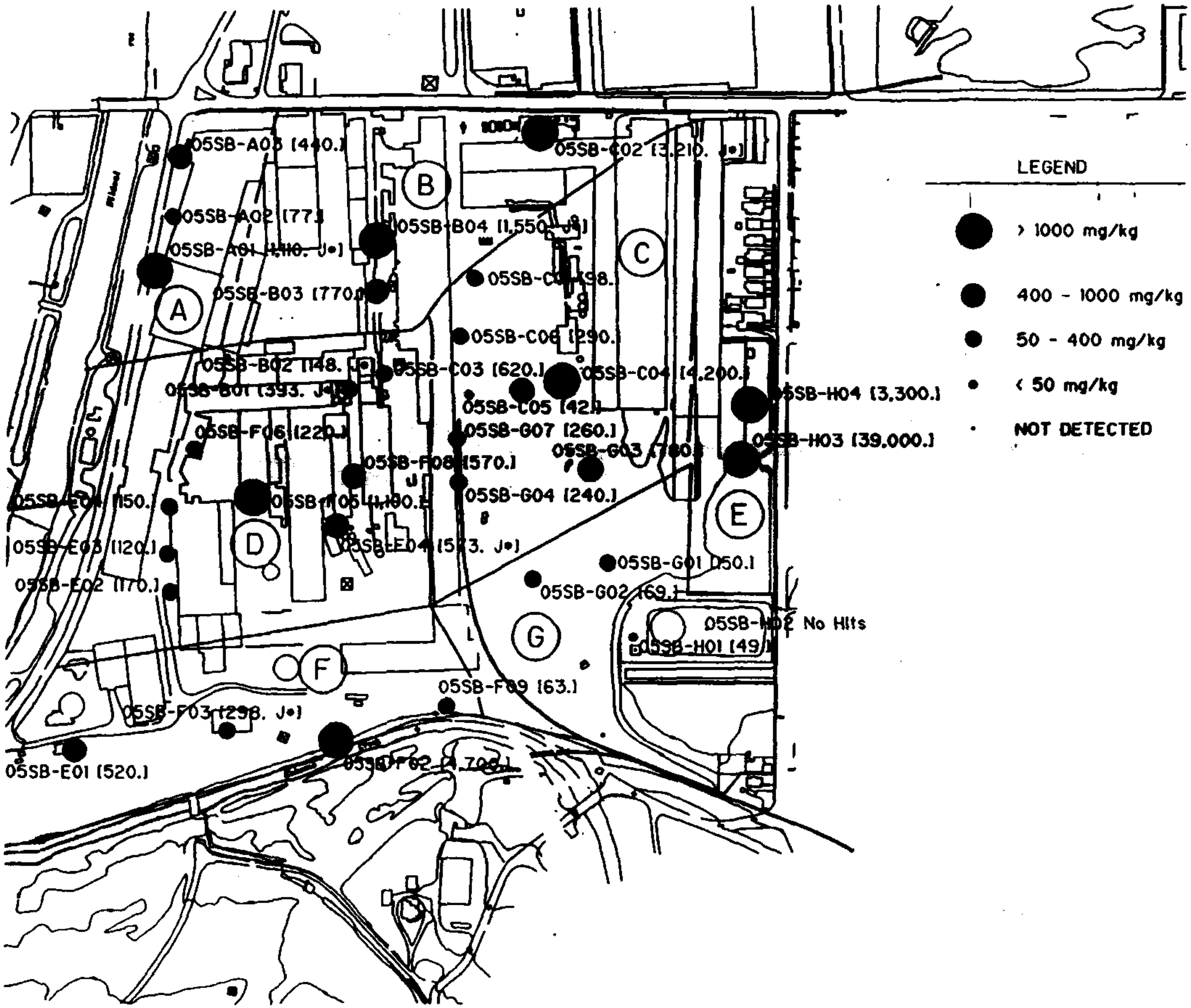
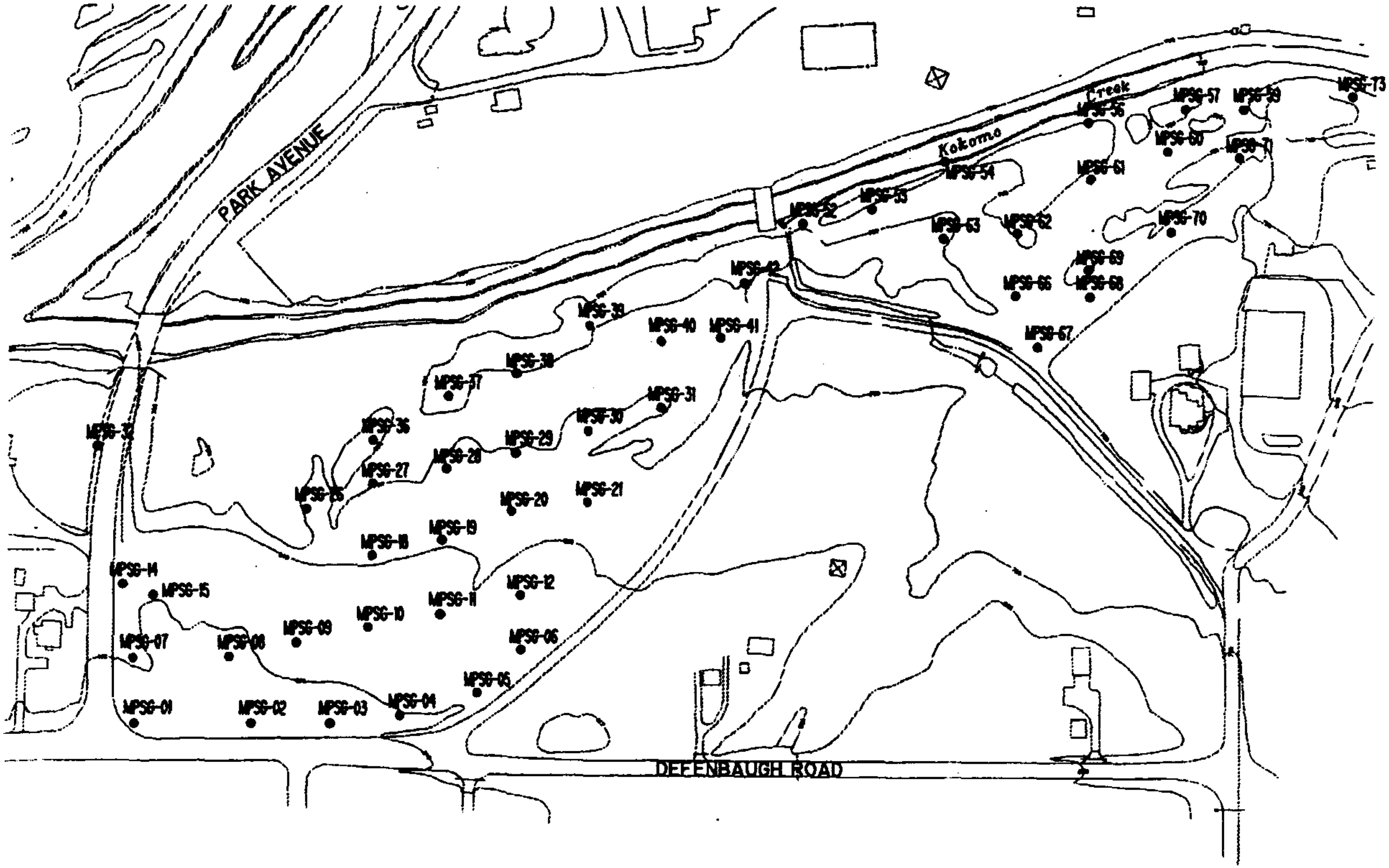
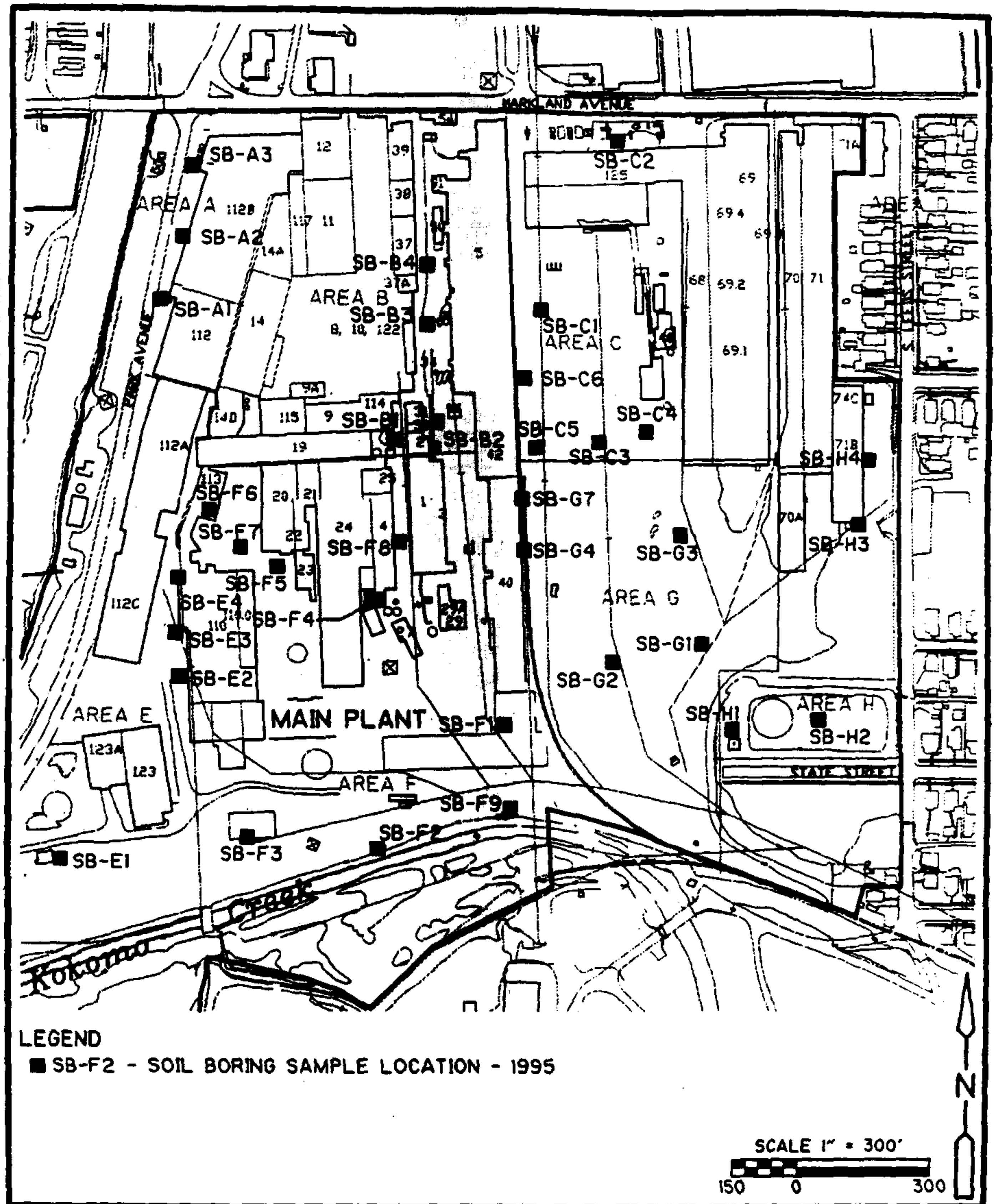


Figure 5b
Main Plant (South) - Operable Unit 5
Soil Gas Survey Locations





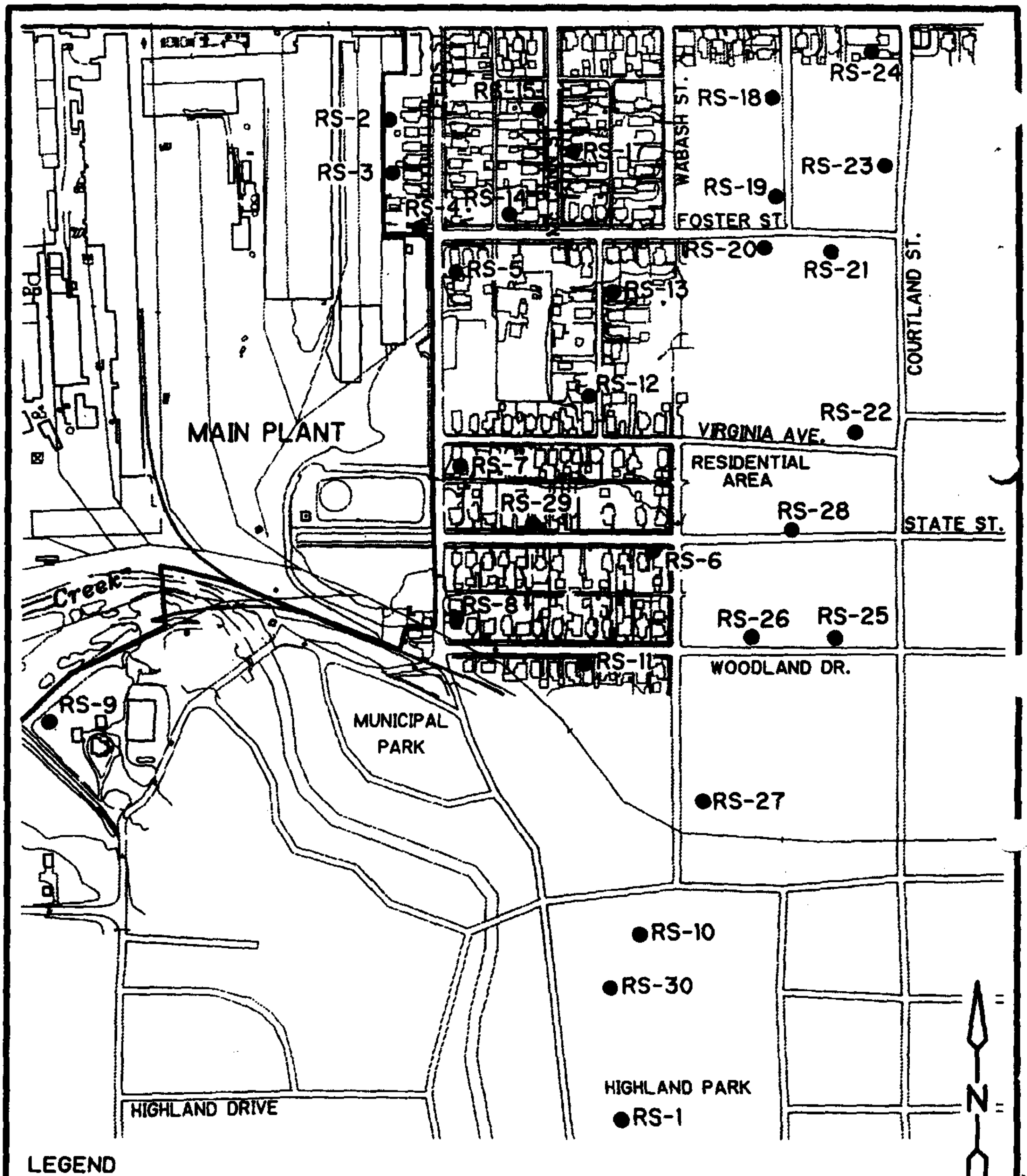
CONTINENTAL STEEL SUPERFUND SITE
KOKOMO, INDIANA

CDM
environmental engineers, scientists, planners, & management consultants

MAIN PLANT SOIL BORING
SAMPLE LOCATIONS

Figure 5c

M. KUZEL NMW-CHL.S7 3:44:41 10/30/96 09:14:17 SOILBLOC



LEGEND

● RS-1 RESIDENTIAL SURFACE SOIL SAMPLE LOCATION - 1995

CONTINENTAL STEEL SUPERFUND SITE
KOKOMO, INDIANA

CDM
environmental engineers, scientists, planners, & management consultants

RESIDENTIAL SURFACE SOIL SAMPLE LOCATIONS

Figure 5d

M. KUZEL NMW-CHL57 5.4/16 10/30/96 09:23:51 RESIDESS \100\RT6\DRN K:\

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	CONTINENTAL
DOC ID #	75504
DESCRIPTION OF ITEM(S)	MAP
REASON WHY UNSCANNABLE	_X_ ILLEGIBLE or ___FORMAT OVERSIZED
DATE OF ITEM(S)	NONE
NO. OF ITEMS	1
PHASE	___ Remedial _X_ Removal ____ Deletion Docket _X_ AR Enf. Volume _1_ of _1_ ___ Original _X_ Update # _4_
O.U.	
LOCATION	Box # _1_ Folder # _6_
COMMENTS	

APPENDIX B

Evaluation Criteria Tables

Table 1

NINE CRITERIA SUMMARY COMPARISON TABLE

OU-1 (Side-Wide Groundwater)

(see table below for common actions)

EVALUATION CRITERIA	ALT. MM-1 No Action	ALT. MM-2 Monitored Natural Attenuation of Intermediate and Lower Groundwater	ALT. MM-3 Collect Intermediate and Lower Groundwater and Dispose Off-Site at WWTP	ALT. MM-4 Collect Intermediate and Lower Groundwater and Dispose Off-Site at Wildcat Creek	ALT. MM-5 Collect Intermediate and Lower Groundwater at Martin Marietta Quarry and Dispose Off-Site
1. Overall Protection of Human Health & Environment	❑	▲	▲	▲	■
2. Compliance with ARARs	❑	▲	▲	▲	▲
3. Long-term Effectiveness and Permanence	❑	▲	▲	■	■
4. Reduction of Toxicity, Mobility or Volume thru Treatment	❑	▲	■	■	▲
5. Short Term Effectiveness	■	■	■	■	■
6. Implementability	N/A	■	▲	▲	■
7. Cost (in millions)	$0	$5.53	$13.2	$13.38	$6.39
8. Support Agency Acceptance	U.S. EPA Support for Alternative MM-5 will be evaluated after the public comment period.				
9. Community Acceptance	Community Acceptance after the Proposed Plan public comment period was very favorable.				

