FEASIBILITY STUDY

FOR

SOIL REMEDIATION OPTIONS

FORMER MANUFACTURED GAS PLANT
MASON CITY, IOWA

Prepared for

INTERSTATE POWER COMPANY
DUBUQUE, IOWA

Project No. 2334.0040

August 1990

Prepared by

James M. Montgomery
Consulting Engineers, Inc.
11107 Aurora Avenue
Des Moines, Iowa 50322
515-253-0830

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

CHAPTER 1

INTRODUCTION

This chapter presents the purpose and objective of this document along with a general description and history of the site. Also presented is a summary of the activities and events regarding site investigation and remediation.

PURPOSE AND OBJECTIVE

This document has been prepared by James M. Montgomery, Consulting Engineers, Inc. (JMM) on behalf of Interstate Power Company (IPW). The purpose of the document is to assemble background data on various remedial action alternatives, with the ultimate objective of determining which alternative will provide a cost-effective remediation method that will be protective of human health and the environment while meeting the established cleanup criteria.

Each option considered will be evaluated for compliance with regulatory standards, time required to complete remediation, its ability to be protective of human health and the environment and total project cost.

SITE DESCRIPTION

The site is located on a parcel of land near the western edge of Section 10, T96N, R20W in Mason City, Iowa, as shown on the site location map (Figure 1-1).

The site is currently vacant with the exception of an electrical substation and a brick storage building. The site is level and lightly graveled with relatively sparse vegetation. The site is bounded on the east and west by South Pennsylvania Avenue and South Delaware Avenue, respectively. The southern boundary is Fifth Street, S.E., while the northern boundary is Willow Creek. The general site layout is shown in Figure 1-2.

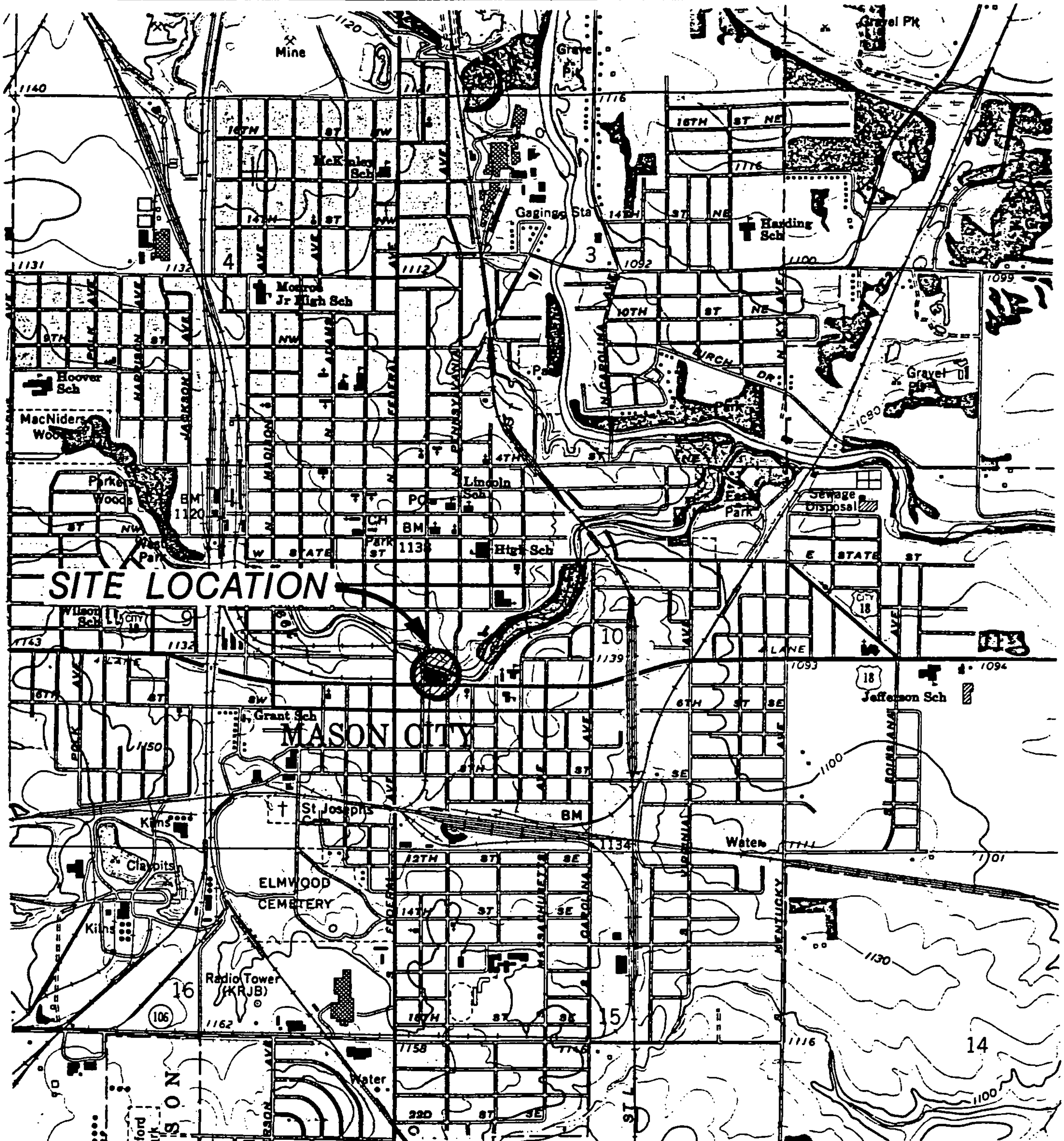
SITE HISTORY

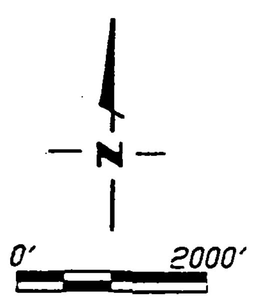
The original gas plant was apparently constructed between 1897 and 1901. A small gas plant is shown on a Sanborn Fire Insurance map from 1901 (Figure 1-3) and is part of the Brice Gas and Electric Company.

By 1909, the name of the gas plant and the electric plant to the west had been changed to Peoples Gas and Electric Company. The gas plant was demolished in 1952. IPW acquired the site in 1957 and remained sole owner until 1983 when the City of Mason City became a partial owner. A segment of a 1918 Sanborn map is shown on Figure 1-4. Please note that the street names shown in parentheses are the street names prior to an extensive renaming project in 1916.

Oily sludges, demolition material and other wastes were left on site at the time the plant was closed. These sludges were discovered during an excavation across the site for a sanitary sewer line in 1984. The majority of these sludges were contained in three subsurface storage structures. The sludges have been excavated and stockpiled at the site.

In September, 1985, the United States Environmental Protection Agency (EPA), Region VII issued a draft Consent Order to IPW. The final draft of the Consent Order was signed in May, 1986 and required IPW to investigate potential soil contamination and remediate contaminated soil. A copy of the signed Consent Order is contained in Appendix A.

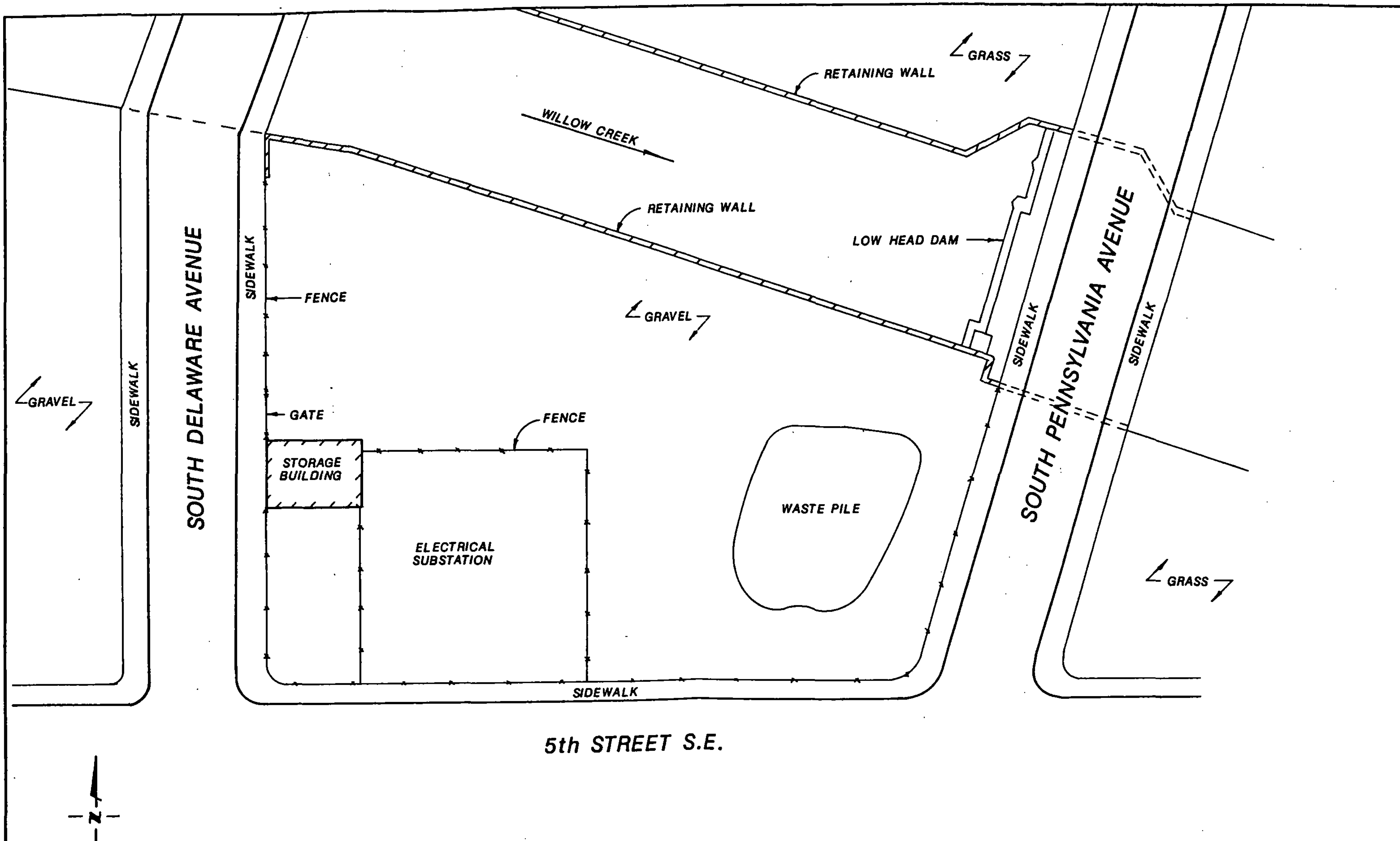




SOURCE:

U.S.G.S. TOPOGRAPHIC QUADRANGLE,
MASON CITY, IOWA T.96 N., R.20 W., SEC. 10

INTERSTATE POWER COMPANY MASON CITY, IOWA	JAMES M. MONTGOMERY	AUG., 1990
SITE LOCATION MAP	CONSULTING ENGINEERS, INC. DES MOINES, IOWA	FIGURE 1-1



