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Superfund Record of Decision:

John Deere (Ottumwa Works Landfill), IA

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16. Abstract (Limit: 200 words)

The 105-acre John Deere (Ottumwa Works Landfill) site is an active agricultural equipment manufacturing and assembly facility in Ottumwa, Wapello County, Iowa. Land use in the area is predominantly residential, with wetlands located within 1,000 feet of the site across the Des Moines River. All of the site lies within the 100-year floodplain of the Des Moines River, and a drainage ditch borders the site on the east side. The estimated 27,000 Ottumwa residents use municipal water obtained from the Des Moines River as their drinking water supply, the municipal intake is located approximately 1,000 feet upgradient from the site. Black Lake, located 150 feet east of the site, is used as an additional water source on an infrequent basis, contributing approximately 1/2 to 1 1/2 percent of the total annual volume of water distributed by the Ottumwa Water Works. From 1911 to 1973, Deere & Company buried plant generated wastes including solvents, paint sludge, heat treating cyanide, heat treating sludge, petroleum distillates, and foundry sand in the shallow alluvium underlying the site. After landfilling, some of the wastes were burned onsite on a regular basis. In 1965, Deere & Company acquired the southwestern portion of the site, which had been used previously as a salvage yard. In the late 1980's,

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision John Deere (Ottumwa Works Landfill), IA
First Remedial Action - Final
Contaminated Media: soil, sediment, debris
Key Contaminants: organics (PAHs), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 92
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(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

investigations of the disposal areas identified subsurface soil and ground water contamination by VOCs, other organics, and metals. This Record of Decision (ROD) addresses the disposal areas, the drainage ditch, and Black Lake surface water. The primary contaminants of concern affecting the soil, sediment, and debris are organics including PAHs; and metals including arsenic, chromium, and lead.

The selected remedial action for this site includes implementing institutional controls including deed restrictions, and site access restrictions including maintaining the perimeter fence. The estimated present worth cost for this remedial action is $4,000. There are no O&M costs associated with this remedial action since fence maintenance is covered by the facility's operating budget.

<u>PERFORMANCE STANDARDS OR GOALS</u>: Not provided.

RECORD OF DECISION

JOHN DEERE-OTTUMWA WORKS SITE

OTTUMWA, IOWA

Prepared by

U. S. ENVIRONMENTAL PROTECTION AGENCY

REGION VII

KANSAS CITY, KANSAS

SEPTEMBER 1991

RECORD OF DECISION

DECLARATION

Declaration for the Record of Decision

John Deere-Ottumwa Works Site

Ottumwa, Iowa

Statement of Basis and Purpose

This decision document presents the selected remedial action for the John Deere-Ottumwa Works site in Ottumwa, Iowa. The selected remedy was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site. The information supporting this remedial action decision is contained in the administrative record for this site.

The State of Iowa concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of the Selected Remedy

The principal threat at this site is posed by buried plant-generated waste material. Currently, the site is used for industrial purposes only.

The major component of the selected remedy is the placement of deed restrictions, to run with the land, which provide for maintenance of an existing perimeter fence and which limit land use.

Continued ground water and surface water monitoring will also be required to ensure the selected remedy remains protective of human health and the environment.

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies, to the maximum extent practicable for this site. However, the selected remedy does not reduce toxicity, mobility or volume of the site waste material through treatment, and therefore does not satisfy the statutory preference for treatment as a principal element of the remedial action. The site waste materials are not liquid, and are of low toxicity and low mobility. Treatment is not practicable because it is not cost effective.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, and so not allow for unlimited use and unrestricted exposure at the site, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Morris Kay ______ 9-23-91

Morris Kay
Regional Administrator
United States Environmental Protection Agency
Region VII

Date

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RECORD OF DECISION

DECISION SUMMARY

1.0 SITE BACKGROUND

1.1 SITE LOCATION AND DESCRIPTION

The John Deere-Ottumwa Works site is located in Ottumwa, a city of approximately 27,000 people, in Wapello County, Iowa. A site location map, Figure 1, is attached.

The site occupies approximately 105 acres. It is bounded by the Wabash Railroad tracks on the west with Madison Avenue located immediately west of the railroad. Highway 63/34 bounds the site on the east and Vine Street forms the northern boundary. The entire site is enclosed by a eight foot high chain link fence topped with barbed wire, except for an area on the southeast corner where the right-of-way for Highway 63/34 is located. The southern boundary of the site is defined by the location of this fence. Adjacent property to the north, south, and west is used for residential purposes. Deere & Company is an active facility and currently manufactures and assembles agricultural equipment at the site.

A single disposal area of approximately 20 acres has been determined to exist on-site with the depth of waste material ranging between four and 10 feet deep. Waste material consists of amber to black colored friable sand and vitrified greenish-yellow material with pieces of wood and coal, metal fragments, and paint chips. Approximately 90% of the landfill area is currently covered with buildings or pavement.

The primary contaminants at the John Deere-Ottumwa Works site have been determined to be the metals arsenic, cadmium, chromium, and lead as well as semi-volatile polynuclear aromatic hydrocarbons (PAHs).

The site is located within the Des Moines River flood plain and is approximately 1,000 feet southwest of the river. Flood water periodically inundated the site until 1955 when a series of dikes were constructed to control river levels. The alluvial aquifer in the vicinity of the site is classified as IIB, a potential source of drinking water. Topography of the site is essentially flat. A wetland is located across the Des Moines River from the site and is unaffected by site contaminants. Approximately 150 feet east of the northern portion of the site is Black Lake, one of the secondary sources of drinking water for the City of Ottumwa, and as such falls within Iowa Class C, drinking water sources. Black Lake is used only intermittently when the primary source, the Des Moines River, cannot provide all of the municipal water supply needs for the City of Ottumwa. Total annual withdrawal from Black Lake for use in the Ottumwa water supply is normally 15 to 30 million gallons.

Immediately underlying the site are approximately 13 to 26 feet of alluvial deposits consisting primarily of unconsolidated silty clay, silty sand, sand, and gravel. Ground water in the alluvial aquifer flows in a generally east-northeasterly direction toward the Des Moines River. Underlying the sand and gravel is a shale unit of approximately 100 to 150 feet in thickness. This shale unit is not a major source of ground water in the area because of its impermeable nature.

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

From 1911 to 1973, Deere & Company disposed of plant generated waste on-site by burying the wastes in the shallow alluvium. Wastes buried on-site include solvents, paint sludges, heat treating cyanide, heat treating sludges, petroleum distillates and foundry sand. After placement on the land, some of the waste material was burned on a regular basis.

In 1965, Deere & Company purchased what is now the southwestern portion of the site. Prior to Deere & Company acquiring this additional property, it had been used as a salvage yard. An oily coating on the ground surface within parts of this piece of property existed at the time of purchase by Deere & Company. A single building exists today from the salvage operation and is used by Deere & Company for storage.

Deere & Company granted a right of way easement of a portion of their property to Iowa Department of Transportation (IDOT) for construction of Highway 63/34. Based on historical aerial photos and soil borings completed during the RI, it appears likely that a portion of the area called Landfill 1 which contains waste material extends onto what is now IDOT right of way, which encompasses approximately 8.3 acres.

In May 1985, the EPA conducted a Site Investigation (SI) at the site. Analysis of soil and sediment sample collected during the investigation showed elevated levels of metals and organics in samples collected in the vicinity of the drum and hazardous waste storage area and from the drainage ditch adjacent to Deere & Company property.

Based upon SI data, the site was evaluated for possible inclusion on the National Priorities List (NPL) by completing a Hazard Ranking Scoring (HRS). An HRS score of 42.32 was assigned to the John Deere-Ottumwa Works site (a score of 28.5 is sufficient to place a site on the NPL). The NPL is a nationwide list of sites that, due to site conditions and contaminants, have been made priorities for remedial evaluation and response, if necessary. EPA proposed the site for listing in June 1988 and it became final on the NPL in February 1990.

On September 20, 1989, EPA and Deere & Company entered into an Administrative Order on Consent. The order required Deere & Company to perform a Remedial Investigation (RI) for the purpose of determining the nature and extent of any contamination existing on-site by conducting a field investigation. In addition, the order required a Feasibility Study (FS) to be performed, evaluating a range of appropriate alternatives to address contaminants identified during the field investigation. EPA reviewed and approved plans detailing work to be conducted by Deere & Company in fulfilling terms of the order. EPA also provided oversight of RI field activities conducted by Deere & Company.

Deere & Company contracted with Geraghty & Miller, Inc. to conduct field sampling at the site and to incorporate the investigation results into RI and FS Reports. The field investigation was completed in November 1990. The final RI and FS Reports were completed in July 1991 and approved by EPA in consultation with IDNR.

1.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI and FS Reports and the Proposed Plan for the John Deere-Ottumwa Works site were released to the public for comment as required by CERCLA Section 113(k)(2)(b)(I-V) and Section 117. The public comment period was from July 20, 1991 to August 19, 1991. These two documents were made available to the public with the administrative record, which is located at the Ottumwa Public Library and at the EPA Region VII office. The notice of availability for these documents was published in the Ottumwa Courier on July 13, 1991. A public meeting was held on August 8, 1991 in Ottumwa, Iowa. At this meeting, representatives from EPA, the State of Iowa, the Iowa Department of Public Health, and the Agency for Toxic Substances and Disease Registry (ATSDR) were available to answer questions about problems at the site and the remedial alternatives under consideration. Comments received during the comment period and EPA responses to the comments comprise the Responsiveness Summary, which is attached hereto as Appendix D. The decision for this site is based on the Administrative Record, which includes the Responsiveness Summary.

2.0 SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

The response activities described in the Decision Summary address all contaminants known at the site and are intended to constitute final action for this site.

3.0 SUMMARY OF SITE CHARACTERISTICS

The nature and extent of contamination at the John Deere-Ottumwa Works site is summarized below. This summary is based primarily on data generated by the work performed by Deere & Company in May through November 1990, and in the RI. An in-depth discussion of the nature and extent of contamination characterized during the RI may be found in the RI Report which is contained in the administrative record. Tabulated analytical results from the RI may be found in Tables 1 through 11, attached. Background .pa levels of site related contaminants are also presented in Tables 1 through 11.

During the RI, Geraghty & Miller, technical contractor for Deere & Company, characterized the nature and extent of waste material and investigated the effects the presence of waste material at the site has had on ground water, surface water, and sediments. The discussion of these findings are divided into three main media: soils and waste material, ground water, and surface water and sediments. Soils and waste materials are further divided into five areas of initial concern: Landfill 1, Landfills 2 and 3, Hazardous Waste/Drum Storage Area, Oil Spill Area, and the South Scar Area. A site map displaying the various areas of concern is presented in Figure 2, attached. Figure 3 displays soil boring and sediment sampling locations and Figure 4 displays monitoring well, piezometer, and surface water sample locations.

The primary contaminants at the John Deere-Ottumwa Works site have been determined to be the metals arsenic, cadmium, chromium, and lead as well as semi-volatile polynuclear aromatic hydrocarbons (PAHs).

3.1 SOIL AND WASTE MATERIAL RESULTS

Prior to the RI, several separate former disposal areas were thought to exist on-site: Landfill 1, Landfills 2 and 3 which are adjacent to each other, and the South Scar Area. Soil/waste (hereafter called soil) boring sample analysis and visual observation of soil, monitoring well, and piezometer boring materials provided information necessary to redefine the extent of these waste disposal areas. Figure 5 shows the general boundary of what is now known to be a more extensive single disposal area of approximately 20 acres. A majority of the northeast quadrant (shaded area on Figure 5) of the site contains plant generated waste at depths ranging from 4 to 10 feet below ground surface. The extreme northeastern area of the site was apparently used for disposal in the early years of plant operation, which was discontinued when this lower-lying area became built up and Deere & Company required additional buildings for its plant operations. Subsequently, numerous buildings have been constructed over the former disposal area. Currently, approximately 90% of the landfill area is covered with buildings or pavement.

Waste materials identified in the areas on-site known as Landfill 1 and Landfills 2 and 3 consist of amber to black colored friable sand and vitrified greenish-yellow material with pieces of wood and coal, metal fragments, and paint chips.

Metals concentrations in on-site waste material are elevated relative to on-site background soil metals levels. Acetone and methylene chloride were detected a number of times in waste material samples and acetone was detected three times in ground water samples. Both acetone and methylene chloride are considered site related contaminants.

3.1.1 LANDFILL 1

Subsurface soil and waste sample results from Landfill 1 indicate the presence of low levels of two volatile organic compounds, acetone and tetrachloroethene, and ten semi-volatile organics including up to 19,000 parts per billion (ppb) total carcinogenic polynuclear aromatic hydocarbons (PAHs) and 25,600 ppb total (carcinogenic and non-carcinogenic) PAHs. Various inorganic compounds were detected above background levels including arsenic, beryllium, and lead at levels up to 26 parts per million (ppm), 3.0 ppm, and 810 ppm, respectively.

No shallow soil samples were collected from the Landfill 1 because it is covered with concrete and gravel.

3.1.2 LANDFILLS 2 AND 3

Subsurface soil and waste sample results from Landfills 2 and 3 indicate the presence of low levels of four volatiles, acetone, methylene chloride, toluene, and xylene, and sixteen semi-volatiles including up to 5,000 ppb total carcinogenic PAHs and up to 84,500 ppb total PAHs. Various metals were detected above background levels including beryllium and lead at levels up to 2.0 ppm and 150 ppm, respectively.

No shallow soil samples were collected from the Landfills 2 and 3 because they are covered with either concrete or gravel.

3.1.3 HAZARDOUS WASTE/DRUM STORAGE AREA

The hazardous waste/drum storage area is currently used by Deere & Company to store new materials for use in production operations and to store waste materials while waiting for off-site disposal. Deere & Company is a Resource Conservation and Recovery Act (RCRA) waste generator and may store waste materials for a period not to exceed ninety (90) days.

Subsurface soil and waste sample results from the Hazardous Waste/Drum Storage Area indicate the presence of two low level volatiles, acetone and methylene chloride, and five semi-volatiles including up to 560 ppb total carcinogenic PAHs and 1,280 ppb total PAHs. Various metals were detected above background levels including lead at levels up to 77 ppm.

Shallow (0-2 foot depth) soil sample results from the Hazardous Waste/Drum Storage Area showed a single occurrence of acetone at a low level and six semi-volatiles including up to 470 ppb total carcinogenic PAHs and 1,330 ppb total PAHs. Various metals were detected above background levels including lead at levels up to 350 ppm.

3.1.4 OIL SPILL AREA

Subsurface soil and waste sample results from the Oil Spill Area show the presence of two low level volatiles, acetone and toluene. No semi-volatiles were detected and no metals were detected above background levels with the exception of aluminum at levels up to 7,500 ppm.

Shallow soil sample results from the Oil Spill Area indicate that no elevated levels of organic compounds were detected. Various metals were detected above background levels including beryllium at levels up to 1.9 ppm and zinc up to 860 ppm.

The oily coating which was observed in this area during the 1985 Site Investigation, was not detected during the RI and no waste material such as has been identified in the northeast portion of the site was found.

3.1.5 SOUTH SCAR AREA

Subsurface soil and waste sample results from the South Scar Area show the presence of two low level volatiles, acetone and xylene, and a single occurrence of the semi-volatile naphthalene at 1200 ppb. Various metals were detected above background levels including copper at levels up to 24 ppm and zinc up to 85 ppm.

Shallow soil sample results from the South Scar Area indicate the presence of two low level volatiles, acetone and tetrachloroethene. Various metals were detected above background levels including lead at levels up to 80 ppm.

The South Scar Area boring samples did not contain waste material as was identified in the northeast portion of the site. The top two feet, below the vegetative cover, did contain construction-type rubble such as bricks and concrete.

3.2 GROUND WATER RESULTS

Two rounds of ground water samples were analyzed from on-site and downgradient off-site monitoring wells. These two rounds of samples were collected under Phase I and Phase II of the RI field work. Phase I samples were collected after a limited amount of well purging (pumping), producing very turbid samples from the alluvial aquifer. Phase II samples were collected after much more extensive purging efforts. The resulting samples were considerably clearer than Phase I samples.