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria ❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

Common Actions to the OU-1 Alternatives, except No Action
♦ **Groundwater Use Restrictions**
♦ **Collect Shallow Groundwater and Dispose Off-site at Kokomo Wastewater Treatment Plant**

TABLE 1a - Operable Unit 1 CONTINENTAL STEEL SUPERFUND SITE COMPARISON OF REMEDIAL ALTERNATIVES SITE-WIDE GROUNDWATER							
Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs**	**Long-term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume**	**Short-term Effectiveness**	**Implementability**	Cost
MM-1:	Not protective of human health or the environment.	ARARs not attained, except through natural attenuation.	Exposure potential would persist for hundreds of years.	No reduction except through natural attenuation.	Additional risks to workers during monitoring. Site risks still persist.	No remedial actions take place under this alternative.	**$0**
MM-2:	Protective of human health. Reductions in exposure potential through institutional controls and extraction of shallow groundwater.	ARARs would eventually be attained for the shallow water-bearing zone. The time frame for achieving ARARs for intermediate and lower water-bearing zones would exceed 200 years.	Collection effective for the shallow water-bearing zone only, assuming that use restrictions are employed.	Volume, mobility, and toxicity of shallow groundwater contaminants would be reduced. Treatment would be addressed at the WWTP. Only natural attenuation would impact intermediate and lower zones.	Short-term risks to workers during extraction system installation and monitoring activities.	Technically easy to implement. Some logistics issues. Requires approval of a TI waiver. Natural attenuation for the intermediate and lower zones is easy to implement. Use restrictions would need to encompass the area of concern for an extended duration.	**$5,532,000**
MM-3:	Protective of human health and the environment. Elimination of exposure potential through groundwater extraction and off-site disposal.	ARARs would eventually be attained for all three water-bearing zones though limited effectiveness of recovery for the intermediate and lower water bearing zones. ARARs would not be attained for the lower zones for at least 200 years.	This alternative would provide a long-term solution to contamination in all three water-bearing zones through collection and natural degradation.	Volume, mobility, and toxicity of groundwater contaminants would be reduced, but at marginal effectiveness as compared to natural attenuation.	Short-term risks to workers during extraction system installation and monitoring activities.	Logistically possible to implement. Use restrictions over large area of industrial/ commercial use may not be an issue.	**$13,204,000**

TABLE 1a - Operable Unit I CONTINENTAL STEEL SUPERFUND SITE COMPARISON OF REMEDIAL ALTERNATIVES SITE-WIDE GROUNDWATER							
Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs**	**Long-term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume**	**Short-term Effectiveness**	**Implementability**	**Cost**
MM-4:	Protective of human health and the environment. Elimination of exposure potential through groundwater extraction and off-site disposal/direct discharge. Limited potential for environmental impacts would remain due to direct discharge.	ARARs would eventually be attained for all three water-bearing zones though limited effectiveness of recovery for the intermediate and lower water bearing zones. ARARs would not be attained for these zones for at least 200 years.	This alternative would provide a long-term solution to contamination in all three water-bearing zones through collection and natural degradation.	Volume, mobility, and toxicity of groundwater contaminants would be reduced, but at marginal effectiveness as compared to natural attenuation.	Short-term risks to workers during extraction system installation and monitoring activities.	Logistically possible to implement. Use restrictions over large area of industrial/commercial use may not be an issue. Requires permit for discharge.	**$13,384,000**
MM-5:	Protective of human health and the environment. Elimination of exposure potential through groundwater extraction and off-site disposal/direct discharge. Limited potential for environmental impacts would remain due to direct discharge.	ARARs would eventually be attained for all three water-bearing zones though limited effectiveness of recovery for the intermediate and lower water bearing zones. ARARs would not be attained for these zones for at least 200 years.	This alternative would provide a long-term solution to contamination in all three water-bearing zones through collection and natural degradation.	Volume, mobility and toxicity of groundwater contaminants would be reduced, but at marginal effectiveness as compared to natural attenuation.	Short-term risks to workers during extraction system installation and monitoring activities. Some additional community risk due to off-site collection at Martin Marietta Quarry.	Logistically possible to implement. Use restrictions over large area of industrial/commercial use may not be an issue. Requires permit discharge and potential operation of Martin Marietta Quarry beyond the life of the quarry.	**$6,386,000**

Table 2

NINE CRITERIA COMPARISON SUMMARY TABLE

OU-2 (Lagoon Area)

(see table below for common actions)

EVALUATION CRITERIA	ALT. SC-1L No Action	ALT. SC-2L Cap Areas with Elevated VOCs	ALT. SC-3L Cap Contaminated Solids / Elevated VOC Solids Removal / Contain & Collect Shallow Groundwater with Interception Trench System and Dispose Off-Site	ALT. SC-4L Excavate Contaminated Solids and Consolidate On-Site / Collect & Contain Shallow Groundwater with an Expanded Interception Trench System and Dispose Off-Site
1. Overall Protection of Human Health & Environment	❑	▲	▲	■
2. Compliance with ARARs	❑	▲	■	■
3. Long-term Effectiveness and Permanence	❑	■	■	■
4. Reduction of Toxicity, Mobility or Volume thru Treatment	❑	▲	■	■
5. Short Term Effectiveness	❑	■	■	■
6. Implementability	❑	■	■	■
7. Cost (in millions)	$0	$29.97	$36.81	$44.75
8. Support Agency Acceptance	U.S. EPA Support for Alternative SC-4L will be evaluated after the public comment period.			
9. Community Acceptance	Community Acceptance of the Selected Alternative after the public comment period was favorable.			

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria ❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

Common Actions to the OU-2 Alternatives, except No Action
♦ **Deed & Groundwater Use Restrictions**
♦ ***RCRA Surface Impoundment***

TABLE 2b - Operable Unit 2
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES
LAGOON AREA

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-1L:	Not protective of human health or the environment, except through natural attenuation. Surface impoundments not addressed.	ARARs not attained for solids and groundwater.	Exposure potential would persist until contaminant concentrations are sufficiently reduced through natural attenuation.	No reduction except through natural attenuation.	No risks through implementation: Site risks still persist.	No remedial actions take place under this alternative.	$0
SC-2L:	Adequately protective of human health and the environment. Exposure pathways for solids addressed partially through access restrictions and RCRA impoundment closure. VOC source to groundwater addressed by capping. Groundwater would be addressed by natural attenuation and use restrictions.	ARARs attained by capping solids with VOCs, RCRA closure and access restrictions. Shallow groundwater will attain ARARs by natural attenuation in 10 years. Need groundwater use restrictions in the interim.	Some solid media and all groundwater exposure pathways permanently eliminated. Restrictions must be enforced/ maintained. Remaining groundwater potential would persist for 10 years.	Mobility of some solids contaminants reduced via capping and RCRA impoundment closure. Groundwater addressed via natural attenuation only.	This alternative will present short-term risks to the community and environment through RCRA impoundment closure and solidification. These risks can be managed through the implementation of site control measures.	Remedial actions of this alternative are commonly applied, technically proven, and technically simple.	$29,967,000 NOTE: Includes costs that facilitate lower cost for several other OUs - mostly by eliminating off-site disposal costs.
SC-3L:	Protective of human health and the environment. Exposure pathways controlled through capping, VOC removal, and RCRA impoundment closure. Shallow groundwater source collected for disposal at WWTP. Deed and use restrictions address long-term contact.	Solids ARARs attained via capping or removal. Shallow groundwater collection will eventually attain ARARs in 6 years with use restrictions in the interim.	Elevated VOC solids would be removed. Solids contaminants would persist, but exposure pathways eliminated with permanent capping. Shallow groundwater would be permanently addressed via collection and use restrictions.	Mobility of solids contaminants would be reduced via capping, VOC removal and RCRA impoundment closure. Shallow groundwater contaminant volume, mobility, and toxicity would be reduced via collection and disposal at WWTP.	This alternative will present short-term risks to the community and environment through RCRA impoundment closure and solidification and elevated VOC area solids removal. These risks can be managed through implementation of site control measures.	Most remedial actions of this alternative are commonly applied, technically proven, protective, and effective. Hydrogeologic characteristics may hinder implementation of shallow groundwater actions.	$36,812,000 NOTE: Includes costs that facilitate lower cost for several other OUs - mostly by eliminating off-site disposal costs.

TABLE 2b - Operable Unit 2
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES
LAGOON AREA

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-4L:	Protective of human health and the environment. Exposure pathways eliminated by placement into a secure landfill. Groundwater source addressed by shallow collection for disposal and groundwater use restrictions.	Solids excavated and placed in a secure landfill to attain ARARs. Shallow groundwater collection will attain ARARs in 3 years with groundwater use restrictions.	All contaminated solids would be excavated and placed into the secure landfill/CAMU. Shallow groundwater would be permanently addressed via aggressive collection and use restrictions.	Mobility of solids contaminants would be reduced via landfilling, VOC removal and RCRA impoundment closure. Shallow groundwater contaminant volume, mobility and toxicity would be reduced via collection and disposal at WWTP.	This alternative will present short-term risks to the community and environment through RCRA impoundment closure and solidification, and excavation of solids. These risks can be managed through the implementation of site control measures.	Remedial actions of this alternative are technically proven, protective, and effective. On-site solids disposal may be administratively more difficult to implement since the Lagoon Area must be the first area addressed and the CAMU must be approved and designed. Hydrogeologic characteristics may hinder performance and effectiveness of shallow groundwater actions.	**$44,746,000** NOTE: Includes costs that facilitate lower cost for several other OUs - mostly by eliminating off-site disposal costs.

Table 3

NINE CRITERIA COMPARISON SUMMARY TABLE

OU-3 (Kokomo & Wildcat Creeks)

(see table below for common actions)

EVALUATION CRITERIA	ALT. SC-1 No Action	ALT. SC- 2C Restricted Access	ALT. SC- 3C Contain Contaminated Sediment In-Place	ALT. SC- 4C Excavate Contaminated Sediment and Consolidate On-Site
1. **Overall Protection of Human Health & Environment**	❑	▲	■	■
2. **Compliance with ARARs**	❑	▲	■	■
3. **Long-term Effectiveness and Permanence**	❑	❑	▲	■
4. **Reduction of Toxicity, Mobility or Volume thru Treatment**	❑	❑	▲	▲
5. **Short Term Effectiveness**	❑	▲	▲	▲
6. **Implementability**	❑	■	■	■
7. **Cost (in millions)**	$0	$1.15	$7.89	$12.56
8. **Support Agency Acceptance**	U.S. EPA Support for Alternative SC-4C will be evaluated after the public comment period.			
9. **Community Acceptance**	Community Acceptance of the Selected Alternative after the Proposed Plan public comment period was favorable.			

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

There are NO Common Actions to the OU-2 Alternatives.

TABLE 3a - Operable Unit 3
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES
WILDCAT AND KOKOMO CREEKS

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-1C:	Not protective of the environment, except through natural attenuation and dispersion. Effects individual species as compared to the aquatic population in	ARARs not attained for sediment.	No permanent solution for contaminated sediment. Affects local portion of Creeks. Sediment may be transported downstream to other areas of the Creeks.	No reduction except through natural attenuation and hydraulic transport.	No short-term risks to the community or environment. Short-term risks to workers during environmental monitoring. Site risks still persist.	Easy to implement from a technical standpoint.	**$0**
SC-2C:	Adequately protective of human health through fence and sign placement. This would require long-term maintenance. Not protective of the aquatic environment over these two miles except through natural	ARARs not attained for sediment.	No permanent solution for contaminated sediment. Affects local portion of Creeks. Sediment may be transported downstream to other areas of the Creeks	No reduction except through natural attenuation and hydraulic transport.	Short-term risks during fence installation and monitoring. Site risks still persist.	Easy to implement from a technical standpoint. Maintenance of fence is an issue. No protection for aquatic species.	**$1,147,000**
SC-3C:	Adequately protective of human health and the environment. Concrete matting would prevent migration and leaching of contaminants from sediment.	Would comply with ARARs because exposure pathways would be eliminated. Sediment itself would not be in compliance for extended period. May	No treatment or removal of contaminated sediment, but is a long-term solution to exposure through installation of protective cover. Impact of upstream contaminated sediment to recontaminate area needs to be addressed.	Mobility of sediment contaminants reduced through installation of low-permeability cap. Toxicity and volume not addressed.	Short-term risks during cap placement to workers and significant impact to the aquatic habitat. Other risks during monitoring.	May require floodplain mitigation and Army Corps permits. Impact to habitat significant. Odor control/fish kill possibly required.	**$7,890,000**

TABLE 3a - Operable Unit 3 CONTINENTAL STEEL SUPERFUND SITE COMPARISON OF REMEDIAL ALTERNATIVES WILDCAT AND KOKOMO CREEKS							
Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs**	**Long-term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume**	**Short-term Effectiveness**	**Implementability**	**Cost**
SC-4C:	Protective of human health and the environment. Removal and on-site disposal of sediment in a secure landfill would eliminate pathways of migration and exposure.	Would comply with ARARs because sediment would be permanently removed and contained within a secure landfill.	Removal and containment of sediment in a secure landfill. Permanent solution for the contaminated sediment. No residual contaminated sediment would remain. Impact of upstream contaminated sediment to recontaminate area needs to be addressed.	Volume and mobility would be reduced through sediment removal and through isolation in a secure landfill.	Short-term risks possible during sediment removal and monitoring. Significant impact to aquatic habitat possible. These risks are manageable through implementation of adequate, proper institutional control measures and health and safety protocols.	Special design considerations for control of turbidity, storage, and dewatering/solidification options. Odor control/fish kill possibly required. Dependent on on-site landfill approval and completion to the point of accepting sediments from the creeks. These are manageable through appropriate design development and design implementation.	$12,560,000 NOTE: Includes a cost benefit via on-site CAMU landfill by eliminating off-site disposal costs.

Table 4

NINE CRITERIA COMPARISON SUMMARY TABLE

OU-4 (Markland Avenue Quarry)

(see table below for common actions)

EVALUATION CRITERIA	ALT. SC-1Q No Action	ALT. SC- 2Q Cap Contaminated Solids/Deed Restrictions	ALT. SC- 2.5Q (modified) Cap Contaminated Solids/ Collect & Contain Shallow Groundwater and Dispose Off-Site/Deed Restrictions	ALT. SC- 3Q Cap Contaminated Solids/Elevated VOC Solids Removal/Collect & Contain Shallow Groundwater and Dispose Off-Site/Deed Restrictions	ALT. SC- 4Q Excavate Contaminated Solids and Dispose Off-Site/Collect & Contain Shallow Groundwater and Dispose Off-Site
1. Overall Protection of Human Health & Environment	❑	▲	■	■	■
2. Compliance with ARARs	❑	▲	■	■	■
3. Long-term Effectiveness and Permanence	❑	▲	■	■	■
4. Reduction of Toxicity, Mobility or Volume thru Treatment	❑	▲	▲	▲	■
5. Short Term Effectiveness	■	■	▲	▲	▲
6. Implementability	■	▲	▲	▲	▲
7. Cost (in millions)	$0	$17.3	$11.2	$31.61	$351.3
8. Support Agency Acceptance	U.S. EPA Support for Alternative SC-2Q (modified) will be evaluated after the public comment period.				
9. Community Acceptance	Community Acceptance of the Selected Alternative after the Proposed Plan public comment period was favorable.				

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

Common Actions to the OU-4 Alternatives, except No Action
♦ Groundwater Use Restrictions
♦ Excavate Contaminated Sediment from Quarry Pond
♦ Backfill Quarry Pond

TABLE 4a - Operable Unit 4
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES
MARKLAND AVENUE QUARRY

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-1Q:	Not protective of human health or the environment, except through natural attenuation.	Would not comply with ARARs for solids, groundwater or surface water.	Exposure pathways would remain until contaminant concentrations are sufficiently reduced through natural attenuation.	No reduction except through natural attenuation.	No additional risks to the community or environment through implementation. Site risks still persist.	No remedial actions take place under this alternative.	$0
SC-2Q:	Protective of both human health and the environment. Capping and sediment removal would reduce solids leaching potential. Surface water exposure pathway eliminated. Site access restricted. Natural attenuation with groundwater use limitations to address groundwater.	Surface water and solid media ARARs would be attained all or in part. ARARs for shallow groundwater would be achieved in 30 years.	Surface water pathways permanently eliminated. Capping, sediment removal and use restrictions would reduce solids and groundwater pathways. Need long-term maintenance and groundwater use restrictions.	Surface water eliminated. Mobility of solids contaminants reduced through capping and sediment removal.	Short-term risks to workers and environment during capping, sediment removal and filling in the pond.	Moderately difficult to implement from a technical standpoint. Sediment removal would require less common and technically complex remedial techniques.	$17,281,000
SC-2.5Q: (modified)	Protective of both human health and the environment. Cover system and sediment removal would reduce solids leaching potential. Surface water exposure pathway eliminated with Quarry backfilling. Site access restricted. Containment of shallow water-bearing zone immediately around Quarry. Natural attenuation with groundwater use limitations to address groundwater.	Surface water and solid media ARARs would be attained all or in part. ARARs for shallow groundwater would be achieved in 15-20 years.	Surface water pathways permanently eliminated. Cover system, sediment removal and use restrictions would reduce solids and groundwater pathways. Need long-term maintenance and groundwater use restrictions. Groundwater contamination reduced below MCLs in shorter timeframe. Less time for potential exposure.	Surface water eliminated. Mobility of solids contaminants reduced through capping and sediment removal. Mobility and volume of shallow groundwater contamination reduced.	Short-term risks to workers and environment during cover installation, sediment removal and filling in the pond.	Moderately difficult to implement from a technical standpoint. Sediment removal would require less common and technically complex remedial techniques.	$11,200,000

TABLE 4a - Operable Unit 4 CONTINENTAL STEEL SUPERFUND SITE COMPARISON OF REMEDIAL ALTERNATIVES MARKLAND AVENUE QUARRY							
Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs**	**Long-term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume**	**Short-term Effectiveness**	**Implementability**	**Cost**
SC-3Q:	Protective of human health and the environment. Surface water eliminated. Solids addressed by capping and removal. Shallow groundwater addressed through collection and groundwater use restrictions.	Surface water and solid media ARARs would be attained. Collect shallow groundwater. Groundwater ARARs achieved in 20 years.	Surface water pathway eliminated. Capping, sediment and elevated VOC solids removal would permanently reduce leaching. Shallow groundwater would be permanently remediated. Need restrictions to protect from groundwater use.	Surface water eliminated. Mobility of solids reduced through capping, elevated VOC solids and sediment removal. Groundwater contaminant volume and mobility reduced through collection.	Short-term risks during capping, sediment removal, VOC pond filling and groundwater extraction system installation.	Moderately difficult to implement from a technical standpoint. Sediment removal would require less common and technically complex remedial techniques.	$31,608,000
SC-4Q:	Protective of human health and the environment. Surface water eliminated. Contaminated solids eliminated. Shallow groundwater addressed through collection and groundwater use restrictions.	Surface water and solid media ARARs would be attained. Collect shallow groundwater. Groundwater ARARs achieved in 15 years.	Surface water and contaminated solids pathways permanently eliminated. Shallow groundwater permanently remediated. Need groundwater use restrictions.	Mobility of surface water and contaminated solids eliminated by placement in a secure landfill. No area to treat on-site. Groundwater contaminant volume, toxicity, and mobility would be reduced.	Short-term risks during pond filling, solids removal, and groundwater extraction system installation.	Difficult to implement from a technical and materials handling standpoint. Sediment removal would require less common and technically complex remedial techniques. 1.28M cubic yards of material removed to over 50 feet in depth would be very difficult.	$351,272,000

Table 5

NINE CRITERIA COMPARISON SUMMARY TABLE

OU-5 (Main Plant Property)

(see table below for common actions)

EVALUATION CRITERIA	ALT. SC-1 No action	ALT. SC- 2M Deed Restrictions	ALT. SC- 3M Cap Contaminated Solids / Collect & Contain Shallow Groundwater and Dispose Off-Site / Deed Restrictions	ALT. SC- 3.5M (modified) Cap Contaminated Solids / PCB Solids Removal / Collect & Contain Shallow Groundwater and Dispose Off-Site / Deed Restrictions	ALT. SC- 4M Excavate All Contaminated Solids / Collect and Contain Shallow Groundwater and Dispose Off-Site
1. Overall Protection of Human Health & Environment	❑	▲	■	■	■
2. Compliance with ARARs	❑	❑	■	■	■
3. Long-term Effectiveness and Permanence	❑	▲	■	■	■
4. Reduction of Toxicity, Mobility or Volume thru Treatment	❑	❑	▲	▲	▲
5. Short Term Effectiveness	❑	■	■	■	■
6. Implementability	❑	▲	■	■	■
7. Cost (in millions)	$0	$2.15	$4.82	$7.7	$20.33
8. Support Agency Acceptance	U.S. EPA Support for Alternative SC-3M (modified) will be evaluated after the public comment period.				
9. Community Acceptance	Community Acceptance of the Selected Alternative after the Proposed Plan public comment period was favorable.				