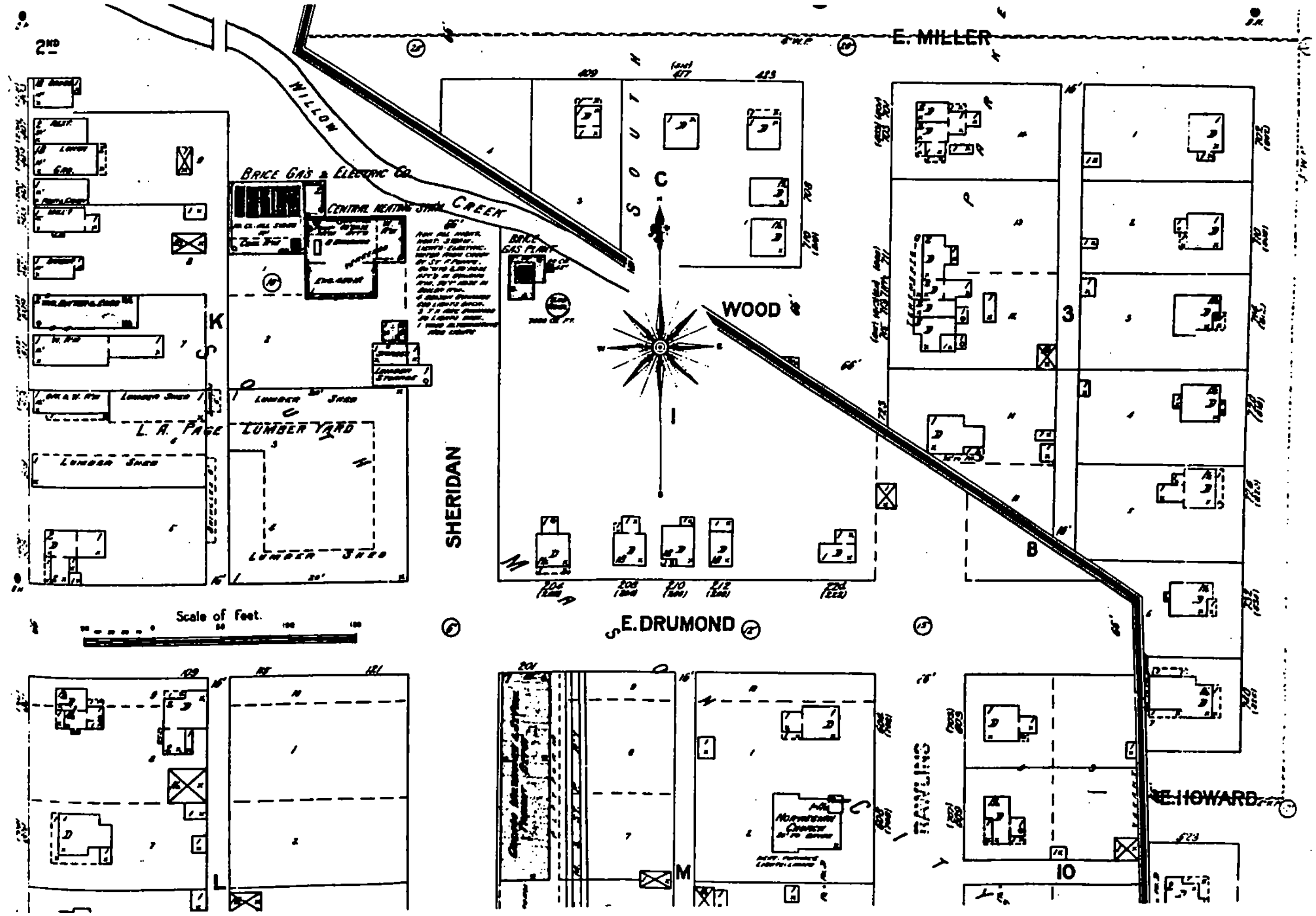
INTERSTATE POWER COMPANY MASON CITY, IOWA

SITE PLAN

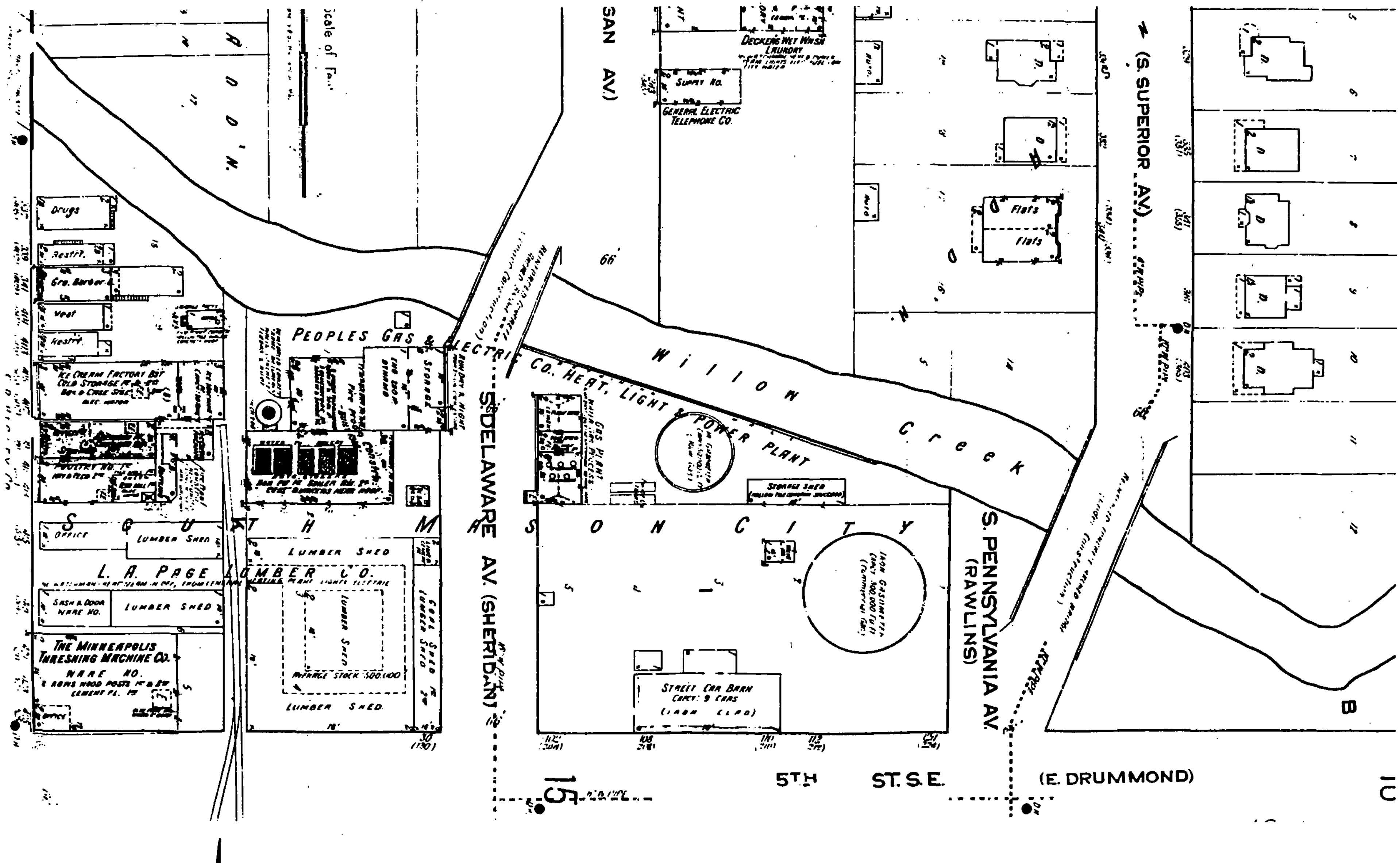
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
DES MOINES, IOWA

AUG., 1990

FIGURE 1-2



INTERSTATE POWER COMPANY MASON CITY, IOWA	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. DES MOINES, IOWA
1901 SANBORN MAP	AUG., 1990 FIGURE 1-3



INTERSTATE POWER COMPANY MASON CITY, IOWA	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. DES MOINES, IOWA	AUG., 1990
1918 SANBORN MAP		FIGURE 1-4

PREVIOUS WORK

The previous site investigations were conducted by or under the direct supervision of personnel from Eugene A. Hickok and Associates, which is now part of JMM.

The initial field investigation took place in the fall of 1986 and included the completion of soil borings and monitoring wells to define subsurface conditions. The work completed followed that outlined in the "Preliminary Assessment Plan of Study." The results of the investigation were discussed in detail in the report entitled, "Field Investigation and Preliminary Assessment."

Subsequent review and discussion with the EPA determined that additional investigations were necessary. In a letter dated October 13, 1987, the EPA required a "Plan of Investigation" to be submitted for the additional investigation. This letter also proposed cleanup levels for both soil and water and requested an evaluation of remedial alternatives for cleanup of the site.

As a result, a second (Phase II) investigation was conducted. Field work was completed between November 30, 1987 and January 13, 1988. The report was completed in April, 1988.

The report addressed the initial EPA concerns, however, the new data also indicated geologic conditions that could directly impact groundwater movement from the site. A supplemental investigation was determined to be necessary in order to address the extent of a shale layer and its impact on groundwater movement within the bedrock. Additional information regarding vertical groundwater movement and the degree of fractured bedrock at the site were also deemed necessary.

As a result, the third (Phase III) investigation was instituted. Field work was initiated in September, 1988 with the report being completed in March, 1989.

The third phase of field investigation furthered the understanding of the geology, hydrology and extent of contamination at the site. A list of the investigatory plans and associated reports are contained in Table 1-1. Conclusionary sections of each of the three investigation reports are contained in Appendix B.

Additional site work has included general site cleanup and completion of three test trenches in the stockpile of material excavated from the subsurface storage structures.

Trench #1 was excavated approximately ten feet from the eastern edge of the waste pile. The characteristics of material ranged from visually uncontaminated soil encountered in the waste pile berm, to restricted pockets of tar-contaminated soil sloughing from the trench piles. In general, this trench consisted of heavily stained soil with about 10 to 15% wood and concrete construction debris.

Trench #2 was excavated in the approximate middle of the waste pile. The soil was similar to that of Trench #1 in that staining was heavy with limited tar-contaminated soil sloughing from the sides of the trench. More construction debris was encountered in this trench and included 2-inch diameter conduit approximately 30 feet in length, angle iron and rebar, tar-stained timbers and rock and brick up to 0.5' x 2' x 3' in size. Approximately 10 to 15% of this trench volume was construction debris.

Trench #3 was excavated approximately ten feet from the western edge of the waste pile. The conditions encountered were similar to that of Trench #2 with an increase in tar-contaminated soil that sloughed from the sides of the excavation. Approximately ten percent of the trench volume consisted of construction debris of smaller size than Trench #2.