The metals arsenic, cadmium, chromium, and lead pose the principal threat to ground water at the John Deere-Ottumwa Works site.

Acetone, at 48 ppb in monitoring well 11 (MW 11), was the only volatile detected in ground water during the first phase of sampling. A total of six volatiles were detected in Phase II samples including 1,2-dichloroethane and benezene found at 3 ppb and 2 ppb, respectively in MW 4 which is down gradient from the South Scar Area. Five of the six volatiles detected are common constituents of petroleum fuels and were found in monitoring wells 4, 5, and 6, downgradient from the South Scar Area and in MW 3, directly northeast of the South Scar Area. The highest concentration of these petroleum related contaminants was 41 ppb. The remaining volatile detected in Phase II samples was acetone at 2 ppb and 48 ppb in MW 8, located adjacent to Landfills 2 and 3, and MW 11, located in the Hazardous Waste/Drum Storage Area, respectively.

No semi-volatiles were detected in Phase I ground water samples although three compounds were detected in Phase II samples at levels up to 4 ppb in MW 1 and piezometer 2 (PZ 2), downgradient from Landfill 1 and the Hazardous Waste/Drum Storage Area, respectively. Two of the three semi-volatiles, bis(2-ethylhexyl)phthalate and di-n-butyl phthalate, detected in ground water are ubiquitous common laboratory contaminants and were not detected in EPA's split samples. No PAHs were detected in ground water. Piezometer 2 was not sampled during Phase I activities.

Various metals were detected above Maximum Contaminant Levels (MCLs) in Phase I samples including arsenic, barium, cadmium, chromium, and lead. Monitoring wells 5 and 6, located downgradient from the South Scar area, contained the highest concentrations of arsenic (0.37 ppm), barium (13 ppm), and chromium (0.24 ppm) detected at the site. The highest level of lead (0.48 ppm) was detected in MW 7, adjacent to Landfills 2 and 3. Other monitoring well locations with relatively high levels of total metals in Phase I samples are the Oily Spill Area and the Hazardous Waste/Drum Storage Area.

Two metals of potential concern were detected in Phase II ground water samples at elevated levels. Barium and lead were each detected at only one monitoring well location. Barium was found at 1.1 ppm in MW 11, located in the Hazardous Waste Storage Area. Lead was found at 0.093 ppm in PZ 2, located downgradient from the Hazardous Waste/Drum Storage Area.

Turbidity measurements were performed on Phase II ground water samples with results indicating that the clearer Phase II samples were, in general, one to two orders of magnitude (ten to 100 times) greater than EPA's Maximum Contaminant Level (MCL) for turbidity applied to surface drinking water supplies. Turbid ground water samples potentially contain not only contaminant source metals but also naturally occurring metals.

Naturally occurring metals are often physically associated with fine-grained clay and silt sediments found in alluvial aquifers. Ground water samples collected from monitoring wells that are pumped infrequently often contain such sediments, producing turbid samples. When total metals analyses are conducted on turbid ground water samples, naturally occurring metals may inadvertently be measured along with any metals that may be due to the presence of waste material.

Because the monitoring wells were purged extensively prior to collection of Phase II ground water samples, these samples were considerably clearer than Phase I samples and so Phase II results showed a marked decrease in metals concentrations. Considering the potential effect of turbid samples, the higher metals concentrations in Phase I samples are consistent with, and verify, the metals results from Phase II samples. Because of the turbidity in Phase I samples, Phase II data is more representative of dissolved metals concentrations that may move along with the ground water and so potentially be found in drinking water produced from the alluvial aquifer. For this reason, Phase II ground water results were used in risk assessment calculations.

To assure adequate protection of human health and the environment, continued ground water monitoring at the site is required.

3.3 SURFACE WATER AND SEDIMENT RESULTS

3.3.1 BLACK LAKE SURFACE WATER

Black Lake surface water was sampled and found to contain no hazardous organic compounds, but three metals of potential interest, barium (0.43 ppm), manganese (0.15 ppm), and zinc (0.038 ppm), although none above EPA's Maximum Contaminant Levels (MCLs) established for drinking water supplies.

3.3.2 DRAINAGE DITCH AND BLACK LAKE SEDIMENT

Sediment samples were collected from the drainage ditch between the site and Highway 63/34, which drains surface water from the eastern portion of the site, and from the southern edge of Black Lake near a culvert outlet. During times of high rainfall, the culvert may allow site surface water to reach Black Lake.

No hazardous organic compounds were detected in the drainage ditch or Black Lake sediments. Elevated levels of copper, lead, and selenium were detected in the upgradient (background) drainage ditch sample. Downgradient drainage ditch samples exhibited decreased levels of these constituents. Black Lake sediment contained several inorganics of potential interest; arsenic (0.64 ppm), barium (8.7 ppm), cadmium (1.2 ppm), chromium (3.5 ppm), and nickel (8.5 ppm).

4.0 SUMMARY OF SITE RISKS

4.1 OVERVIEW OF BASELINE RISK ASSESSMENT

A Baseline Risk Assessment is an evaluation of the potential threat to human health and the environment in the absence of any remedial action. It provides information to help EPA determine whether remedial action is necessary at a site. A Baseline Risk Assessment was conducted for this site to determine the potential effects on human health and the environment. In this evaluation, both current and future land-use scenarios were evaluated. The complete Baseline Risk Assessment is presented in the RI Report which is available in the administrative record.

4.2 INDICATOR COMPOUNDS

A total of 19 chemicals plus PAHs were identified in the Baseline Risk Assessment to be of potential concern. Toxicity information was evaluated for all chemicals of concern including, where applicable, cancer potency factors and noncarcinogenic effects. Cumulative effects from all contaminants available for uptake were evaluated for each pathway. Contaminants of concern are contaminants that have been detected at the site, have inherent toxic or carcinogenic effects, and are likely to pose the greatest concern with respect to the protection of human health and the environment. The compounds selected include the more mobile and persistent chemicals at the site, as well as those present at the highest concentrations. These indicator compounds are listed in Table 12.

4.3 EXPOSURE ASSESSMENT

The exposure assessment identified potential pathways and routes for contaminants of concern to reach the receptors as well as the estimated contaminant concentration at the points of exposure. Pathways by which humans could be exposed, both on-site and off-site, to the chemicals of concern were evaluated based on reasonable assumptions about current and future land uses. The following pathways were evaluated:

1) Exposure of on-site workers to contaminated soil/waste through dermal contact, inhalation, and ingestion;

2) Exposure of on-site workers in the future by dermal contact, ingestion, and inhalation of subsurface soil/waste currently covered by concrete pads or buildings;

3) Exposure of potential on-site residents (children and adults) in the future to contaminated soil/waste through dermal contact, inhalation, and ingestion;

4) Exposure of on-site and off-site residents in the future through ingestion and inhalation of contaminated ground water used as a primary potable water source;

5) Exposure of on-site and off-site residents in the future through ingestion and inhalation of Black Lake surface water used as a primary potable water source;

6) Exposure of local residents, through ingestion, to fish caught from Black Lake;

4.4 TOXICITY ASSESSMENT

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day (parts per million/day), are estimates of lifetime daily exposure levels for humans that are likely to be without appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. The RfDs applicable at the John Deere-Ottumwa Works site are listed in Table 13.

Cancer potency factors (CPFs) or slope factors (SF) have been developed for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. SFs, which are also expressed in units of mg/kg/day (parts per million/day), are multiplied by the estimated intake of a potential carcinogen to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. The SFs applicable to the John Deere-Ottumwa Works site are listed in Table 13.

4.5 RISK CHARACTERIZATION

The risk characterization quantifies present and potential future risk to human health that may result from exposure to the contaminants of concern found at the site. The site-specific risk values are estimated by incorporating information from the toxicity and exposure assessments.

Two quantitative evaluations are made: the incremental risk to the individual resulting from exposure to a carcinogen; or, for non-carcinogens, a numerical index or ratio of the exposure dose level to an acceptable reference dose.

4.5.1 RISKS FROM CARCINOGENIC COMPOUNDS

For carcinogens or suspected carcinogens, a quantitative risk assessment involves calculating risk levels considered to represent the probability or range of probabilities of developing additional incidences of cancer under the prescribed exposure conditions. Carcinogenic risk estimates, expressed as additional incidences of cancer, are determined by multiplying the cancer potency by the projected exposure dose level. It is the carcinogenic potency factor, expressed in $(mg/kg/day)^{-1}$ which converts the estimated exposure dose level, expressed in mg/kg/day, to incremental risk. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}).

An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site. A cancer risk level of 1×10^{-4} means that an individual has an estimated excess cancer risk of one in ten thousand when exposed to a given concentration over a lifetime. These risk estimates are based on upper bound values, and are likely to be lower, possibly even zero. The EPA generally considers risk levels of 10^{-4} or lower to be acceptable.

The carcinogenic risks were calculated for pathways 1, 2, 3, and 4. Carcinogenic risk was not calculated for pathways 5 and 6 because no carcinogenic compounds were present for exposure through these routes. Carcinogenic risks calculated range between 1×10^{-5} and 3×10^{-4}, as shown in Tables 14 through 30.

The Baseline Risk Assessment indicated that there are no site related compounds that present a potentially unacceptable cancer risk level.

4.5.2 <u>RISKS FROM NON-CARCINOGENIC COMPOUNDS</u>

Estimations of risk associated with exposure to non-carcinogenic compounds employ a slightly different procedure. The EPA has developed standards, guidelines, and criteria that provide levels of intakes considered to protect human populations from possible adverse effects resulting from chemical exposures. A ratio of the estimated chemical intake derived from the contaminant concentration in a given medium to the contaminant's Reference Dose (RFD) provides a numerical measure of the potential that adverse health effects may result. This ratio is referred to as the chronic hazard quotient (HQ). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated.

In general, an HI value of one (1) or greater indicates that some risk of noncarcinogenic health effects exist with these risks increasing proportionally to the HI value.

A Hazard Index was calculated for each pathway evaluated. The HI value calculated for each pathway was equal to or less than 1, indicating no anticipated noncarcinogenic risks, with the exception of pathway 3 for children, as shown in Tables 14 through 30. The HI value associated with potential exposure of children, who in the future, might reside on-site and come in contact with contaminated soil/waste is slightly above 1, which means a noncarcinogenic risk exists which must be addressed by this ROD. Currently, neither children nor adults reside on-site.

4.5.3 RISKS FROM LEAD

Lead is also a carcinogen but EPA believes that toxic effects for sensitive populations will occur at lower levels than those which will produce carcinogenic effects. The EPA has established a unique procedure for evaluating risk due to exposure to lead, which is a compound of concern at the site. The EPA has developed the Uptake/Biokinetic (UBK) model to estimate blood lead levels resulting from exposures to lead. The EPA has established 10 micrograms of lead per deciliter (ug/dL) as a blood level in children which is unlikely to result in adverse health effects. Levels above 10 ug/dL are believed to result in adverse neurobehavioral effects in exposed children.

Mean blood levels predicted by the UBK model are presented in Table 31. Blood lead levels of hypothetical children who may, in the future, be exposed to site contaminants by direct contact with waste material, inhalation of site-generated dust, and site ground water range up to 4.59 ug/dL. This level is well below the accepted standard of 10 ug/dL, indicating no adverse health effects are expected due to site-related lead concentrations.

4.5.4 ENVIRONMENTAL RISKS

Environmental and ecological risks, including potential risks to critical habitats and endangered species and endangered species habitats, associated with the presence of contamination at the site were also considered as part of the risk assessment. No such risks were identified.

4.5.4.1 BLACK LAKE SURFACE WATER

Two constituents of concern were detected in the Black Lake water sample: barium and zinc. The soluble barium concentration would likely have to exceed 50 ppm before adverse effects to aquatic life would be expected. The reported barium concentration of 0.43 ppm suggests that the potential for barium to impact aquatic life in Black Lake is very low. The detected concentration of zinc, 0.038 ppm, is less than the Class B Iowa Water Quality Criteria of 0.10ppm (Black Lake falls within Class C, drinking water sources).

4.5.4.2 BLACK LAKE SEDIMENT

No hazardous organic compounds were detected in sediment collected from Black Lake. A comparison of the reported sediment metal concentrations with the background soil concentrations indicate that the concentrations are similar to background values.

The sediment metal data suggest that the site is not acting as a significant release source for sediment-bound metals.

4.5.4.3 TERRESTRIAL RISK

The John Deere-Ottumwa Works facility has been used for equipment manufacturing since the early 1900s and so does not provide suitable habitat to support a complex terrestrial ecosystem. The site has not been identified as a critical habitat for any species. Historical records report sightings of four rare and threatened or endangered species in the Ottumwa area: Graham's Watersnake (Regina grahami), piping plover (Charadrius melodus), woodland vole (Microtus pinetorum), and the southern bog lemming (Synaptomys cooperi). Ottumwa is also a wintering ground for the bald eagle (Haliaeetus leucocephalus) and roosts are located several miles downstream on the Des Moines River.

RI sample results have indicated that waste material is either buried or covered with buildings or pavement and little to no migration of site related contaminants has occurred. Potential exposures to threatened or endangered species are considered to be low and no greater than those estimated for the aquatic and terrestrial ecosystems.

4.5.5 CONCLUSION

In conclusion, based on the results of the risk assessment, EPA has determined that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment.

4.6 REMEDIATION GOALS

Federal and state cleanup standards for the contaminants of concern in soil have not been established at this time. The goal of any remedial action is to prevent unacceptable risks to human health and the environment from occurring due to the presence of site related contaminants. This may be accomplished by one of two means: removing and/or treating contaminated material to reduce contaminant concentrations or by breaking exposure pathways to prevent unacceptable exposures of sensitive populations from occurring.

The EPA has determined that implementing institutional controls to prevent children from being exposed to on-site contaminants is adequate to address health concerns at the John Deere-Ottumwa Works site, by breaking the exposure pathway.

5.0 DESCRIPTION OF ALTERNATIVES

The alternatives that were evaluated in detail in the Feasibility Study (FS) are described in this section. Four alternatives were determined to be appropriate for consideration at this site. These alternatives provided a range of various remedial alternatives. The following descriptions summarize the alternatives, including their treatment components, implementation requirements, estimated costs, and estimated time for completion. The three media potentially affected by the site, as discussed in section 3.0, ground water, soil/waste material, and surface water and sediments are further addressed below.

5.1 GROUND WATER

The Baseline Risk Assessment indicated that ground water contamination does not pose a significant threat to human health or the environment, therefore only the "no-action" alternative is described below.

5.1.1 NO-ACTION (WITH CONTINUED GROUND WATER MONITORING)

This alternative involves no action at the site to prevent or reduce exposures to potentially contaminated ground water. There are no costs associated with this alternative.

However, EPA will require that continued ground water monitoring would be conducted to ensure that no unacceptable exposure to risks posed by conditions at the site occur in the future. Ground water and surface water samples would be collected on a regular basis from existing monitoring wells on-site and off-site and from Black Lake unless new information is obtained which indicates that additional monitoring locations are necessary to properly evaluate site contaminants in ground water and surface water. Samples would be analyzed for volatile organic, semi-volatile organics, and metals.

The total present worth cost of continued collection and analysis of ground water samples, assuming a periodic monitoring program over five years, is estimated to be approximately $99,600.

There are no federal or state ARARs for the no-action alternative. Compliance with federal and state ARARs is not required because no remedial action is necessary to protect human health or the environment.

5.2 SURFACE WATER AND SEDIMENT

Data collected during the RI and the Baseline Risk Assessment indicate that surface water and sediments do not pose a significant threat to human health or the environment, therefore, only the "no-action" alternative is described below.

5.2.1 NO-ACTION (WITH ADDITIONAL SURFACE WATER MONITORING)

This alternative involves no action at the site to prevent or reduce exposures to potentially contaminated surface water and sediments. There are no costs associated with this alternative.

However, EPA will require that surface water samples from Black Lake be collected and analyzed in addition to ground water samples as discussed above in Section 5.1.1.