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria ❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

Common Actions to the OU-5 Alternatives, except No Action
♦ **Groundwater Use Restrictions**
♦ **Elevated VOC Solids Removal and On-Site Disposal**

TABLE 5a - Operable Unit 5
MAIN PLANT
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-1M:	Not protective of human health or the environment. All exposure pathways would remain.	ARARs would not be attained for solids or groundwater, except through natural attenuation.	No permanent solution for contaminated solids or groundwater.	No reductions, except through natural attenuation and dispersion.	No additional risks to the community, workers, or the environment. Site risks still persist.	Easy to implement from a technical standpoint.	$0
SC-2M:	Solids addressed by site restrictions that require enforcement. VOC leaching potential eliminated through removal. Natural attenuation with groundwater use limitations to address groundwater.	ARARs not attained for solids, except through natural attenuation. Shallow groundwater would attain ARARs in approximately 40 years.	Long-term solution to leaching potential. Additional permanent risk reduction through institutional controls. Relies on long-term enforcement.	Little to no reduction, except through natural attenuation. VOC leaching potential from solids reduced.	Limited risks to workers during VOC removal and monitoring. Some site risks still persist.	Easy to implement from a technical standpoint.	$2,145,000
SC-3M:	Human exposure pathways to contaminated solids eliminated. Shallow groundwater collected for disposal. Enforcement of deed and groundwater use restrictions is still required.	ARARs attained for solids and eventually shallow groundwater in approximately 15 years.	Exposure pathways to contaminated solids permanently eliminated, but long-term maintenance required. Elevated VOC solids removed and remaining contaminated solids remain in-place. Shallow groundwater permanently addressed through collection.	Mobility reduced for solids contaminants through capping. Volume, mobility, and toxicity of shallow groundwater reduced.	Limited risks to workers during VOC hot spot removal, cap placement, monitoring and trenching.	Moderately difficult to implement. Relies on Lagoon Area as CAMU and Lagoon Area initially addressed.	$4,822,000

TABLE 5a - Operable Unit 5 MAIN PLANT CONTINENTAL STEEL SUPERFUND SITE COMPARISON OF REMEDIAL ALTERNATIVES							
Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs**	**Long-term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume**	**Short-term Effectiveness**	**Implementability**	**Cost**
SC-3.5M:	Human exposure pathways to contaminated solids eliminated. Shallow groundwater collected for disposal. Enforcement of deed and groundwater use restrictions is still required.	ARARs attained for solids and eventually shallow groundwater in approximately 10 years.	Exposure pathways to contaminated solids permanently eliminated, but long-term maintenance required. Elevated VOC solids and PCBs removed and remaining contaminated solids remain in-place. Shallow groundwater permanently addressed through collection.	Mobility and volume reduced for solids contaminants through removal of source area solids. Volume, mobility, and toxicity of shallow groundwater reduced.	Limited risks to workers during VOC & PCB removal, cover installation, monitoring and trenching.	Moderately difficult to implement. Relies on Lagoon Area as CAMU and Lagoon Area initially addressed and ready to receive solid wastes.	**$4,822,000**
SC-4M:	Human exposure pathways to contaminated solids eliminated by placement in a secure landfill. Shallow groundwater collected for disposal. Groundwater use restrictions required.	ARARs attained for solids and eventually shallow groundwater in approximately 10 years.	Exposure pathways to contaminated solids eliminated by permanent placement in a secure landfill. Shallow groundwater permanently addressed.	Mobility of contaminated solids reduced through removal. Volume, mobility, and toxicity of shallow groundwater reduced through collection and off-site disposal.	Increased risks to on-site workers and the community during solids removal, trenching, and monitoring.	Moderately difficult to implement. Relies on Lagoon Area approved as CAMU and Lagoon Area initially addressed.	**$20,334,000**

Table 6

NINE CRITERIA COMPARISON SUMMARY TABLE

OU-6 (Slag Processing Area)

(see table below for common actions)

EVALUATION CRITERIA	ALT. SC-1S No Action	ALT. SC- 2S Regrade Piles / Stabilize Creek Bank / Deed Restrictions	ALT. SC- 3S Regrade Slag Piles / Cap Contaminated Solids / Deed Restrictions / Stabilize Creek Bank	ALT. SC- 3.5S Regrade Slag Piles / Cover Contaminated Solids with Common Soil / Deed Restrictions / Stabilize Creek Bank	ALT. SC- 4S Excavate Contaminated Solids and Consolidate On-Site
1. Overall Protection of Human Health & Environment	❑	▲	■	■	■
2. Compliance with ARARs	❑	■	■	■	■
3. Long-term Effectiveness and Permanence	❑	■	■	■	■
4. Reduction of Toxicity, Mobility or Volume thru Treatment	❑	■	■	■	■
5. Short Term Effectiveness	■	▲	▲	▲	■
6. Implementability	■	■	■	■	▲
7. Cost (in millions)	$0	$2.62	$3.05	$2.42	$25.87
8. Support Agency Acceptance	U.S. EPA Support for Alternative SC-3S (modified) will be evaluated after the public comment period.				
9. Community Acceptance	Community Acceptance of the Selected Alternative after the Proposed Plan public comment period was favorable.				

N/A - Not Addressed ■ Fully meets criteria ▲ Partially meets criteria❑ Does not meet criteria

For more information, see the detailed nine criteria comparison table that follows or the Feasibility Study in the Repository at the Library.

There are NO Common Actions to the OU-6 Alternatives.

TABLE 6a - Operable Unit 6
CONTINENTAL STEEL SUPERFUND SITE
COMPARISON OF REMEDIAL ALTERNATIVES
SLAG PROCESSING AREA

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost
SC-1S:	Not protective of human health or the environment. Exposure pathways would remain under residential use scenario.	Would not comply with ARARs.	No long-term solution to solid media contamination.	No reductions, since there would be no treatment options.	No short-term risks to the community or environment. Site risks still persist.	Not applicable, because there are no actions to implement.	$0
SC-2S:	Limited reduction of the threat to human health and the environment resulting from metals in the slag. Slag piles would be regraded to eliminate a potential pathway for contamination. Depends on access restrictions to control risks.	ARARs would not be fully attained through removing some of slag and using it as fill in other areas of the CSSS. Subsurface media would still not achieve ARARs.	Restrictions on property use, fencing, and material relocation would afford long-term effectiveness as long as enforced.	Some reductions in mobility due to removing slag piles.	Short-term risks to the community or environment only due to regrading.	Technically easy to implement.	$2,622,000
SC-3S:	Pathways for human exposure eliminated and would significantly reduce exposure potential.	ARARs would be attained through capping of contaminated solids	Cap would afford long-term reductions in exposure potential but would need to be maintained. Coordinate with construction of house foundations.	Mobility of solid media contaminants would be reduced through capping. Toxicity and volume would be unaffected.	Short-term risks would be limited to dust emissions and direct exposure potential during cap installation.	Technically easy to implement.	$3,045,000
SC-3.5S:	Pathways for human exposure eliminated and would significantly reduce exposure potential.	ARARs would be attained through covering of contaminated solids	Cover system would afford long-term reductions in exposure potential but would need to be maintained. Coordinate with construction of house foundations.	Mobility of solid media contaminants would be reduced due to cover system. Toxicity and volume would be unaffected.	Short-term risks would be limited to dust emissions and direct exposure potential during cover system installation.	Technically easy to implement.	$2,420,000
SC-4S:	Pathways for human exposure would be eliminated.	ARARs would be attained through removal, relocation, and on-site disposal of contaminated solids.	Removal would afford permanent elimination of exposure pathways.	Mobility of solid media contaminants would be eliminated. Volume and toxicity would be unaffected.	Short-term risks would be limited to dust emissions and direct exposure potential during contaminated solids removal.	Technically easy to implement. Relies on approval of CAMU and Lagoon Area is addressed initially.	$25,622,000

APPENDIX C

Risk Assessment Cancer and Noncancer Result Tables

Table ES-1
Cancer Risk Estimates
Final Baseline Risk Assessment
Continental Steel Superfund Site
Kokomo, Indiana

Exposure Pathway by Operable Unit	Receptor									
	Current and Future Offsite Residents		Future Onsite Residents		Future Onsite Commercial/ Industrial Workers		Future Onsite Construction Worker		Current and Future Onsite Trespasser	
	RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
Main Plant										
Soil Ingestion	7.6E-05	5.7E-06	NA	NA	7.4E-05	1.1E-06	1.5E-06	8.6E-09	2.5E-05	1.8E-06
Dermal Contact	5.7E-06	2.1E-07	NA	NA	2.0E-05	8.5E-07	1.6E-07	6.2E-09	6.9E-05	1.4E-06
Total Risk	8.2E-05	5.9E-06	NA	NA	9.4E-05	2.0E-06	1.7E-06	1.5E-08	9.4E-05	3.2E-06
Markland Avenue Quarry										
Soil Ingestion	1.1E-04	6.0E-06	1.6E-04	9.7E-06	6.8E-05	7.0E-06	1.4E-06	5.5E-08	2.3E-05	5.6E-06
Dermal Contact	2.2E-04	1.7E-06	2.9E-04	4.9E-06	8.0E-06	8.2E-07	6.4E-08	6.1E-09	2.8E-05	1.3E-06
Surface Water Ingestion	-	-	-	-	-	-	-	-	2.2E-06	-
Dermal Contact with Surface Water	-	-	-	-	-	-	-	-	3.7E-06	-
Total Risk *	3.3E-04	7.7E-06	4.5E-04	1.5E-05	7.6E-05	7.9E-06	1.4E-06	6.1E-08	5.1E-05	6.9E-06
Slag Processing Area										
Soil Ingestion	NA	NA	1.7E-04	1.3E-05	7.2E-05	9.5E-06	1.5E-06	7.2E-08	2.4E-05	1.5E-05
Dermal Contact	NA	NA	7.4E-07	1.6E-10	2.0E-08	2.7E-10	1.6E-10	2.0E-12	7.0E-08	4.3E-11
Total Risk	NA	NA	1.7E-04	1.3E-05	7.2E-05	9.5E-06	1.5E-06	7.2E-08	2.4E-05	1.5E-05
Lagoon Area										
Soil Ingestion	NA	NA	NA	NA	1.6E-04	5.3E-07	NA	NA	5.2E-05	8.5E-07
Dermal Contact	NA	NA	NA	NA	3.6E-05	3.0E-07	NA	NA	1.2E-04	4.9E-07
Total Risk	NA	NA	NA	NA	1.9E-04	8.4E-07	NA	NA	1.7E-04	1.3E-06

NA Not applicable
* Total Risk does not include exposure to surface water, due to the high pH of the quarry water (pH 12 or higher) exposure is not considered likely.

Table ES-1
Cancer Risk Estimates
Final Baseline Risk Assessment
Continental Steel Superfund Site
Kokomo, Indiana

	Kokomo and Wildcat Creeks											
	Recreational Visitors											
	Reach 1		***Reach 2***		***Reach 3***		***Reach 4***		***Reach 5***		***Reach 6***	
Exposure Pathway	***RME***	***CTE***	***RME***	***CTE***	***RME***	***CTE***	***RME***	***CTE***	***RME***	***CTE***	***RME***	***CTE***
Sediment Ingestion	1.6E-04	1.8E-06	3.4E-05	1.6E-06	1.4E-05	1.1E-06	1.2E-03	1.2E-06	1.9E-04	1.8E-06	7.6E-06	8.7E-07
Dermal Contact	8.6E-04	2.7E-06	1.8E-04	1.1E-06	7.5E-05	1.2E-06	6.8E-03	3.0E-06	1.1E-03	1.6E-06	4.5E-05	1.3E-06
Ingestion of Site-wide Surface Water	3.1E-07	7.6E-09	-	-	-	-	-	-	-	-	-	-
Total Risk [b]	1.0E-03	4.4E-06	2.1E-04	2.7E-06	8.8E-05	2.3E-06	8.0E-03	4.2E-06	1.2E-03	3.5E-06	5.3E-05	2.2E-06

NA Not applicable
[a] Total Risk does not include exposure to surface water, due to the high pH of the quarry water (pH 12 or higher) exposure is not considered likely.
[b] Total Risk does not include ingestion of surface water.

Table ES-2 Non Cancer Risk Estimates Final Baseline Risk Assessment Continental Steel Superfund Site Kokomo, Indiana										
Exposure Pathway by Operable Unit	Receptor									
	Current and Future Offsite Residents		Future Onsite Residents		Future Onsite Commercial/Industrial Workers		Future Onsite Construction Worker		Current and Future Onsite Trespasser	
	RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
Main Plant										
Soil Ingestion	2.7E+00	8.8E-01	NA	NA	1.1E+00	2.6E-02	1.6E+00	8.9E-03	1.1E+00	3.8E-02
Dermal Contact	0E+00	0E+00	NA	NA	2.3E-01	1.1E-02	1.4E-01	3.7E-3	2.4E+00	1.7E-2
Total Risk	2.7E+00	8.8E-01	NA	NA	1.3E+00	3.7E-02	1.7E+00	1.3E-02	3.5E+00	5.6E-02
Markland Avenue Quarry										
Soil Ingestion	2.78E+00	9.08E-01	6.37E+00	1.49E+00	5.20E-01	1.48E-01	7.89E-01	5.15E-02	5.41E-01	1.10E-01
Dermal Contact	NC	NC	7.70E-01	3.04E-02	2.48E-02	5.95E-03	1.49E-02	1.97E-03	2.67E-01	9.13E-03
Surface Water Ingestion	-	-	-	-	-	-	-	-	1.05E-01	-
Dermal Contact with Surface Water	-	-	-	-	-	-	-	-	4.86E-01	-
Total Risk *	2.8E+00	9.1E-01	7.1E+00	1.5E+00	5.4E-01	1.5E-01	8.0E-01	5.3E-02	5.9E-01	1.2E-01
Slag Processing Area										
Soil Ingestion	NA	NA	8.9E+00	2.3E+00	7.3E-01	2.2E-01	1.1E+00	7.6E-02	7.6E-01	3.3E-01
Dermal Contact	NA	NA	3.9E-03	2.8E-06	1.3E-04	1.1E-06	7.6E-05	1.9E-07	1.4E-03	8.4E-07
Total Risk	NA	NA	8.9E+00	2.3E+00	7.3E-01	2.2E-01	1.1E+00	7.6E-02	7.6E-01	3.3E-01
Lagoon Area										
Soil Ingestion	NA	NA	NA	NA	2.9E+00	3.0E-02	NA	NA	3.8E+00	5.7E-02
Dermal Contact	NA	NA	NA	NA	5.7E-01	7.0E-03	NA	NA	6.1E+00	1.1E-02
Total Risk	NA	NA	NA	NA	3.5E+00	3.7E-02	NA	NA	1.0E+01	6.7E-02

NA Not applicable

* Total Risk does not include exposure to surface water, due to the high pH of the quarry water (pH 12 or higher) exposure is not considered likely.

Table ES-2
Non Cancer Risk Estimates
Final Baseline Risk Assessment
Continental Steel Superfund Site
Kokomo, Indiana

	Kokomo and Wildcat Creeks											
	Recreational Visitors											
	Reach 1		Reach 2		Reach 3		Reach 4		Reach 5		Reach 6	
Exposure Pathway	RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
Sediment Ingestion	2.1E+01	4.8E-02	4.5E+00	2.7E-02	1.6E+00	2.0E-02	1.1E+02	2.3E-02	1.5E+01	2.8E-02	5.3E-01	1.4E-02
Dermal Contact	1.2E+01	8.6E-03	2.3E+00	1.8E-3	8.2E-01	2.1E-03	6.4E+01	4.4E-03	8.25E+00	1.3E-03	2.3E-01	1.0E-03
Total Risk [b]	3.3E+01	5.7E-02	6.9E+00	2.8E-02	2.4E+00	2.2E-02	1.7E+02	2.8E-02	2.3E+01	3.0E-02	7.6E-01	1.0E-02

	Kokomo and Wildcat Creeks	
	Recreational Visitors	
Exposure Pathway	RME	CTE
Ingestion of Site-wide Surface Water (All Reaches)	4.1E-02	1.9E-3

NA Not applicable
[a] Total Risk does not include exposure to surface watei, due to the high pH of the quarry water (pH 12 or higher) exposure is not considered likely.
[b] Total Risk does not include ingestion of surface water.

APPENDIX D

Phase II Remedial Investigation Sampling Result Tables

Table MM-1S SIDE-WIDE GROUNDWATER Shallow Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1,1-Trichloroethane	5	28	1 - 43
1,1,2-Trichloroethane	1	28	1 - 1
1,1-Dichloroethane	5	28	1 - 5
1,1-Dichloroethene	11	28	1 - 7
1,2-Dichloroethane	1	28	2000 - 2000
1,2-Dichloroethene (total)	3	3	200 - 400
Acetone	4	28	3 - 4
Benzene	4	28	1 - 1
Chloroform	3	28	1 - 19
cis-1,2-Dichloroethene	19	25	1 - 880
m&p-Xylene	1	25	1 - 1
Methylene Chloride	3	28	1 - 1
o-Xylene	1	25	2 - 2
Tetrachloroethene	9	28	1 - 1900
trans-1,2-Dichloroethene	13	25	1 - 7
Trichloroethene	17	28	1 - 2000
Vinyl Chloride	13	28	1 - 110
Group: SVOCs (µg/L)			
1,2,4-Trimethylbenzene	1	25	9 - 9
1,3,5-Trimethylbenzene	1	25	4 - 4
1,4-Dichlorobenzene	1	28	2 - 2
bis(2-Ethylhexyl)phthalate	2	3	2 - 8
di-n-Butylphthalate	1	3	2 - 2
Group: PAHs (µg/L)			
Naphthalene	2	28	1 - 16
Pyrene	1	3	.5 - .5
Group: PCBs (µg/L)			
Aroclor-1242	2	6	1.6 - 4.5
Aroclor-1248	2	6	5.8 - 6.4
Group: Pesticides (µg/L)			

Table MM-1S SIDE-WIDE GROUNDWATER Shallow Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
alpha-Chlordane	2	3	.081 - .09
Group: Inorganics (mg/L)			
Aluminum	4	4	.344 - .775
Aluminum, Dissolved	7	29	.082 - .923
Antimony, Dissolved	2	29	.002 - .006
Arsenic	3	4	.003 - .013
Arsenic, Dissolved	8	29	.004 - .014
Barium	4	4	.099 - .169
Barium, Dissolved	28	29	.018 - .358
Cadmium	3	4	.0003 - .0031
Cadmium, Dissolved	3	29	.0004 - .0007
Calcium	4	4	131 - 235
Calcium, Dissolved	29	29	13 - 620
Chromium, Dissolved	3	29	.017 - .066
Cobalt, Dissolved	3	29	.007 - .13
Copper	2	4	.015 - .016
Copper, Dissolved	16	29	.006 - .015
Iron	4	4	7.58 - 12.5
Iron, Dissolved	21	29	.083 - 3050
Lead	4	4	.009 - .03
Lead, Dissolved	1	29	.12 - .12
Magnesium	4	4	28 - 49
Magnesium, Dissolved	28	29	11 - 236
Manganese	4	4	.879 - 1.77
Manganese, Dissolved	29	29	.009 - 38.7
Mercury	13	29	.0001 - .0003
Nickel, Dissolved	7	29	.021 - .875
Potassium	1	4	5.24 - 5.24
Potassium, Dissolved	17	29	6 - 79
Sodium	4	4	45 - 127
Sodium, Dissolved	29	29	19 - 456
Vanadium	2	4	.009 - .011
Vanadium, Dissolved	6	29	.008 - .012
Zinc	3	4	.058 - .246

Table MM-1S SIDE-WIDE GROUNDWATER Shallow Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Zinc, Dissolved	7	29	.045 - .621
Group: Miscellaneous (mg/L)			
Alkalinity	4	4	310 - 620
Chloride	27	29	32 - 265
Nitrate/Nitrite Nitrogen	3	4	.65 - 4.89
Sulfate	4	4	70 - 182
Total Phosphorous	4	4	.07 - .53

Table MM-11 SIDE-WIDE GROUNDWATER Intermediate Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1,1-Trichloroethane	3	33	1 - 18
1,1-Dichloroethane	9	33	1 - 55
1,1-Dichloroethene	11	33	1 - 7
1,2-Dichloroethene (total)	1	1	2000 - 2000
Acetone	3	29	5 - 14
Acrylonitrile	5	28	19 - 140
Benzene	2	33	1 - 1
Carbon Disulfide	1	29	3 - 3
Chloromethane	1	29	1 - 1
cis-1,2-Dichloroethene	31	32	1 - 1900
Ethylbenzene	1	33	1 - 1
m&p-Xylene	3	32	1 - 4
Methylene Chloride	4	33	1 - 1
o-Xylene	1	32	1 - 1
Styrene	3	29	1 - 11
Tetrachloroethene	2	33	76 - 99
Toluene	1	33	1 - 1
trans-1,2-Dichloroethene	16	32	1 - 29
Trichloroethene	18	33	1 - 5100
Vinyl Chloride	22	29	1 - 150
Group: SVOCs (µg/L)			
Hexachlorobutadiene	1	28	1 - 1
Group: Inorganics (mg/L)			
Aluminum, Dissolved	6	27	.082 - .144
Antimony, Dissolved	5	27	.002 - .004
Arsenic, Dissolved	9	27	.003 - .008
Barium, Dissolved	27	27	.012 - .278
Calcium, Dissolved	27	27	3 - 427
Chromium, Dissolved	1	27	.048 - .048
Cobalt, Dissolved	2	27	.019 - .019
Copper, Dissolved	12	27	.006 - .012