Composite soil samples were obtained from Trenches #1, #2 and #3. The composite samples were obtained by visually selecting representative contaminated soil at four or six locations from each trench excavation. After trenching activities were completed, the pile was regraded to the extent possible with the backhoe and a 30 mil "Ultra Tech" synthetic membrane cap was installed. The cap consists of two 38.5' x 100' panels overlapped approximately 5 feet in the center of the pile. It is held in place by sand bags spaced every three feet around the perimeter and where the panels overlap.

SITE CONTAMINANTS

One of the by-products of coal gasification is coal tar. The coal tar constituents consist of polynuclear aromatic hydrocarbon (PAH) compounds, phenols, light aromatic compounds, inorganic chemicals and minor amounts of metals. The principle coal tar compounds of concern are presented in Table 1-2. PAH compounds, light aromatic compounds, cyanide and selected metals have been detected at the site. However, the PAH compounds are the most significant contaminants and are the basis for site remediation. Remedial activities that are effective for the PAH compounds will also be effective for the light aromatic compounds. Cyanide and metals were detected at relatively low levels and are not of high concern. A summarization of the carcinogenic PAH, total PAH and cyanide concentrations across the site is presented in Table 1-3. The locations of the soil borings and existing groundwater monitoring wells are shown on Figure 1-5. Physical and chemical properties of the contaminants have been previously described in the June, 1988 document entitled, "Risk Evaluation."

Based on their method of generation, the contaminants detected at the site are not regulated as listed hazardous wastes as defined by the Resource Conservation and Recovery Act (RCRA). RCRA regulations may apply if the materials were found to be hazardous due to characteristics of ignitability, corrosivity, reactivity or EP toxicity. However, the material has been treated as hazardous for personal protection during site activities. Appropriate precautions will also be taken during future site work and remediation. A copy of an EPA memorandum describing the applicability of RCRA regulations to this site is contained in Appendix C.

The Consent Order specifies a cleanup standard of 100 mg/kg for total PAHs in the soil. However, an October 13, 1987 letter from EPA to E. D. Forslund of IPW indicates soil cleanup levels for the site are 100 mg/kg for total carcinogenic PAH compounds and 500 mg/kg for total PAHs. The carcinogenic PAHs consists of benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene and chrysene. The 100 mg/kg criteria for carcinogenic PAHs assumes that all of the carcinogenic PAHs listed above are as potent as benzo(a)pyrene. This level is based on a January 17, 1987 memorandum from the Department of Health and Human Services to Mr. Carl R. Hickman of EPA Region VI. Copies of the letter and memorandum are also contained in Appendix C.

The 500 mg/kg level for total PAH is based on the ratio of carcinogenic to noncarcinogenic PAHs. Typically the carcinogenic PAHs comprise approximately 20 percent of the total PAHs found in coal tar contaminated soils. Twenty percent of 500 mg/kg corresponds to the established cleanup level for carcinogenic PAHs of 100 mg/kg. The 100/500 mg/kg criteria has been used at other sites with equivalent exposure potentials and is recommended for this site. Due to the potential for future excavation at the site for utility service work, the 100/500 mg/kg criteria should be applied to the full depth of unconsolidated material. The remedial action alternatives discussed in this document will be evaluated only if they will meet the cleanup criteria in a reasonable length of time, while providing protection of the surrounding community, workers at the site and any further environmental impacts.

TABLE 1-1

PREVIOUS REPORTS

Preliminary Assessment - Plan of Study, Mason City, Coal Gasification Plant	August, 1986
Field Investigation and Preliminary Assessment	May, 1987
Plan of Investigation	October, 1987
Phase II Investigation	April, 1988
Supplemental Investigation Work Plan (Phase III)	June, 1988
Phase III Supplemental Field Investigation Mason City, Iowa	March, 1989

TABLE 1-2

COAL TAR CONSTITUENTS

1. Polynuclear Aromatic Hydrocarbons

Acenaphthene	Chrysene[a]
Acenaphthylene	Dibenzo(a,h)Anthracene[a]
Anthracene	Fluoranthene
Benzo(a)Anthracene[a]	Fluorene
Benzo(a)Pyrene[a]	Indeno(1,2,3-cd)Pyrene[a]
Benzo(b)Fluoranthene[a]	Naphthalene
Benzo(g,h,i)Perylene	Phenanthrene
Benzo(k)Fluoranthene	Pyrene

[a] Carcinogenic PAH compound

2. Phenolic Compounds

3. Light Aromatic Compounds

   Benzene
   Ethylbenzene
   Toluene
   Xylenes

4. Inorganic Chemicals

   Cyanides
   Nitrates
   Sulfides

5. Metals

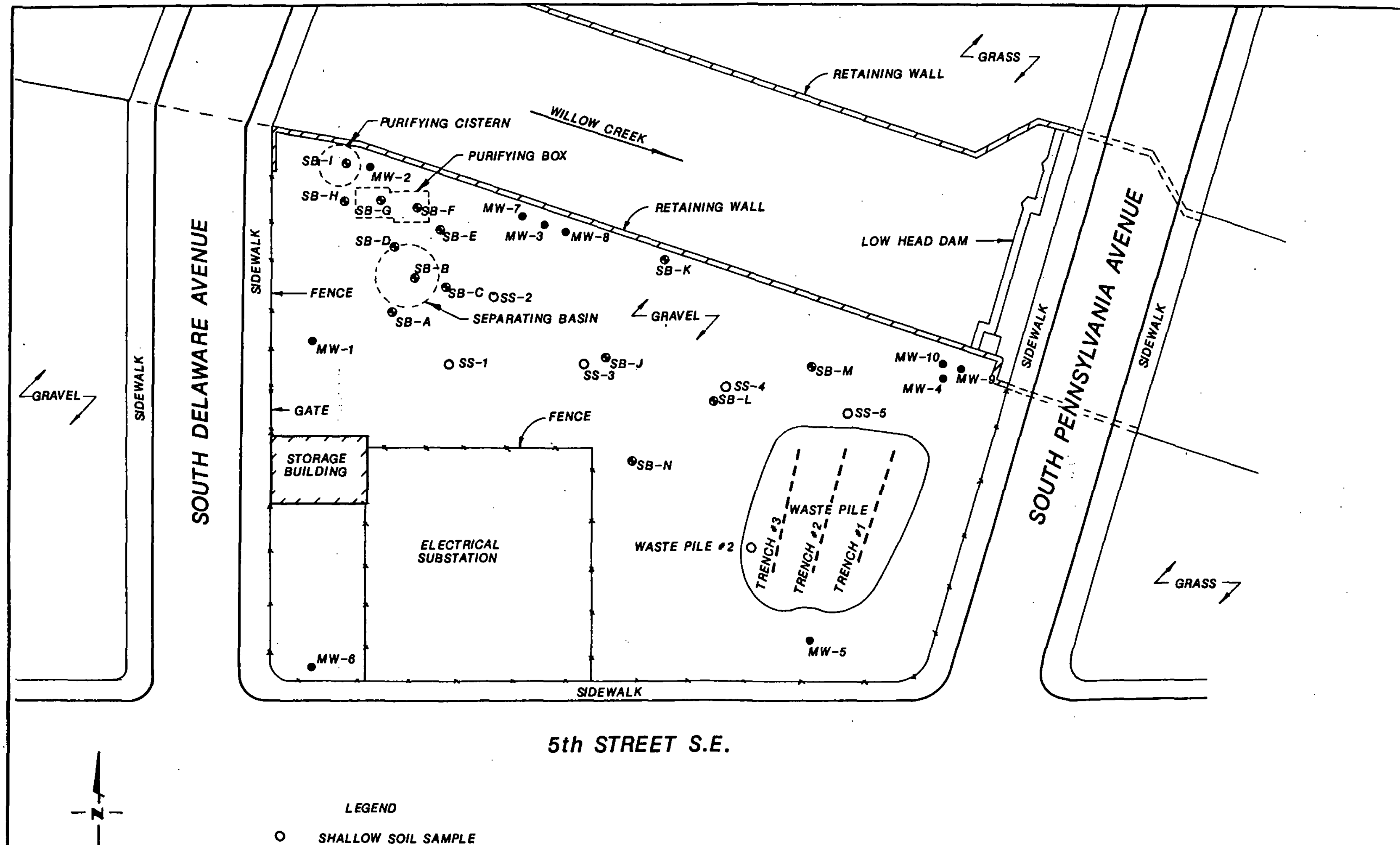
   Copper
   Iron
   Lead
   Zinc

TABLE 1-3

SOIL CONTAMINATION SUMMARY (mg/kg)

Sample Location	Carcinogenic PAHs	Total PAHs	Total Cyanide
SB-A	3.7	9.1	4.5
SB-B	40.9	245.5	NA
SB-C	80.0	725.0	9.7
SB-D	59.7	540.7	7.7
SB-E	27.1	164.6	6.2
SB-F	7.5	39.4	9.5
SB-G	126.2	608.2	83.0
SB-H	75.6	479.4	6.8
SB-I	NA	NA	NA
SB-J	ND	1.1	ND
SB-K	NA	NA	NA
SB-L	50.8	321.8	0.3
SB-M	ND	18.4	0.4
SB-N	182.0	583.2	ND
MW-1	NA	NA	NA
MW-2	198.0	1,395.2	2.1
MW-3	40.5	272.9	ND
MW-4	1.5	9.0	8.5
MW-5	NA	NA	NA
MW-6	NA	NA	NA
MW-7	NA	NA	NA
MW-8	NA	NA	NA
MW-9	NA	NA	NA
MW-10	NA	NA	NA
SS-1	0.8	2.0	1.2
SS-2	18.1	40.5	4.5
SS-3	19.9	42.2	6.2
SS-4	0.9	1.8	1.9
SS-5	6.0	14.8	5.3
Waste Pile #2	394.0	1,563.0	3.2
Trench #1	ND	6,250.0	16.0
Trenches #2 & #3	700.00	12,820	36.0

NA - Not Analyzed
ND - No Detected



INTERSTATE POWER COMPANY MASON CITY, IOWA

SOIL BORING AND MONITORING WELL LOCATIONS

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. DES MOINES, IOWA

AUG., 1990

FIGURE 1-5

CHAPTER 2

CHAPTER 2

OBJECTIVES AND TREATMENT TECHNOLOGIES

This Chapter will introduce the technologies that are available for site remediation and eliminate those which do not meet the site cleanup objectives or constraints of the site. The remaining viable technologies will be discussed in depth in the following chapter.

REMEDIAL ACTION OBJECTIVES

Remedial action alternatives are all aimed at eliminating, reducing or otherwise ensuring that contaminant levels or exposures such that the potential for adverse health effects are maintained within currently acceptable risk levels. Each of the remedial options being considered are intended to meet federal and state applicable or relevant and appropriate requirements (ARARs). The soil cleanup level for this site was established by EPA and is based on the health risk level for benzo(a)pyrene, which is thought to be the most carcinogenic PAH compound.