There are no federal or state ARARs for the no-action alternative. Compliance with federal and state ARARs is not required because no remedial action is necessary to protect human health or the environment.

5.3 <u>SOIL/WASTE</u> <u>MATERIAL</u>

The Baseline Risk Assessment indicated a potential noncarcinogenic health threat to children from site soil/waste material if the site were allowed to be used for residential purposes in the future. Therefore, a range of alternatives was evaluated as described below.

5.3.1 ALTERNATIVE 1: NO-ACTION

The National Contingency Plan (NCP) requires that the no-action alternative be evaluated for every site. This alternative involves no action at the site to prevent or reduce exposures to site waste material. There would be no costs associated with this alternative.

5.3.2 ALTERNATIVE 2: INSTITUTIONAL CONTROLS

This alternative would include implementation of deed restrictions to run with the land which limit access and land use for both the Deere & Company property and the right-of-way for Highway 63/34. The restrictions would require continued maintenance of the existing eight foot site perimeter fence topped with barbed wire to restrict unauthorized public access, and would limit future use of the site to prevent residential development of the property or other similar exposure situations (e.g., school building, preschool).

A maintenance program for the existing peripheral fence is currently being carried out by Deere & Company. Deed restrictions are easily implemented by filing such deed restrictions with local government officials.

The total present worth cost of implementing alternative 2 is associated with lodging the deed restrictions and is estimated to be approximately $4,000. The cost of maintaining the perimeter fence is currently covered by the facility's operating budget and so would require no additional funds.

5.3.3 ALTERNATIVE 3: CONCRETE CAP AND INSTITUTIONAL CONTROLS

A reinforced concrete cap would be placed over those portions of the site that contain buried waste material or have exhibited soil contamination and are not currently covered with concrete or buildings. In addition, the institutional controls discussed in alternative 2 would also be implemented. The discussion under section 5.3.2, above, also applies to this alternative.

This remedial alternative would be easily implemented and maintained because the necessary materials and technology are readily available. Long term maintenance would be required to ensure the continuing physical integrity of the cap.

The time required to implement the capping alternative is estimated to be approximately 16 months. The present worth cost of constructing the concrete cap and lodging the deed restriction is estimated to be approximately $2,226,000. The present worth cost of maintaining the concrete cap is approximately $442,300 over a thirty year period. Therefore the total present worth cost of alternative 3 over a 30 year period would be approximately $2,667,900.

5.3.4 ALTERNATIVE 4: IN-SITU STABILIZATION/SOLIDIFICATION WITH CONCRETE CAP AND INSTITUTIONAL CONTROLS

This alternative involves the in-situ (in place) stabilization/solidification of contaminated soil and waste material. Solidifying agents and chemical reagents would be injected into the contaminated soil/waste and mixed with large augers to obtain a uniform mixture. The mixture then sets up into a cement-type matrix. In addition, a concrete cap would be constructed and institutional controls implemented. The discussion included under alternative 3, above, also applies to this alternative.

The necessary solidifying agents, chemical reagents, and mixing equipment are available from a number of commercial vendors who specialize in this technology. A treatability study would be required prior to implementation in order to determine the most effective reagent or combination of reagents for stabilizing the soil/waste. Uniform treatment of the heterogeneous waste material would be difficult to ensure. Long term maintenance would be required to ensure the continuing physical integrity of the concrete cap.

The time required to implement the in-situ stabilization/ solidification alternative, including performance of a treatability study, is estimated to be approximately 1 to 2 years, after which the concrete cap would require approximately 16 months to complete. The present worth cost of implementing the stabilization/solidification technology and constructing the concrete cap is estimated at approximately $25,665,000. The present worth cost of performance monitoring of the solidified matrix and maintaining the concrete cap is approximately $805,100 over a thirty year period. Therefore, the total present worth cost of implementing alternative 4 is approximately $26,470,100.

6.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The NCP has established nine criteria that are used to evaluate remedial alternatives. These criteria serve as the basis for conducting detailed analyses during the Feasibility Study and are subsequently used to determine the appropriate alternative for the site. Attachment D provides a glossary of the nine criteria.

Based on the Baseline Risk Assessment, EPA has determined that ground water, surface water, and sediment contamination do not pose a significant threat to human health. Therefore, no remedial action with respect to these media is necessary to ensure protection of human health and the environment. However, ground water and surface water monitoring would be conducted to verify that no unacceptable exposure to risks posed by ground water or surface water affected by the site occur in the future.

EPA's selected remedy for soil/waste material at the John Deere-Ottumwa site is Alternative 2, institutional controls. EPA used the nine criteria to evaluate all of the alternatives. The selected remedy was determined to provide the best balance of trade-offs with respect to the criteria. The selected remedy is described in Section 7.0 and discussed below in relation to the criteria and is compared to the other alternatives under each criterion. The criteria are organized into three categories to prioritize the criteria used in making the final selection.

THRESHOLD CRITERIA

The first such category is threshold criteria. An alternative must meet the following two requirements to be considered as a final remedy for the site:

6.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy would require continuing maintenance of the existing site perimeter fence in order to restrict unauthorized public access. In addition, deed restrictions would be placed on the properties to prevent residential development or other similar exposure situations from occurring on-site in the future. These actions will ensure that the sensitive population, children, would not be exposed to site related contaminants above health based levels.

Both Alternatives 3 and 4 would provide protection of human health and the environment by reducing or controlling risk through treatment, engineering controls, or institutional controls. The no-action alternative does not provide overall protection of human health and the environment and therefore will not be evaluated further.

6.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Applicable requirements are those state or federal requirements legally applicable to the release or remedial action contemplated that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the site. If it is determined that a requirement is not applicable, it may still be relevant and appropriate to the circumstances of the release. Requirements are relevant and appropriate if they address problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and are well suited to the site.

There are no federal or state ARARs for the selected remedy, institutional controls.

The remaining alternatives, 3 and 4, would comply with their respective ARARs which include RCRA, the Clean Air Act, the Clean Water Act, and state laws.

PRIMARY BALANCING CRITERIA

The second category of criteria is primary balancing criteria. The following five criteria are used to evaluate the alternatives to determine the option that provides the best balance for the final alternative for the site:

6.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Institutional controls in the form of continued maintenance of the existing perimeter fence and placement of deed restrictions on future use of the site properties would eliminate the long-term risks associated with direct contact of site soil and waste material to the sensitive population, children. These requirements would run with ownership of the land, offering permanence of the selected alternative.

Alternatives 3 and 4 would both offer the effectiveness and permanence associated with institutional controls in addition to construction of physical barriers which further inhibit direct contact exposures to all populations, not just the single sensitive population identified in the Baseline Risk Assessment. The concrete cap would be susceptible to weathering, requiring long-term maintenance and the solidified matrix would require regular sample collection to ensure that the additional degree of protectiveness provided by these alternatives continues permanently. Continued ground water monitoring would be required for all alternatives discussed.

6.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The selected remedy, institutional controls, would not require treatment and so does not offer reduction of toxicity, mobility, or volume of contaminated material. Data provided by the RI indicates that contaminated material at the John Deere-Ottumwa Works site does not pose an unacceptable health risk to site workers, the most probable current and future exposure scenario.

Alternative 3, construction of a concrete cap with institutional controls, would cover contaminated soils thereby reducing mobility by preventing direct contact with contaminated soil and preventing contaminated soil from becoming air-entrained and so, inhaled.

Alternative 4, stabilization/solidification with a concrete cap and institutional controls, would offer the reduction of mobility provided by alternative 3 as well as a reduction in mobility of contaminants to the ground water, although impact on ground water has been shown to be minimal. Additionally, a reduction of toxicity would be achieved by the use of reagents to chemically bind the contaminants. The stabilization/ solidification technology generally involves some increase in volume of treated material due to the addition of reagents and solidifying agents.

6.5 SHORT-TERM EFFECTIVENESS

The selected remedy would provide a high degree of short-term effectiveness because no construction activities are required. Risks associated with the present use of the site are considered acceptable and would not be increased by implementation of this alternative.

Alternative 3 would involve a temporary increase in the potential for plant and remedial action workers to be exposed to waste material due to grading of the site required prior to construction of the concrete cap.

Implementation of Alternative 4 would involve an increase in potential exposure of plant and remedial action workers to contaminated soil/waste during grading of the site and augering of contaminated soil/waste.

6.6 IMPLEMENTABILITY

Potential problems associated with implementing the selected remedy are expected to be minimal because a maintenance program for the existing peripheral fence is currently being carried out by Deere & Company and deed restrictions are easily implemented by filing with local government officials.

Alternative 3 would be easily implemented and maintained because the necessary materials and technology are readily available. Long term maintenance would be required to ensure the continuing physical integrity of the cap.

A treatability study would be required prior to implementation of alternative 4, stabilization/solidification. Uniform treatment of the heterogeneous waste material would be difficult to ensure. Long term maintenance would be required to ensure the continuing physical integrity of the concrete cap.

6.7 COST

The cost of implementing the selected remedy is associated with lodging the deed restrictions and is estimated to be approximately $4,000. The cost of maintaining the perimeter fence is currently covered by the facility's operating budget and so would require no additional funds.

The total present worth cost of alternative 3 over a 30 year period would be approximately $2,667,900. The total present worth cost of implementing alternative 4 over a 30 year period would be approximately $26,470,100. The costs associated with alternatives 3 and 4 are considered by EPA to be excessive when compared with the marginal increase in protectiveness offered by these alternatives over alternative 2.

Although not considered a remedial action activity, the ground water monitoring that will be required by EPA is estimated to be $99,600 over a five year period.

MODIFYING CRITERIA

The third category of criteria is modifying criteria. The following two criteria are considered when evaluating the alternatives and are used to help determine the final remedy for the site:

6.8 STATE ACCEPTANCE

The State of Iowa concurs with and supports the selected remedy at the John Deere-Ottumwa Works site, see Appendix E.

6.9 COMMUNITY ACCEPTANCE

Community acceptance of the institutional controls alternative, along with ground water and surface water monitoring, has been evaluated following the public meeting held on August 8, 1991, and conclusion of the public comment period on August 19, 1991. The results of this evaluation are presented in the Responsiveness Summary, Appendix A.

7.0 SELECTED REMEDY

7.1 GROUND WATER, SURFACE WATER, AND SEDIMENTS

Based on the Baseline Risk Assessment, EPA has determined that ground water, surface water, and sediment contamination do not pose a significant threat to human health and, therefore, no remedial action is necessary. However, ground water and surface water monitoring would be conducted to verify that no unacceptable exposure to risks posed by ground water and surface water affected by the site occur in the future.

Pursuant to CERCLA Section 121(c), ground water and surface water monitoring data and other information, including site conditions shall be evaluated no less often than each five years. If results of the five-year review support EPA's current determination that the site does not present a significant potential threat to human health or the environment via ground water or surface water, monitoring could be modified or terminated.

If the periodic review indicates that continued monitoring is necessary to ensure that no potential unacceptable exposures occur in the future, monitoring will be continued for an additional period of time and a second review will be performed. Ground water and surface water monitoring and periodic reviews will continue to ensure that the site does not present a significant potential threat to human health or the environment.

If, however, an endangerment exists or a periodic review indicates that unacceptable migration of site related contaminants or exposures may occur, EPA has the option to amend the ROD, re-evaluating remedial options.

7.2 SOIL/WASTE MATERIAL

Based on the relative performance of each alternative with respect to the evaluation criteria, EPA has made the determination that the appropriate approach for the John Deere-Ottumwa Works site is alternative 2, institutional controls, which represents the best balance of trade-offs among the alternatives.

Alternative 2 satisfies the statutory requirements in Section 121 of CERCLA, 42 U.S.C. 9721: it is protective of human health and the environment; it complies with all federal and state requirements that are legally applicable or relevant and appropriate for the alternative; and it is cost-effective.

Of the alternatives 2, 3, and 4, all of which meet the threshold criteria, alternative 2 is by far the least costly. Alternatives 3 and 4 would slightly increase short term risk due to construction activities. There would be no increase in the short-term risk during implementation of the selected remedy, alternative 2, because no construction activities are required and an effective perimeter fence is already in place.

The selected remedy does not reduce toxicity, mobility, or volume through treatment. Data provided by the RI shows that contaminant levels in all media are low enough as to allow unlimited use of the site and affected media with the exception of children exposed to the waste material itself throughout their childhood years. Baseline Risk Assessment results indicate that site conditions do not require treatment of contaminated soil/waste if children do not live on-site or are not allowed a similar exposure to the soil/waste material (e.g., school building, preschool). Alternatives 3 and 4 would decrease mobility, and alternative 4 would reduce toxicity with some increase in volume.

The selected remedy would be protective of human health by providing for institutional controls that require the existing eight foot high chain link fence topped with barbed wire be maintained indefinitely. Alternative 2, the selected alternative, also requires the lodging of deed restrictions which prevents the development of residences or other similar exposure situations on-site in the future. These measures would ensure, on a long-term basis, that the sensitive population, children, are not exposed to site waste.

There are no federal or state ARARs to be considered for the selected remedy. ARARs for alternatives 3 and 4 would not likely pose any problem for those alternatives.

The selected remedy for the John Deere-Ottumwa site will provide long-term protection of human health and the environment and provides the best balance of all factors considered when evaluating possible options at this site.

During the statutory periodic reviews, EPA will ensure that deed restrictions remain in place and are complied with.

8.0 STATUTORY DETERMINATIONS

The selected remedy satisfies the statutory requirements of Section 121 of CERCLA, 42 U.S.C. § 9721, as follows:

8.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy would be protective of human health by providing for institutional controls that require the existing eight foot high chain link fence topped with barbed wire be maintained indefinitely. Alternative 2, the selected remedy, also requires the lodging of deed restrictions which prevents the development of residences or other similar exposure situations on-site in the future. These measures would ensure, on a long-term basis, that the sensitive population, children, are not exposed to site waste, thereby preventing the only potentially unacceptable exposure scenario from occurring. The Hazard Index (HI) associated with children directly contacting waste material is slightly above 1. Restricting access and preventing residential type development will preclude children from contacting waste material, thereby breaking the exposure pathway. No unacceptable site related cancer risks were identified.

Implementation of institutional controls will eliminate the long-term risks associated with direct contact of site soil and waste material to the sensitive population, children. There would be no increase in the short-term risk during implementation of the selected remedy because no construction activities are required and an effective perimeter fence is already in place.

Continued ground water and surface water monitoring will ensure that these media are not significantly impacted by the site in the future and will ensure that cross media contamination does not occur from waste material to ground water and surface water.

8.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy would comply with all federal and state ARARs. No chemical-specific or location-specific or action-specific ARARs were identified for the site in implementing the selected alternative.

8.3 COST-EFFECTIVENESS

The selected remedy is cost effective because it has been determined to provide overall effectiveness proportional to its cost, with the net present value being approximately $4,000 for placement of deed restrictions. The selected remedy is the least costly of remedies that were judged to provide equal protection of human health.

8.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the John Deere-Ottumwa Works Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that this selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume achieved through treatment, short-term effectiveness, implementability, and cost.

All the alternatives evaluated would be protective of human health and the environment on a long-term basis, with the exception of Alternative 1, the no-action alternative. Because no liquid, highly toxic or highly mobile wastes have been identified at the site, the additional benefit to be gained from Alternatives 3 and 4 over Alternative 2 in ensuring the protection of human health and the environment are marginal.

The selected remedy does not reduce toxicity, mobility, or volume through treatment. The site waste will not be treated because it is not liquid, highly toxic or highly mobile, and treatment is not practicable because the benefit from treatment of the large volume of waste is marginal compared to the cost of such treatment. Alternatives 3 and 4 would decrease mobility, and alternative 4 would reduce toxicity with some increase in volume.

Alternatives 3 and 4 would slightly increase short term risk due to exposure of waste material during construction activities. There would be no increase in the short-term risk during implementation of the selected remedy because no construction activities are required and an effective perimeter fence is already in place.

Implementing institutional controls is readily accomplished by filing with the proper local officials and a maintenance program for the existing perimeter fence is currently in effect. Ground water monitoring wells are already in place for ground water sampling. Alternative 3 could be implemented without difficulty but alternative 4 would require a highly complex effort in order to handle the heterogeneous waste material in-situ.