Table MM-1I SIDE-WIDE GROUNDWATER Intermediate Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Iron, Dissolved	24	27	.213 - 13.9
Magnesium, Dissolved	26	27	3 - 248
Manganese, Dissolved	25	27	.006 - 1.04
Mercury	1	27	.0006 - .0006
Nickel, Dissolved	4	27	.032 - .272
Potassium, Dissolved	18	27	5 - 53
Sodium, Dissolved	27	27	16 - 144
Vanadium, Dissolved	2	27	.016 - .016
Zinc, Dissolved	4	27	.05 - .622
Group: **Miscellaneous** (mg/L)			
Chloride	27	28	24 - 211

Table MM-1L SIDE-WIDE GROUNDWATER Lower Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethane	3	15	1 - 1
1,1-Dichloroethene	4	15	1 - 2
1,2-Dibromoethane	1	11	1 - 1
Acetone	1	11	18 - 18
Acrylonitrile	6	11	8 - 150
Carbon Disulfide	2	11	1 - 2
Chloroform	2	14	1 - 1
Chloromethane	1	14	1 - 1
cis-1,2-Dichloroethene	15	16	1 - 4700
m&p-Xylene	1	15	1 - 1
Methylene Chloride	2	16	1 - 4.5
Styrene	2	14	1 - 6
Tetrachloroethene	1	15	130 - 130
trans-1,2-Dichloroethene	6	16	1 - 4
Trichloroethene	9	16	1 - 160
Vinyl Chloride	8	15	1 - 330
Group: PAHs (µg/L)			
Naphthalene	1	14	1 - 1
Group: Inorganics (mg/L)			
Aluminum, Dissolved	4	11	.081 - .147
Antimony, Dissolved	2	11	.002 - .007
Aluminum, Dissolved	4	11	.081 - .147
Antimony, Dissolved	2	11	.002 - .007
Arsenic, Dissolved	2	11	.002 - .003
Barium, Dissolved	11	11	.033 - .159
Cadmium, Dissolved	3	11	.0003 - .0003
Calcium, Dissolved	11	11	13 - 167
Chromium, Dissolved	1	11	.016 - .016
Copper, Dissolved	5	11	.007 - .014
Iron, Dissolved	9	11	.128 - 1.09
Magnesium, Dissolved	11	11	6 - 62

Table MM-1L SIDE-WIDE GROUNDWATER Lower Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Manganese, Dissolved	10	11	.009 - .135
Mercury	1	11	.0001 - .0001
Potassium, Dissolved	10	11	5 - 19
Selenium, Dissolved	1	11	.027 - .027
Sodium, Dissolved	11	11	23 - 107
Zinc, Dissolved	4	11	.048 - .062
Group: Miscellaneous (mg/L)			
Chloride	11	11	22 - 139

Table LA-1S LAGOON AREA Shallow Water-Bearing Zone Sample Results			
Parameters	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCS (µg/L)			
1,1-Dichloroethene	1	3	2 - 2
Acrylonitrile	1	3	8 - 8
Carbon Disulfide	1	3	1 - 1
Chloromethane	1	3	1 - 1
cis-1,2-Dichloroethene	3	3	4 - 630
Styrene	1	3	1 - 1
trans-1,2-Dichloroethene	1	3	3 - 3
Trichloroethene	2	3	1 - 160
Vinyl Chloride	3	3	1 - 25
Group: Inorganics (mg/L)			
Aluminum, Dissolved	2	3	.1 - .119
Antimony, Dissolved	1	3	.002 - .002
Barium, Dissolved	3	3	.033 - .159
Cadmium, Dissolved	1	3	.0003 - .0003
Calcium, Dissolved	3	3	69 - 160
Copper, Dissolved	2	3	.007 - .007
Iron, Dissolved	3	3	.128 - 1.09
Magnesium, Dissolved	3	3	32 - 51
Manganese, Dissolved	3	3	.009 - .135
Potassium, Dissolved	3	3	7 - 13
Sodium, Dissolved	3	3	33 - 64
Zinc, Dissolved	2	3	.056 - .062
Group: Miscellaneous (mg/L)			
Chloride	3	3	22 - 112

Table LA-1I LAGOON AREA Intermediate Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethane	2	6	1 - 2
1,1-Dichloroethene	4	6	1 - 4
Acrylonitrile	1	6	140 - 140
Carbon Disulfide	1	6	3 - 3
cis-1,2-Dichloroethene	6	6	2 - 1100
Styrene	1	6	11 - 11
trans-1,2-Dichloroethene	4	6	2 - 6
Trichloroethene	3	6	5 - 1300
Vinyl Chloride	5	6	2 - 110
Group: Inorganics (mg/L)			
Aluminum, Dissolved	2	6	.082 - .118
Antimony, Dissolved	3	6	.002 - .004
Barium, Dissolved	6	6	.018 - .278
Calcium, Dissolved	6	6	53 - 427
Chromium, Dissolved	1	6	.048 - .048
Copper, Dissolved	4	6	.007 - .011
Iron, Dissolved	5	6	.29 - 13.9
Magnesium, Dissolved	6	6	18 - 248
Manganese, Dissolved	6	6	.006 - .204
Nickel, Dissolved	1	6	.272 - .272
Potassium, Dissolved	3	6	8 - 47
Sodium, Dissolved	6	6	21 - 82
Vanadium, Dissolved	1	6	.016 - .016
Group: Miscellaneous (mg/L)			
Chloride	6	6	24 - 211

Table LA-1L LAGOON AREA Lower Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethane	1	7	3 - 3
1,1-Dichloroethene	2	7	2 - 7
1,2-Dichloroethene (total)	2	2	320 - 400
Acetone	1	7	4 - 4
Benzene	3	7	1 - 1
cis-1,2-Dichloroethene	5	5	4 - 410
Methylene Chloride	1	7	1 - 1
Tetrachloroethene	3	7	2 - 350
trans-1,2-Dichloroethene	4	5	1 - 7
Trichloroethene	7	7	1 - 710
Vinyl Chloride	4	7	1 - 110
Note: Volatile organic compounds were analyzed by two different laboratories, CLP and CRL. The CLP laboratory reported total 1,2-dichloroethene and CRL reported the individual isomers. Thus, both the total (CLP) and individual isomers (CRL) were reported in this range list.			
Group: BNAs (µg/L)			
1,4-Dichlorobenzene	1	5	2 - 2
Group: Inorganics (mg/L)			
Aluminum	2	2	.344 - .484
Aluminum, Dissolved	3	7	.103 - .923
Antimony, Dissolved	1	7	.002 - .002
Arsenic	1	2	.003 - .003
Arsenic, Dissolved	2	7	.007 - .009
Barium	2	2	.137 - .138
Barium, Dissolved	6	7	.018 - .129
Cadmium	2	2	.0003 - .0003
Cadmium, Dissolved	1	7	.0007 - .0007
Calcium	2	2	224 - 235
Calcium, Dissolved	7	7	13 - 620
Chromium, Dissolved	3	7	.017 - .066
Cobalt, Dissolved	1	7	.13 - .13
Copper, Dissolved	4	7	.01 - .015

Table LA-1L
LAGOON AREA
Lower Water-Bearing Zone Sample Results

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Group: Inorganics (mg/L)			
Iron	2	2	7.58 - 12.5
Iron, Dissolved	7	7	.111 - 3050
Lead	2	2	.009 - .011
Magnesium	2	2	45 - 49
Magnesium, Dissolved	7	7	35 - 236
Manganese	2	2	1.4 - 1.54
Manganese, Dissolved	7	7	.032 - 38.7
Mercury	2	7	.0001 - .0001
Nickel, Dissolved	5	7	.024 - .875
Potassium	1	2	5.24 - 5.24
Potassium, Dissolved	7	7	6 -32
Sodium	2	2	125 - 127
Sodium, Dissolved	7	7	95 - 456
Vanadium	1	2	.009 - .009
Vanadium, Dissolved	2	7	.008 - .008
Zinc	2	2	.15 - .246
Zinc, Dissolved	4	7	.045 - .491
Group: INDIC (mg/L)			
Alkalinity	2	2	460 - 460
Chloride	7	7	90 - 195
Nitrate/Nitrite Nitrogen	2	2	4.75 - 4.89
Sulfate	2	2	172 - 182
Total Phosphorous	2	2	.08 - .08

Table C-1S KOKOMO & WILDCAT CREEKS Shallow Water-Bearing Zone			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1,1-Trichloroethane	3	14	1 - 2
1,1-Dichloroethane	4	14	1 - 3
1,1-Dichloroethene	8	14	1 - 7
1,2-Dichloroethane	1	14	2000 - 2000
Acetone	2	14	3 - 4
Benzene	3	14	1 - 1
Chloroform	1	14	1 - 1
cis-1,2-Dichloroethene	13	14	1 - 880
Methylene Chloride	1	14	1 - 1
Tetrachloroethene	6	14	4 - 600
trans-1,2-Dichloroethene	9	14	1 - 5
Trichloroethene	9	14	1 - 2000
Vinyl Chloride	9	14	17 - 110
Group: SVOCs (µg/L)			
1,4-Dichlorobenzene	1	15	2 - 2
di-n-Butylphthalate	1	1	2 - 2
Group: PAHs (µg/L)			
Naphthalene	1	15	1 - 1
Pyrene	1	1	.5 - .5
Group: Inorganics (mg/L)			
Aluminum	1	1	.775 - .775
Aluminum, Dissolved	3	15	.101 - .923
Arsenic	1	1	.013 - .013
Arsenic, Dissolved	6	15	.004 - .009
Barium	1	1	.169 - .169
Barium, Dissolved	14	15	.025 - .181
Cadmium	1	1	.0031 - .0031
Cadmium, Dissolved	1	15	.0004 - .0004
Calcium	1	1	131 - 131
Calcium, Dissolved	15	15	13 - 548
Chromium, Dissolved	3	15	.017 - .066

Table C-1S
KOKOMO & WILDCAT CREEKS
Shallow Water-Bearing Zone

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Cobalt, Dissolved	3	15	.007 - .13
Copper	1	1	.016 - .016
Copper, Dissolved	7	15	.006 - .015
Iron	1	1	10.8 - 10.8
Iron, Dissolved	14	15	.086 - 3050
Lead	1	1	.017 - .017
Magnesium	1	1	28 - 28
Magnesium, Dissolved	15	15	23 - 236
Manganese	1	1	1.77 - 1.77
Manganese, Dissolved	15	15	.027 - 38.7
Mercury	6	15	.0001 - .0001
Nickel, Dissolved	3	15	.055 - .875
Potassium, Dissolved	8	15	6 - 32
Sodium	1	1	75 - 75
Sodium, Dissolved	15	15	34 - 456
Vanadium, Dissolved	3	15	.009 - .012
Zinc	1	1	.058 - .058
Zinc, Dissolved	4	15	.061 - .491
Note: Several dissolved metals (calcium magnesium, manganese, sodium and zinc) are listed as having greater concentrations than the total than the total concentration for the same metal. This discrepancy occurs because only one sample was analyzed for the total metal versus 15 samples analyzed for the dissolved metal.			
Group: Miscellaneous (mg/L)			
Alkalinity	1	1	310 - 310
Chloride	14	15	48 - 214
Sulfate	1	1	94 - 94
Total Phosphorous	1	1	.53 - .53

Table MAQ-1 MARKLAND AVENUE QUARRY Surface Water Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
Trichloroethene	13	13	13 - 3400
Methylene Chloride	3	13	8.6 - 19
cis-1,2-Dichloroethene	3	13	34 - 41
Group: Inorganics (mg/L)			
Arsenic, Total	1	13	.054 - .054
Barium, Total	11	13	.048 - .68
Zinc, Total	3	13	.02 - .12

Table MAQ-2 MARKLAND AVENUE QUARRY Pond Sediment Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/kg)			
1,1-Dichloroethene	2	9	26 - 100
1,2-Dichloroethane	1	9	2 - 2
Benzene	2	9	20 - 28
Chlorobenzene	1	9	30 - 30
Ethylbenzene	4	9	5.1 - 4000
m&p-Xylene	3	9	5.7 - 330
o-Xylene	5	9	5.4 - 3400
Tetrachloroethene	3	9	5.8 - 75
Toluene	5	9	8 - 8600
Trichloroethene	9	9	260 - 200,000
Methylene Chloride	1	9	12 - 12
cis-1,2-Dichloroethene	5	9	6.8 - 260
trans-1,2-Dichloroethene	1	9	38 - 38
Group: PAHs (µg/kg)			
Acenaphthene	2	9	3100 - 3800
Acenaphthylene	2	9	3000 - 3900
Anthracene	2	9	2500 - 3000
Benzo(a)pyrene	4	9	3700 - 14,000
Benzo(a)anthracene	6	9	11,000 - 30,000
Benzo(b&k)fluoranthene	6	9	6000 - 24,000
Benzo(g,h,i)perylene	2	9	7400 - 8200
Fluoranthene	5	9	2500 - 9900
Fluorene	2	9	4300 - 5400
Indeno(1,2,3-cd)pyrene	3	9	15,000 - 28,000
Chrysene	3	9	22,000 - 28,000
Phenanthrene	5	9	2000 - 9300
Group: PCBs (µg/kg)			
Aroclor-1242	3	9	900 - 3300
Aroclor-1248	5	9	700 - 5100

Table MAQ-2 MARKLAND AVENUE QUARRY Pond Sediment Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: Inorganics (mg/kg)			
Arsenic, Total	7	9	13 - 73
Barium, Total	9	9	140 - 300
Cadmium, Total	9	9	5 - 18
Chromium, Total	9	9	33 - 190
Copper, Total	9	9	38 - 310
Lead, Total	9	9	500 - 1300
Nickel, Total	9	9	11 - 120
Zinc, Total	9	9	160 - 2900
Group: Miscellaneous (%)			
Percent Solids	9	9	45 - 79.8

Table MAQ-3 MARKLAND AVENUE QUARRY Surface Soil Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: PAHs (µg/kg)			
Acenaphthylene	1	29	1600 - 1600
Anthracene	3	29	2100 - 4200
Benzo(a)pyrene	3	29	4600 - 7600
Benzo(a)anthracene	3	29	11,000 - 18,000
Benzo(b&k)fluoranthene	4	29	5100 - 17,000
Group: PAHs (µg/kg) (Continued)			
Benzo(g,h,i)perylene	4	29	3100 - 7100
Dibenzo(a,h)anthracene	1	29	22,000 - 22,000
Fluoranthene	4	29	2800 - 5300
Indeno(1,2,3-cd)pyrene	3	29	16,000 - 24,000
Chrysene	4	29	16,000 - 27,000
Phenanthrene	3	29	1800 - 4400
Group: PCBs (µg/kg)			
Aroclor-1248	6	29	670 - 16,000
Group: Inorganics (mg/kg)			
Arsenic, Total	29	29	42 - 140
Barium, Total	29	29	20 - 690
Cadmium, Total	24	29	4 - 36
Chromium, Total	29	29	10 - 2800
Copper, Total	28	29	29 - 1100
Lead, Total	28	29	77 - 2400
Nickel, Total	29	29	19 - 850
Zinc, Total	29	29	63 - 41,000
Group: Miscellaneous (%)			
Percent Solids	29	29	67.1 - 95.7

Table MAQ-4 MARKLAND AVENUE QUARRY Residential Surface Soil Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: PAHs (µg/kg)			
Benzo(g,h,i)perylene.	1	12	3000 - 3000
Dibenzo(a,h)anthracene	1	12	15,000 - 15,000
Fluoranthene	2	12	2600 - 3100
Group: PCBs (µg/kg)			
Aroclor-1248	2	12	650 - 680
Group: Inorganics (mg/kg)			
Arsenic, Total	13	13	43 - 74
Barium, Total	13	13	46 - 130
Cadmium, Total	3	13	4 - 6
Chromium, Total	13	13	16 - 38
Copper, Total	11	13	20 - 57
Lead, Total	12	13	44 - 180
Nickel, Total	13	13	17 - 93
Zinc, Total	13	13	72 - 370
Group: Miscellaneous (%)			
Percent Solids	13	13	77 - 85.9

Table MAQ-5 MARKLAND AVENUE QUARRY Soil Gas Analytical Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (mg/m^3)			
1,1-dichloroethene	6	77	1 - 32
Cis-1,2-dichloroethene	19	77	1 - 1980
Trans-1,2-dichloroethene	6	77	2 - 17
Trichloroethene	34	77	1 - 4530
Vinyl chloride	5	77	1 - 290

Table MAQ-6 MARKLAND AVENUE QUARRY Groundwater Screening Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1,1-Trichloroethane	3	8	590 - 1200
1,2-Dichloroethane	2	8	560 - 700
cis-1,2-Dichloroethene	6	8	6.7 - 33,000
Benzene	1	8	20 - 20
Chlorobenzene	1	8	18 - 18
Ethylbenzene	1	8	18 - 18
Methylene Chloride	1	8	250 - 250
Toluene	1	8	22 - 22
Trichloroethene	7	8	6.6 - 3000
m&p-Xylene	1	8	20 - 20
o-Xylene	3	8	8 - 55

Table MAQ-7S
MARKLAND AVENUE QUARRY
Shallow Water-Bearing Zone Sample Results

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Group: VOCs (µg/L)			
1,1-Dichloroethene	1	4	1 - 1
Acetone	1	4	3 - 3
Benzene	1	4	1 - 1
cis-1,2-Dichloroethene	1	4	150 - 150
m&p-Xylene	1	4	1 - 1
Methylene Chloride	1	4	1 - 1
o-Xylene	1	4	2 - 2
trans-1,2-Dichloroethene	1	4	5 - 5
Trichloroethene	1	4	440 - 440
Vinyl Chloride	1	4	4 - 4
Group: SVOCs (µg/L)			
1,2,4-Trimethylbenzene	1	4	9 - 9
1,3,5-Trimethylbenzene	1	4	4 - 4
Group: PAHs (µg/L)			
Naphthalene	1	4	16 - 16
Group: Inorganics (mg/L)			
Aluminum, Dissolved	2	4	.082 - .646
Antimony, Dissolved	1	4	.006 - .006
Barium, Dissolved	4	4	.039 - .358
Cadmium, Dissolved	1	4	.0004 - .0004
Calcium, Dissolved	4	4	87 - 205
Copper, Dissolved	2	4	.013 - .013
Iron, Dissolved	1	4	.083 - .083
Lead, Dissolved	1	4	.12 - .12
Magnesium, Dissolved	3	4	11 - 25
Manganese, Dissolved	4	4	.01 - .07
Mercury	2	4	.0002 - .0003
Nickel, Dissolved	1	4	.021 - .021

Table MAQ-7S MARKLAND AVENUE QUARRY Shallow Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Potassium, Dissolved	1	4	79 - 79
Sodium, Dissolved	4	4	61 - 139
Zinc, Dissolved	1	4	.621 - .621
Group: Miscellaneous (mg/L)			
Chloride	3	4	51 - 265

Table MAQ-7I MARKLAND AVENUE QUARRY Intermediate Water-bearing Zone Sample Reults			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethene	1	5	3 - 3
Acetone	1	4	14 - 14
Benzene	1	5	1 - 1
Chloromethane	1	4	1 - 1
cis-1,2-Dichloroethene	4	5	44 - 1400
Group: VOCs (µg/L) (Continued)			
m&p-Xylene	1	5	1 - 1
Toluene	1	5	1 - 1
trans-1,2-Dichloroethene	3	5	12 - 29
Trichloroethene	4	5	11 - 720
Vinyl Chloride	2	4	3 - 5
Group: Inorganics (mg/L)			
Aluminum, Dissolved	1	4	.101 - .101
Antimony, Dissolved	1	4	.002 - .002
Arsenic, Dissolved	1	4	.003 - .003
Barium, Dissolved	4	4	.012 - .106
Calcium, Dissolved	4	4	3 - 102
Copper, Dissolved	2	4	.007 - .009
Iron, Dissolved	2	4	.266 - .347
Magnesium, Dissolved	3	4	3 - 31
Manganese, Dissolved	2	4	.027 - .049
Potassium, Dissolved	2	4	7 - 53
Sodium, Dissolved	4	4	16 - 72
Group: Miscellaneous (mg/L)			
Chloride	4	4	29 - 107