Remedial action objectives are to reduce carcinogenic PAH levels to less than 100 mg/kg and total PAH levels to less than 500 mg/kg. The remedial action alternative(s) selected for the site will, at a minimum, meet this criteria. Soil remediation options for PAH contamination are introduced in the remainder of this chapter.

Any remediation of groundwater contamination will not be addressed in this report. Following soil remediation, the groundwater will continue to be monitored. If groundwater concentrations in excess of acceptable standards are present, remediation will proceed.

NO ACTION

One option that must be addressed in any potential remedial action situation is whether any action needs to be taken. Low level contamination at a remote location with little risk of exposure may require only periodic site monitoring to document the status and determine the rate of natural attenuation of the contaminants.

This is not an option being considered for this site. The previous site investigations have established that soil contamination in excess of the cleanup criteria exists at the site.

OFF-SITE LAND DISPOSAL

This option consists of the excavation of contaminated material and disposal in a Resource Conservation and Recovery Act (RCRA) Part B permitted landfill. Soil and rubble can be disposed of without segregation or crushing. However, tars and sludges may need to be fixated with drier materials or binding agents prior to disposal.

Excavation and removal of the material from the site can be accomplished in a rather short time frame. A disadvantage of this remediation effort is that liability for the material continues after disposal. The generator or responsible party may be drawn into a remediation effort if there is a release from the disposal facility. This situation typically arises only when the disposal company is uninsured or underinsured and does not have the assets to fund the cleanup. However, RCRA permitted facilities are required to maintain financial assurance programs to provide funding in the event of a suspected or actual release.

This method is typically less expensive than more elaborate options and results in a rapid site restoration. Costs, applicability and liability is addressed in greater detail in following chapters.

DEDICATED LANDFILL

Two disposal options exist under this general heading. One is the development of a private landfill dedicated solely to the waste material derived at the Former Manufactured Gas Plant (FMGP) site. Discussions with personnel of the Iowa Department of Natural Resources (IDNR) revealed that they would require the landfill to be designed, maintained and monitored as if it were a RCRA type facility. The design would require a double-lined base with a leachate collection system, monitoring systems and an impervious cap over the waste material. The facility would have to be monitored for 30 years and be backed by a financial assurance plan. IPW would remain liable for any releases from the facility.

The second option is a dedicated cell within an existing sanitary landfill. Since existing facilities do not meet the requirements of a RCRA Part B permitted landfill, the IDNR would again require complete RCRA compliance for the cell. Additional requirements may also be imposed by the cooperating landfill.

Although the transportation and disposal costs would be minimal for those options, the time and expense to design, permit and monitor this type of facility, along with serious reservations expressed by the IDNR and continuing liability to IPW, eliminate these options from further consideration.

PHYSICAL FIXATION

Physical fixation consists of blending contaminated material with binding agents that reduce the mobility and volatilability of the contaminants. The binding agents must be selected to maximize immobilization of the contaminated material. Contaminated material can also be encased by an inert substance such as concrete.

Physical fixation of the coal tar and contaminated material does not prevent leaching or volatilization of the PAH compounds. Encasement in concrete will control leaching and volatilization but only until the concrete degrades and cracks. Thus, physical fixation is not a permanent remediation and will not be considered as a treatment option by itself. However, physical fixation may be required to bind liquid and semi-liquid contaminants prior to transportation or handling for other treatment or disposal options.

CHEMICAL FIXATION

Chemical fixation consists of binding the contaminants to less mobile compounds or slightly altering the chemical composition to yield a less mobile and possibly less toxic material.

Chemical fixation of coal tars and sludges is a technically feasible option to prevent leaching of PAHs to groundwater. However, chemical fixation does not reduce the volume or ultimate toxicity of the material. Also, the PAHs are not altered to the point where they cannot be extracted by solvents. Since laboratory analysis is generally performed by extraction with a solvent, standard laboratory analysis could not be used to establish compliance with health risks.

Introduction of a solvent (such as gasoline) into the groundwater system from an upgradient source could mobilize the PAH compounds, resulting in future public exposure and environmental impact. This option will not be included for further consideration.

OFF-SITE INCINERATION

Off-site incineration offers quick, convenient site remediation with minimal potential for public exposure and environmental impact. Off-site incineration will require permitting and regulatory compliance by the generator or other responsible party. However, air quality and ash disposal permits are generally maintained by the incinerator facility. Most incinerator companies offer disposal of the ash as well as incineration for a single price. Large rubble may need to be segregated and crushed prior to incineration.

Test burns or analysis of the material may be required to determine the rates of incineration and to ensure compliance with air quality standards for the facility's air quality permits. Off-site incineration of this type is typically very expensive, however, due to the limited continuing liability and quick site remediation, this option will be considered more completely in Chapter 3.

An alternative off-site incineration option is burning the material in a power plant boiler. This option would require a test burn to ensure compliance with existing permits or to obtain data for application of the appropriate permits. IPW does not have a suitable boiler and other area utilities are very reluctant to accept the material. This option will not be considered in further detail.

ON-SITE INCINERATION

As with off-site incineration, on-site incineration offers minimal potential for public exposure and additional environmental impact through nearly complete destruction of the PAH compounds. Portable incinerators can be transported on flatbed semitrailers and assembled on site. These incinerators are downscaled versions of permanent facilities with a reduced throughput rate. Transportation costs for the waste materials can be eliminated or greatly reduced.

Sterilized soil and ash may be disposed of at a sanitary landfill under an Iowa Special Waste Authorization (SWA) issued by the IDNR or possibly placed back in the original excavation. If placed back in the excavation, site monitoring following soil remediation would then be required to monitor the ash as well as any residual contamination that was below the cleanup standards left on site.

State air quality permits would be required along with applicable county or city registration or permits. Rock and rubble would need to be segregated and crushed prior to incineration. Liquid and semi-liquid tars would need to be stabilized to facilitate handling. Stabilization can be achieved by blending the liquid and semi-liquid material with drier soils or binding agents such as lime, cement kiln dust or crushed coal. This option will be considered in greater detail in Chapter 3.

BIOREMEDIATION

Bioremediation is applicable in-situ or using a reactor vessel. In either application it is theoretically feasible to reduce the PAH compounds to nonvolatile nonleachable levels through decomposition by the use of microorganisms. The effectiveness of bioremediation techniques varies from site to site based on numerous variables.

In-situ bioremediation offers the advantage of eliminating the need for excavation and transportation of the contaminated materials. In-situ bioremediation is most applicable in homogeneous mediums where the flow of nutrients necessary for microorganism enhancement can be evenly distributed throughout the water and soil matrix. This site is comprised largely of rubble, fill and buried structures that would make subsurface distribution and control impossible. Pockets of unremediated soil may be left on site and go undetected. The inability to control site conditions and the unknown effectiveness of in-situ bioremediation eliminate this option from further consideration.

Bioremediation using a reactor vessel also requires a relatively homogeneous medium, which is obtained by the excavation of the material and segregating rocks and rubble. A reactor vessel allows a more controlled environment for the biological reactions to occur. The reactor would be relatively labor intensive and would take a fairly long time to treat all of the contaminated material. Treated soil may be disposed of at a sanitary landfill under a SWA or possibly placed back into the excavation. This method may be able to meet the site cleanup criteria but would need bench scale testing to determine the effectiveness. This option will be considered in greater detail.

CHAPTER 3

CHAPTER 3

ANALYSIS OF ALTERNATIVES

This chapter will discuss the effectiveness, applicability and costs of the selected remedial action alternatives in specific reference to the site.

OFF-SITE LAND DISPOSAL

As previously discussed, this option consists of the excavation of the contaminated material with disposal at a RCRA Part B permitted landfill. This option allows a very rapid site remediation since the contaminated material is completely removed from the site and the excavation is filled with clean soil. This generates a very effective remediation at the site by complete, physical removal of contaminated material that does not meet the cleanup criteria. However, the contaminated soil and rubble is simply relocated to another site where the contaminants still exist in their present form. This does not provide a permanent remediation for the contaminants. Volume, mobility and toxicity of the contaminants are not reduced. The contaminants are confined to a relatively controlled environment where leachates are collected and treated and the potential for human or environmental exposure to the waste or leachate is minimized.

Short-term effectiveness of this alternative during implementation are similar to other alternatives where excavation is involved. Excavation activities will expose contaminated soil to the atmosphere where volatile constituents will be able to be lost. Site workers will need to have access to respiratory protection equipment in the event that ambient air levels approach personal protection upgrade levels. Vapors and dust are unlikely to pose health problems on adjacent properties. All loads of contaminated soil and rubble will be covered with a heavy tarp prior to being transported off site to minimize nuisance dust and odors.

The long-term effectiveness of this alternative is very good at the site itself. Residual contaminant levels will be at levels less than current advisory levels as dictated by the Consent Order and will continue to decrease through natural biodegradation. Future uses of the site will be restricted so as to further reduce potential exposures. As previously mentioned, the contaminated material is not actually treated to reduce or eliminate the contaminants but is placed in a controlled facility for permanent storage and monitoring.

Off-site land disposal is easily implemented and requires minimal site preparation and permitting. Samples or sample analyses need to be submitted to the disposal facility for approval prior to transportation. Liquids or sludges that do not pass the paint filter test will not be accepted. These materials would need to be fixated with dry soil or binding agents. Excavation and handling of the material can be accomplished with typical earth moving equipment.

Off-site land disposal is the least costly active remedial action alternative. Disposal costs for soil and rubble are typically approximately $120 per ton. Additional costs include excavation, loading transportation and sampling. Excavation and loading costs will be approximately the same for all off-site options and is estimated to approximately $30. The closest RCRA Part B permitted landfill is Peoria Disposal Company's facility near Peoria, Illinois. Assuming transportation costs of $4 per loaded mile, 340 miles one way and 21 tons per load, the cost for transportation from Mason City to Peoria would be approximately $65 per ton. Total transportation and disposal cost would, therefore, be approximately $215 per ton.

This type of disposal will meet cleanup requirements for the site by simply removing all of the material that does meet the requirements. This type of waste can be accepted at RCRA facilities such as Peoria Disposal Company's.

Off-site land disposal is generally acceptable by the public due to the rapid remediation of the site and disposal of the material in a secure facility located a great distance from their homes. Out of state disposal has been historically acceptable by the IDNR.

OFF-SITE INCINERATION

Off-site incineration at a commercial hazardous waste incinerator offers a quick and effective method of site remediation. Incineration of the material destroys the PAH compounds and amenable cyanide, leaving sterilized soil and ash for disposal. The mobility and toxicity of the contaminants are eliminated with their destruction but the overall volume of the material changes very little. Disposal of the ash and soil is done at a controlled facility near the incinerator.

As with off-site land disposal, the ease of implementation is an advantage. Site work would consist primarily of excavation, rubble segregation and truck loading. Very little specialized equipment would be required for these operations. A sample of the material may be required for a test burn to ensure compliance with the air quality permits of the facility and the compatibility with other materials. Short-term effects of this alternative are very similar to those for off-site land disposal. Dust and vapors generated by excavation will need to be monitored and controlled to the extent possible. Unlike land disposal, however, the rubble would need to be segregated and crushed prior to incineration. Noise and dust generated by the crushing would not be desirable at the site. A staging station outside Mason City is recommended to prepare the soil and rubble. This activity will increase the costs and time required to complete site remediation.