Of the alternatives 2, 3, and 4, which meet the threshold criteria, the preferred remedy, alternative 2, is by far the least costly. Of all the balancing criteria, above, cost was the most decisive factor in the selection decision given the low level of risk at the site, followed by the short-term risk and implementability criteria.

The State of Iowa concurs with and supports the selected remedy for the John Deere-Ottumwa Works site.

As reflected in the Responsiveness Summary, attached, the community accepts the selected remedy.

8.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy does not reduce toxicity, mobility, or volume through treatment. Data provided by the RI shows that contaminant levels in all media are low, which allows all but children the unlimited use of the site and affected media. Baseline Risk Assessment results indicate that site conditions do not require treatment of contaminated soil/waste if children do not live on-site or are not allowed a similar exposure to the soil/waste material (e.g., school building, preschool).

Alternatives 3 and 4 would decrease mobility, and alternative 4 would reduce toxicity with some increase in volume although both alternatives would be implemented at substantially greater cost than the selected remedy. The site waste will not be treated in implementing the selected remedy because it is not liquid, highly toxic or highly mobile, and treatment is not practicable because the benefit from treatment of the large volume of waste is marginal compared to the cost of such treatment.

9.0 DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes were made in selecting the preferred alternative as described in the Proposed Plan.

ATTACHMENT A

RESPONSE TO PUBLIC COMMENTS
ON THE
PROPOSED PLAN
FOR THE
JOHN DEERE-OTTUMWA WORKS SITE
OTTUMWA, IOWA

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) held a public comment period from July 20 through August 19, 1991 on the EPA Proposed Plan for the John Deere-Ottumwa Works Site in Ottumwa, Iowa. The purpose of the public comment period was to provide interested parties with an opportunity to comment on the Proposed Plan. The Proposed Plan was made available on July 16, 1991 at the Ottumwa Public Library in Ottumwa, Iowa. Notification of the public comment period was published in the Ottumwa Courier.

A public meeting was held on August 8, 1991 at the Ottumwa Public Library in Ottumwa, Iowa. At this meeting EPA representatives described the alternatives evaluated, presented the EPA preferred alternative, and answered questions about the John Deere-Ottumwa Works site and the remedial alternatives under consideration.

Section 113(k)(2)(B)(iv) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that EPA respond to significant comments on the EPA Proposed Plan. This Response Summary provides a review and summary of comments on the Proposed Plan. In addition to summarizing significant concerns and questions, the Response Summary presents EPA's responses to those concerns.

2.0 PUBLIC COMMENTS AND EPA RESPONSES

2.1 COMMENTS FROM INTERESTED CITIZENS

2.1.1 One written comment requested that the U.S. Environmental Protection Agency give a clean bill of health to the John Deere-Ottumwa Works site and discontinue any further testing.

EPA Response

While the Baseline Risk Assessment indicates that potential exposures to site contaminants are within acceptable ranges for adults, waste material containing hazardous constituents will remain on-site and poses a potential future exposure risk to children (children currently are not exposed to site waste material). Therefore, the limited remedial action of institutional controls must be implemented.

Also, to ensure that unacceptable exposures to site contaminants do not occur in the future via ground water or surface water, monitoring of ground water and surface water will be conducted for a minimum of five years in order to verify ground water data collected during the Remedial Investigation.

2.1.2 One commenter at the public meeting expressed appreciation for what Deere & Company, EPA, and IDNR have done and are going to do at the site, but remarked that EPA had surveyed community reaction. The commenter had not heard a report back.

EPA Response

EPA did interview several members of the public regarding the site and site activities. The information received was compiled in a Community Relations Plan for the site. The Community Relations Plan is available in the Administrative Record in the Ottumwa Public Library.

2.1.3 One commenter at the public meeting on behalf of Deere & Company expressed agreement with the conclusion and recommendation of the proposed plan and expressed Deere & Company's commitment to carrying out the proposed plan.

EPA Response

The willingness of Deere & Company to carry out the proposed plan enhances the implementability of the selected remedy.

2.1.4 One commenter at the public meeting stated concerns over whether the government or Deere & Company would bear costs for the work. The commenter was particularly concerned about how costs imposed on Deere & Company would affect jobs in the community. The commenter asked "if it's no danger to the public, why the continued monitoring?" The commenter also suggested that if there is no risk associated with the site, EPA should remove it from the Superfund list.

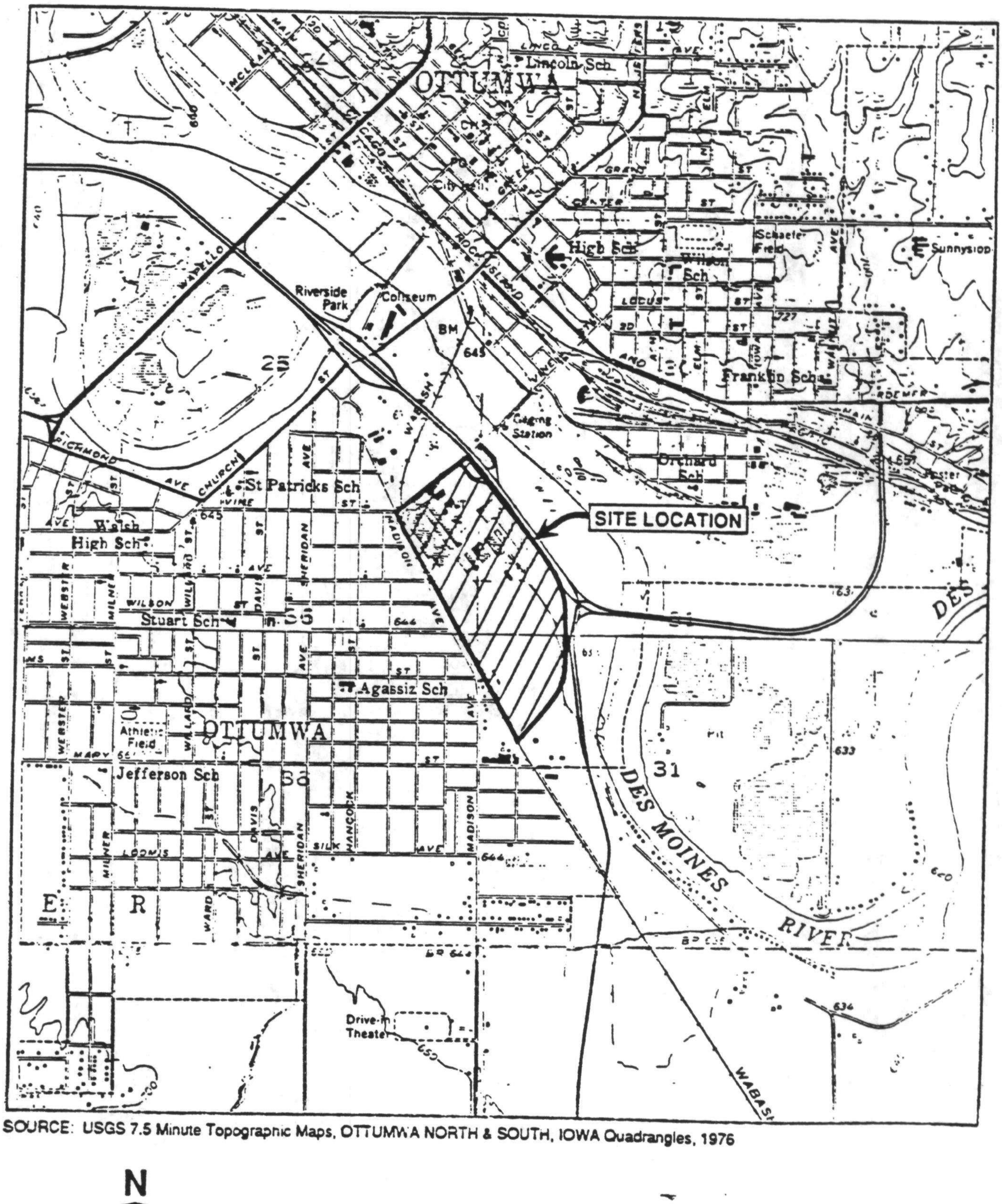
EPA Response

Deere & Company has paid all costs to date and is obligated to pay all EPA costs to date under the existing Consent Order. EPA does not have knowledge how costs affect Deere & Company's operations or how it might affect jobs in the area. Future costs, including ground water and surface water monitoring, are relatively minimal compared to other Superfund sites.

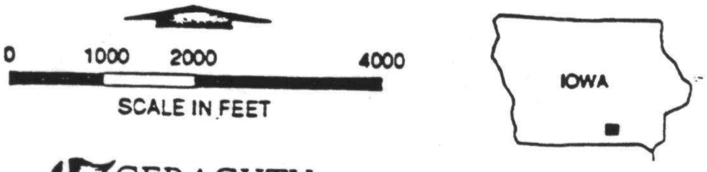
Waste material remains on-site and EPA is therefore required by statute, CERCLA Section 121(c), to conduct a periodic review not less than every five years to ensure the remedy is protective of human health and the environment. Continued ground water and surface water monitoring will be conducted for a minimum of five years to provide data to base the five-year review on. The site may be considered for deletion from the National Priority List ("Superfund" list) after a minimum of one five-year review.

ATTACHMENT B

FIGURES

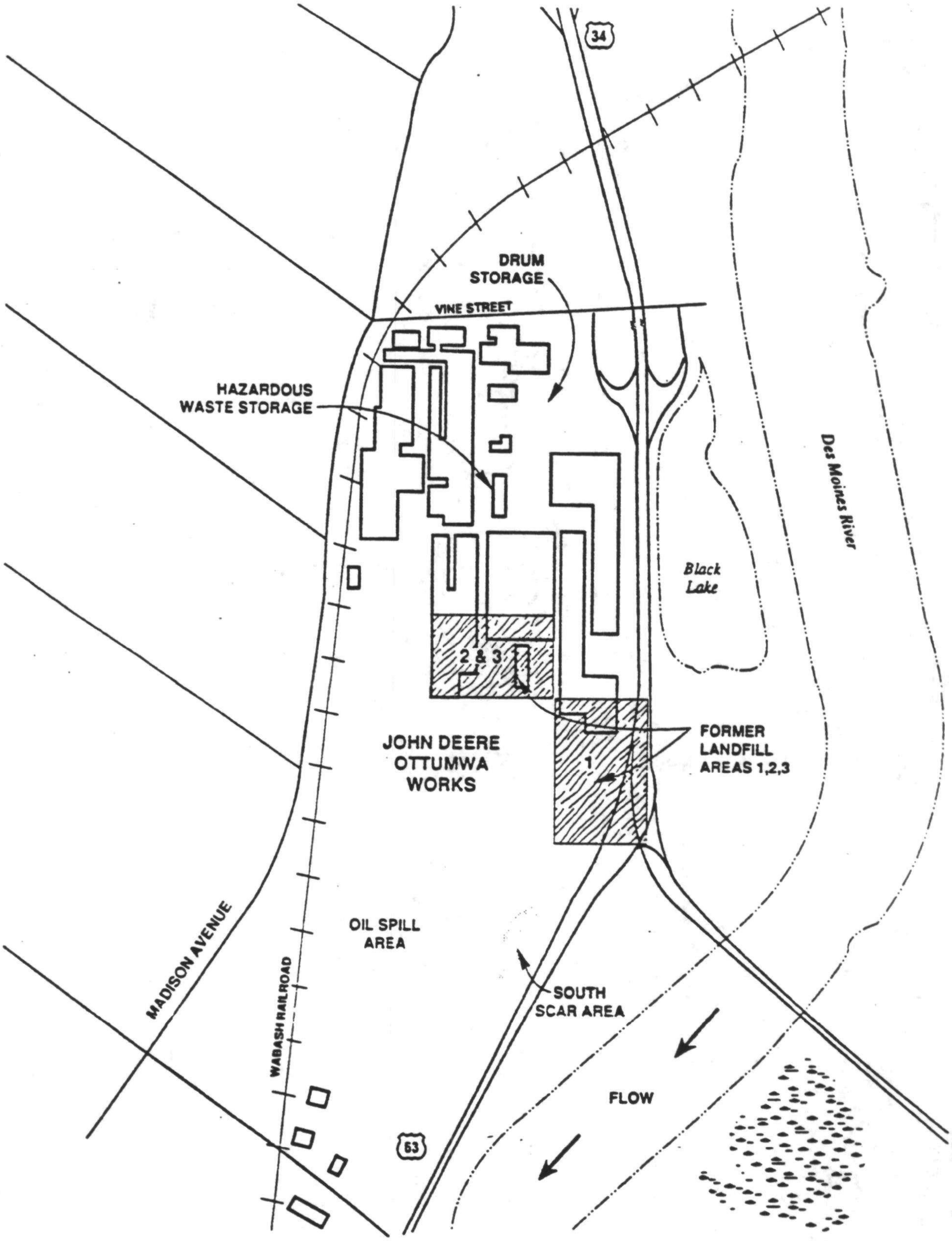


SOURCE: USGS 7.5 Minute Topographic Maps, OTTUMWA NORTH & SOUTH, IOWA Quadrangles, 1976

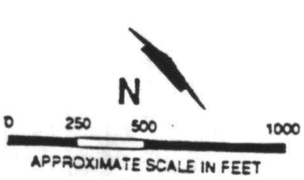


GERAGHTY & MILLER, INC.
Environmental Services

FIGURE 1
SITE LOCATION
REMEDIAL INVESTIGATION
JOHN DEERE OTTUMWA WORKS
OTTUMWA, IOWA
CI01301 - 0064.01

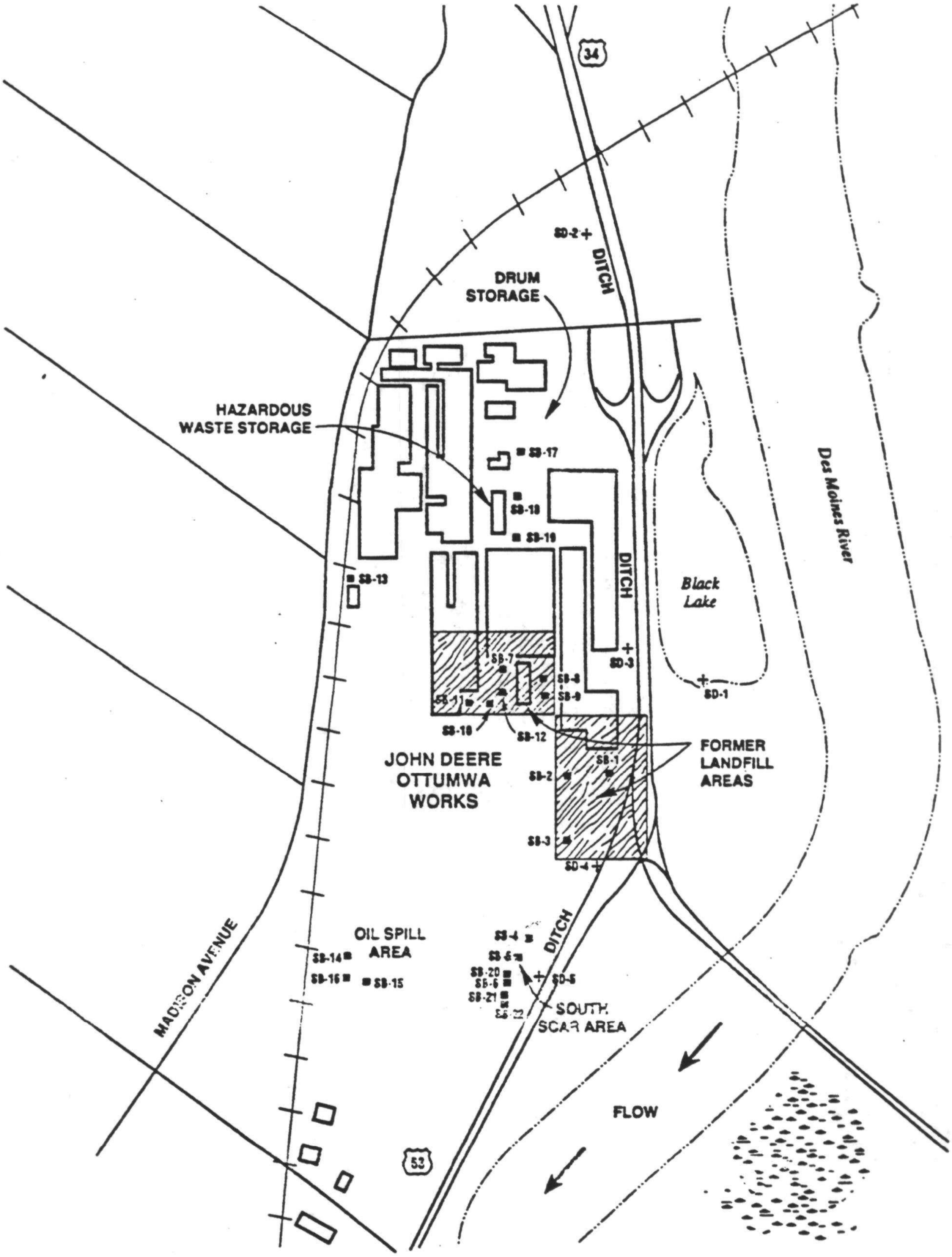


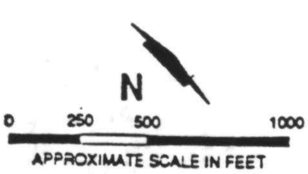
NOTE: THE SITE FEATURES ARE BASED UPON AN AREAL PHOTOGRAPH OF THE FACILITY WHICH WAS TAKEN ON APRIL 21, 1989.