Table MAQ-7L MARKLAND AVENUE QUARRY Lower Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
Acetone	1	2	18 - 18
Acrylonitrile	2	2	21 - 85
Carbon Disulfide	1	2	2 - 2
cis-1,2-Dichloroethene	1	2	19 - 19
Group: VOCs (µg/L) (Continued)			
m&p-Xylene	1	2	1 - 1
Styrene	1	2	6 - 6
trans-1,2-Dichloroethene	1	2	1 - 1
Trichloroethene	1	2	62 - 62
Group: PAHs (µg/L)			
Naphthalene	1	2	1 - 1
Group: Inorganics (mg/L)			
Barium, Dissolved	2	2	.038 - .114
Calcium, Dissolved	2	2	13 - 104
Chromium, Dissolved	1	2	.016 - .016
Iron, Dissolved	1	2	.261 - .261
Magnesium, Dissolved	2	2	6 - 37
Manganese, Dissolved	1	2	.014 - .014
Potassium, Dissolved	1	2	11 - 11
Sodium, Dissolved	2	2	23 - 36
Group: Miscellaneous (mg/L)			
Chloride	2	2	51 - 65

Table MP-1 MAIN PLANT Wipe Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: SVOCs (µg/ft²)			
Phenol	1	21	1500 - 1500
bis(2-Ethylhexyl)phthalate	1	21	770 - 770
di-n-Octylphthalate	1	21	710 - 710
Group: PCBs (µg/ft²)			
Aroclor-1248	6	21	1.1 - 106
Aroclor-1260	1	21	1.4 - 1.4
Group: Inorganics (µg/ft²)			
Arsenic	21	21	16 - 190
Barium	21	21	6.7 - 730
Cadmium	21	21	1.1 - 36
Chromium	21	21	4.3 - 1100
Copper	21	21	34 - 4600
Lead	21	21	11 - 100,000
Nickel	21	21	17 - 530
Zinc	21	21	120 - 24,000

Table MP-2
MAIN PLANT
Basement Sample Results

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Group: VOCs (µg/L)			
1,2-Dichloroethene (total)	1	3	3 - 3
cis-1,2-Dichloroethene	2	19	22 - 370
Trichloroethene	2	22	28 - 31
Note: Volatile organic compounds were analyzed by two different laboratories, CLP and FASP. The CLP laboratory reported total 1,2-dichloroethene and FASP reported the individual 1,2-dichloroethene isomers. Thus, both the total individual isomers were reported in this list.			
Group: PAHs (µg/L)			
Acenaphthene	2	24	84 - 390
Acenaphthylene	4	24	34 - 5200
Anthracene	4	24	52 - 330
Group: PAHs (µg/L) (Continued)			
Benzo(a)anthracene	3	24	340 - 390
Benzo(a)pyrene	4	24	80 - 410
Benzo(b&k)fluoranthene	5	21	300 - 41,000
Benzo(g,h,i)perylene	3	24	490 - 3000
Chrysene	2	24	680 - 680
Dibenzo(a,h)anthracene	4	24	460 - 980
Fluoranthene	4	24	83 - 1500
Fluorene	4	24	52 - 260
Indeno(1,2,3-cd)pyrene	2	24	640 - 900
Naphthalene	1	24	420 - 420
Phenanthrene	4	24	53 - 230
Pyrene	4	24	130 - 650
Group: PCBs (µg/L)			
Aroclor-1242	1	23	11 - 11
Group: Inorganics (mg/L)			
Aluminum	1	3	.156 - .156
Arsenic	2	23	.061 - .1
Barium	20	23	.0135 - .11
Cadmium	1	23	.02 - .02

Table MP-2 MAIN PLANT Basement Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Calcium	3	3	24.3 - 57.5
Chromium	2	23	.028 - .05
Copper	8	23	.0099 - .2
Iron	3	3	1.14 - 2.11
Lead	4	23	.002 - .1
Magnesium	3	3	1.58 - 3.41
Manganese	3	3	.201 - .215
Nickel	9	23	.02 - .22
Potassium	3	3	5.25 - 7.32
Sodium	3	3	4.04 - 8.95
Zinc	23	23	.0063 - 12

Table MP-3 MAIN PLANT Sewer Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/kg)			
2-Butanone	2	2	13 - 43
Acetone	2	2	61 - 200
Chlorobenzene	1	8	280 - 280
Chloroform	1	2	6 - 6
cis-1,2-Dichloroethene	1	6	230 - 230
Ethylbenzene	3	8	5 - 410
o-Xylene	1	6	1000 - 1000
Tetrachloroethene	1	8	17 - 17
Toluene	2	8	2 - 18
Total Xylenes	2	2	30 - 300
Trichloroethene	1	8	2600 - 2600
Group: SVOCs (µg/kg)			
di-n-Butylphthalate	1	2	970 - 970
2-Methylnaphthalene	2	2	6500 - 6700
Group: PAHs (µg/kg)			
Acenaphthene	2	7	2400 - 2900
Acenaphthylene	1	7	1000 - 1000
Anthracene	1	7	2000 - 2000
Benzo(a)anthracene	1	7	13,000 - 13,000
Benzo(a)pyrene	3	7	6000 - 12,000
Benzo(b&k)fluoranthene	3	5	7300 - 62,000
Benzo(g,h,i)perylene	3	7	5400 - 16,000
Chrysene	2	7	21,000 - 29000
Dibenzo(a,h)anthracene	1	7	18,000 - 18,000
Fluoranthene	2	7	2600 - 6300
Fluorene	2	7	640 - 4200
Indeno(123-cd)pyrene	1	7	20,000 - 20,000
Naphthalene	3	7	4200 - 24,000
Phenanthrene	1	7	7700 - 7700
Pyrene	3	7	3000 - 15,000

Table MP-3 MAIN PLANT Sewer Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: PCBs (µg/kg)			
Aroclor-1242	2	7	2100 - 25,000
Aroclor-1248	2	7	11,000 - 25,000
Aroclor-1254	1	7	25,000 - 25,000
Aroclor-1260	1	7	25,000 - 25,000
Group: Pesticides (µg/kg)			
4,4'-DDE	2	2	36 - 53
4,4'-DDT	1	2	16 - 16
Aldrin	2	2	20 - 22
alpha-BHC	2	2	21 - 30
Endrin	2	2	49 - 61
Group: Inorganics (mg/kg)			
Aluminum	2	2	6660 - 7520
Antimony	2	2	32.1 - 33.3
Arsenic	9	9	7.3 - 220
Barium	9	9	53 - 800
Beryllium	2	2	.66 - .68
Cadmium	8	9	5 - 53.1
Calcium	2	2	42,900 - 46,500
Chromium	8	9	22 - 704
Cobalt	2	2	12.6 - 14.8
Copper	9	9	55 - 1330
Iron	2	2	123,000 - 129,000
Lead	9	9	6.1 - 8800
Magnesium	2	2	11,700 - 12,700
Manganese	2	2	4250 - 5280
Mercury	2	2	.22 - .33
Nickel	9	9	22 - 480
Potassium	2	2	865 - 916
Selenium	2	2	4.7 - 5.7
Silver	2	2	2.5 - 2.5
Sodium	2	2	383 - 755

Table MP-3 MAIN PLANT Sewer Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Thallium	2	2	6.7 - 7.1
Vanadium	2	2	48.8 - 54
Zinc	9	9	72 - 510,000
Miscellaneous (%)			
Percent Solids	7	7	60 - 82.1

Table MP-4ss MAIN PLANT Soil Borings (Surface) Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/kg)			
1,1-Dichloroethene	1	47	330 - 330
2-Butanone	1	12	8 - 8
Acetone	8	12	7 - 76
Carbon Disulfide	1	12	7 - 7
Ethylbenzene	2	47	3 - 8.1
m&p-Xylene	1	35	16 - 16
Methylene Chloride	18	47	1 - 39
Xylene	3	35	18 - 26
Tetrachloroethene	5	47	4 - 1600
Toluene	8	47	3 - 76
Total Xylenes	1	12	26 - 26
Trichloroethene	3	47	9.6 - 5600
Group: SVOCs (µg/kg)			
bis(2-Ethylhexyl)phthalate	3	9	96 - 180
Butylbenzylphthalate	2	9	20 - 120
di-n-Butylphthalate	4	9	22 - 55
Diethylphthalate	1	9	71 - 71
2,4-Dimethylphenol	1	9	62 - 62
2-Methylnaphthalene	4	9	28 - 260
Group: PAHs (µg/kg)			
Acenaphthene	3	44	28 - 260
Acenaphthylene	1	44	45 - 45
Anthracene	7	44	88 - 2100
Benzo(a)anthracene	10	44	23 - 16,000
Benzo(a)pyrene	12	44	21 - 8800
Benzo(b&k)fluoranthene	4	35	8800 - 15,000
Benzo(b)fluoranthene	9	9	34 - 1600
Benzo(g,h,i)perylene	6	44	38 - 4000
Benzo(k)fluoranthene	6	9	24 - 1100
Carbazole	3	9	21 - 130
Chrysene	12	44	27 - 30,000

Table MP-4ss
MAIN PLANT
Soil Borings (Surface) Sample Results

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Dibenzo(a,h)anthracene	5	44	150 - 20,000
Dibenzofuran	3	9	56 - 220
Fluoranthene	12	44	29 - 8000
Fluorene	6	44	35 - 2300
Indeno(123-cd)pyrene	7	44	31 - 21,000
Naphthalene	4	44	21 - 310
Phenanthrene	10	44	21 - 4000
Pyrene	13	44	33 - 16,000
Group: PCBs (µg/kg)			
Aroclor-1242	4	47	600 - 30,000
Aroclor-1248	11	47	110 - 30,000
Aroclor-1254	4	47	49 - 30,000
Aroclor-1260	1	47	300 - 30,000
Group: Pesticides (µg/kg)			
4,4'-DDD	1	12	9.4 - 9.4
4,4'-DDE	4	12	5.5 - 280
4,4'-DDT	2	12	3.8 - 18
Aldrin	2	12	3.9 - 1000
alpha-Chlordane	4	12	3.4 - 320
beta-BHC	2	12	2.4 - 360
Dieldrin	1	12	170 - 170
Endosulfan I	1	12	2 - 2
Endosulfan II	2	12	7.7 - 8
Endosulfan Sulfate	1	12	2.7 - 2.7
Endrin Aldehyde	1	12	7.5 - 7.5
Endrin Ketone	1	12	15 - 15
gamma-BHC (Lindane)	1	12	190 - 190
Heptachlor	3	12	8.8 - 280
Heptachlor	3	12	8.8 - 280
Methoxychlor	1	12	21 - 21
Group: Inorganics (mg/kg)			
Aluminum	10	10	4880 - 9920

Table MP-4ss MAIN PLANT Soil Borings (Surface) Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Antimony	5	10	2.6 - 37.1
Arsenic	44	46	5.4 - 89
Barium	46	46	18 - 580
Beryllium	10	10	.34 - 1.8
Cadmium	40	46	.82 - 83
Calcium	10	10	21,700 - 111,000
Chromium	46	46	6.3 - 2800
Cobalt	10	10	4.5 - 12.2
Copper	46	46	15 - 1300
Iron	10	10	19,700 - 78,800
Lead	44	46	42 - 39,000
Magnesium	10	10	8450 - 38,900
Manganese	10	10	484 - 12,800
Mercury	7	10	.06 - .81
Nickel	46	46	14 - 260
Potassium	9	10	191 - 1380
Selenium	9	10	.53 - 2.7
Silver	5	10	.65 - 11
Sodium	9	10	83.2 - 5710
Thallium	5	10	.43 - .68
Vanadium	10	10	19.1 - 113
Zinc	46	46	42 - 92,500
Group: Miscellaneous (%)			
Percent Solids	36	36	79 - 96

Table MP-4sd MAIN PLANT Soil Borings (Deep) Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/kg)			
1,1-Dichloroethene	2	34	2.1 - 170
2-Butanone	1	4	6 - 6
Acetone	4	4	15 - 46
Ethylbenzene	1	34	7 - 7
m&p-Xylene	1	30	17 - 17
Methylene Chloride	5	34	1 - 19
Xylene	2	30	26 - 230
Tetrachloroethene	2	34	7 - 25
Toluene	1	34	2 - 2
Total Xylenes	1	4	2 - 2
Trichloroethene	1	34	190 - 190
Group: SVOCs (µg/kg)			
bis(2-Ethylhexyl)phthalate	3	7	67 - 93
di-n-Butylphthalate	3	7	37 - 54
Diethylphthalate	1	7	350 - 350
Dimethylphthalate	1	7	120 - 120
Group: PAHs (µg/kg)			
Acenaphthene	2	37	88 - 2700
Anthracene	1	37	1500 - 1500
Benzo(a)anthracene	3	37	7100 - 14,000
Benzo(a)pyrene	2	37	4400 - 5800
Benzo(b&k)fluoranthene	3	30	7100 - 14,000
Benzo(g,h,i)perylene	1	37	2400 - 2400
Chrysene	2	37	26 - 11,000
Dibenzofuran	1	7	22 - 22
Fluoranthene	3	37	67 - 4600
Fluorene	2	37	38 - 2000
Indeno(123-cd)pyrene	1	37	22,000 - 22,000
Phenanthrene	4	37	40 - 4700
Pyrene	4	37	72 - 6300

Table MP-4sd
MAIN PLANT
Soil Borings (Deep) Sample Results

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Group: PCBs (µg/kg)			
Aroclor-1248	3	34	2700 - 9300
Group: Pesticides (µg/kg)			
beta-BHC	1	4	5.3 - 5.3
Group: Inorganics (mg/kg)			
Aluminum	6	6	8690 - 12,400
Antimony	1	6	.93 - .93
Arsenic	31	36	6.2 - 65
Barium	36	36	15 - 170
Beryllium	6	6	.51 - .82
Cadmium	16	36	.39 - 89
Calcium	6	6	3590 - 11,300
Chromium	36	36	6.3 - 890
Cobalt	6	6	7.7 - 12.4
Copper	33	36	11 - 900
Iron	6	6	17,100 - 26,300
Lead	28	36	7.1 - 3600
Magnesium	6	6	2760 - 4910
Manganese	6	6	435 - 1200
Mercury	2	6	.06 - .24
Nickel	36	36	13 - 160
Potassium	6	6	613 - 1590
Selenium	4	6	.23 - 1.4
Sodium	5	6	58.3 - 127
Thallium	4	6	.47 - 1.6
Vanadium	6	6	22.1 - 28.1
Zinc	36	36	37 - 4100
Group: Miscellaneous (%)			
Percent Solids	30	30	76 - 95

Table MP-5S MAIN PLANT Shallow Water-Bearing Zone			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1,1-Trichloroethane	1	9	1 - 1
1,1-Dichloroethene	3	9	3 - 3
1,2-Dichloroethane	1	9	2000 - 2000
Chloroform	1	9	19 - 19
cis-1,2-Dichloroethene	6	9	1 - 790
trans-1,2-Dichloroethene	3	9	3 - 5
Trichloroethene	3	9	1 - 2000
Vinyl Chloride	3	9	46 - 71
Group: SVOCs (µg/L)			
bis(2-Ethylhexyl)phthalate	2	3	2 - 8
di-n-Butylphthalate	1	3	2 - 2
Group: PAHs (µg/L)			
Naphthalene	1	12	1 - 1
Pyrene	1	3	.5 - .5
Group: PCBs (µg/L)			
Aroclor-1242	2	6	1.6 - 4.5
Aroclor-1248	2	6	5.8 - 6.4
Group: Pesticides (µg/L)			
alpha-Chlordane	2	3	.081 - .09
Group: Inorganics (mg/L)			
Aluminum	1	1	.775 - .775
Aluminum, Dissolved	1	10	.105 - .105
Antimony, Dissolved	1	10	.006 - .006
Arsenic	1	1	.013 - .013
Arsenic, Dissolved	4	10	.004 - .014
Barium	1	1	.169 - .169
Barium, Dissolved	10	10	.025 - .133
Cadmium	1	1	.0031 - .0031

Table MP-5S MAIN PLANT Shallow Water-Bearing Zone			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Cadmium, Dissolved	1	10	.0004 - .0004
Calcium	1	1	131 - 131
Calcium, Dissolved	10	10	87 - 229
Copper	1	1	.016 - .016
Copper, Dissolved	3	10	.01 - .014
Iron	1	1	10.8 - 10.8
Iron, Dissolved	8	10	.086 - 7.11
Lead	1	1	.017 - .017
Magnesium	1	1	28 - 28
Magnesium, Dissolved	10	10	18 - 84
Manganese	1	1	1.77 - 1.77
Manganese, Dissolved	10	10	.009 - 1.71
Mercury	5	10	.0001 - .0002
Nickel, Dissolved	1	10	.021 - .021
Potassium, Dissolved	4	10	6 - 9
Sodium	1	1	75 - 75
Sodium, Dissolved	10	10	19 - 105
Vanadium, Dissolved	2	10	.009 - .012
Zinc	1	1	.058 - .058
Zinc, Dissolved	2	10	.061 - .088
Group: Miscellaneous (mg/L)			
Alkalinity	1	1	310 - 310
Chloride	10	10	48 - 131
Sulfate	1	1	94 - 94
Total Phosphorous	1	1	.53 - .53

Table MP-5I
MAIN PLANT
Intermediate Water-Bearing Zone

Parameter	No. of Detects	No. of Samples Analyzed	Range of Concentrations Detected
Group: VOCs (µg/L)			
1,1-Dichloroethene	1	7	7 - 7
1,2-Dichloroethene (total)	1	1	2000 - 2000
Acetone	1	7	7 - 7
Acrylonitrile	2	6	19 - 34
cis-1,2-Dichloroethene	6	6	1 - 1900
Ethylbenzene	1	7	1 - 1
m&p-Xylene	1	6	4 - 4
Methylene Chloride	3	7	1 - 1
o-Xylene	1	6	1 - 1
Styrene	2	7	1 - 1
trans-1,2-Dichloroethene	2	6	3 - 15
Trichloroethene	4	7	13 - 5100
Vinyl Chloride	5	7	1 - 82
Note: Volatile organic compounds were analyzed by two different laboratories, CLP and FASP. The CLP laboratory reported total 1,2-dichloroethene and FASP reported the individual 1,2-dichloroethene isomers. Thus, both the total individual isomers were reported in this list.			
Group: SVOCs (µg/L)			
Hexachlorobutadiene	1	6	1 - 1
Group: Inorganics (mg/L)			
Arsenic, Dissolved	2	6	.003 - .003
Barium, Dissolved	6	6	.034 - .087
Calcium, Dissolved	6	6	100 - 174
Iron, Dissolved	6	6	.387 - 2.74
Magnesium, Dissolved	6	6	31 - 43
Manganese, Dissolved	6	6	.013 - .23
Nickel, Dissolved	1	6	.032 - .032
Potassium, Dissolved	3	6	5 -14
Sodium, Dissolved	6	6	21 - 53
Zinc, Dissolved	3	6	.05 - .622

Table MP-5I MAIN PLANT Intermediate Water-Bearing Zone			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: Miscellaneous (mg/L)			
Chloride	6	6	35 - 184
Group: VOCs (µg/L)			
1,1-Dichloroethene	1	2	2 - 2
Acrylonitrile	2	2	10 - 11
cis-1,2-Dichloroethene	2	2	1 - 700
Methylene Chloride	1	2	1 - 1
trans-1,2-Dichloroethene	1	2	3 - 3
Trichloroethene	1	2	5 - 5
Vinyl Chloride	1	2	330 - 330
Group: Inorganics (mg/L)			
Chloride	2	2	59 - 139
Barium, Dissolved	2	2	.058 - .141
Calcium, Dissolved	2	2	96 - 167
Iron, Dissolved	2	2	.155 - .903
Magnesium, Dissolved	2	2	39 - 62
Manganese, Dissolved	2	2	.014 - .025
Potassium, Dissolved	2	2	11 - 16
Sodium, Dissolved	2	2	42 - 47