Long-term effectiveness of the remediation would be met at the site by the complete removal of all contaminated material that does not meet the cleanup criteria. Permanence of the remediation would be ensured by the destruction of the contaminants through incineration.

Off-site commercial incineration is the most costly option under consideration. Incineration and disposal costs are approximately $1,400 per ton. The closest facility to Mason City is located near East St. Louis, Illinois, approximately 470 miles from Mason City. Therefore, transportation cost would be approximately $90 per ton. Excavation, segregation, crushing, handling, etc. would add approximately $95 per ton. Total treatment and disposal costs would be approximately $1,585 per ton.

Off-site incineration would permit compliance with the cleanup standards established for the site by complete removal of the material that exceeds 500 mg/kg total PAHs or 100 mg/kg total carcinogenic PAHs. Also, the complete destruction of the PAHs ensures that future potential exposures to the public and environment are minimized or eliminated. This method is generally acceptable with state regulators and the community due to the quick site remediation and out of state treatment and disposal.

ON-SITE INCINERATION

As with off-site incineration, on-site incineration offers essentially complete destruction of the contaminants. The short-term and long-term effectiveness of the option is similar to using an off-site incinerator in that the site is quickly remediated and the potential for future threats to the public health and the environment are eliminated by the destruction of the contaminants. The mobile incinerators are capable of slower through put rates which will slightly increase the time required for site remediation.

As with the other potential alternatives, the site can be remediated to the cleanup standards by excavation and treatment of the contaminated soil. Thermal treatment destroys nearly all of the hydrocarbon compounds such that the resulting soil and ash may contain only trace amounts of residual PAH compounds, if any at all. The incineration eliminates the toxicity of the material and, therefore, the potential for migration of toxic substances but does not significantly change volume of the material.

Implementation of an on-site incinerator will require a greater effort than off-site incineration or land disposal. Air emissions permits will be required by the IDNR, which may require a test burn of the material to gather analytical data. Dispersion modeling of the emissions can be implemented and should provide satisfaction of local concerns. Crushing equipment would be required on site to reduce the rubble to a small enough size to be treated in the incinerator. Common construction equipment would be needed for the excavation.

The small size of the site will pose a problem for the excavation and incineration on site. Areas will need to be established for stockpiling excavated materials, fixation, ash stockpiles and incineration activities. Stockpiling the material and operating the incinerator may not be allowed within the Willow Creek floodplain. Also, siting of the incinerator in a populated area is generally not recommended. Operation of the incinerator on IPW owned property outside the city limits will facilitate permitting, implementation and community acceptance. Dust and noise generated by rubble crushing activities will also be more acceptable outside of a populated area.

Incineration using a mobile incinerator costs more than land disposal but less than an off-site fixed base incinerator. Operation costs per ton are quite low but the mobilization and set up costs can significantly effect project cost. Based on an assumed 3,000 tons of contaminated soil, the cost for incineration with a mobile unit is approximately $350 per ton. Assuming the incinerator is set up within 15 miles of the site, transportation costs will be approximately $5 per ton. The cost for segregation and crushing of rubble and excavation will be approximately $95 per ton, for a total cost of $450 per ton.

State and community approval of a mobile incinerator will be more difficult to achieve than for treatment and disposal out of the state. State approval can be gained through the permitting process. On-site operations would require compliance with state solid waste regulations. The regulations would require a solid waste comprehensive plan and state solid waste storage, treatment and transfer station permits, as well as, state air permits. On-site activities will also need to comply with county zoning requirements. Community approval, though not necessarily required, plays a major role in the execution of remedial activities in an effective and safe manner. Public meetings and education are recommended to gain community understanding and cooperation.

ON-SITE BIOLOGICAL TREATMENT

Biological treatment of contaminated soil consists of inoculating the material with bacteria, fungi or other microbes that feed on the contaminants or evolve enzymes that destroy the compounds. Maintaining a consistent environment for the microbes with a reactor vessel allows some control over the rate and completeness of remediation. The result can be the elimination of contamination or a reduction in the concentration to levels that do not pose a health or environmental hazard.

Biological treatment has the potential to reduce the concentrations of the PAH compounds to levels below those established in the consent order. However, the actual percentage of destruction cannot be determined without a bench scale study. A bench-scale feasibility test was implemented to determine the effectiveness of biotreatment on soil samples from the IPW site. The test, performed by Bioprocess Engineering, Inc. and Bioscience Management, Inc. indicated a reduction in the PAH content of the test reactors. However, none of the three reactors reduced the carcinogenic PAH concentration to less than 100 ppm during the duration of the test (32 days). This indicates that biotreatment of the site waste would be an extremely lengthy task with a risk that the cleanup standard may not be met.

The duration of a biological site remediation would limit the short-term effectiveness of the method by requiring that the excavation be open for a long period of time or that additional stockpiles of contaminated material be established, increasing the risk of casual contact or other exposures.

Potential long-term effectiveness of biological treatment would be as favorable as any other option. Residual bacteria in soil placed back in the excavation may be able to further reduce PAH levels both in the disturbed soil and in surrounding areas of low level contamination. Mobility and toxicity of the contaminants are greatly reduced or eliminated using biological treatment. The volume of material is virtually unchanged and the material may be placed directly back into the original excavation, provided appropriate solid waste regulations can be met.

As mentioned previously, a major drawback is the time and capital required to get a system operational to treat the PAHs in a reasonable length of time. The excavation stockpiles and reactor may require more space than is available at the site. Therefore, a reactor should be set up on another parcel, similar to that proposed for a mobile incinerator. In order to handle contaminated rubble, a segregation and crushing operation, similar to that for incineration, would be required

Costs of biological treatment may be as high as $1,100 per ton, excluding costs for rubble processing, pilot studies and design and construction of a reactor, if necessary. Permitting efforts would less involved than on-site incineration but greater than those for off-site landfilling or incineration.

Community response to biological treatment is likely to be positive due to the lack of potentially hazardous emissions. State regulators also consider biological treatment as an acceptable method to remediate the contaminated soils as long as the cleanup standards and permitting requirements can be met. As with on-site incineration state solid waste rules regarding a comprehensive plan and storage, treatment and transfer station permits, would be required.

COST COMPARTION

Dollars Per Ton

Activity	Off-Site Land Disposal	Off-Site Incineration	On-Site Incineration	On-Site Biological Treatment
Excavation and Loading	$ 30	$ 30	$ 30	$ 30
Transportation	65	90	5	5
Rubble Processing	-	65	65	65
Treatment and Disposal	120	1,400	350	1,100
TOTAL	$ 215	$ 1,585	$ 450	$ 1,200

CHAPTER 4

CHAPTER 4

RECOMMENDED REMEDIAL ACTION

Of the remedial action methods considered, incineration using a mobile incinerator is recommended for the Mason City site. This method is recommended because of the speed at which the site can be remediated, the complete destruction of PAH compounds, moderate cost and elimination of continuing environmental liability.

Operation of the rubble crusher and the incinerator should be performed on land owned by IPW that is outside the city limits of Mason City. This will reduce the potential risks to nearby residents, noise and dust complaints and permitting difficulties.

APPENDIX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

RECEIVED
23 1986
SUPERFUND BRANCH

REGIONAL HEARING CLERK
JUN 3 1985
REGION VII

IN THE MATTER OF Interstate Power Company Dubuque, Iowa Mason City Coal Gasification Plant Site Proceedings under Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9606	)	NO. 85-F-0032 CONSENT ORDER

PRELIMINARY STATEMENT

This Consent Order has been issued by the United States Environmental Protection Agency, Region VII (EPA), to the Interstate Power Company, Respondent (IPW). The Findings of Fact, Conclusions of Law, and all terms and conditions herein have been reviewed and agreed upon by the parties. The Order is issued pursuant to the authority vested in the President of the United States by Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) 42 U.S.C. §9606(a)(1980) and delegated to the Administrator of EPA by Executive Order 12316 and dated August 14, 1981, 47 Federal Register 42237 (1981). Respondent accepts the jurisdictional foundation for this Order. The Regional Administrator of EPA Region VII, pursuant to the authority granted by EPA Delegation No. 14-14-A, dated April 16, 1984, has determined that the site described herein is a site where hazardous substances have been treated, stored, or disposed of in a manner which may present an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance. Sampling and analyses conducted by Respondent pursuant to this Order shall be used by EPA to determine the extent and significance of such hazards. The objective of this Order on Consent is to provide the framework for an environmental response to be conducted by the Respondent with the approval and oversight of the EPA. Respondent IPW has reviewed the terms of this Order, consents to its issuance and agrees to fully comply with its terms. Respondent, however, neither admits nor denies the Findings of Fact set forth herein. Notice of this Order has been given to the State of Iowa, Department of Water, Air and Waste Management (IDWAWM).

FINDINGS OF FACT

1. Respondent Interstate Power Company is a Delaware corporation, which is authorized to do business, and is in good standing, in the State of Iowa. The Registered Agent for Interstate Power Company in Iowa is: G. J. Muir, 1000 Main Street, Dubuque, Iowa 52001.

2. The Mason City Coal Gasification Plant site (Facility) is located at Delaware Avenue and Fifth Street, S.E. in Mason city, in Section 10 of T96N, R20W in Cerro Gordo County, Iowa.

3. Respondent IPW is the current owner of a portion of the Facility and had been the sole owner of the Facility from 1957 to 1983. The City of Mason City, Iowa, has owned part of the site since 1983.

4. It is believed the Coal Gasification Plant was operated by previous owners until 1951 although no operating records are available. Some of the oily sludges and other substances, which were generated during the operation of the Coal Gasification plant, were disposed on site in 1952 and are still present on the Facility.

5. In August of 1984 a new sewer line was being installed through the Facility. The previously disposed oily sludges were discovered during excavation in shallow ground water being withdrawn for the installation of the sewer line through the site.

6. The oily sludges, which were generated by the Coal Gasification Plant, contain hazardous substances. A sample of the oily sludge was chemically analyzed for the Respondent during November and December of 1984. The sample was found to contain the following concentrations of hazardous substances:

Cyanide 170 mg/kg	Chrysene 2,500 mg/kg
Acenaphthene 63,000 mg/kg	Dibenzo[a,h]anthracene 180 mg/kg
Acenaphthylene 18,000 mg/kg	Fluoranthene 18,000 mg/kg
Anthracene 3,700 mg/kg	Fluorene 2,700 mg/kg
Benzo[a]anthracene 2,300 mg/kg	Indeno(1,2,3-c,d)pyrene 200 mg/kg
Benzo[a]pyrene 1,200 mg/kg	Naphthalene 17,000 mg/kg

Benzo[b]fluoranthene 1,800 mg/kg	Phenanthrene 9,600 mg/kg
Benzo[g,h,i]perylene 290 mg/kg	Pyrene 11,000 mg/kg
Benzo(k)fluoranthene 1,000 mg/kg	

7. Oily sludges, which were generated in the operation of the Coal Gasification Plant, were disposed by prior owner-operators in three below-grade basins. Some of the basins may have been lined with brick, concrete, or metal. It is believed that upon deactivation of the Coal Gasification Plant, the oily sludges were left in the basins and covered with soils borrowed from adjacent locations and with other materials.