GERAGHTY & MILLER, INC.

FIGURE 2
SITE FEATURES
REMEDIAL INVESTIGATION
JOHN DEERE OTTUMWA WORKS



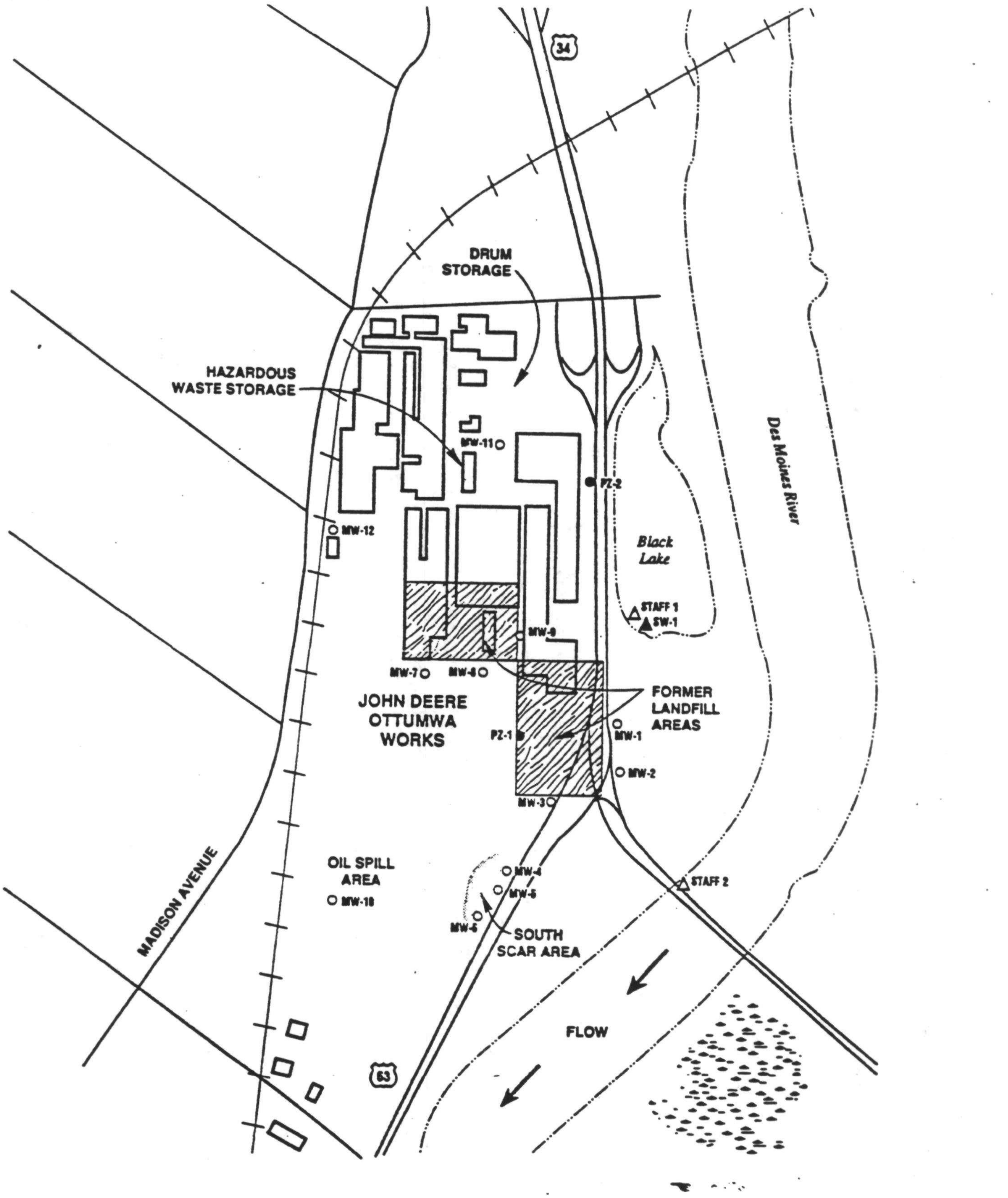


GERAGHTY

LEGEND

SD-1 + SEDIMENT SAMPLING LOCATION

FIGURE 3
SOIL BORING AND
SEDIMENT SAMPLING LOCATIONS
REMEDIAL INVESTIGATION



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APPROXIMATE SCALE IN FEET

GERAGHTY & MILLER, INC.

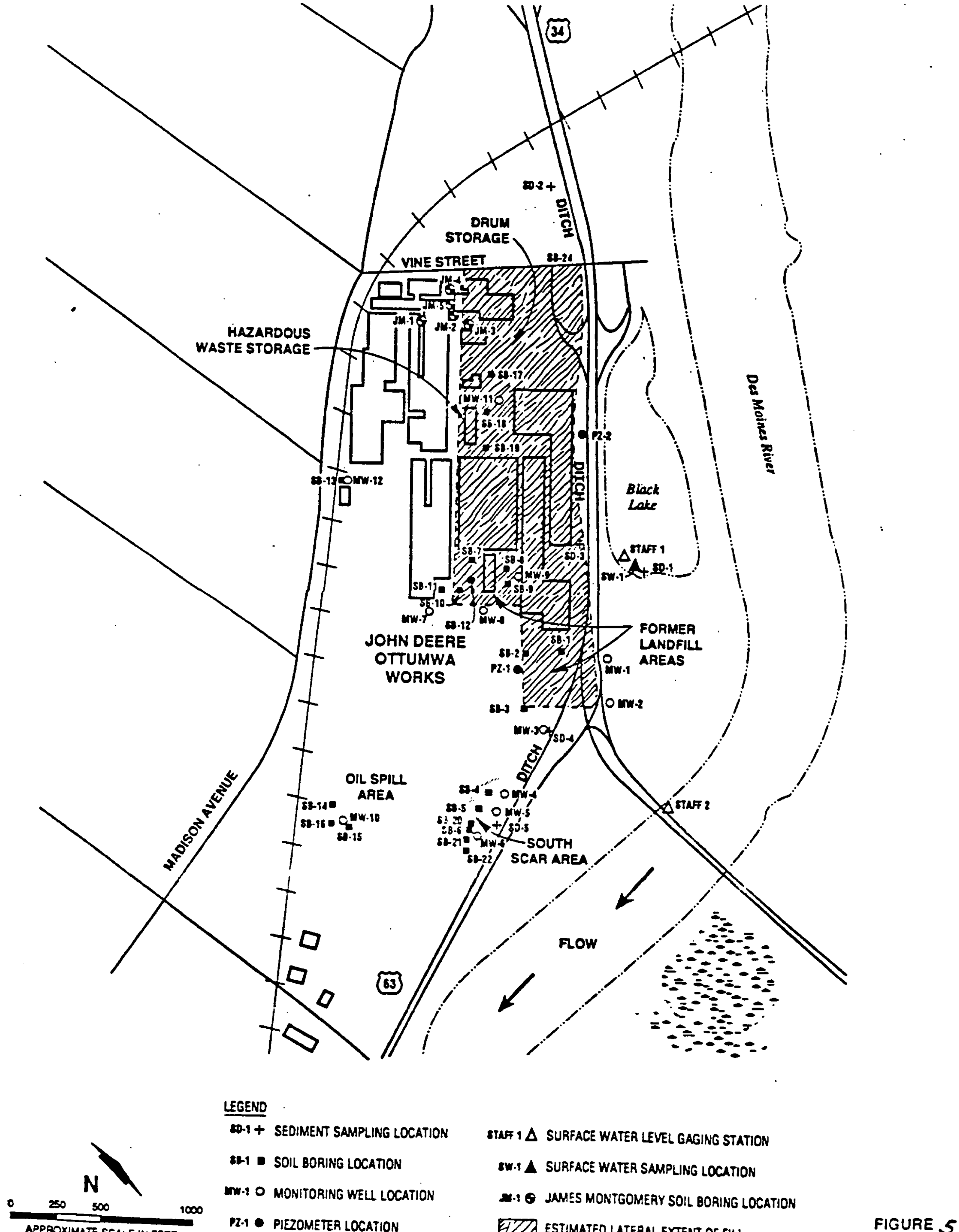
LEGEND

MW-1 ○ MONITORING WELL LOCATION

PZ-1 ● PIEZOMETER LOCATION

STAFF 1 △ SURFACE WATER LEVEL GAGING STATION

FIGURE 4
MONITORING WELL, PIEZOMETER AND SURFACE WATER GAGING LOCATIONS
REMEDIAL INVESTIGATION
JOHN DEERE OTTUMWA WORKS



GERAGHTY & MILLER, INC.
Environmental Services

FIGURE 5
ESTIMATED LATERAL EXTENT OF FILL
REMEDIAL INVESTIGATION
JOHN DEERE OTTUMWA WORKS
OTTUMWA, IOWA

ATTACHMENT C

TABLES

ATTACHMENT D

GLOSSARY OF EVALUATION CRITERIA

The following evaluation criteria were developed by EPA to address CERCLA statutory requirements and technical, cost, and institutional considerations. The evaluation criteria serve as the basis for conducting the detailed analyses during the Feasibility Study and for subsequently selecting an appropriate remedial action.

THRESHOLD CRITERIA

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives are assessed as to whether they can provide adequate protection from risks above health-based levels posed by contamination present at the site by eliminating, reducing, or controlling exposures.

COMPLIANCE WITH ARARS

The alternatives are assessed as to whether they attain applicable or relevant and appropriate requirements of other federal and state environmental and public health laws or provide grounds for invoking a waiver.

PRIMARY BALANCING CRITERIA

LONG-TERM EFFECTIVENESS AND PERMANENCE

The magnitude of risk remaining after implementation of the alternative is evaluated. The adequacy and reliability of controls used to manage treatment residuals or untreated wastes that remain at the site are also assessed.

REDUCTION OF TOXICITY, MOBILITY AND VOLUME

The degree to which the alternatives employ treatment that reduces toxicity, mobility, or volume is assessed.

SHORT-TERM EFFECTIVENESS

The alternatives are evaluated with respect to their effects on human health and the environment during implementation of the alternative.

IMPLEMENTABILITY

The technical and administrative feasibility of implementing an alternative and the availability of services and materials are evaluated.

COST

Direct and indirect capital costs and operation and maintenance costs incurred over the life of the project are identified.

MODIFYING CRITERIA

STATE ACCEPTANCE

Technical and administrative issues and concerns the state may have regarding the alternatives are assessed.

COMMUNITY ACCEPTANCE

The issues and concerns of the public regarding the alternatives are assessed.

Table 1 Occurrence of Constituents in Phase II Unfiltered Ground-Water Samples[a], John Deere Ottumwa Works, Ottumwa, Iowa.

Constituents	Range[b]	Mean[c]	UCL	Background[d]
VOCs				
Acetone	0.002 - 0.005	0.0048 (NA)	0.0052	<0.010
Benzene	0.002 - 0.0025	0.0025 (NA)	0.0025	<0.005
1,2-Dichloroethane	0.0025 - 0.003	0.0025 (NA)	0.0026	<0.005
Ethylbenzene	0.0025 - 0.008	0.0033 (NA)	0.0043	<0.005
Toluene	0.0025 - 0.015	0.0035 (NA)	0.0053	<0.005
Xylene (total)	0.0025 - 0.041	0.0074 (NA)	0.013	<0.005
Semi-VOCs				
Bis(2-ethylhexyl)phthalate	0.001 - 0.005	0.0046 (NA)	0.0052	<0.010
Di-n-butylphthalate	0.001 - 0.005	0.0045 (NA)	0.0051	<0.010
1,2,4-Trichlorobenzene	0.004 - 0.005	0.0049 (NA)	0.0050	<0.010
Inorganics				
Aluminum	0.16 - 7.5	2.6 (<0.027)	3.8	5.3
Arsenic	0.001 - 0.027	0.0084 (<0.002)	0.013	0.023
Barium	0.13 - 1.1	0.38 (0.29)	0.51	0.63
Cadmium	0.0025 - 0.005	0.0027 (<0.005)	0.0031	0.006
Calcium	97 - 240	150 (158)	170	166
Chromium	0.003 - 0.018	0.0060 (<0.006)	0.0085	0.014
Cobalt	0.005 - 0.028	0.0093 (<0.01)	0.013	0.079
Copper	0.0025 - 0.032	0.011 (<0.005)	0.016	0.033
Iron	0.32 - 32	14 (6.8)	20	41
Lead	0.0005 - 0.093	0.0099 (<0.001)	0.023	0.019
Magnesium	15 - 50	33 (36)	37	43
Manganese	1.1 - 7.6	3.3 (3.5)	4.4	4.3
Nickel	0.0045 - 0.058	0.016 (0.0075)	0.024	0.11
Potassium	1.7 - 8.2	4.9 (6.2)	5.9	6.6
Silver	0.002 - 0.005	0.0025 (<0.004)	0.0031	<0.004
Sodium	15 - 147	55 (64)	77	29
Vanadium	0.002 - 0.031	0.011 (<0.004)	0.015	0.074

Table 1 Occurrence of Constituents in Phase II Unfiltered Ground-Water Samples[a], John Deere Ottumwa Works, Ottumwa, Iowa.

Constituents	Range[b]	Mean[c]	UCL	Background[d]
Inorganic (cont')				
Zinc	0.007 - 0.17	0.050 (0.020)	0.077	0.11

Concentrations reported in milligrams per liter (mg/L).

NA Not analyzed.

UCL Upper 95 percent confidence limit.

a Unfiltered Phase II sample data from 12 samples (GMMW01 through GMMW11 and GMPZ02).

b Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

c Arithmetic mean of unfiltered sample data using one-half the detection limit for non-detects. Values in parenthesis ( ) are the arithmetic mean of Phase II filtered sample data.

d Background sample is GMMW12-02 from the Phase II unfiltered sample.

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Table 2 Occurrence of Constituents in Surface-Water and Sediment From Black Lake, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Detected Water[a] Concentration (mg/L)	Detected Sediment[b] Concentration (mg/kg)
Inorganics		
Aluminum	0.40	650
Arsenic	<0.005	0.64
Barium	0.43	8.7
Cadmium	<0.001	1.2
Calcium	29	1,200
Chromium	<0.01	3.5
Cobalt	<0.01	4.6
Copper	<0.02	6.5
Iron	0.75	3,600
Lead	<0.005	<0.61
Magnesium	11	720
Manganese	0.15	150
Nickel	<0.01	8.5
Potassium	4.6	82
Sodium	31	39
Vanadium	<0.01	4.8
Zinc	0.038	19

a Data from GMSW-01.
b Data from GMSD-01.