Table MP-6 MAIN PLANT Residential Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: SVOCs (µg/kg)			
2-Methylnaphthalene	4	6	27 - 400
Group: PAHs (µg/kg)			
Anthracene	2	36	22 - 37
Benzo(a)anthracene	6	36	36 - 11,000
Benzo(a)pyrene	6	36	39 - 1400
Benzo(b&k)fluoranthene	2	30	4500 - 4800
Benzo(b)fluoranthene	6	6	61 - 200
Benzo(g,h,i)perylene	6	36	58 - 4300
Benzo(k)fluoranthene	6	6	45 - 220
Butylbenzylphthalate	2	6	23 - 28
Carbazole	1	6	74 - 74
Chrysene	5	36	57 - 250
di-n-Octylphthalate	1	6	410 - 410
Dibenzo(a,h)anthracene	1	36	16,000 - 16,000
Diethylphthalate	5	6	20 - 32
Fluoranthene	8	36	58 - 2200
Indeno(123-cd)pyrene	7	36	31 - 16,000
Phenanthrene	6	36	29 - 210
Pyrene	8	36	50 - 2600
Group: PCBs (µg/kg)			
Aroclor-1254	3	36	120 - 1100
Group: Pesticides (µg/kg)			
4,4'-DDE	2	6	3.6 - 3.7
4,4'-DDT	5	6	2.5 - 25
Aldrin	5	6	1.2 - 2.3
Endrin	2	6	4 - 4.4
Endrin Ketone	3	6	1.9 - 3.3
gamma-Chlordane	2	6	2.6 - 3
Heptachlor Epoxide	3	6	.94 - 1.6

Table MP-6 MAIN PLANT Residential Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: Inorganics (mg/kg)			
Aluminum	6	6	3250 - 10,600
Antimony	4	6	.81 - 2.6
Arsenic	37	37	7.1 - 86
Barium	37	37	10 - 550
Beryllium	6	6	.47 - .68
Cadmium	28	37	2 - 73
Calcium	6	6	2220 - 105,000
Chromium	37	37	7 - 110
Cobalt	6	6	6.2 - 13.9
Copper	33	37	20 - 2630
Iron	6	6	17,500 - 25,000
Lead	35	37	50 - 1500
Magnesium	6	6	2340 - 39,200
Manganese	6	6	428 - 1550
Mercury	6	6	.14 - .37
Nickel	37	37	7 - 69
Potassium	6	6	1270 - 1720
Selenium	1	6	1.2 - 1.2
Silver	4	6	.55 - 2.8
Sodium	3	6	85.1 - 109
Vanadium	6	6	15.6 - 26.9
Zinc	37	37	21 - 6700
Group: Miscellaneous (%)			
Percent Solids	31	31	68.1 - 96.7

Table SP-1 SLAG PROCESSING AREA Surface Soil Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/kg)			
Methylene Chloride	10	14	27 - 100
Group: SVOCs (µg/kg)			
4-Choro-3-methylphenol	1	3	12 - 12
1,2,4-Trichlorobenzene	1	3	2 - 2
2-Methylnaphthalene	1	3	5 - 5
di-n-Butylphthalate	1	3	16 - 16
Diethylphthalate	2	3	4 - 17
Group: PAHs (µg/kg)			
Acenaphthene	2	14	1 - 7
Anthracene	1	14	4 - 4
Benzo(a)pyrene	3	14	4 - 18
Benzo(b)fluoranthene	3	3	7 - 25
Benzo(g,h,i)xperylene	2	14	10 - 11
Benzo(k)fluoranthene	3	3	2 - 8
Chrysene	3	14	8 - 28
Fluoranthene	3	14	11 - 41
Ideno(1,2;3-cd)pyrene	2	14	7 - 8
Phenanthrene	2	14	29 - 34
Pyrene	2	14	30 - 42
Group: PCBs (µg/kg)			
Aroclor-1242	2	14	160 - 210
Aroclor-1254	3	14	12 - 72
Group: Pesticides (µg/kg)			
4,4'-DDE	1	3	1.5 - 1.5
Alpha-Chlordane	1	3	0.76 - 0.76
Heptachlor Epoxide	3	3	0.74 - 5.1
Methoxychlor	1	3	2 - 2

Table SP-1 SLAG PROCESSING AREA Surface Soil Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: Inorganics (.ng/L)			
Aluminum	3	3	16,800 - 20,900
Antimony	3	3	8.9 - 20.4
Arsenic	14	14	6 - 140
Barium	14	14	290 - 660
Beryllium	3	3	0.55 - 0.46
Cadmium	14	14	5.2 - 73
Calcium	3	3	137,000 - 206,000
Chromium	14	14	2770 - 4700
Cobalt	3	3	6.9 - 17.8
Copper	14	14	86 - 647
Iron	3	3	176,000 - 338,000
Lead	14	14	160 - 6800
Magnesium	3	3	32,400 - 41,100
Manganese	3	3	22,000 - 37,000
Mercury	3	3	0.24 - 0.32
Nickel	14	14	33 - 328
Potassium	1	3	135 - 135
Selenium	2	3	0.45 - 0.73
Silver	3	3	2.2 - 6.6
Sodium	3	3	295 - 423
Vanadium	3	3	179 - 234
Zinc	14	14	473 - 67,000
Group: Miscellaneous (%)			
Percent Solids	11	11	91.3 - 96.8

Table SP-2S SLAG PROCESSING AREA Shallow Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
cis-1,2-Dichloroethene	2	2	1 - 1
Group: Inorganics (mg/L)			
Arsenic, Dissolved	2	2	.004 - .005
Barium, Dissolved	2	2	.084 - .097
Calcium, Dissolved	2	2	108 - 115
Cobalt, Dissolved	2	2	.007 - .007
Copper, Dissolved	2	2	.006 - .008
Iron, Dissolved	2	2	.701 - .767
Magnesium, Dissolved	2	2	30 - 32
Manganese, Dissolved	2	2	.981 - 1.05
Mercury	1	2	.0001 - .0001
Sodium, Dissolved	2	2	57 - 61
Vanadium, Dissolved	1	2	.009 - .009
Group: Miscellaneous (mg/L)			
Chloride	1	2	24 - 24

Table SP-2I SLAG PROCESSING AREA Intermediate Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethane	2	3	2 - 4
1,1-Dichloroethene	1	3	2 - 2
cis-1,2-dichloroethene	3	3	76 -800
m&p-Xylene	1	3	1 - 1
trans-1,2-Dichloroethene	2	3	1 - 3
Trichloroethene	2	3	110 - 140
Vinyl Chloride	3	3	8 - 34
Group: Inorganics (mg/L)			
Arsenic, Dissolved	3	3	.003 - .004
Barium, Dissolved	3	3	.04 - .083
Calcium, Dissolved	3	3	137 - 166
Cobalt, Dissolved	2	3	.019 - .019
Iron, Dissolved	3	3	1.74 - 2.19
Magnesium, Dissolved	3	3	36 - 47
Manganese, Dissolved	3	3	.139 - .38
Nickel, Dissolved	2	3	.052 - .056
Potassium, Dissolved	3	3	6 - 14
Sodium, Dissolved	3	3	53 - 83
Group: Miscellaneous (mg/L)			
Chloride	3	3	110 - 115

Table SP-2L SLAG PROCESSING AREA Lower Water-Bearing Zone Sample Results			
Parameter	**No. of Detects**	**No. of Samples Analyzed**	**Range of Concentrations Detected**
Group: VOCs (µg/L)			
1,1-Dichloroethane	1	1	1 - 1
Acrylonitrile	1	1	150 - 150
cis-1,2-Dichloroethene	1	1	2 - 2
Group: Inorganics (mg/L)			
Barium, Dissolved	1	1	.062 - .062
Calcium, Dissolved	1	1	102 - 102
Iron, Dissolved	1	1	.525 - .525
Magnesium, Dissolved	1	1	35 - 35
Manganese, Dissolved	1	1	.026 - .026
Potassium, Dissolved	1	1	6 - 6
Sodium, Dissolved	1	1	38 - 38
Group: Miscellaneous (%)			
Chloride	1	1	59 - 59

APPENDIX E

Responsiveness Summary

RESPONSIVENESS SUMMARY

CONTINENTAL STEEL SUPERFUND SITE

KOKOMO, HOWARD COUNTY, INDIANA

PURPOSE

This responsiveness summary has been prepared to meet the requirements of Sections 13(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1986 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the Indiana Department of Environmental Management (IDEM) to respond to each of the significant comments, criticisms, and data submitted in written and oral presentations on the proposed plan for remedial action. The responsiveness summary provides a summary of citizens' comments and concerns identified and received during the public comment period, and IDEM responses to those comments and concerns. All comments received by IDEM during the public comment period were considered in the selection of the remedial alternatives for the six operable units of the Continental Steel Corporation Superfund Site. The responsiveness summary serves two purposes: it summarizes community preferences and concerns regarding the remedial alternatives, and it shows members of the community how their comments were incorporated into the decision-making process.

This document summarizes written and oral comments received during the Proposed Plan Summary public comment period of February 25 to March 24, 1998 and the extended public comment period of April 20 to May 19, 1998 due to the later release of the Administrative Proposed Plan. Some of the comments have been paraphrased to efficiently present them in this document. The Proposed Plan public meeting was held from 7:00-9:00 p.m. on Thursday, March 5, 1998 in the Ralph W. Neal Council Chambers of the Kokomo City Hall, Kokomo, Howard County, Indiana. A full transcript of the public meeting, as well as all site related documents, are available at the Information Repository, located in the Reference Section at the Kokomo/Howard County Public Library, 220 North Union Street, Kokomo, Indiana. Comments and questions were received during the public meeting from several residents and political officials. Additionally, comments were received through conventional and electronic mail and orally through a special toll-free voice-mail system by IDEM.

OVERVIEW

The proposed remedial alternatives for the six operable units associated with the Continental Steel Superfund Site were announced to the public just prior to the beginning of the public comment period. IDEM proposed the following alternatives for OU1-OU6:

For OU-1 (Side-Wide Groundwater), Alternative MM-5was proposed and consists of:

- Collect Intermediate and Lower Groundwater at Martin Marietta Quarry to Contain Contaminated Groundwater within Current Boundaries
- Dispose of Collected Groundwater Off-Site
- Invoke Technical Impracticability (TI) Waiver for the Intermediate and Lower Groundwater due to no active treatment and over 200 years to attain ARARs through Natural Attenuation

- Collect Shallow Groundwater and Dispose Off-site at City Wastewater Treatment Plant
- Monitor Groundwater until ARARs are attained.
- Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $6,386,000

For OU-2 (Lagoon Area), Alternative SC-4L was proposed and consists of:

- Excavate Contaminated Solids and Consolidate On-Site/Collect and Contain Shallow Groundwater with Expanded Interception Trench System and Dispose Off-Site
- RCRA Surface Impoundment
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $44,746,000

For OU-3 (Wildcat & Kokomo creeks), Alternative SC-4C was proposed and consists of:

- Excavate Contaminated Sediment and Consolidate On-Site
- 30-Yr. Net Present Worth Cost: $12,560,000

For OU-4 (Markland Avenue Quarry), Alternative SC-2.5Q was proposed and consists of:

- Excavate Contaminated Sediment from Quarry Pond
- Backfill Quarry Pond
- Dispose of Quarry Sediment in Lagoon Area CAMU
- Cover Contaminated Solids with Common Soil and vegetate
- Contain & Collect Shallow Groundwater & Dispose at WWTP
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $11,163,000

For OU-5 (Main Plant Property), Alternative SC-3.5M was proposed and consists of:

- Elevated VOC Solids Removal and On-Site Disposal
- Excavate PCB Solids along Kokomo Creek and Dispose On-Site
- Install Common Soil Cover and vegetate
- Collect & Contain Shallow Groundwater and Dispose Off-Site
- Deed & Groundwater Use Restrictions
- 30-Yr. Net Present Worth Cost: $7,747,000

For OU-6 (Slag Processing Area), Alternative SC-3.5S was proposed and consists of:

- Regrade Slag Piles to Level Site
- Install Protective Common Soil Cover Over Contaminated Solids and vegetate
- Deed Restrictions
- Stabilize Creek Bank
- 30-Yr. Net Present Worth Cost: $2,420,000

SUMMARY OF COMMENTS AND AGENCY RESPONSES

Listed below are summaries of the public comments received from oral comments at the public meeting and written and oral comments received during the public comment period for the Final Remedy Proposed Plan. Six individuals provided twelve oral comments at the public meeting. A total of seventy-two (72) written comments and one oral comment were received within the 30-day public comment period deadline.

ORAL COMMENTS RECEIVED FROM MARCH 1998 PROPOSED PLAN PUBLIC MEETING:

Comment #1:
Over the past 22 years, I've seen the Markland Avenue Quarry pond being used by water foul increasingly over the years, from almost none to many. I don't have figures, but I know some of them are residents and some are migratory. And if I understand the law correctly, when you drain a wetland or fill in a wetland, you're supposed to replace it with something of equal or greater value. I disagree with the comment that the pond has no ecological significance, because of these migratory water foul. What will become of them? I agree that this site needs cleaned up, and it's actually worse than I realized it was, but I wonder what will become of these birds that have been accustomed to going to this place.

Response #1:
Based upon our information from investigations of the Markland Avenue Quarry, the pond contains no significant aquatic life. The pH of the water is at least 11.7, which alone would cause this condition to exist. The water is also contaminated with several metals and volatile organic compounds. The water fowl may possibly utilize the pond as a temporary resting place. However once they realize the adverse conditions of the water they move to another local water body such as Wildcat Creek or Kokomo Creek.

According to an Indiana Department of Natural Resources - Fish & Wildlife Division Water Fowl Biologist, due to the small size of the pond and the presence of other possible water bodies in close proximity to the Quarry, the impact of the backfilling of the Quarry pond will result in insignificant harm to the migratory and resident water fowl in the area. The presence of contaminants in the Quarry pond and soil around the pond are a more significant threat to the health of the water fowl than eliminating the pond habitat through backfilling. The presence of the pond likely serves as an attractive feature that draws water fowl to the property and the contaminants present on the property.

You are correct in your assessment that replacement of wetlands is required in the regulations. IDEM Superfund Section has informed the appropriate IDEM Water Division section of the selected remedial action to backfill the quarry pond and their need to assess this action. Superfund staff is working with and will continue to work with Water staff to investigate and determine what level of mitigation (replacement) would be required or necessary based on regulation and the assessed conditions of the quarry pond. Mitigation may or may not be required depending on the results of the assessment.

Comment #2:
I'm a representative of the Wildcat Guardians, a group who's worked to help clean up Wildcat Creek throughout the watershed. I want to ask what the final construction – final reconstruction of Wildcat Creek will be like. That's our biggest concern with this project. Going along with that, we have concerns about the possible degradation of the scenic downstream areas of Wildcat Creek. We would like to become involved in the planning and design aspects of the reconstruction of Wildcat Creek. We have ideas and we'd like to have a forum to express our ideas. We want to come and offer ourselves as advisors, and later on, as workers, if possible, to achieve a result in an area that can become a scenic recreational area for Kokomo and Howard County.

Response #2:
Public participation in the design of the selected remedial alternatives is encouraged. Wildcat and Kokomo creek Remedial Design meetings will therefore be open to Wildcat Guardians. However, it may be necessary to limit the number of individuals in attendance in order to maximize use of meeting time. It would be helpful to identify key persons within the group to attend meetings. These key persons can be provided the opportunity to review and comment on draft remedial design documents on the Wildcat and Kokomo creeks.

Comment #3:
The residential yards east of the Main Plant property are being cleaned up right now. I am concerned that dust generated from tearing down the buildings will recontaminate these residential properties.

Response #3:
Dust emission was a major concern during the design development for the Decontamination and Demolition project. Dust control measures and several air monitoring approaches must be utilized during demolition activities, including an independent Air Technician looking specifically for visual dust emissions. This individual will have the authority to immediately cease all operations upon notice of visible air emissions from the demolition activities. IDEM will also be present to oversee the decontamination and demolition activities and will monitor for air emissions.

Comment #4:
I really thoughtfully wish that there had been more emphasis over the past ten years of using the knowledge of people that worked at the plant and have implicit knowledge about activities and common practices. A few have now passed on. That was a loss, but there are still some individuals still around, like me.

Response #4:
During the Remedial Investigation, many plant employees were interviewed by IDEM and its contractor. The information gathered from these interviews helped to guide or expand investigation activities to discover those areas identified as problem areas. As we move into remedial design for the selected alternatives, any information that can be obtained from ex-employees of the Continental Steel Corporation that will aid in development of remedial design documents will be welcomed.

Comment #5:
I have mentioned the old stockyard area before. Everybody needs to understand the extent that many materials were brought to the plant for scrap steel from all over the Midwest. These materials were loaded by scrap dealers, mostly to increase weight, with oils, contaminant oils, solvents, etc. from machine shops. The scrap included cars and anything, including the kitchen sink and railroad engines. All these materials were stored on the ground surface in this area known as the stockyard. At one point in time, the stockyard caught fire, and men were almost killed from an almost unseen fire taking place underground. I have reservations on whether we want to cover that stuff up or not, and then allow our kids to walk on it or people to build on it.

Response #5:
Presently the Main Plant property is deed restricted to commercial/industrial use only. This restriction alone does not eliminate exposure threats associated with the contamination and past conditions that occurred in the area of the stockyard. However, the focused remedial investigation on the Main Plant property investigated the presence of the contaminants suggested and in the area indicated by former

employees as the stockyard. The remedial investigation verified the existence of the contamination. The selected remedial alternative deals with it by removing and disposing of the areas with the highest levels of contamination which were identified as posing the highest risk to human health and the environment. After removal of these areas, the entire site will be covered with 24-inches of clean common soil and vegetated per EPA guidance to minimize or eliminate human health exposure to remaining contaminants.

Comment #6:
West of Dixon Road, I really don't understand that whole proposition over there, because before the end of the mill, the quarry site up on Markland Avenue and the quarry site west (Dixon Road Quarry/Landfill) -- Martin Marietta -- west of Dixon Road became prime disposal areas. I noticed recently that somebody brought in a bunch of dirt with a bulldozer and very carefully covered up that whole thing -- and probably with permit, as I'm told just a few minutes ago -- and there was some proposition that they were going to keep that quarry dry for 200 years. Well, let me simply say that we won't. Why don't we just use that, then; just throw all of this debris into that quarry and keep it dry for 200 years? Because if it's already there, the unknown, when it does get wet, it will start leaching.

Response #6:
The Dixon Road Quarry/Landfill property was purchased by Mohr Construction, who entered it into the Voluntary Remediation Program of IDEM to address the presence of contamination on the property. IDEM provided technical support, document review and comment, and guidance on properly addressing this contamination. A final action has been completed and approved by IDEM. Mohr Construction has been presented with a Certificate Of Completion from IDEM Commissioner, John Hamilton, and a Covenant Not To Sue by Governor Frank O'Bannon.

The Markland Avenue Quarry was investigated to identify the contaminants of potential concern and develop the baseline risk assessment which analyzes the human health exposure threats posed by those contaminants. The proposed action is to remove the most concentrated contaminants, fill the quarry pond with acceptable materials, and place two feet of clean soil cover and vegetation over the entire area. The final remedy for the Quarry minimizes the threats for these contaminants and treats the groundwater.

Comment #7:
Let's go to the slag. Either slag is a true bad animal, or it's not. We're spending a lot of money -- thinking of spending a lot of money -- cleaning up the area there by the underpass. What are you going to do about the site over there where the jail's built, and thousands of other sites around, where we hauled it, by the State Highway Department, by private citizens who today have it in their driveways around this town? They should at least be warned to get it up and get it out of there, or that it's running by their door.

Response #7:
Based upon information from the risk assessment, cancer risks at the Slag Processing Area exceed the U.S. EPA's acceptable risk range of 10^{-4} to 10^{-6} (U.S. EPA 1990). That means the highest estimated risk probability is 2 excess cancers in 10,000 people for future onsite residents. Future onsite residents simply means that the property would not be required to have property access restrictions such as a security fence. Cancer risk is due mainly to the presence of cadmium. Noncancer risks exceed the U.S. EPA's acceptable hazard index (HI) for future onsite residents and construction workers. The noncancer risks are due mainly to the presence of arsenic. These results would indicate that slag could be a material that produces adverse health affects. The ultimate use of the slag removed from the CSSS would dictate the potential exposure threat posed by the material. If the material were covered with asphalt, concrete, or 24 inches of clean soil, the exposure threat would be minimal, since these are effective measures for

minimizing or eliminating exposure to the material. Those materials that remain exposed for direct contact could pose a human health threat based upon the figures from the risk assessment. CSSS has been a well-publicized superfund site in Kokomo, Howard County and in the State of Indiana. The health risks associated with the site have been identified and presented to the public in many different ways. The public has been made aware of the potential exposure threats from the site.