8. In September of 1984 oily sludges were removed from the three basins by Respondent IPW. They are currently being stored in an aboveground waste pile on the site, pending ultimate disposal or treatment.

9. Surrounding soils and ground water could be contaminated by releases of oily sludges, or constituents of the oily sludges.

10. The Facility is located in an urban/commercial/residential section of Mason City, Iowa. An estimated 30,000 people reside or work within three miles of the Facility.

11. The hydrogeologic setting of the Facility is such that releases from the site may contaminate shallow groundwater, bedrock groundwater or the surface water of Willow Creek and the Winnebago River. The Facility is located adjacent to Willow Creek, which drains in to the Winnebago River approximately 6300 feet downstream of the site. Surfacial soils consist of approximately

10-15 feet of permeable alluvial deposits. The uppermost bedrock formation beneath the Facility is found at a depth of about 10-15 feet below ground surface. Alluvial groundwater is found as close (depending upon seasonal water table fluctuations) as 5-10 feet below the ground surface. Alluvial ground water is at risk of contamination by releases from the basins in which oily sludges were disposed. If alluvial groundwater is contaminated by such releases, Willow Creek and Winnebago River surface water and sediments may be affected.

12. Bedrock groundwater is hydraulically connected with alluvial groundwater beneath the site and is therefore at risk of contamination by releases from the basins. Bedrock groundwater in Mason City is a source of private and public drinking water.

13. Any release of contamination from the site into the Winnebago River that may have occurred could affect the quality of that surface water and the ability of that water body to support aquatic life. Contamination of the river could also adversely affect its usability as a recreational resource and as a habitat for game fish, sport fish, and other animals drinking water from this river or using it as a habitat.

14. Acenaphthylene; anthracene; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo(k)fluoranthene; chrysene; dibenzo[a,h]anthracene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; phenanthrene and pyrene are all polynuclear aromatic hydrocarbon (PAHs) compounds

and are all hazardous substances. PAHs are toxic to man and animals via oral, dermal or respiratory routes of exposure. As environmental pollutants some PAHs are slightly to moderately soluble in water and are soluble in other organics such as benzene and chloroform. Some PAHs are animal carcinogens and are mutagens. Some PAHs are confirmed human carcinogens and others are potential human carcinogens. PAHs are moderately persistent in the environment and have some potential for short term bioaccumulation.

15. Acenaphthene is similar in molecular structure and behavior to PAHs. It is also a hazardous substance. Acenaphthene is toxic to man and animals via oral, dermal or respiratory routes of exposure. As an environmental pollutant acenaphthene is moderately soluble in water and in other organics and is moderately persistent. Acenaphthene has some potential for short-term bioaccumulation, is an animal carcinogen and may be a human carcinogen, and is a mutagen.

16. Naphthalene is a hazardous substance and is similar in molecular structure and behavior to PAHs. Naphthalene is toxic to man and animals via oral, dermal or respiratory routes of exposure. As an environmental pollutant naphthalene is moderately to slightly soluble in water and is soluble in other organics. Naphthalene has some potential for short-term bioaccumulation. Naphthalene is an animal carcinogen, may be a human carcinogen, and is a mutagen.

17 Cyanides are nonmetal inorganic compounds. However, cyanides can combine with organics to form organocyanide compounds

and with metals to form metal-cyanide compounds. The behavior, physical properties and toxicity of cyanides will depend upon the form of cyanide present. Analytical data on samples from the site provided to EPA did not identify the form of cyanide present. Many cyanides are soluble in water. Cyanides are also not attenuated by clay soils, which tends to make them more mobile and more likely to result in groundwater contamination. Many cyanides are toxic to man and animals via oral or respiratory routes of exposure. Some cyanides are also toxic via dermal exposures.

18. The City of Mason City, Iowa, has granted IPW written permission to enter that portion of the site that is owned by the City in order to perform any and all necessary actions contemplated by this order.

CONCLUSIONS OF LAW

19. The Mason City Coal Gasification Plant site, as described in paragraph 2, was used for storing or disposing hazardous substances as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601 (14).

20. The Mason City Coal Gasification Plant site is a "facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. §9601(9).

21. Respondents IPW is a "person" as defined in Section 101(21) of CERCLA, 42 U.S.C. §9601 (21).

22. The substances previously described in paragraph 7 are each a "hazardous substance" as defined in Section 101(14) of CERCLA, 42 U.S.C. §9601(14).

23. The past, present, or the potential migration of hazardous substances from the site constitutes an actual and/or threatened "release" as defined in Section 101(22) of CERCLA, 42 U.S.C. §9601(22).

24. Respondent IPW is an "owner" of a facility, as defined by Section 101(20) and as used in Section 107(a)(1) and (2) of CERCLA, 42 U.S.C. §§ 9601(20) and 9607(a)(1) and (2).

DETERMINATION

25. The Regional Administrator of EPA Region VII has determined that the presence of hazardous substances described in this Order, and the threat of release of such hazardous substances into the environment, may present an imminent and substantial endangerment to the public health or welfare or the environment. The Regional Administrator has determined that the oily sludges that IPW has presently stored above-ground at the Facility, and any additional oily sludge or contaminated soil beneath the ground surface, resulting from the storage sludges and below grade storage basins should be responded to in a manner that is consistent with the "National Contingency Plan" 40 C.F.R. Part 300. The Regional Administrator has further determined that the

following described monitoring, testing, analyzing, reporting and removal is necessary to protect public health and welfare and the environment and is consistent with the NCP.

ORDER

The objectives of the following required actions are to remove the oily sludges from the three below grade storage basins and those stored above-ground at the site and to ascertain the nature and extent of the endangerment to human health or welfare, or the environment from the release or threatened release of those hazardous substances that may still be found on or below ground.

26. Respondent is hereby ordered by the EPA to remove and dispose of or treat all oily sludges and substances that have been excavated and that are currently being stored in an above ground waste pile on the site and any additional oily sludges and materials in the three below grade storage basins that have a concentration of total PAHs of 100 ppm and any additional subsurface oily sludge and contaminated soil resulting from these two areas. IPW shall perform this removal and disposal or treatment in a manner that is consistent with the National Contingency Plan, 40 C.F.R. 300, and pursuant to a plan submitted to and approved by EPA.

27. Respondent shall, unless otherwise specified, comply with the following requirements for an environmental monitoring program. Any further requirements for environmental monitoring will be dependent upon acquisition and evaluation of the data described below.

28. Monitoring, Analysis and Reporting Requirements

Respondent shall complete the following activities by the dates required below:

(A) Within forty five (45) days prepare a detailed plan of Study for the project specifying the exact level of study, numbers of borings, soil samples, groundwater monitoring wells, surface water samples and locations, creek sediment samples, laboratory analysis to be performed, underground facility investigation and air quality monitoring. The Plan of Study will be submitted to EPA for review, consent and approval prior to actual implementation.

(B) Complete soil borings and surface samples on the site to determine the extent of movement of contaminants at the site. For purposes of this order, it is required that at least ten (10) borings will be accomplished to an average of fifteen (15) feet or to bedrock, unless otherwise approved by EPA. An Organic Vapor Analyzer (OVA), calibrated to monitor for non-methane organics, or a photoionization meter (such as HNu), will be utilized in the field. It is required that at least ten (10) soil samples from the soil borings will be analyzed in the laboratory. In addition, it is required that at least five (5) surface soil samples will be collected for analysis, unless otherwise approved by EPA.

(C) A groundwater monitoring system for the shallow groundwater system will be installed for initial groundwater monitoring on the site. A minimum of four (4) wells are necessary to document the groundwater flow network. It is required that at least the wells will be an average of fifteen (15) feet in depth with a five (5) foot screen, unless otherwise approved by EPA. Complete well logs will be maintained.

(D) An initial set and a follow-up set of groundwater samples will be taken from each well for laboratory analysis. The elevations and locations of the wells will be surveyed as a part of this work effort.

(E) At least two sets (an initial set and a follow-up set) of surface water and sediment samples will be collected on Willow Creek in the vicinity of the Facility for chemical analyses. Surface water and sediment samples shall be collected from the following points in the creek:

- 100 to 200 feet upriver (west) of the Facility;
- adjacent to the Facility at the down-river (eastern) boundary of the Facility; and
- approximately one quarter mile down-river (east) of the Facility and above the confluence with any other surface water body of equal or greater size.

(F) Laboratory analysis will be performed for all the samples collected during the study. The parameters for testing will be established, and will include at a minimum the total of the PAH compounds, Acenaphthene, Naphthalene, and Cyanide for the following:

1. Soil boring Samples - 10
2. Surface Soil Samples - 5
3. Groundwater Samples - 8

4. Surface Water Samples - 6
5. Creek Sediment Sample - 6

TOTAL 35

(G) The portable OVA or HNu instrument will be used for air quality monitoring at frequencies, parameters and locations as specified in the completed Plan of Study (A).

(H) A Preliminary Assessment report will be prepared that addresses all the areas of actual or potential contamination studied. The report will be submitted to the EPA for review and concurrence. EPA will then use the information to evaluate the Facility to determine if further cleanup work (in addition to what has already been done) will be necessary or if any further monitoring is required.

(I) For all samples collected, Respondent IPW shall specify the collection, storage, and management procedures.

(J) For all samples collected, Respondent IPW shall specify the chain-of-custody procedures for all phases of samples management, including any forms which are used. The methods and procedures for samples management and chain of custody shall be equivalent to those of the EPA, National Enforcement Investigations Center (NEIC).

(K) For all samples collected, Respondent IPW shall state the analytical parameters and the limits of detection and the rationale for this selection.

(L) For samples collected, Respondent IPW shall specify the laboratory procedures to be used for samples analysis, quality control and quality assurance programs. Any laboratory used for chemical analyses pursuant to this Order must be an EPA contract laboratory, or provide adequate documentation to EPA of its capability to perform the required analyses in a Quality Assurance Project Plan.

(M) The identity of the analytical parameters and limits of detection specified in the Plan to be submitted by Respondent IPW, will be reviewed by EPA and must be approved by EPA.

29. General Requirements

In addition to the above-mentioned specific requirements, each plan should also address the following general requirements:

(A) The Plan of Study should specify an expeditious and reasonable schedule for the implementation and completion of its various components.

(B) The Plan of Study should provide for periodic reports to EPA on the progress of the monitoring work.

(C) Each plan shall specify the precautions which will be taken to insure the health and safety of the individuals associated with this project.

(D) The environmental monitoring initiated at the site may be required to be continued on a long-term basis in order to determine, define and evaluate any health and environmental hazards which may be related to the site. The necessity for long-term environmental monitoring will be determined following review of the data.