707johndeere.12.tb.

Table 3 Occurrence of Constituents in Drainage Ditch Sediment Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Site Background[c]
Inorganics				
Aluminum	2,700 - 3,400	3,000	3,400	8,700
Arsenic	2.9 - 3.8	3.4	3.8	7.6
Barium	70 - 85	77	85	170
Beryllium	0.28 - 0.31	0.29	0.31	1.1
Cadmium	2.8 - 3.3	3.0	3.3	6.4
Calcium	4,300 - 6,300	5,000	6,300	7,900
Chromium	7.1 - 7.5	7.3	7.5	15
Cobalt	5.9 - 8.1	7.2	8.1	12
Copper	6.1 - 6.6	6.3	6.6	20
Iron	8,700 - 10,000	9,400	10,000	19,000
Lead	9.0 - 37	21	37	39
Magnesium	1,700 - 1,900	1,800	1,900	2,800
Manganese	300 - 400	360	400	640
Nickel	12 - 14	13	14	25
Potassium	350 - 420	400	420	1,200
Sodium	35 - 46	40	46	89
Vanadium	10 - 12	11	12	25
Zinc	37 - 53	47	53	110

Concentrations reported in milligrams per kilogram (mg/kg).

UCL Upper 95 percent confidence level.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

b Arithmetic mean of three samples (GMSD-03, GMSD-04, and GMSD-05) using one-half the detection limit for non-detects.

c Background sample is GMSD-02.

707johndeere/11.tbl

Table 4 Occurrence of Constituents in Landfill 1, Subsurface Material Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
Organics				
Acetone	0.005 - 0.051	0.022	0.034	<0.01
Bis(2-ethylhexyl) phthalate	0.18 - 0.9	0.29	0.44	<0.35
Tetrachloroethene	0.003 - 0.039	0.007	0.015	<0.005
cPAHs	1.1 - 23	3.7	8.1	<0.39
tPAHs	1.6 - 27	4.8	9.8	<0.39
Inorganics				
Aluminum	1,500 - 11,000	4,900	7,400	1,700
Arsenic	0.27 - 26	5.6	11	4.2
Barium	15 - 240	100	140	85
Beryllium	0.14 - 3.0	0.78	1.4	0.65
Cadmium	1.0 - 32	7.3	13	3.7
Calcium	2,000 - 270,000	38,000	92,000	1,800
Chromium	2.5 - 140	25	52	10
Cobalt	1.5 - 15	7.6	10	7.7
Copper	1.6 - 70	19	33	4.8
Iron	4,500- 59,000	25,000	37,000	14,000
Lead	3.2 - 810	120	280	9.9
Magnesium	50 - 3,800	2,200	2,900	1,400
Manganese	160 - 640	380	470	400
Mercury	0.027 - 0.49	0.1	0.20	<0.059
Nickel	5.2 - 28	16	20	13
Potassium	150 - 1,300	660	920	370
Selenium	0.027 - 3.1	0.50	1.1	<0.59
Sodium	26 - 1,800	360	710	81
Vanadium	3.2 - 27	14	20	18
Zinc	10 - 2,800	420	980	26
Cyanide	0.[illegible]6 - 53	6.1	17	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).

UCL Upper 95 percent confidence limit.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

b Arithmetic mean of nine samples using one-half the detection limit for non-detects.

c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

cPAHs Carcinogenic PAHs.

tPAHs Total PAHs; includes carcinogenic and noncarcinogenic PAHs.

716johndeere#3/3.tbl

Table 5 Occurrence of Constituents in Landfills 2 and 3, Subsurface and Composite Material Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
Organics				
Acetone	0.005 - 0.18	0.08	0.11	<0.01
Dibenzofuran	0.19 - 5.6	1.0	1.8	<0.39
Methylene Chloride	0.003 - 0.038	0.008	0.014	<0.005
Toluene	0.003 - 0.009	0.004	0.004	<0.005
cPAHs	1.3 - 14	4.4	6.2	<0.39
tPAHs	2.8 - 94	17	30	<0.39
Xylene	0.003 - 0.007	0.003	0.004	<0.005
Inorganics				
Aluminum	2,300 - 9,600	5,700	6,700	1,700
Arsenic	1.9 - 36	9.0	15	4.2
Barium	51 - 570	180	260	85
Beryllium	0.14 - 2.0	1.0	1.3	0.65
Cadmium	2.2 - 41	9.5	15	3.7
Calcium	2,200 - 16,000	8,100	11,000	1,800
Chromium	5.9 - 36	13	17	10
Cobalt	5.0 - 12	8.2	9.5	7.7
Copper	5.9 - 48	19	26	4.8
Iron	7,700 - 49,000	22,000	29,000	14,000
Lead	5.6 - 150	62	88	9.9
Magnesium	790 - 2,900	1,900	2,200	1,400
Manganese	280 - 690	400	470	400
Mercury	0.029 - 0.16	0.055	0.077	<0.059
Nickel	9.5 - 36	20	25	13
Potassium	430 - 1,300	830	960	370
Selenium	0.28 - 3.3	0.83	1.4	<0.59
Sodium	97 - 460	200	260	81
Vanadium	8.9 - 22	17	19	18
Zinc	29 - 25,000	2,300	6,000	26
Cyanide	0.14 - 20	2.9	6.0	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).
UCL Upper 95 percent confidence limit.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.
b Arithmetic mean of 12 samples using one-half the detection limit for non-detects.
c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

cPAHs Carcinogenic PAHs.
tPAHs Total PAHs; includes carcinogenic and noncarcinogenic PAHs.

716johndeere#3/4.tbl

Table 6 Occurrence of Constituents in Drum Storage/Hazardous Waste Storage Area, Surficial Material Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
<u>Organics</u>				
Acetone	0.005 - 0.078	0.03	0.078	<0.01
Methylene Chloride	0.003[d]	0.003	0.003	<0.005
cPAHs	0.38 - 0.47	0.42	0.47	<0.39
tPAHs	1.2 - 1.7	1.4	1.7	<0.39
3,3-Dichlorobenzidine	0.37[d] - 0.39[d]	0.38	0.39	<0.78
<u>Inorganics</u>				
Aluminum	6,000 - 6,400	6,100	6,400	1,700
Arsenic	3 - 16	8.3	16	4.2
Barium	75 - 400	190	400	85
Beryllium	0.84 - 1.1	0.95	1.1	0.65
Cadmium	8.8 - 14	11	14	3.7
Calcium	16,000 - 42,000	26,000	42,000	1,800
Chromium	14 - 70	35	70	10
Cobalt	6.7 - 8.7	8.0	8.7	7.7
Copper	22 - 43	29	43	4.8
Iron	19,000 - 48,000	36,000	48,000	14,000
Lead	52 - 350	170	350	9.9
Magnesium	460 - 1,600	1,000	1,600	1,400
Manganese	69 - 870	520	870	400
Mercury	0.028 - 0.082	0.047	0.082	<0.059
Nickel	18 - 23	21	23	13
Potassium	750 - 820	780	820	370
Selenium	0.28 - 1.2	0.86	1.2	<0.59
Sodium	160 - 480	280	480	81
Vanadium	13 - 20	17	20	18
Zinc	340 - 640	490	640	26
Cyanide	0.14 - 1.0	0.43	1.0	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).

UCL Upper 95 percent confidence limit.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

b Arithmetic mean of three samples using one-half the detection limit for non- detects.

c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

d Not detected in surficial soil, but because it was detected in subsurface soil, the value shown represents one-half the detection limit.

cPAHs Carcinogenic PAHs.

tPAHs Total PAHs; includes carcinogenic and noncarcinogenic PAHs.

716johndeere#3/5.tbl

Table 7 Occurrence of Constituents in Drum Storage/Hazardous Waste Storage Area, Subsurface Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
Organics				
Acetone	0.005 - 0.095	0.036	0.095	<0.01
Methylene Chloride	0.003 - 0.01	0.005	0.01	<0.005
cPAHs	0.37 - 0.56	0.44	0.56	<0.39
tPAHs	1.1 - 1.7	1.3	1.7	<0.39
3,3-Dichlorobenzidine	0.21 - 0.40	0.33	0.40	<0.78
Inorganics				
Aluminum	2,800 - 10,000	6,000	10,000	1,700
Arsenic	3.0 - 10	5.4	10	4.2
Barium	47 - 200	120	200	85
Beryllium	0.14 - 1.0	0.54	1.0	0.65
Cadmium	2.6 - 10	5.2	10	3.7
Calcium	4,700 - 21,000	15,000	21,000	1,800
Chromium	6.4 - 22	12	22	10
Cobalt	3.2 - 10	6.8	10	7.7
Copper	9.7 - 32	18	32	4.8
Iron	8,600 - 32,000	17,000	32,000	14,000
Lead	10 - 77	34	77	9.9
Magnesium	2,100 - 2,800	2,400	2,800	1,400
Manganese	190 - 830	450	830	400
Mercury	0.028 - 0.061	0.04	0.061	<0.059
Nickel	6.9 - 45	22	45	13
Potassium	360 - 1,100	670	1,100	370
Selenium	0.28 - 0.31	0.30	0.31	<0.59
Vanadium	7.5 - 26	15	26	18
Zinc	48 - 1,300	470	1,300	26
Cyanide	0.14 - 0.30	0.24	0.30	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).

UCL Upper 95 percent confidence limit.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

b Arithmetic mean of three samples using one-half the detection limit for non-detects.

c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

cPAHs Carcinogenic PAHs.

tPAHs Total PAHs; includes carcinogenic and noncarcinogenic PAHs.

716johndeere#3/6.tbl

Table 8 **Occurrence of Constituents in Oil Spill Area, Surficial Soil Samples, John Deere Ottumwa Works, Ottumwa, Iowa.**

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
<u>Organics</u>				
Acetone	0.006[d]	0.006	0.006	<0.01
Toluene	0.003[d]	0.003	0.003	<0.005
<u>Inorganics</u>				
Aluminum	10,000 - 14,000	11,000	14,000	1,700
Arsenic	3.3 - 4.8	4.1	4.8	4.2
Barium	160 - 190	170	190	85
Beryllium	0.9 - 1.9	1.4	1.9	0.65
Cadmium	5.0 - 6.7	5.6	6.7	3.7
Calcium	2,800 - 3,900	3,400	3,900	1,800
Chromium	12 - 18	15	18	10
Cobalt	6.2 - 9.0	7.9	9.0	7.7
Copper	93 - 17	12	17	4.8
Iron	15,000 - 19,000	17,000	19,000	14,000
Lead	12 - 27	18	27	9.9
Magnesium	2,100 - 2,500	2,300	2,500	1,400
Manganese	390 - 790	600	790	400
Nickel	17 - 22	19	22	13
Potassium	620 - 1,300	940	1,300	370
Sodium	68 - 86	75	86	81
Vanadium	22 - 28	25	28	18
Zinc	45 - 860	320	860	26
Cyanide	0.15 - 0.45	0.25	0.45	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).
UCL Upper 95 percent confidence limit.
a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.
b Arithmetic mean of three samples using one-half the detection limit for non- detects.
c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).
d Not detected in surficial soil, but because it was detected in the subsurface soil, the value represents one-half the detection limit.

Table 9 Occurrence of Constituents in Oil Spill Area, Subsurface Soil Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
Organics				
Acetone	0.005 - 0.37	0.016	0.037	<0.01
Toluene	0.003 - 0.095	0.033	0.95	<0.005
Inorganics				
Aluminum	1,500 - 7,500	4,000	7,500	1,700
Arsenic	0.91 - 2.9	2.2	2.9	4.2
Barium	14 - 160	81	160	85
Beryllium	0.13 - 1.4	0.72	1.4	0.65
Cadmium	1.1 - 5.3	2.9	5.3	3.7
Calcium	610 - 3,700	1,700	3,700	1,800
Chromium	4.6 - 11	7.3	11	10
Cobalt	4.1 - 11	6.8	11	7.7
Copper	2.0 - 10	5.4	10	4.8
Iron	4,300 - 16,000	8,800	16,000	14,000
Lead	1.3 - 13	6.5	13	9.9
Magnesium	920 - 2,300	1,400	2,300	1,400
Manganese	120 - 700	470	700	400
Nickel	6.7 - 21	14	21	13
Potassium	120 - 740	350	740	370
Sodium	30 - 92	60	92	81
Vanadium	5.1 - 18	11	18	18
Zinc	13 - 51	30	51	26
Cyanide	0.13 - 0.15	0.14	0.15	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).
UCL Upper 95 percent confidence limit.
a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.
b Arithmetic mean of three samples using one-half the detection limit for non- detects.
c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

716johndeere#3/8.tbl

Table 10 Occurrence of Constituents in South Scar Area, Surficial Soil Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
<u>Organics</u>				
Acetone	0.006 - 0.049	0.024	0.049	<0.01
Naphthalene	0.19 - 0.20	0.19	0.20	<0.39
Tetrachloroethene	0.003 - 0.048	0.018	0.048	<0.005
Xylene	0.003[d]	0.003	0.003	<0.005
<u>Inorganics</u>				
Aluminum	4,400 - 7,900	5,700	7,900	1,700
Arsenic	2.8 - 4.2	3.6	4.2	4.2
Barium	87 - 160	110	160	85
Beryllium	0.63 - 0.84	0.71	0.84	0.65
Cadmium	3.2 - 6.0	4.7	6.0	3.7
Calcium	4,300 - 9,600	6,500	9,600	1,800
Chromium	13 - 21	18	21	10
Cobalt	8.6 - 10	9.4	10	7.7
Copper	9.2 - 38	22	38	4.8
Iron	11,000 - 24,000	18,000	24,000	14,000
Lead	20 - 80	46	80	9.9
Magnesium	2,100 - 2,800	2,400	2,800	1,400
Manganese	260 - 660	480	660	400
Mercury	0.028 - 0.06	0.039	0.06	<0.059
Nickel	13 - 21	18	21	13
Potassium	510 - 910	680	910	370
Sodium	66 - 140	92	140	81
Vanadium	14 - 21	17	21	18
Zinc	54 - 100	78	100	26
Cyanide	0.15[d]	0.15	0.15	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).

UCL Upper 95 percent confidence limit.

a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.

b Arithmetic mean of three samples using one-half the detection limit for non- detects.

c Arithmetic mean background using two samples: GMSB13-03 (4-6 ft. bls) and GMSB13-05 (8-10 ft. bls).

d Not detected in the surficial soil, but because it was detected in subsurface soil, the value represents one-half the detection limit.

Table 11 Occurrence of Constituents in South Scar Area, Subsurface Soil Samples, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Range[a]	Mean[b]	UCL	Mean Background[c]
Organics				
Acetone	0.005 - 0.064	0.031	0.049	<0.01
Naphthalene	0.18 - 1.2	0.37	0.70	<0.39
Tetrachloroethene	0.003[d]	0.003	0.003	<0.005
Xylene	0.003 - 0.16	0.029	0.08	<0.005
Inorganics				
Aluminum	1,000 - 11,000	4,700	7,900	1,700
Arsenic	0.3 - 8.9	3.3	5.9	4.2
Barium	32 - 190	94	150	85
Beryllium	0.14 - 1.3	0.56	0.96	0.65
Cadmium	1.1 - 5.7	3.1	4.5	3.7
Calcium	2,500 - 6,500	5,200	6,500	1,800
Chromium	4.1 - 18	9.4	14	10
Cobalt	3.4 - 11	7.3	9.6	7.7
Copper	1.7 - 24	9.8	18	4.8
Iron	4,800 - 22,000	11,000	17,000	14,000
Lead	1.5 - 27	10	19	9.9
Magnesium	2,100 - 3,500	2,800	3,200	1,400
Manganese	230 - 580	400	530	400
Mercury	0.028 - 0.033	0.031	0.033	<0.059
Nickel	8.3 - 25	14	20	13
Potassium	100 - 1,200	540	920	370
Sodium	38 - 140	77	110	81
Vanadium	5.2 - 27	14	21	18
Zinc	11 - 85	42	69	26
Cyanide	0.14 - 0.36	0.19	0.26	<0.01

Concentrations reported in milligrams per kilogram (mg/kg).
UCL Upper 95 percent confidence limit.
a Minimum concentration in range represents either the lowest detected concentration or one-half the detection limit for non-detects.
b Arithmetic mean of six samples using one-half the detection limit for non- detects.
c Arithmetic mean background using two samples: GMSB13-03 (46 ft. bls) and GMSB13-05 (8-10 ft. bls).
d Not detected in subsurface soil, but because it was detected in surficial soil, the value represents one-half the detection limit.