Comment #8:
Let's take a look at the Markland Quarry itself, and again, I say, it was toward the end of the thing when they were burying stuff over there. I don't know what all they put there. There are people alive who know what they put there. Why don't you ask them?

Response #8:
Many former employees have been interviewed and many of the materials disposed from the CSSS have been identified, including the locations where they were disposed. This information was utilized when the remedial investigation work plans were developed. These areas were investigated during field implementation of the remedial investigation.

Comment #9:
Part of the contamination in the stream -- of course, it's dry right now, but it's still like a mountain on the south end of the creek down there. I'm not even sure about the pond water in the lagoons that we're spending so much on. No doubt they tested proper.

I wonder if you know how many wells there are around that site, so you can really test. And have they been tested regularly over these past ten years, so you can see what the improvements or worsening of that site are? And are there not other wells within that building structure (treatment buildings)? A few wells exist that you don't know are there, which you could be utilizing today.

Response #9:
The selected remedy for the Lagoon Area would pump out the contaminated water from the lagoons (ponds) and send them to the Kokomo wastewater treatment plant (WWTP) for treatment and disposal. The cost of the lagoons is expensive due to the construction of a RCRA impoundment of approximately $27.9M. There are 13 monitoring wells within the Lagoon Area property. The wells were tested several times during the Remedial Investigation (RI), but have not been tested since 1995. The well sampling results from the RI showed contaminant levels above drinking water standards migrating in a westerly direction. Surface water sampling results indicate that shallow groundwater contaminants are not being transmitted from groundwater to surface water anywhere along the Wildcat or Kokomo creeks. Also, the selected remedy includes a shallow groundwater extraction system to contain and treat the groundwater under the Lagoon Area property.

Comment #10:
My concern is children entering the OU-5, or the Main Plant area. I believe there should be routine fencing performed until the areas are considered residential.

Response #10:
The fence has been regularly inspected and repairs made as necessary. However, the fence is frequently damaged by trespassers, both children and adults. The likely solution to trespasser problems may be the implementation of the Interim Record of Decision for Decontamination and Demolition of the Main Plant structures and buildings. Once this action is completed, the removal of most of the treasures, play areas,

and profitable items should minimize trespassing. During the D&D action, continuous site security measures should also minimize or prevent site entry by trespassers.

Comment #11:
My name is Karen Burkhardt. As a 20-year resident of Kokomo, I am now the new District 30 Representative to Indianapolis, and I am definitely in a listening and learning mode here. I thank all of the people who have come before me and have put so much time and effort and research into bringing us to this point, so I have much to learn, but I am committed to taking the concerns that I hear tonight to the (IDEM) Commissioner, John Hamilton, and to Indianapolis to make a difference and make sure that this does happen for Kokomo, and happens in a very healthy, safe manner, because in listening to all of the contaminants and kinds of things that could possibly happen, we need to proceed cautiously, but we need to proceed. To procrastinate any longer does not make it any easier or any better for the citizens of Kokomo. Thank you.

Response #11:
Thank you Ms. Burkhardt for your comments indicating your support of the final remedy and your commitment to express your support and stress timely action to the decision-makers. This Final Decision has been proposed in order to remove the public health threat posed by the entire site. Contamination remaining onsite after the interim action will be addressed by the final remedial action.

Comment #12:
My name is Jim Troubaugh (Mayor and resident of Kokomo). I live at 428 South Western Avenue, which is about two blocks from Continental Steel. I am in complete agreement, and I want to go down on record as being in complete agreement, with the remedial alternative that has been proposed here tonight, the cleanup of Continental Steel. Thank you.

Response #12:
Thank you Mayor Troubaugh for your comments supporting the selected remedy.

WRITTEN COMMENTS RECEIVED DURING PROPOSED PLAN PUBLIC COMMENT PERIOD:

Comment #13:
Some consideration should be given to testing the former employees for lead and other contaminants, i.e., asbestos, associated with the plant operations. Lead exposure appears to be of greatest concern with the sites associated with Continental Steel. Has the Indiana Department of Health (ISDH) done lead testing on former employees of Continental? This population is still in Kokomo and available for testing. The lead removal for the residential areas, which is planned for the 3 to 4 months, should make sure lead exposure is limited in the current population.

Response #13:
Lead or any other chemical exposure in the work place is typically within Occupational Safety & Health Agency (OSHA) jurisdiction. This matter has been referred to the ISDH and the following information obtained. Lead testing has been performed in the past by the State and local health departments. Former employees may also request blood lead screening from their family physicians. Since the plant closed over 12 years ago, lead exposures received by former employees at that time would no longer be present in the body at this time due to natural removal and assimilation processes in the human body. Also, positive blood lead results at this time would be difficult to link to the plant after this length of time.

Comment #14:
What are the components of the Operation & Maintenance (O&M) costs for the annual O&M for the various operable units? These proposals show about $700,000 in annual O&M costs. Are there ways to reduce these O&M costs?

Response #14:
O&M components vary depending on the remedy for the operable unit. Some standard components of O&M are sample monitoring events (i.e., quarterly, semiannual, annual), pump and pipe replacement, mowing, washout repairs to caps/soil covers, fence repairs, tree removals, and treatment system repairs. The O&M costs are only estimates, yet they are based upon past experience and performance at other superfund sites. The actual cost may be more or less. IDEM has worked hard to scrutinize and reduce the cost of this action and will, in the future, work to minimize the O&M costs to the extent possible.

Comment #15:
Taxes will probably result in recovery of the (Main Plant) property by the local government. If so, the likely use of the property would be as a park. I agree and hope that this will be used for this purpose.

Response #15:
The Main Plant property is currently deed restricted by the present owner as commercial/industrial use only. All remedial alternatives, including the selected alternative, were based on this use scenario. The Risk Assessment was also developed based on this scenario. For the property to be utilized as a park, additional cleanup actions may have to occur in order for the deed restriction to be removed. Additional cleanup actions would be based upon the results of a human health reassessment under a residential use scenario.

Comment #16:
Supportive comments were received through 68 written comments from the Kokomo community. One comment was hand written from a husband and wife stating' "We support the recommended remedial alternatives as listed for each site location of the Continental Steel Superfund Site." The remaining 67 supportive comments were identical typed comments stating, "I support the remedial alternatives for the Continental Steel Superfund Site as described by IDEM officials and hope that funding will be approved by the Indiana Department of Environmental Management and United States Environmental Protection Agency." One of these comments included a hand written comment noting their past affiliation with the site as a former employee and having knowledge of past dumping practices for the plant.

Response #16:
Thank you for your support for funding and selection of the final remedies for the six operable units of the Continental Steel Superfund Site.

Comment #17:
There are several beneficial uses for slag. Has there been any thought or pursuit of these uses for the slag located on the Slag Processing Area and other parts on the site?

Response #17:
The beneficial use of all materials associated with the Continental Steel Superfund Site and cost savings will be sought and implemented within the bounds of regulatory restrictions and requirements.

APPENDIX F

Administrative Record Update Summary

Continental Steel Superfund Site

Administratititive Record Index

Initial Index

April 1993

(3 pages)

APRIL, 1993

ADMINISTRATIVE RECORD INDEX
CONTINENTAL STEEL SUPERFUND SITE
KOKOMO, INDIANA

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PG'S	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCUMENT NO.
294	1-1992	Final Management Plan for Continental Steel Site Remedial Investigation/Feasibility Study, Kokomo, IN	ABB Environmental Services, Inc.	Gabriele Hauer, IDEM	PLANS/STUDIES/REPORTS	1

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS
CONTINENTAL STEEL SUPERFUND SITE

Guidance documents are available for review at the Indiana Department of Environmental Management's Office--Indianapolis, Indiana

TITLE	AUTHOR	DATE
Ambient Water Quality Criteria Documents	USEPA	80/
Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans	USEPA, QAMS-005/80	80/12/29
Slurry Trench Construction for Pollution Migration Control	USEPA, EPA/540/2-84/001	84/02/
Practical Guide for Ground-Water Sampling	USEPA, EPA/600/2-85/104	85/09/
Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Laboratory Manual, Vol. 1A & Vol. 1B	USEPA, SW-846	86/11
Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Field Methods, Vol. 1C	USEPA, SW-846	86/11
The RPM Primer, An Introductory Guide to the Role and Responsibilities of the Superfund Remedial Project Manager	USEPA, EPA/540/G-87/005 OSWER Directive 9355.1-02	87/09/
A Compendium of Superfund Field Operations Methods	USEPA, EPA/540/P-87/001 OSWER Directive 9355.0-14	87/12/
Superfund Exposure Assessment Manual	USEPA, EPA/540/1-88/001 OSWER Directive 9285.5-1	88/04/
Community Relations in Superfund, Interim Version	USEPA, EPA/540/G-88/002 OSWER Directive 9230.0-03B	88/06/
CERCLA Compliance with Other Laws Manual: Interim Final	USEPA, EPA/540/G-89/006	88/08/
Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Interim Final)	USEPA, EPA/540/G-89/004	88/10/
Guidance on Remedial Actions for Contaminated Ground-Water at Superfund Sites	USEPA, EPA/540/G-88/003	88/12/
User's Guide to Contract Laboratory Program	USEPA, EPA/540/8-89/012	88/12/
USEPA Contract Laboratory Program, Statement of Work for Inorganics Analysis	USEPA, SOW Document No. ILM01.0	88/12/
USEPA Contract Laboratory Program, Statement of Work for Organics Analysis	USEPA, SOW Document No. OLM01.0	88/12/
Risk Assessment Guidance for Superfund Volume II Environmental Manual, Interim Final	USEPA, EPA/540/1-89/001	89/03/
Interim Guidance on Administrative Records for Selection of CERCLA Response Actions	USEPA, OSWER Directive #9833.3A	89/03/01
Guidelines for the Preparation of Standard Operating Procedures (SOPS) for Field and Laboratory Measurements	USEPA, Region V	89/03/16
Final Standard Quality Assurance Project Plan Content Document	USEPA, Contract No. 68-01-7331	89/06/14
CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes and State Requirements	USEPA, EPA/540/G-89/009 OSWER Directive 9234.1-02	89/08/
Health and Safety Audit Guidelines, SARA Title I, Section 126	USEPA, EPA/540/G-89/010	89/12/

ADMINISTRATIVE RECORD GUIDANCE DOCUMENTS
CONTINENTAL STEEL SUPERFUND SITE

Guidance documents are available for review at the Indiana Department of Environmental Management's Office--Indianapolis, Indiana

TITLE	AUTHOR	DATE
Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), Interim Final	USEPA, EPA/540/1-89/002	89/12/
National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule (40 CFR Part 300)	USEPA, F.R./Vol.55, No. 46	90/03/08
Guidance On Oversight of Potentially Responsible Party Remedial Investigations and Feasibility Studies, Final, Volume 1	USEPA, OSWER Directive No. 9835.1(c)	91/ /
Guidance on Oversight of Potentially Responsible Party Remedial Investigations and Feasibility Studies, Final, Volume 2 Appendices	USEPA, OSWER Directive No. 9835.1(d)	91/ /
Enforcement Project Management Handbook	USEPA, OSWER Directive 9837.2-A	91/01/
Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites	USEPA, EPA/540/P-91/001	91/02/
Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells	USEPA, EPA/600/4-89/034	91/03/
Handbook, Remediation of Contaminated Sediments	USEPA, EPA/625/6-91/028	91/04/
Model Quality Assurance Project Plan, Region V, Office of Superfund	USEPA, Region V	91/05/24
Handbook Ground-Water, Volume II: Methodology	USEPA, EPA/625/6-90/016B	91/07/

Continental Steel Superfund Site

Administratitive Record Index

UPDATE #1

November 1994

(3 pages)

ADMINISTRATIVE RECORD INDEX
(CONTINENTAL STEEL) Superfund Cleanup Site
KOKOMO, HOWARD COUNTY, INDIANA

NOVEMBER 1994 UPDATE #1

Pgs	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO
17	1-23-94	Continental Steel Site Unilateral Administrative Order	USEPA Region 5	Matthew Gentry	Orders Decrees	1
3	4-14-94	Amendment of the (ROD) Dates for Continental Steel	Pat Carrasquero IDEM	Romona Smith USEPA	Correspondence	2
3	8-26-94	Letter of comments for Site Review and Update For Continental Steel	Bernard Schorle USEPA	Louise Fabinski USPHS	Plans Studies Reports	3
12	8-15-94	Site Review and Update for Continental Steel	USPHS	Bernard Schorle USEPA	Plans Studies Reports	4
17	10-26-93	Proposed Bioslurry Tests at T&E, Continental Steel Site	Edward Opatken USEPA	Subhas Sikdar USEPA	Plans Studies Reports	5
13	10-26-93	Field Studies for Biological Characterization	Norman Richardson ABB. Inc	USEPA	Plans Studies Reports	6
57	May 1993	Technical Memorandum #3 RI/FS for Continenal Steel Site	ABB Environmental Services	IDEM	Plans Studies Reports	7

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(CONTINENTAL STEEL) Superfund Cleanup Site
KOKOMO, HOWARD COUNTY, INDIANA

NOVEMBER 1994 **UPDATE #1**

Pages	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO
717	May 1993	Sampling and Analysis Plan Revision #3 for Continental Steel	ABB Environmental Services	IDEM	Plans Studies Reports	8
38	May 1993	Work Plan Revision #4 for Continental Steel RI/FS	ABB Environmental Services	IDEM	Plans Studies Reports	9
218	May 1993	Health and Safety Plan for Continental Steel	ABB Environmental Services	IDEM	Plans Studies Reports	10
2	7-12-94	Letter about the cleanup by EPA at Continental Steel	Clayton Duncan Sr.	IDEM	Community Relations	11
6	10-5-93	Letter with questions about Continental Steel	William Muno USEPA	Gayl Catt	Community Relations	12
8	8-26-93	Conference Report for Continental Steel	ABB Environmental Services	IDEM	Community Relations	13
14	4-30-93	Public Meeting plus Questions/Answers for Continental Steel	IDEM	General Public	Community Relations	14

ADMINISTRATIVE RECORD INDEX
(CONTINENTAL STEEL) Superfund Cleanup Site
KOKOMO, HOWARD COUNTY, INDIANA

NOVEMBER 1994 UPDATE #1

Pages	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO
22	March 1993	Community relations Plan for Continental Steel	ABB Environmental Services	IDEM	Community Relations	15

Continental Steel Superfund Site

Administratitive Record Index

UPDATE #2

February 1996

(4 pages - index
7 pages - sampling index
4 pages - field documentation)

ADMINISTRATIVE RECORD INDEX
CONTINENTAL STEEL SUPERFUND SITE
KOKOMO, HOWARD COUNTY, INDIANA

FEBRUARY 1996

UPDATE #2

PGS	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO.
25	3-1-95	Initial Scoping Meeting Focused RI/FS	John J. O'Grady, USEPA	Arthur C. Garceau, IDEM	Correspondence	1
2	6-19-95	Amendment Of The ROD Dates For Continental Steel	Pat Carrasquero, IDEM	Romona Smith, USEPA	Correspondence	2
1	9-5-95	Request For RA/FS Building Demolition Costs	Arthur C. Garceau, IDEM	Mark A. Burgess, Camp, Dresser & McKee, Inc.	Correspondence	3
1	10-13-95	Approval Of Technical Memorandum Background Contaminate Levels	Arthur C. Garceau, IDEM	Mark A. Burgess, Camp, Dresser & McKee, Inc.	Correspondence	4
4	10-19-95	Conditional Approval Of QAPP For Focused Remedial Investigation/Feasibility Study	John J. O'Grady, USEPA	Arthur C. Garceau, IDEM	Correspondence	5
1	12-7-95	Approval Of Site Work Plan	Romona R. Smith, USEPA	Pat Carrasquero, IDEM	Correspondence	6
1	12-8-95	Approval Of Focused RI/FS Work Plan, Figures, And Appendices A And B	Arthur C. Garceau, IDEM	Mark A. Burgess, Camp, Dresser & McKee, Inc.	Correspondence	7
1	12-20-95	Approval Letter For Documents For The Continental Steel Superfund Site	Romona R. Smith, USEPA	Pat Carrasquero, IDEM	Correspondence	8

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FEBRUARY 1996

UPDATE #2

PG'S	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO.
1	1-9-96	Approval Letter, Documents For The Continental Steel Superfund Site	Arthur C. Garceau, IDEM	Mark A. Burgess, Camp, Dresser & Mckee, Inc.	Correspondence	9
2	1-29-96	Formal Request And Support To Demolish Buildings At Continental Steel Superfund Site	James E. Trobaugh, Mayor of Kokomo	Kathy Prosser, Commissioner IDEM	Correspondence	10
2	1-30-96	Formal Request And Support To Demolish Buildings At Continental Steel Superfund Site	Dave Griffey, Howard County Commissioner	Kathy Prosser, Commissioner, IDEM	Correspondence	11
1	1-30-96	Approval Letter Of The QAPP For The Continental Steel Superfund Site	Romona R. Smith, USEPA	Pat Carrasquero, IDEM	Correspondence	12
1	2-6-96	Approval Of Phase II Quality Assurance Project Plan	Arthur C. Garceau, IDEM	Mark a. Burgess, Camp, Dresser & McKee, Inc.	Correspondence	13
7	8-2-95	Continental Steel/Superfund Site Visit/Meeting (8/10/95)	Heather Johnson, Congressman Steve Buyer' Office	Art Garceau, IDEM	Memoranda	14
7	8-31-95	Continental Steel Redevelopment Meeting (Chicago 8/31/95)	John O'Grady, USEPA	Art Garceau, IDEM	Memoranda	15
6	9-22-95	IDEM Continental Steel Superfund Site RI/FS Background Contaminant Levels	Mark A. Burgess, P.E.	Art Garceau, IDEM, John O'Grady, USEPA	Memoranda	16

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KOKOMO, HOWARD COUNTY, INDIANA

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14	1 30 96	Continental Steel Treatability Studies	Edward R. Bates, USEPA	Art Garceau, IDEM	Memoranda	17
67	3 7 95	Remedy Selection Level Bench Scale Bioslurry Study On Contaminated Soil From The Continental Steel Superfund Site	Douglas W. Grosse, TSAP Coordinator, USEPA	Bernard Schorle, USEPA	Plans/ Studies / Reports	18
11	8 28 95	Continental Steel Superfund Site Technical Memorandum Building Demolition Costs	Mark A. Burgess, P.E., Camp, Dresser & McKee, Inc.	Arthur C. Garceau, IDEM	Plans/ Studies/ Reports	19
12	2 1 96	Gravity Dewatering Testing Results	Mark A. Burgess, P.E. Camp, Dresser & McKee, Inc.	Mr. Ed Bates, USEPA	Plans/ Studies/ Reports	20
403	11 95	Phase II Quality Assurance Project Plan	Camp, Dresser & McKee, Inc.	IDEM	Plans/ Studies/ Reports	21
264	10 20 95	Focused RI/FS Work Plan	Camp, Dresser & McKee, Inc.	IDEM	Plans/ Studies/ Reports	22
78	10-20-95	Focused RI/FS Work Plan Figures	Camp, Dresser & McKee, Inc.	IDEM	Plans/ Studies/ Reports	23
220	10-20-95	Focused RI/FS Work Plan Data Summary Tables and Preliminary Feasibility Study	Camp, Dresser & Mckee, Inc.	IDEM	Plans/ Studies/ Reports	24

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KOKOMO, HOWARD COUNTY, INDIANA

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UPDATE #2

PG'S	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO.
225	10 20 95	Phase II Field Sampling Plan	Camp, Dresser & Mckee, Inc.	IDEM	Plans/ Studies/ Reports	25
214	10 6 95	Focused RI/FS Health And Safety Plan	Camp, Dresser & Mckee, Inc.	IDEM	Plans/ Studies/ Reports	26
23	10-95	Community Relations Plan	Camp, Dresser & McKee, Inc.	IDEM	Plans/ Studies/ Reports	27
78	2-96	Interim Risk Assessment/ Feasibility Study Main Plant Buildings	Camp, Dresser & Mckee, Inc.	IDEM	Plans/ Studies/ Reports	28
2	5 14 95	News Article	H.W. Peabody, and Boyd Jenkins	Kokomo Tribune	Community Relations	29
1	5 17 95	News Release -- IDEM Undertakes Investigation And Study At Continental Steel Superfund Site	IDEM	News Media	Community Relations	30
1	6-13-95	News Article	Jeff Parrott, Kokomo Tribune - Staff Writer	Kokomo Tribune	Community Relations	31
1	6-21-95	Appreciation Letter -- Town Meeting (6/20/95)	Jon R. Padfield, State Representative	Art Garceau, IDEM	Community Relations	32
1	9-15-95	News Release - IDEM Warns Public Not To Trespass On Continental Steel Superfund Site In Kokomo	IDEM	News Media	Community Relations	33