30. Plan Review and Approval Process

(A) Within 30 days of EPA's receipt of Respondent IPW Plan of Study, EPA shall review the plan and notify Respondent IPW in writing of its approval or disapproval.

(B) Upon written approval of the Plan by EPA, Respondent IPW shall, within 30 days, initiate work according to the approved monitoring plan. Inclement weather could result in a delay beyond the 30 days.

(C) In the event of EPA disapproval of the Plan of Study in whole or in part, EPA shall note in writing the specific deficiencies in the plan, and the reasons therefore, and shall send this notice to Respondent IPW representative as designated in Paragraph 31(A).

(D) Within 15 days of receipt of a notice of disapproval, Respondent IPW shall modify and submit the revised plan to EPA for review and written approval. EPA shall review the revised plan and notify Respondent IPW within 30 days of its approval or disapproval.

(E) Should Respondent IPW take exception to all or part of EPA's disapprovals in Paragraphs 31(C) and 31(D), Respondent IPW shall submit to EPA in writing the statement of the grounds for such exception. Representatives of EPA and IPW shall then confer by telephone or in person in an attempt to resolve any disagreement. At such conference, a resolution may be reached with regard to each area of disagreement and shall be reduced to writing and signed by representatives of each party.

(F) In the event the parties cannot resolve their disagreement, IPW shall implement the plan as directed by EPA.

(G) Upon written approval by EPA the Plan of Study as originally proposed, or as amended, Respondent IPW shall proceed to carry out the plan in accordance with the schedule in the plan.

(H) Respondent IPW shall, within 45 days after completion of all work specified in the Plan of Study submit to EPA an accurate report of its findings, including copies of the results of all analysis of soil, surface water, sediment and groundwater samples and copies of the hydrogeologic assessment.

(I) EPA shall notify Respondent IPW in writing in an expeditious manner of the necessity for further work at the Facility which will require an amendment to this Consent Order.

31. <u>Access to Third Party Property</u>

It is the responsibility of Respondent IPW to secure permission necessary to obtain access to and use of any offsite areas. Respondent IPW shall assume full responsibility for any claims arising from the activities conducted by Respondent IPW or its representatives on third-party property in connection with this Order. Respondent shall save harmless the United States Government from any such claims. A copy of the necessary access document which shall be in the form of a written City resolution or a City clerk certified copy of Council minutes wherein access is duly granted by the City of Mason City, Iowa is attached to this Order as Exhibit A.

32. Site and Information Access; Confidentiality

Respondent IPW shall provide access to the Facility to EPA employees and to EPA contractors at reasonable times and shall permit such persons to be present and move freely in the area where any work is being conducted at all times when work is being conducted pursuant to this Order. Any EPA employees and EPA contractors on Facility while work is being conducted shall be required to abide by any Facility safety plan which may be in effect. Respondent IPW shall provide EPA with copies of all charts, maps, letters, memoranda, invoices, shipping manifests or other records or documents considered by EPA to be relevant to the subject matter of this Order. Any information requested pursuant to this Order must be provided, notwithstanding its possible characterization as Confidential Business Information (CBI). However, Respondent IPW may request, at the time of submitting information pursuant to this Order, that such information be treated as CBI. If such a request is made, EPA shall process such a request in accordance with the provisions of 40 C.F.R., Part 2 Subpart B.

33. Sample Splitting

Respondent IPW shall upon request from EPA provide EPA or EPA Contractors with a split of all samples taken pursuant to this Order. Before disposal of any samples by Respondent, the EPA shall be given thirty (30) days notice and opportunity to take possession of such samples.

34. Exchange of Information

(A) Whenever under the terms of this Order, notice is required to be given by one party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice in writing to the parties of another individual designated to receive such communication:

E. D. Forslund
Director, Power Production
Interstate Power Company
General Office
1000 Main Street
Dubuque, Iowa 52001

Robert L. Morby
Site Project Officer
Superfund Branch
EPA Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

(B) Routine communications concerning the plan, reports, or any aspects of this Order may be exchanged by phone between the parties to facilitate the work required by this Order, but no verbal communication shall in any way alter or amend the provisions of this Order.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE STATUTES AND REGULATIONS

35. All actions undertaken pursuant to this Order by Interstate Power Company or its duly authorized representatives shall be done in accordance with all relevant and appropriate or applicable federal statutes and regulations and all applicable state and local statutes and regulations, including the statutes and regulations of the United States Occupational Safety and Health Administration.

PENALTIES FOR NON-COMPLIANCE

36. Respondent is hereby advised that:

(A) Pursuant to Section 106(b) of CERCLA, 42 U.S.C. §9606(b)(1980), any person who willfully violates or fails or refuses to comply with this Order may be fined not more than $5,000 for each day in which such violation occurs or such failure to comply continues; and (B) Pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. §9607(c)(3) (1980), any person who is liable for a release or threat of release of a hazardous substance and who fails without sufficient cause to properly provide the actions specified in this Order may be liable to the United States for punitive damages in an amount at least equal to and not more than three times the amount of any costs incurred by the government as a result of such failure to take proper action.

AMENDMENTS

37. The parties hereto may by mutual agreement modify this Order, only if such modification is in writing and executed by representatives of each party. Amendments shall be effective upon Respondent's receipt of a fully executed copy.

LIABILITY

38. Neither the United States Government nor any agent thereof shall be liable for any injuries or damage to persons or property resulting from acts or omissions of Respondent, its officers, directors, employees, agents, servants, receivers, trustees, successors, or assigns, or of any persons, including but not limited to firms, corporations, subsidiaries, contractors or consultants, in carrying out activities pursuant to this Order, nor shall the United States Government or any agency thereof be held out as a party of any contract entered into by Respondent in carrying out activities pursuant to this Order.

ENFORCEMENT

39. Nothing contained herein shall be construed to prevent EPA from seeking legal or equitable relief to enforce the terms of this Order, or from taking other legal or equitable action as it deems appropriate or necessary with respect to the site, or from requiring future activities at the site, pursuant to CERCLA, 42 U.S.C. §9601, et seq. or other applicable law.

RESERVATION OF RIGHTS

40. In particular EPA retains the right to determine whether further response actions are required at the Facility and to require such further actions, pursuant to this authority under Section 106 of CERCLA, 42 U.S.C. §9606 (1980), or any other relevant provisions of law. Nothing in this Order shall be construed to limit such authority.

Nothing herein shall be construed to prevent or prohibit IPW from seeking legal or equitable relief from any determination by EPA that IPW has failed to comply with this Consent Order. Further, nothing herein shall be construed as a waiver by IPW of any rights it may have against third parties regarding the subject matter of this Consent Order.

MISCELLANEOUS

41. The provisions of this Order shall be binding upon the employees, agents, successors and assigns of the parties hereto.

EFFECTIVE DATE

42. This Order is effective upon receipt by Respondent of a fully executed copy of this Order. All times for performance of response activities shall be calculated from that time and date.

HAVING FULLY REVIEWED the foregoing paragraphs, the United States Environmental Protection Agency and the Interstate Power Company, do hereby consent to the provisions of this ORDER.

May 8, 1986
Date

David Lamar Kopp
Assistant Regional Counsel
United States Environmental
Protection Agency, Region VII
Kansas City, Kansas 66101

May 20, 1986
Date

D. H. Buswell
President
Interstate Power Company
Dubuque, Iowa 52001

IT IS SO DETERMINED AND ORDERED.

6-3-86
Date

Morris Kay
Regional Administrator
United States Environmental
Protection Agency, Region VII
Kansas City, Kansas 66101

APPENDIX B

FIELD INVESTIGATION AND PRELIMINARY ASSESSMENT

V. SUMMARY OF FINDINGS

1. Coal tar material was apparently left on-site and buried in three underground structures when the coal gasification plant was dismantled. A majority of the material has been previously removed from the subsurface by Interstate Power Company.

2. A sample of sludge obtained from the site in 1984 contained at least 15.2 percent of polynuclear aromatic hydrocarbons (PAH). Five PAH compounds, napthalene, acenapthylene, acenaphthene, fluoranthene and pyrene, represent 82 percent of the priority pollutant PAH compounds in the sample. None of the five compounds have been identified as a carcinogen. The compounds tend to have higher water solubilities, lower molecular weights and lower boiling points than other PAH compounds quantified.

3. Samples obtained at the site were generally collected, handled and analyzed in accordance with the approved Plan of Study. Site-specific conditions required some modification of procedures described in the Plan of Study. All modifications are described and justified in the text and appendices.

4. Geologic conditions at the site have been defined. Approximately 10.5 to 14 feet of fill material overlies limestone and dolomite bedrock (Shell Rock Formation) at the site. Some native soils may be present in localized bedrock depressions. The fill material consists of uncontrolled rubble (concrete, brick, scrap metal, and wood) in a silty to sandy clay matrix.

5. The water table at the site occurs within the fill material and its elevation is partially controlled by the elevation of Willow Creek. Shallow groundwater flows toward Willow Creek (northeast) under most conditions. A reversal in groundwater flow direction will occur during periods when the level of Willow Creek rises rapidly.

6. Major aquifers near the site include the St. Peter Sandstone, Prairie du Chien Group and the Jordan Sandstone. The St. Peter Sandstone, the shallowest major aquifer, lies approximately 700 feet below ground surface at the site. Four bedrock units, approximately 400 feet thick, separate the shallow bedrock at the site from the St. Peter Sandstone. These four units are classified as an aquaclude and act to impede downward migration of groundwater. Based upon the known geologic conditions, it is unlikely that coal tar materials on site will negatively impact a major bedrock aquifer.

7. Significant concentrations of coal tar constituents have not been identified in shallow (0-6 inches) soil samples.

8. Significant concentrations of coal tar constituents have been identified in deep soil samples. The highest concentrations occurred in samples obtained near the three subsurface structures.

9. With the exception of benzo(a) pyrene, most PAH compounds consistently detected in deep soil samples were of a relatively low molecular weight. Naphthalene, phenanthrene and pyrene represent a large percentage of total PAH compounds identified in deep soil samples.

10. In deep soil samples, statistical anlaysis indicates an excellent linear correlation exists between total PAH compound concentrations and the concentrations of the following individual compounds: naphthalene, fluorene, phenanthrene and benzo(a) pyrene.

11. Water quality impacts attributed to coal tar constituents have been identified at three monitoring wells (MW-2, MW-3 and MW-4). Impacts are greatest at MW-2 and MW-3 which are nearest to the underground structures. Water quality impacts have also been identified at MW-1; however, the absence of naphthalene at this location suggests that an on-site or upgradient source other than coal tar may be present.

12. No water quality impacts attributable to coal tar constituents have been identified in Willow Creek.

13. Sediment samples from Willow Creek indicate elevated concentrations of PAH compounds at some locations; however, existing data suggests that the source of PAH compounds is a storm sewer. Thus, impacts to Willow Creek sediment cannot be attributed to the site at this time.

PHASE II INVESTIGATION

IV. SUMMARY OF FINDINGS

1. Information collected from the additional soil borings indicates that the entire site is covered with fill material. Some minor deposits of native soil occur intermittently at the bedrock surface.