707johndeere#3/10.tbl

TABLE 12

INDICATOR COMPOUNDS USED IN RISK ASSESSMENT CALCULATIONS

Inorganics

Arsenic
Barium
Beryllium
Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Zinc

Volatile Organics

Acetone
Methylene Chloride
Tetrachloroethene
Toluene
Xylenes

Semi-Volatile Organics

Dibenzofuran
3,3-Dichlorobenzidine
Carcinogenic Polycyclic Aromatic Hydrocarbons
Non-Carcinogenic Polycyclic Aromatic Hydrocarbons

Table 13 Reference Doses (RfD), and Cancer Slope Factors (SF) for Indicator Compounds

Constituent	RfD (mg/kg-day)		SF (mg/kg/day)$^{-1}$	
	Oral	Inhalation[a]	Oral	Inhalation
Inorganics				
Arsenic	1.0E-3	(1.E-03)	1.75	5.0E+1
Barium	5.0E-2	1.0E-4	--	--
Beryllium	5.0E-3	(5.0E-3)	4.3E+0	8.4E+0
Cadmium (water)	5.0E-4	(5.0E-4)	*	6.1E+0
Cadmium (food)	1.0E-3	(1.0E-3)	*	6.1E+0
Chromium (VI)	5.0E-3	(5.7E-07)	*	4.1E+1
Copper	3.7E-2	1.0E-02	-	-
Cyanide (free)	2.0E-2	(2.0E-2)	-	-
Lead	ND	ND	ND	ND
Mercury	3.0E-4	8.6E-05	-	-
Nickel	2.0E-2	(2.0E-2)	*	8.4E-1
Selenium	3.0E-3	(3.0E-3)	-	-
Zinc	2.0E-1	1.0E-2	-	-
Volatile Organics				
Acetone	1.0E-1	1.0E-1	-	-
Methylene Chloride	6.0E-2	8.6E-1	7.5E-3	1.4E-2
Tetrachloroethene	1.0E-2	(1.0E-2)	5.1E-2	1.8E-03
Toluene	2.0E-1	6.0E-1	-	-
Xylenes	2.0E+0	9.0E-2	-	-
Semi-Volatile Organics				
Dibenzofuran	ND	ND	ND	ND
3,3-Dichloro-benzidine	ND	ND	4.5E-1	ND
Polycyclic Aromatics				
Carcinogenic PAHs				
Benzo(a)pyrene[b]	ND	ND	1.15E+1	6.1E+0
Total PAHs				
Naphthalene[c]	4.0E-3	(4.0E-3)	-	-

a If inhalation data were not available, oral data were used (numbers in parentheses).
b Data for benzo(a)pyrene were used to represent all carcinogenic PAHs.
c Data for naphthalene were used to calculate risk of noncarcinogenic effects for all PAHs.
ND No data.
* Not a carcinogen via oral exposure.

References: IRIS, 1991; USEPA, 1990a; USEPA, 1986d.

716johndeere/18.tbl

Table 14 Potable Ground-Water Exposure Doses (GWExDs), Hazard Quotients, and Excess Lifetime Cancer Risks, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cgw	GWExD	Cancer Risk and Hazard Quotient
Cancer Effects			
Arsenic	0.013	1.6E-04	3E-04
		ELCR	3E-04
Non-Cancer Effects			
Acetone	0.0052	1.5E-04	1E-03
Toluene	0.0053	1.5E-04	8E-04
Xylene	0.013	3.7E-04	2E-04
Arsenic	0.013	3.7E-04	4E-01
Barium	0.51	1.5E-02	3E-01
Cadmium	0.0031	8.9E-05	2E-01
Chromium	0.0085	2.4E-04	5E-02
Copper	0.016	4.6E-04	1E-02
Lead	0.023	6.6E-04	NQ
Nickel	0.024	6.9E-04	3E-02
Zinc	0.077	2.2E-03	1E-02
		HI	1E+00

Cgw Ground water concentration (mg/L).
GWExD Ground water exposure dose (mg/kg/day) calculated using the 95 percent upper confidence limit concentration (Table 47).
HI Hazard index (sum of the hazard quotients[GWExD/reference doses from Table 64]).
ELCR Excess lifetime cancer risk (GWExD x cancer slope factor from Table 64).
NQ Not quantifiable. Hazard quotient could not be calculated because there is no reference dose for lead. The potential health risk is evaluated using the UBK model.

716jd/3/67.wk1

Table 15 Current Site Worker Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Drum Storage Hazardous Waste Storage Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	16	2.1E-06	2.4E-09	4E-06
Beryllium	1.1	5.4E-07	1.6E-10	2E-06
Cadmium	14	1.1E-05	2.1E-09	1E-08
Chromium	70	6.3E-05	1.0E-08	9E-08
3,3-Dichlorobenzidine	0.39	2.1E-07	5.8E-11	4E-07
Methylene chloride	0.003	3.3E-09	4.4E-13	2E-11
Nickel	23	2.1E-05	3.4E-09	3E-09
cPAHs	0.47	2.5E-07	7.0E-11	3E-06
			ELCR	1E-05
Non-Cancer Effects				
Acetone	0.078	2.0E-07	2.7E-11	2E-06
Arsenic	16	5.0E-06	5.5E-09	5E-03
Barium	400	8.4E-04	1.4E-07	2E-02
Beryllium	1.1	1.3E-06	3.8E-10	3E-04
Cadmium	14	2.5E-05	4.8E-09	3E-02
Chromium	70	1.5E-04	2.4E-08	7E-02
Copper	43	1.7E-05	1.5E-08	5E-04
Cyanide	1.0	3.3E-06	3.5E-10	2E-04
3,3-Dichlorobenzidine	0.39	4.9E-07	1.3E-10	NQ
Lead	350	1.0E-04	1.2E-07	NQ
Methylene chloride	0.003	7.7E-09	1.0E-12	1E-07
Nickel	23	4.8E-05	7.9E-09	2E-03
tPAHs	1.7	2.1E-06	5.9E-10	5E-04
Selenium	1.2	3.8E-07	4.1E-10	1E-04
Zinc	640	3.2E-04	2.2E-07	2E-03
			HI	1E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

13johndeere/t23.wk1

Table 16 Current Site Worker Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Oil Spill Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	4.8	6.4E-07	7.1E-10	1E-06
Beryllium	1.9	9.4E-07	2.8E-10	4E-06
Cadmium	6.7	5.2E-06	9.9E-10	6E-09
Chromium	18	1.6E-06	2.7E-09	1E-07
Nickel	22	2.0E-05	3.3E-09	3E-09
			ELCR	5E-06
Non-Cancer Effects				
Acetone	0.006	1.5E-08	2.1E-12	2E-07
Arsenic	4.8	1.5E-06	1.7E-09	2E-03
Barium	190	4.0E-04	6.6E-08	9E-03
Beryllium	1.9	2.2E-06	6.6E-10	4E-04
Cadmium	6.7	1.2E-05	2.3E-09	2E-02
Chromium	18	3.8E-05	6.2E-09	8E-03
Copper	17	6.9E-06	5.9E-09	2E-04
Cyanide	0.45	1.5E-06	1.6E-10	7E-05
Lead	27	7.8E-06	9.3E-09	NQ
Nickel	22	4.6E-05	7.6E-09	2E-03
Toluene	0.003	7.7E-09	1.0E-12	4E-08
Zinc	860	4.3E-04	3.0E-07	2E-03
			HI	5E-02

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

13johndeere/t24.wk1

Table 17 . Current Site Worker Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, South Scar Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risks and Hazard Quotients
Cancer Effects				
Arsenic	4.2	5.6E-07	6.2E-10	1E-06
Beryllium	0.84	4.2E-07	1.2E-10	2E-06
Cadmium	6.0	4.6E-06	8.9E-10	5E-09
Chromium	21	1.9E-05	3.1E-09	1E-07
Nickel	21	1.9E-05	3.1E-09	3E-09
Tetrachloroethene	0.048	5.3E-08	7.1E-12	3E-09
			ELCR	3E-06
Non-Cancer Effects				
Acetone	0.049	1.3E-07	1.7E-11	1E-06
Arsenic	4.2	1.3E-06	1.4E-09	1E-03
Barium	160	3.3E-04	5.5E-08	7E-03
Beryllium	0.84	9.7E-07	2.9E-10	2E-04
Cadmium	6.0	1.1E-05	2.1E-09	1E-02
Chromium	21	4.4E-05	7.2E-09	2E-02
Copper	38	1.5E-05	1.3E-08	4E-04
Cyanide	0.15	5.0E-07	5.2E-11	2E-05
Lead	80	2.3E-05	2.8E-08	NQ
Mercury	0.07	6.1E-08	2.4E-11	4E-04
Nickel	21	4.4E-05	7.2E-09	2E-03
tPAHs	0.20	2.5E-07	6.9E-11	6E-05
Tetrachloroethene	0.048	1.2E-07	1.7E-11	1E-05
Zinc	100	5.0E-05	3.5E-08	3E-04
			HI	4E-02

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

13johndeere/t25.wk1

Table 18 Future Site Worker Soil Exposure Doses, Hazard Quotients and Excess Lifetime Cancer Risks, Landfill 1, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	11	1.5E-06	1.6E-09	3E-06
Beryllium	1.4	6.9E-07	2.1E-10	3E-06
Cadmium	13	1.0E-05	1.9E-09	1E-08
Chromium	52	4.7E-05	7.7E-09	3E-07
Nickel	20	1.8E-05	3.0E-09	2E-09
cPAHs	8.1	4.3E-06	1.2E-09	5E-05
PCE	0.015	1.6E-08	2.2E-12	8E-10
			ELCR	6E-05
Non-Cancer Effects				
Acetone	0.034	8.7E-08	1.2E-11	9E-07
Arsenic	11	3.4E-06	3.8E-09	3E-03
Barium	140	2.9E-04	4.8E-08	6E-03
Beryllium	1.4	1.6E-06	4.8E-10	3E-04
Cadmium	13	2.3E-05	4.5E-09	2E-02
Chromium	52	1.1E-04	1.8E-08	5E-02
Copper	33	1.3E-05	1.1E-08	4E-04
Cyanide	17.0	5.6E-05	5.9E-09	3E-03
Lead	280	8.1E-05	9.7E-08	NQ
Nickel	20	4.2E-05	6.9E-09	2E-03
tPAHs	9.8	1.2E-05	3.4E-09	3E-03
Selenium	1.1	3.4E-07	3.8E-10	1E-04
Zinc	980	4.9E-04	3.4E-07	2E-03
PCE	0.015	3.8E-07	5.2E-12	4E-06
			HI	1E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/AD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/74.wk1

Table 19 Future Site Worker Soil Exposure Doses, Hazard Quotients and Excess Lifetime Cancer Risks, Landfills 2 and 3, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	15	2.0E-06	2.2E-09	4E-06
Beryllium	1.3	6.4E-07	1.9E-10	3E-06
Cadmium	15	1.2E-05	2.2E-09	1E-08
Chromium	17	1.5E-05	2.5E-09	1E-07
Methylene chloride	0.014	1.5E-08	2.1E-12	1E-10
Nickel	25	2.2E-05	3.7E-09	3E-09
cPAHs	6.2	3.3E-06	9.2E-10	4E-05
			ELCR	4E-05
Non-Cancer Effects				
Acetone	0.11	2.8E-07	3.8E-11	3E-06
Arsenic	15	4.7E-06	5.2E-09	5E-03
Barium	260	5.4E-04	9.0E-08	1E-02
Beryllium	1.3	1.5E-06	4.5E-10	3E-04
Cadmium	15	2.7E-05	5.2E-09	3E-02
Chromium	17	3.5E-05	5.9E-09	2E-02
Copper	26	1.1E-05	9.0E-09	3E-04
Cyanide	6.0	2.0E-05	2.1E-09	1E-03
Lead	88	2.5E-05	3.0E-08	NQ
Methylene chloride	0.014	3.6E-08	4.8E-12	6E-07
Nickel	25	5.2E-05	8.6E-09	3E-03
tPAHs	30	3.7E-05	1.0E-08	9E-03
Selenium	1.4	4.4E-07	4.8E-10	1E-04
Zinc	6,000	3.0E-03	2.1E-06	2E-02
Xylenes	0.004	1.0E-08	1.4E-12	5E-09
Dibenzofuran	1.8	3.9E-07	6.2E-10	NQ
			HI	9E-02

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/AD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/75.wk1

Table 20 Adult Resident Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Drum Storage/Hazardous Waste Storage Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	16	7.7E-06	5.3E-10	1E-05
Beryllium	1.1	1.9E-06	3.6E-11	8E-06
Cadmium	14	3.9E-05	4.6E-10	3E-09
Chromium	70	2.2E-04	2.3E-09	9E-08
3,3-Dichlorobenzidine	0.39	7.4E-07	1.3E-11	3E-07
Methylene chloride	0.003	1.2E-08	9.9E-14	9E-11
Nickel	23	7.4E-05	7.6E-10	6E-10
cPAHs	0.47	9.0E-07	1.6E-11	1E-05
			ELCR	3E-05
Non-Cancer Effects				
Acetone	0.078	7.1E-07	6.0E-12	7E-06
Arsenic	16	1.8E-05	1.2E-09	2E-02
Barium	400	3.0E-03	3.1E-08	6E-02
Beryllium	1.1	4.5E-06	8.5E-11	9E-04
Cadmium	14	9.0E-05	1.1E-09	9E-02
Chromium	70	5.2E-04	5.4E-09	1E-01
Copper	43	6.2E-05	3.3E-09	2E-03
Cyanide	1.0	1.2E-05	7.7E-11	6E-04
3,3-Dichlorobenzidine	0.39	1.7E-06	3.0E-11	NQ
Lead	350	3.6E-04	2.7E-08	NQ
Methylene chloride	0.003	2.7E-08	2.3E-13	5E-07
Nickel	23	1.7E-04	1.8E-09	9E-03
tPAHs	1.7	7.6E-06	1.3E-10	2E-03
Selenium	1.2	1.3E-06	9.2E-11	4E-04
Zinc	640	1.1E-03	4.9E-08	6E-03
			HI	3E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

13johndeere/t26.wk1

Table 21 Adult Resident Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Oil Spill Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	4.8	2.3E-06	1.6E-10	4E-06
Beryllium	1.9	3.4E-06	6.3E-11	1E-05
Cadmium	6.7	1.9E-05	2.2E-10	1E-09
Chromium	18	5.8E-05	5.9E-10	2E-08
Nickel	22	7.0E-05	7.3E-10	6E-10
			ELCR	2E-05
Non-Cancer Effects				
Acetone	0.006	5.5E-08	4.6E-13	5E-07
Arsenic	4.8	5.4E-06	3.7E-10	5E-03
Barium	190	1.4E-03	1.5E-08	3E-02
Beryllium	1.9	7.8E-06	1.5E-10	2E-03
Cadmium	6.7	4.3E-05	5.2E-10	4E-02
Chromium	18	1.3E-04	1.4E-09	3E-02
Copper	17	2.5E-05	1.3E-09	7E-04
Cyanide	0.45	5.3E-06	3.5E-11	3E-04
Lead	27	2.8E-05	2.1E-09	NQ
Nickel	22	1.6E-04	1.7E-09	8E-03
Toluene	0.003	2.7E-08	2.3E-13	1E-07
Zinc	860	1.5E-03	6.6E-08	8E-03
			HI	1E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/27 wk1