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Documents not copied, may be reviewed at the Indiana Department of Environmental Management's Office--Indianapolis, Indiana

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5-4-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
4-6-94	QUALITY ASSURANCE REPORT PACKAGE #1581.1	HERITAGE LABORATORIES	MANUELA JOHNSON	REPORT
3-17-94	QUALITY ASSURANCE REPORT PACKAGE #1548	HERITAGE LABORATORIES	MANUELA JOHNSON	REPORT
3-11-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
3-4-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
2-10-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
2-2-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
1-27-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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1-13-94	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-27-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-20-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-13-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-3-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-9-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
12-3-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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9-10-93	CONTINENTAL STEEL CORP FAS LAB RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-3-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-28-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-24-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-17-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-13-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-13-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-11-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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11-29-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
11-15-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
11-9-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
11-5-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
10-27-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
10-20-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
10-14-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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10-12-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
10-8-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-29-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-22-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-15-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-13-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
9-10-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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8-11-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-10-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-6-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-5-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
8-4-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
7-30-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA
7-28-93	CONTINENTAL STEEL CORP LAORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING DATA

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7-27-93	CONTINENTAL STEEL CORP LABORATORY RESULTS	BERNARD J SCHORLE	GABRIELE HAUER	SAMPLING RESULTS

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DATE	TITLE	AUTHOR	RECIPIENT	DOC/ TYPE
3-14-95	OU1/TASK 3A	DON WALSH	G HAUER	LTR
11-3-93	OU1/TASK 3C	DON WALSH	G HAUER	LTR
9-10-93	OU1/TASK 3C	DON WALSH	G HAUER	LTR
8-5-93	OU1/TASK 3D	DON WASLH	G HAUER	LTR
10-29-93	OU1/TAKS 3D	DON WALSH	G HAUER	LTR
3-11-94	OU1/TASK 3D, 3G, 3M	DON WALSH	G HAUER	LTR
3-15-93	OU1/TASK 3D, 3G, 3M	DON WALSH	G HAUER	LTR
6-14-93	OU1/TASK 3F	DON WALSH	G HAUER	LTR
11-3-93	OU1/TASK 3F	DON WALSH	G HAUER	LTR
10-29-93	OU1/TASK 3G	DON WALSH	G HAUER	LTR
9-16-93	OU1/TASK 3G	DON WALSH	G HAUER	LTR
3-17-94	OU1/TASK 3H, 3I, 3K	DON WALSH	G HAUER	LTR
10-29-93	OU1/TASK 3H, 3I, 3K	DON WALSH	G HAUER	LTR
8-5-93	OU1/TASK 3H	DON WALSH	G HAUER	LTR
8-5-93	OU1/TASK 3I	DON WALSH	G HAUER	LTR
8-6-93	OU1/TASK 3J	DON WALSH	G HAUER	LTR
8-5-93	OU/TASK 3K	DON WALSH	G HAUER	LTR
11-17-93	OU1/TASK 3L	DON WALSH	G HAUER	LTR
9-10-93	OU1/TASK 3L	DON WALSH	G HAUER	LTR

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9-10-93	OU1/TASK 3L	DON WALSH	G HAUER	LTR
6-8-94	OU1/TASK 3M	DON WALSH	ART GARCEAU	LTR
8-5-93	OU1/TASK 3M	DON WALSH	G HAUER	LTR
10-19-93	STEPPED DISCHRGE TEST RESULTS	K HEWITT & D WALSH	B DAVIS & G HAUER	MEMO
10-29-93	OU1/TASK 3M	D WALSH	G HAUER	LTR
11-1-93	OU1/TASK 14	D WALSH	G HAUER	LTR
6-21-93	OU1/TASK 14	D WALSH	G HAUER	LTR
2-15-94	OU2/TASK 3A	D WALSH	G HAUER	LTR
8-5-93	OU2/TASK 3A	D WALSH	G HAUER	LTR
11-3-93	OU2/TASK 3A	D WALSH	G HAUER	LTR
3-18-93	OU2/TASK 3B, 3F, 7B	D WALSH	G HAUER	LTR
10-19-93	OU2/TASK 3F	D WALSH	G HAUER & B SCHORLE	MEMO
10-29-93	OU2/TASK 3B, 3F	D WALSH	G HAUER	LTR
9-22-93	OU2/TASK 3B, 3F	D WALSH	G HAUER	LTR
11-3-93	OU2/TASK 3C	D WALSH	G HAUER	LTR
6-21-93	OU2/TASK 3C	D WALSH	G HAUER	LTR
6-21-93	OU2/TASK 3D	D WALSH	G HAUER	LTR
11-3-93	OU2/TASK 3D	D WALSH	G HAUER	LTR
6-22-93	OU2/TASK 3E	D WALSH	G HAUER	LTR
11-3-93	OU2/TASK 3E	D WALSH	G HAUER	LTR

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DATE	TITLE	AUTHOR	RECIPIENT	DOC/ TYPE
9-28-93	OU2/TASK 7B	D WALSH	G HAUER	LTR
3-18-94	OU3/TASK 3A, 3B, 3C, 3D	D WALSH	G HAUER	LTR
10-29-93	OU3/TASK 3A, 3C	D WALSH	G HAUER	LTR
8-5-93	OU3/TASK 3B, 3D	D WALSH	G HAUER	LTR
10-29-93	OU3/TASK 3B, 3D	D WALSH	G HAUER	LTR
6-10-94	OU3/TASK 3E	D WALSH	A GARCEAU	LTR
11-1-93	OU3/TASK 3E	D WALSH	G HAUER	LTR
8-5-93	OU3/TASK 3E	D WALSH	G HAUER	LTR
9-28-93	OU3/TASK 7B	D WALSH	G HAUER	LTR
11-1-93	OU3/TASK 7B	D WALSH	G HAUER	LTR
8-6-93	OU4/TASK 3A	D WALSH	G HAUER	LTR
8-31-93	OU5/TASK 3C	D WALSH	G HAUER	LTR
11-1-93	OU5/TASK 3C	D WALSH	G HAUER	LTR
11-23-93	OU5/TASK 3B	D WALSH	G HAUER	LTR
10-18-94	ANALYTICAL DATABASE OU1, OU2, OU3	D WALSH	A GARCEAU	LTR
9-14-94	FIELD DOCUMENTATION OU1,2,3, TASK 3	D WALSH	A GARCEAU	LTR
11-22-93	OU1/TASK 3A	D WALSH	G HAUER	LTR
6-2-94	RADIONETIVITY VALIDATION	D WALSH	A GARCEAU	LTR

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DATE	TITLE	AUTHOR	RECIPIENT	DOC/ TYPE
2-21-94	OU1/TASK 3M AQUIFER TESTING	K HEWITT	G HAUER	LTR
5-20-93	OU3/TASK 3A, 3C INITIAL SEDIMENT			

Continental Steel Superfund Site

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SEPTEMBER 1996

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PG'S	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOC NO
9	11-25-85	Motion For Order To Show Cause	Henry A. Efroymson, United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	1
30	8-14-90	Order Authorizing Sale Of Real And Personal Property By Public Auction Free And Clear Of Liens, Valid Liens To Attach To Proceeds	Richard W. Vandivier, United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	2
21	11-8-90	Second Application For Orders Confirming Auction Sales Of Real And Personal Property Free And Clear Of Liens, Valid Liens, If Any, To Attach To Proceeds	Henry A. Efroymson, Attorney for N. Wayne Etter, Trustee	Bankruptcy Trustee	Orders/Degrees	3
3	11-13-90	Order Approving Extension Of Offer For Purchase Of Real Estate (And Lease)	Richard W. Vandivier, Judge United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	4
2	11-16-90	Notice Of Filing	Dennis E. Burton, Clerk United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	5
9	12-14-90	Objection Of The United States On Behalf Of The Environmental Protection Agency To Application And Second Application For Orders Confirming Auction Sales Of Real And Personal Property	Jeffrey L. Hunter, Assistant United States Attorney	Bankruptcy Trustee	Orders/Degrees	6
19	12-18-90	Entry And Order On Application And Amended Application For Orders Confirming Auction Sales Of Real And Personal Property Free And Clear Of Liens, Valid Liens, If Any, To Attach To Proceeds	Richard W. Vandivier, Judge United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	7
6	3-15-91	Report Of Sales	Henry A. Efroymson, United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	8

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26	1-24-91	Second Entry And Order On Application And Amended Application For Orders Confirming Auction Sales Of Real And Personal Property Free And Clear Of Liens, Valid Liens, If Any, To Attach To Proceeds	Richard W. Vandivier, Judge, United States Bankruptcy Court	Bankruptcy Trustee	Orders/Degrees	9
4	5-2-90	Aggregation Of Quarry And Plant Areas To The Continental Steel RI/FS	Reginald O. Baker, IDEM	Mr. Dennis Dalga, U.S. Environmental Protection Agency	Correspondence	10
2	5-23-90	Response To May 2, 1990, Letter Regarding The Aggregation Of The Quarry And Plant	Norm Niedergang, Acting Associate Division Director Office Of Superfund	Mr. Reginald Baker, IDEM	Correspondence	11
7	5-20-96	Summary Of May 10th Meeting With EPA And Associated Action Items	Camp Dresser & McKee Inc.	Arthur C. Garceau, IDEM	Correspondence	12
3	6-4-96	Response To An Inquiring Letter, Letter Of April 22, 1996	Kathy Prosser, Commissioner, IDEM	Ms. Gayl D. Catt	Correspondence	13
12	3-14-96	Continental Steel/Superfund Site Kokomo, Indiana Treatability Study Program Comparison Of Treatability Data With Remedial Investigation Data	Rose Najjar, Camp Dresser & McKee Cambridge	Tom Holdsworth, START Laboratory	Memoranda	14
15	9-30-88	In Regards To Conducting A Site Assessment	Roy F. Weston, Spill Prevention & Emergency Response Division	Steven J. Faryan, Deputy Project Officer, United States Environmental Protection Agency	Plans/Studies/ Reports	15

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6	3-31-89	Continental Steels Listing In The Federal register On The National Priorities List For Uncontrolled Hazardous Waste Sites- Final Update #5 Final Rules	Federal Register, United States Environmental Protection Agency	Public	Plans/Studies/ Reports	16
10	10-13-89	In Regards To A Possible Removal Action	Roy F. Weston, Spill Prevention & Emergency Response Division	Public	Plans/Studies/ Reports	17
106	11-89	A Guide To Developing Superfund Records Of Decision	United States Environmental Protection Agency	Public	Plans/Studies/ Reports	18
17	3-26-90	Action Memorandum- Removal Request	Rosanne M. Ellison, On-Scene Coordinator, U. S. EPA	David A. Ullrich, Action Associate Division Director Office of Superfund	Plans/ Studies/ Reports	19
19	6-90	Site Assessment For Continental Steel, Kokomo, Indiana	United States Environmental Protection Agency	Public	Plans/Studies/ Reports	20
4	7-19-90	Amended Action Memorandum- Ceiling Increase Request For Removal And Disposal	Rosanne M. Ellison, On-Scene Coordinator, U.S. EPA	David A. Ullrich, Acting Director Waste Management Division	Plans/ Studies/ Reports	21
6	9-28-90	Request For A Ceiling Increase And Exemption for the $2 Million Statutory Limit For The Continental Steel Site	Steve Luftig, Director Emergency Response Division	Don R. Clay, Assistant Administrator Office Of Solid Waste And Emergency Response	Plans/ Studies/ Reports	22

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3	2-6-91	Action Memorandum - Request For A 12-Month Exemption	Rosanne M. Ellison, On-Scene Coordinator Emergency & Enforcement Response Branch, U.S. EPA	David A. Ullrich, Director Waste Management Division	Plans/Studies/ Reports	23
8	11-24-92	Continental Steel Acid Lagoon Area Site Assessment And Sampling Results	Samuel F. Borries, Acting On-Scene Coordinator, U. S. EPA	FILE	Plans/Studies/ Reports	24
8	12-11-92	Action Memorandum - Request For A Ceiling Increase And Approval For An Amended Action Memorandum	William E. Muno, Acting Director Waste Management Division, U.S. EPA	Valdas V. Adamkus, Regional Administrator	Plans/ Studies/ Reports	25
26	6-9-93	In Regards To Provide Technical Support And Oversight Assistance During Removal Action Activities	Karen M Spangler, Ecology and Environmental, Inc.	Ms. Pat Vogtman, Deputy Project Officer, Emergency And Enforcement Response Branch, U.S. EPA Region V	Plans/Studies/ Reports	26
2	11-23-93	Results From The Screening Treatability Studies Conducted On Soil	Steven I. Safferman, Treatability Study Coordinator, Regional support Section, Technical Support Branch, Superfund Technology Demonstration Division, U.S. EPA Region V	Bernard Schorle, Remedial Project Manager, Region V Waste Management Division	Plans/Studies/ Reports	27

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332	3-24-94	Funded Removal Letter Report	Debra Pool, Region V Technical Assistance Team	Sam Borries, On-Scene Coordinator, Region V, Emergency And Enforcement Response Branch	Plans/Studies/ Reports	28
45	3-24-94	Draft On-Scene Coordinators's Report	Debra Poole, Region V, Technical Assistance Team	Gail Nabasny, Deputy Project Officer, Region V, Emergency And Enforcement Response Branch	Plans/Studies/ Reports	29
11	12-94	Soil Screening Guidance	United States Environmental Protection Agency, Office Of Solid Waste And Emergency Response	Office Of Chemical Safety	Plans/Studies/ Reports	30
4	2-21-95	Action Memorandum - Request For A Ceiling Increase And Removal Action	Samuel Borries, On-Scene Coordinator, Emergency Response Section II	Vladus V. Adamkus, Regional Administrator	Plans/Studies/ Reports	31
85	7-5-96	Results Of Groundwater Treatability Study	Rose Najjar, Camp Dresser & McKee, FS Manager	Arthur C. Garceau, IDEM	Plans/Studies/ Reports	32
30	7-17-96	Solidification/Stabilization Bench-Scale Treatability Studies Preformed On Acid And Non-Acid Sludges	Science Applications International Corporation	Tom Holdsworth, Technical Project Monitor, U.S. EPA, Region V and John O'Grady, Regional Project Manager U.S. EPA, Region V	Plans/Studies/ Reports	33

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9	8-5-96	Final Letter Report On The Potential Applicability Of Air Sparging To Quarry Sediments	Rose Najjar, Camp Dresser & McKee Feasibility Study Manager	Arthur C. Garceau, IDEM	Plans/Studies/ Reports	34
11	8-6-96	Results Of Solidification/Stabilization Treatability Study	Rose Najjar, Camp Dresser & Mckee Feasibility Study Manager	Arthur C. Garceau, IDEM	Plans/Studies/ Reports	35
57	9-3-96	Letter Regarding Results Of Continuing Investigation Of Possible Radiological Hazards	Rex J. Bowser, Coordinator Emergency Response/Radioactive Materials Indoor & Radiological Health, Indiana State Department Of Health	Arthur C. Garceau, IDEM	Plans/Studies/ Reports	36
1	2-15-96	Comment Period Opens On Continental Steel Site	Jeff Parrott, Tribune Staff Writer	Community	Community Relations	37
1	2-20-96	County May Take Over Old Steel Site	Jeff Parrott, Tribune Staff Writer	Community	Community Relations	38
1	2-23-96	Rudolph Family, Kokomo Blessed By Continental Steel County Makes Commitment To EPA On Rusting Steel Plant	Mike Fletcher, Jeff Parrott, Tribune Staff Writers	Community	Community Relations	39

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5	2-23-96	1986-1996 10 Years After The Closing	Tribune Staff Writers	Community	Community Relations	40
4	3-12-96	Letter Regarding The Cleanup At The Continental Steel Superfund Site	John J. O'Grady, Remedial Project Manager, Superfund Division, United States Environmental Protection Agency	Arthur C. Garceau, IDEM	Community Relations	41
1	3-12-96	Continental Questions Remain	William Lane, Tribune Staff Writer	Community	Community Relations	42
53	3-14-96	Transcript From The Public Meeting For The Proposed Plan For Interim Cleanup Action	Jan Alderfer, Registered Professional Reporter, A Notary Public	Public	Community Relations	43
1	3-15-96	Residents Support Demolishing Buildings	Jeff Parrott, Tribune Staff Writer	Community	Community Relations	44
1	3-25-96	LETTERS To The Editor - Speak Up On Continental	Rick A. Parsons, Kokomo	Community	Community Relations	45
1	3-26-96	LETTERS To The Editor - Get Ready For Flood Of Business Article - Council Says Tear Down Mill	Wade Kauble, Kokomo Steve Jackson, Tribune Staff Writer	Community	Community Relations	46
1	3-28-96	Getting Rid Of The Albatross	Arden A. Draeger, Publisher-General Manager John Wiles, Editor and Joe Follick, Opinion Editor	Community	Community Relations	47
1006	3-28-96	Public Comments Concerning The Interim Remedy Proposed Plan	Public	Community	Arthur C. Garceau, IDEM	48

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May 1, 1996	Phase II Field Investigation and Sampling Program Including: Soil Gas Chromatograph OU2,OU4,OU5, OU6 Field Screening OU1,OU3,OU4 Wipe Samples OU5 Air Samples OU5 Soil/Sediment Site Backgroud OU3,OU4,OU5,OU6 Residential Areas and Lagoon Area Groundwater/ Surface Water OU1,OU3,OU4,OU5 Drilling Operation	Mark A. Burgess/ Camp Dresser & McKee Inc.	Art Garceau	Sampling Data

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1	2 14 97	National Remedy Review Board	Wendy L. Carney, Chief Remedial Response Branch #1	Arthur Garceau/ IDEM	Correspondence	1
1	2 24 97	Amendment Of The Record of Decision Dates	Pat Carrasquero/ IDEM	Romona Smith HSRL-6J	Correspondence	2
4	2 26 97	Remedial Investigation Report	Arthur C. Garceau / IDEM	Mark A. Burgess, P.E., DEE	Correspondence	3
1	3 4 97	Aggregation Of Slag Processing Area	Pat Carrasquero/ IDEM	Bruce Sypniewski (HSRM-6J)	Correspondence	4
2	3 21 97	Proposed Final Remedy Selections	Carolyn S. Kauble/ KAP Secretary	Art Garceau/ IDEM	Correspondence	5

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1	4 8 97	Main Plant Buildings Engineering Evaluation/Cost Analysis	Arthur C. Garceau/ IDEM	Mark A. Burgess, P.E., DEE	Correspondence	7
1	6 6 97	Final Engineering Evaluation/Cost Assessment	Romona R. Smith/ USEPA	Pat Carrasquero /IDEM	Correspondence	8
133	3 12 96	Radiochemistry Lab Worksheet	Aimee Vessell/ USEPA	Arthur C. Garceau/ IDEM	Plans/Studies/ Reports	9
236	1 31 97	Remedial Investigation Volume I	Camp Dresser & McKee	Arthur C. Garceau/ IDEM	Plans/Studies/ Reports	10

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309	1 31 97	Remedial Investigation Volume V	Camp Dresser & McKee	Arthur C. Garceau/ IDEM	Plans/Studies/ Reports	14
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10	6 5 97	Continental Steel Health Consult	Dollis M. Wright/ Indiana State Department of Health	Art Garceau/ IDEM	Plans/Studies/ Reports	18
1	9 16 96	IDEM/USEPA Agree To Conduct An Interim Cleanup	Indiana Department of Environmental Management	News Release/ Public	Community Relations	19
2	3 19 97	Presentation Update	James E. Trobaugh, Mayor of Kokomo	Business/ Labor Alliance Committee	Community Relations	20
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