Table 22. Adult Resident Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, South Scar Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	4.2	2.0E-06	1.4E-10	4E-06
Beryllium	0.84	1.5E-06	2.8E-11	6E-06
Cadmium	6.0	1.7E-05	2.0E-10	1E-09
Chromium	21	6.7E-05	6.9E-10	3E-08
Nickel	21	6.7E-05	6.9E-10	6E-10
Tetrachloroethene	0.048	1.9E-07	1.6E-12	1E-08
			ELCR	1E-05
Non-Cancer Effects				
Acetone	0.049	4.5E-07	3.8E-12	4E-06
Arsenic	4.2	4.7E-06	3.2E-10	5E-03
Barium	160	1.2E-03	1.2E-08	2E-02
Beryllium	0.84	3.5E-06	6.5E-11	7E-04
Cadmium	6.0	3.9E-05	4.6E-10	4E-02
Chromium	21	1.6E-04	1.6E-09	3E-02
Copper	38	5.5E-05	2.9E-09	1E-03
Cyanide	0.15	1.8E-06	1.2E-11	9E-05
Lead	80	8.3E-05	6.2E-09	NQ
Mercury	0.07	2.2E-07	5.4E-12	7E-04
Nickel	21	1.6E-04	1.6E-09	8E-03
tPAHs	0.20	8.9E-07	1.5E-11	2E-04
Tetrachloroethene	0.048	4.4E-07	3.7E-12	4E-05
Zinc	100	1.8E-04	7.7E-09	9E-04
			HI	1E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/28.wk1

Table 23 Adult Resident Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Landfill 1, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	11	5.3E-06	3.6E-10	9E-06
Beryllium	1.4	2.5E-06	4.6E-11	1E-05
Cadmium	13	3.6E-05	4.3E-10	3E-09
Chromium	52	1.8E-04	1.7E-09	7E-08
Nickel	20	6.4E-05	6.6E-10	6E-10
cPAHs	8.1	1.5E-05	2.7E-10	2E-04
Tetrachloroethene	0.015	5.9E-08	5.0E-13	3E-09
			ELCR	2E-04
Non-Cancer Effects				
Acetone	0.034	3.1E-07	2.6E-12	3E-06
Arsenic	11	1.2E-05	8.5E-10	1E-02
Barium	140	1.0E-03	1.1E-08	2E-02
Beryllium	1.4	5.8E-06	1.1E-10	1E-03
Cadmium	13	8.4E-05	1.0E-09	8E-02
Chromium	52	3.9E-04	4.0E-09	8E-02
Copper	33	4.8E-05	2.5E-09	1E-03
Cyanide	17	2.0E-04	1.3E-09	1E-02
Lead	280	2.9E-04	2.2E-08	NQ
Nickel	20	1.5E-04	1.5E-09	7E-03
Selenium	1.1	1.2E-06	8.5E-11	4E-04
tPAHs	9.8	4.4E-05	7.6E-10	1E-02
Tetrachloroethene	0.015	1.4E-07	1.2E-12	1E-05
Zinc	980	1.7E-03	7.6E-08	9E-03
			HI	2E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/29.wk1

Table 24

Adult Resident Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Landfills 2 and 3, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	15	7.2E-06	5.0E-10	1E-05
Beryllium	1.3	2.3E-06	4.3E-11	1E-05
Cadmium	15	3.7E-03	5.0E-10	3E-09
Chromium	17	5.4E-05	5.6E-10	2E-08
Methylene chloride	0.014	5.5E-08	4.6E-13	4E-10
Nickel	25	8.0E-05	8.3E-10	7E-10
cPAHs	6.2	1.2E-05	2.0E-10	1E-04
			ELCR	2E-04
Non-Cancer Effects				
Acetone	0.11	1.0E-06	8.5E-12	1E-05
Arsenic	15	1.7E-05	1.2E-09	1E-02
Barium	260	1.9E-03	2.0E-08	4E-02
Beryllium	1.3	5.4E-06	1.0E-10	1E-03
Cadmium	15	9.7E-05	1.2E-09	1E-01
Chromium	17	1.3E-04	1.3E-09	3E-02
Copper	26	3.8E-05	2.0E-09	1E-03
Cyanide	6.0	7.1E-05	4.6E-10	4E-03
Dibenzofuran	1.8	8.0E-06	1.4E-10	NQ
Lead	88	9.1E-05	6.8E-09	6E-02
Mercury	0.077	2.4E-07	5.9E-12	8E-04
Methylene chloride	0.014	1.3E-07	1.1E-12	2E-06
Nickel	25	1.9E-04	1.9E-09	9E-03
tPAHs	30	1.3E-04	2.3E-09	3E-02
Selenium	1.4	1.6E-06	1.1E-10	5E-04
Toluene	0.004	3.7E-08	3.1E-13	2E-07
Xylenes	0.004	3.7E-08	3.1E-13	2E-08
Zinc	6,000	1.1E-02	4.6E-07	5E-02
			HI	3E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/30.wk1

Table 25 Child Resident (age 0 – 6) Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Drum Storage/Hazardous Waste Storage Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	16	1.1E-05	1.8E-09	2E-05
Beryllium	1.1	1.5E-06	1.2E-10	6E-06
Cadmium	14	2.6E-05	1.5E-09	9E-09
Chromium	70	1.5E-04	7.7E-09	3E-07
3,3-Dichlorobenzidine	0.39	5.6E-07	4.3E-11	3E-07
Methylene chloride	0.003	7.5E-09	3.3E-13	6E-11
Nickel	23	4.9E-05	2.5E-09	2E-09
cPAHs	0.47	6.7E-07	5.2E-11	8E-06
			ELCR	3E-05
Non-Cancer Effects				
Acetone	0.078	2.3E-06	1.0E-10	2E-05
Arsenic	16	1.2E-04	2.1E-08	1E-01
Barium	400	9.9E-03	5.1E-07	2E-01
Beryllium	1.1	1.7E-05	1.4E-09	3E-03
Cadmium	14	3.1E-04	1.8E-08	3E-01
Chromium	70	1.7E-03	9.0E-08	5E-01
Copper	43	3.7E-04	5.5E-08	1E-02
Cyanide	1.0	3.6E-05	1.3E-09	2E-03
3,3-Dichlorobenzidine	0.39	6.5E-06	5.0E-10	NQ
Lead	350	2.4E-03	4.5E-07	NQ
Methylene chloride	0.003	8.8E-08	3.9E-12	1E-06
Nickel	23	5.7E-04	3.0E-08	3E-02
tPAHs	1.7	2.8E-05	2.2E-09	7E-03
Selenium	1.2	9.3E-06	1.5E-09	3E-03
Zinc	640	6.1E-03	8.2E-07	3E-02
			HI	1E+00

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeeref3/31.wk1

Table 26 Child Resident (age 0 – 6) Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Oil Spill Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	4.8	3.2E-06	5.3E-10	6E-06
Beryllium	1.9	2.6E-06	2.1E-10	1E-05
Cadmium	6.7	1.3E-05	7.4E-10	4E-09
Chromium	18	3.8E-05	2.0E-09	8E-08
Nickel	22	4.7E-05	2.4E-09	2E-09
			ELCR	2E-05
Non-Cancer Effects				
Acetone	0.006	1.8E-07	7.7E-12	2E-06
Arsenic	4.8	3.7E-05	6.2E-09	4E-02
Barium	190	4.7E-03	2.4E-07	1E-01
Beryllium	1.9	3.0E-05	2.4E-09	6E-03
Cadmium	6.7	1.5E-04	8.6E-09	1E-01
Chromium	18	4.5E-04	2.3E-08	1E-01
Copper	17	1.5E-04	2.2E-08	4E-03
Cyanide	0.45	1.6E-05	5.8E-10	8E-04
Lead	27	1.9E-04	3.5E-08	NQ
Nickel	22	5.4E-04	2.8E-08	3E-02
Toluene	0.003	8.8E-08	3.9E-12	4E-07
Zinc	860	8.2E-03	1.1E-06	4E-02
			HI	5E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/32.wk1

Table 27 Child Resident (age 0 – 6) Exposure Doses, Hazard Quotients and Excess Lifetime Cancer Risks, South Scar Area, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	4.2	2.8E-06	4.6E-10	5E-06
Beryllium	0.84	1.1E-06	9.2E-11	5E-06
Cadmium	6.0	1.1E-05	6.6E-10	4E-09
Chromium	21	4.5E-05	2.3E-09	9E-08
Nickel	21	4.5E-05	2.3E-09	2E-09
Tetrachloroethene	0.048	1.2E-07	5.3E-12	6E-09
			ELCR	1E-05
Non-Cancer Effects				
Acetone	0.049	1.4E-06	6.3E-11	1E-05
Arsenic	4.2	3.3E-05	5.4E-09	3E-02
Barium	160	4.0E-03	2.1E-07	8E-02
Beryllium	0.84	1.3E-05	1.1E-09	3E-03
Cadmium	6.0	1.3E-04	7.7E-09	1E-01
Chromium	21	5.2E-04	2.7E-08	2E-01
Copper	38	3.3E-04	4.9E-08	9E-03
Cyanide	0.15	5.5E-06	1.9E-10	3E-04
Lead	80	5.6E-04	1.0E-07	NQ
Mercury	0.07	9.2E-07	9.0E-11	3E-03
Nickel	21	5.2E-04	2.7E-08	3E-02
tPAHs	0.20	3.3E-06	2.6E-10	8E-04
Tetrachloroethene	0.048	1.4E-06	6.2E-11	1E-04
Zinc	100	9.5E-04	1.3E-07	5E-03
			HI	4E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/33.wk1

Table 28 Child Resident (age 0 – 6) Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Landfill 1, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	11	7.3E-06	1.2E-09	1E-05
Beryllium	1.4	1.9E-06	1.5E-10	8E-06
Cadmium	13	2.5E-05	1.4E-09	9E-09
Chromium	52	1.1E-04	5.7E-09	2E-07
Nickel	20	4.2E-05	2.2E-09	2E-09
cPAHs	8.1	1.2E-05	8.9E-10	1E-04
Tetrachloroethene	0.015	3.8E-08	1.7E-12	2E-09
			ELCR	2E-04
Non-Cancer Effects				
Acetone	0.034	9.9E-07	3.7E-12	1E-05
Arsenic	11	8.5E-05	1.2E-09	9E-02
Barium	140	3.5E-03	1.5E-08	7E-02
Beryllium	1.4	2.2E-05	1.5E-10	4E-03
Cadmium	13	2.9E-04	1.4E-09	3E-01
Chromium	52	1.3E-03	5.7E-09	3E-01
Copper	33	2.9E-04	3.6E-09	8E-03
Cyanide	17	6.2E-04	1.9E-09	3E-02
Lead	280	1.9E-03	3.1E-08	NQ
Nickel	20	4.9E-04	2.2E-09	2E-02
Selenium	1.1	8.5E-06	1.2E-10	3E-03
tPAHs	9.8	1.6E-04	1.1E-09	4E-02
Tetrachloroethene	0.015	4.4E-07	1.7E-12	4E-05
Zinc	980	9.3E-03	1.1E-07	5E-02
			HI	9E-01

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

716johndeere/3/34.wk1

Table 29 Child Resident (age 0 – 6) Soil Exposure Doses, Hazard Quotients, and Excess Lifetime Cancer Risks, Landfills 2 and 3, John Deere Ottumwa Works, Ottumwa, Iowa.

Constituent	Cs	SExD (O/D)	SExD (Inh)	Cancer Risk and Hazard Quotients
Cancer Effects				
Arsenic	15	1.0E-05	1.7E-09	2E-05
Beryllium	1.3	1.8E-06	1.4E-10	8E-06
Cadmium	15	2.8E-05	1.7E-09	1E-08
Chromium	17	3.6E-05	1.9E-09	8E-08
Methylene chloride	0.014	3.5E-08	1.5E-12	3E-10
Nickel	25	5.3E-05	2.8E-09	2E-09
cPAHs	6.2	8.9E-06	6.8E-10	1E-04
			ELCR	1E-04
Non-Cancer Effects				
Acetone	0.11	3.2E-06	1.4E-10	3E-05
Arsenic	15	1.2E-04	1.9E-08	1E-01
Barium	260	6.4E-03	3.3E-07	1E-01
Beryllium	1.3	2.1E-05	1.7E-09	4E-03
Cadmium	15	3.3E-04	1.9E-08	3E-01
Chromium	17	4.2E-04	2.2E-08	1E-01
Copper	26	2.2E-04	3.3E-08	6E-03
Cyanide	6.0	2.2E-04	7.7E-09	1E-02
Dibenzofuran	1.8	3.0E-05	2.3E-09	NQ
Lead	88	6.1E-04	1.1E-07	NQ
Mercury	0.077	1.0E-06	9.9E-11	3E-03
Methylene chloride	0.014	4.1E-07	1.8E-11	7E-06
Nickel	25	6.2E-04	3.2E-08	3E-02
tPAHs	30	5.0E-04	3.9E-08	1E-01
Selenium	1.4	1.1E-05	1.8E-09	4E-03
Toluene	0.004	1.2E-07	5.1E-12	6E-07
Xylenes	0.004	1.2E-07	5.1E-12	6E-08
Zinc	6,000	5.7E-02	7.7E-06	3E-01
			HI	1E+00

Cs Soil concentration (mg/kg).
SExD (O/D) Exposure dose associated with oral/dermal exposure to soil (mg/kg/day).
SExD (Inh) Exposure dose associated with dust inhalation exposure to soil (mg/kg/day).
HI Hazard index (Sum of the hazard quotients [SExD/RfD from Table 64]).
ELCR Excess lifetime cancer risk (SExD x SF from Table 64).
NQ Not quantifiable; toxicity values were not available.

706jdri/35.wk1

Table 30 Potable Surface-Water Exposure Dose (SWExD) and Hazard Quotient, Black Lake, Ottumwa, Iowa.

Constituent	Csw	SWExD	Hazard Quotients
<u>Non-Cancer Effect</u>			
Barium	0.43	1.2E-02	2E-01
Zinc	0.038	1.1E-03	5E-03
		HI	2E-01

Csw Surface water concentration (mg/L).
SWExD Surface water exposure dose (mg/kg/day) calculated using the values from GMSW-01.
HI Hazard index (sum of the hazard quotients [SWExD/reference doses from Table 64]).

706jd/T2.wk1

Table 31 Calculated Blood Lead Levels in Children (Age 0-6)

Source Area	Medium	Lead Concentration (95% UCL)	Blood Lead Levels[a] Geometric Mean µg/dL	Percent Below 10 µg/dL	Percent Below 15 µg/dL
Landfill 1	Soil/Dust Water Air	280 mg/kg 23 µg/L 0.021 µg/m³	4.23	99.36	99.99
Landfill 2 and 3	Soil/Dust Water Air	88 mg/kg 23 µg/L 0.0066 µg/m³	3.23	99.94	100
Drum Storage/ Hazardous Waste Storage Area	Soil/Dust Water Air	350 mg/kg 23 µg/l 0.026 µg/m³	4.59	98.78	99.97
Oil Spill Area	Soil/Dust Water Air	27 mg/kg 23 µg/L 0.002 µg/m³	2.91	99.98	100
South Scar Area	Soil/Dust Water Air	80 mg/kg 23 µg/L 0.006 µg/m³	3.19	99.95	100

[a] Calculated using the USEPA Model "LEAD4".

706pd/blddtvl tbl

ATTACHMENT E

STATE LETTER OF CONCURRENCE

STATE OF IOWA

RECEIVED

JUL 05 1991

REMF SECTION

Site: [illegible]
ID #: [illegible]
Break: 57
Other:

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

June 27, 1991

Anne L. Olberding
Superfund Branch
U.S. EPA Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

RE: John Deere Ottumwa Works Site

Dear Anne:

We have reviewed the Proposed Plan for the John Deere Ottumwa Works Site and concur with the preferred alternative for addressing the contaminated soil/fill material at the site. Please continue to keep us informed about future site activities and schedules when they become known.

If you have any questions or comments regarding this matter please contact me at 515/281-4968 or Keith Schilling at 515/281-4117.

Sincerely,

Morris Preston
Supervisor
Solid Waste Section

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145 / TDD 515-242-5967 / FAX 515-281-8895