2. The uppermost portion of the bedrock is generally highly weathered. The fractures and voids are commonly filled with clay. Beneath the weathered portion, the bedrock is, in general, very hard with fractured zones erratic in occurrence.

3. Fractured zones encountered at MW-7 and MW-8 contained, along with water, tar-like substances. The occurrence of both the tar-like material and the fractures may, at least in part, be the result of construction of the sanitary sewer/utility encasement.

4. Shallow groundwater at the site flows in a northeasterly direction.

5. Recovery abilities of the monitoring wells indicate that permeabilities of the upper saturated materials vary greatly.

6. Water movement in the limestone/dolomite bedrock is primarily through fractures.

7. A downward vertical gradient has been measured for nested monitoring wells 3 and 8 and monitoring wells 4 and 9. No measurable gradient is found between monitoring wells 3 and 7. The vertical gradient information suggests that a groundwater divide may exist beneath the site near Willow Creek. Water moving through the uppermost portions of the bedrock would discharges to Willow Creek, while water moving slightly deeper through the bedrock may migrate past Willow Creek.

8. Soil samples submitted for analysis indicate that soil PAH concentrations vary a great deal throughout the site. Some of the samples recently collected exceeded the proposed cleanup criteria.

9. The single waste pile sample exhibited high concentrations of certain metals and PAH's.

10. The most significant groundwater impacts have been encountered in samples collected from monitoring wells 2, 3, 4 and 7. Very little impact has been found at the deep bedrock wells 8 and 9.

11. Samples collected from upgradient monitoring wells 1 and 6 contained low concentrations of only a few PAH compounds. The compounds present were not those typically found at the other wells. This may suggest a contaminant source upgradient of the site.

PHASE III SUPPLEMENTAL FIELD INVESTIGATION, MASON CITY, IOWA

IV. CONCLUSIONS

1. Information collected from the additional soil borings, monitoring well installation, and rock coring supports and expands previous findings from the Phase II investigation.

2. The entire site appears to be covered with fill material ranging in thickness from 9 to 16 feet.

3. Competent bedrock is generally overlain by 2 to 4 feet of highly weathered bedrock.

4. A predominant northeast groundwater flow direction exists at the site.

5. The correlation of groundwater and Willow Creek water levels indicates a flow reversal from the creek towards the site is likely during periods of high flow within the creek channel.

6. A downward vertical gradient for groundwater has been measured at all three nested well locations, indicating a downward flow gradient along the retaining wall in the central and northeastern portions of the site. A downward flow gradient is also indicated within the Willow Creek channel.

7. A slight mounding of shallow groundwater occurs at monitoring well MW-3 due to the apparent restriction of flow by the retaining wall. This mounding of groundwater at MW-3 appears to develop a small subsystem resulting in a groundwater divide that discharges a portion of the shallow groundwater into Willow Creek.

8. Groundwater flow within the deeper portion of the bedrock and alluvium may move past the Willow Creek channel.

9. The flow of groundwater within the limestone/dolomite bedrock is likely to be greater within the upper 10 to 15 feet of bedrock due to greater fracture frequency.

10. Various interbedded shale layers, at depth, within an elevation range of 1074 to 1984 feet NGVD will act as an aquitard and will restrict downward movement of groundwater and potential downward contaminant migration. One shale layer at an elevation of 1078 feet NGVD appears to be continuous.

11. Oily material was observed within the sediment and weathered bedrock in the Willow Creek channel. The origin of the oily material cannot be associated with the site with certainty since refuse material within the sediment suggests potential dumping at this location or at some point upstream.

12. Oily material has been identified within the fill from approximately 6 to 11 feet in depth in the central portion of the site. Areal distribution of identified oily material within this portion of the site is approximately 2,500 square feet; an area approximately 50 feet x 50 feet. The areal extent of contamination has not been completely defined at the site.

13. Oily material has been identified within the fill from approximately 8 to 10 feet in depth in the northeastern portion of the site. Oily material in this area may be a result of secondary disposal of oily waste originating from excavation associated with the on-site sanitary sewer construction.

14. Oily or tar-like material found within the upper bedrock will likely remain and migrate to the northeast through fractures within the upper 10 to 15 feet of bedrock.

15. The retaining wall appears to restrict discharge of shallow groundwater flow and potential migration of oily material into Willow Creek.

APPENDIX C

Jerry A.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

DEC 23 1987

MEMORANDUM

RECEIVED
DEC 24 1987
CMPL SECTION

SUBJECT: Mason City, Iowa, Coal Gasification Plant

FROM: Luetta A. Flournoy Luetta A. Flournoy
Chief, IOWA Section

TO: Craig Smith
Chief, SCOM Section

THRU: Michael J. Sanderson
Chief, RCRA Branch

On December 17, 1987, Steve Aucherlonie gave me a copy of a November 27, 1987 submittal from Interstate Power Company which had been requested during our November 3, 1987 meeting regarding this site. As requested, I have reviewed this submittal of generic information in order to determine whether or not contaminated soil/groundwater at this site would be regulated under RCRA as a hazardous waste. Although a number of contaminants have been identified which are listed in 40 CFR Part 261, there is no indication that the contamination was caused by listed hazardous wastes such as spent solvents or commercial chemical products. Therefore, the contaminated material would not be regulated under RCRA as listed hazardous wastes. The material would be regulated under RCRA only if it exhibited one or more of the characteristics of ignitability, reactivity, corrosivity or EP Toxicity, which appears unlikely. Please refer to my previous memo dated August 20, 1986 for additional discussion regarding the characteristics.

Even though the material is likely not regulated under RCRA, it may still be appropriate to require management in accordance with RCRA requirements due to the presence of contaminants such as toluene, phenols, ethylbenzene, cyanide, benzene, xylene and various PAHs which are listed in 40 CFR Part 261.

If you have any questions regarding this matter, please contact me.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

October 13, 1987

Received 10/15/87

Mr. E. D. Forslund
Director, Power Production
Interstate Power Company
1000 Main Street
Dubuque, Iowa 52001

Dear Mr. Forslund:

This letter responds to your questions concerning soil and ground water clean-up criteria and USEPA Region VII (the Agency) approval for conducting additional ground water investigations at the Mason City Coal Gasification Plant Site.

The data presented in Interstate Power Company's (IPC) May 1987 report ("Field Investigation and Preliminary Assessment, Interstate Power Company, Mason City, Iowa") documents ground water contamination at the site. Therefore, some type of remedial action is required to clean-up site ground water. Clean-up levels for site ground water are listed in Table 1. The levels reflect the Iowa Department of Natural Resources policy to restore contaminated ground water to a potable state. Clean-up levels for soil and the materials in the on-site waste pile are listed in Table 2. The clean-up standard of 500 mg/kg for PAH's refers to the total of all Priority Pollutant PAH compounds. USEPA Region VII reserves the right to set clean-up levels for other compounds in both soil and water, depending upon the results of additional sampling and analyses.

The Agency's preliminary evaluation of the chemical analyses data on subsurface soils presented in IPC's May 1987 report suggests that removal of contaminated subsoils may not be required, since the total concentrations of carcinogenic PAH's in the upper soils sampled was less than 100 mg/kg. However, IPC should prepare a baseline risk assessment to determine if a no action alternative for subsurface soils is appropriate. A guidance document for preparation of risk assessments will be sent to IPC under separate cover.

Additional investigation is necessary to design an appropriate ground water remediation system. Preliminary remedial action alternatives for ground water clean-up should be identified so that the investigation(s) can focus on collecting data necessary to evaluate selected remedial alternatives. As a minimum, the additional site ground water investigation should collect data to:

RECEIVED

OCT 19 1987

E.A. Hickok & Associates

- evaluate the contaminant flow paths for migration away from the site;
- evaluate the horizontal and vertical extent of ground water contamination;
- characterize ground water flow conditions and the hydraulic properties of the fill and natural soils present at the site;
- establish the hydraulic relationship between Willow Creek and site ground water levels;
- evaluate the hydraulic properties and ground water quality of the Shell Rock Limestone.

IPC must submit an investigation plan to the Agency for review and approval prior to conducting the additional ground water investigation. The investigation plan may be issued as an addendum to the "Preliminary Assessment Plan of Study, Interstate Power Company, Mason City Coal Gasification Plan" dated August 1986.

The addendum must contain the following information:

- A preliminary evaluation of remedial action alternatives for ground water clean-up and a listing of alternatives that will be investigated.
- Locations and depths of proposed monitoring wells and exploratory borings. Suggested monitoring well locations are shown in Figure 1.
- Exploratory boring procedures.
- Well installation procedures and materials.
- Well screen elevations.
- Ground water quality analytes to include cyanide, semi-volatile and volatile organic compounds, since several volatile organics were detected in a sample from MW-4 analyzed by USEPA Region VII.
- Schedule for drilling, well installation, well development, ground water quality sampling and analyses, and ground water and surface water level measurements.
- Sample containers, holding times, chemical analyses methods.
- Quality Assurance/Quality Control Plan for water level measurements and chemical analyses.
- Ground water sampling techniques.

The procedures and information in IPC's August 1986 Plan of Study may be incorporated into the addendum by reference.

The Agency requests that the Investigation Plan addendum be submitted within 21 days of receipt of this letter. The Agency will issue a written response to the addendum within 7 days.

The Agency considers the on-site waste pile an operable unit; consequently, clean-up of the waste pile may be conducted independent of other site clean-up activities. The Agency requests that a feasibility study work plan for clean-up of the on-site waste pile be submitted within 45 days of receipt of this letter. The Agency will issue a written response to this plan within 30 days of receipt.

The cooperation that IPC has shown is appreciated. The Agency would welcome the opportunity to meet with IPC to discuss clean-up levels and site remedial alternatives. Please contact Mr. Steve Auchterlonie at (913) 236-2856 to arrange for a meeting time and to discuss any questions you may have.

Sincerely,

Robert L. Morby
Chief, Superfund Branch
Waste Management Division

cc: Robert Drustrup, IDNR

TABLE 1

CLEAN-UP LEVELS
FOR
GROUND WATER

MASON CITY COAL GASIFICATION PLANT SITE

Analyte	Maximum Concentration Detected in Site Ground Water	Clean-Up Level	Clean-Up Level Reference
Toluene	1.8 ug/l	2,000 ug/l	Federal Register 50-219; 46936-47022
Phenols	55 ug/l	3500 ug/l	EPA Ambient Water Quality Criteria (WQC). See Exhibit 4-6 of Superfund Public Health Evaluation Manual EPA/540/1-86/060
Ethylbenzene	36 ug/l	1400 ug/l	Handbook of Toxic and Hazardous Compounds and Carcinogens, Marshal Sittig, 2nd Edition
Cyanide	4800 ug/l	200 ug/l	WQC
Benzene	130 ug/l	5 ug/l	Maximum Contaminant Level (MCL). See 50 Federal Register 46902 (November 13, 1985)
Xylene	33 ug/l	440 ug/l	Maximum Contaminant Level Goal (MCLG) See 50 Federal Register 46902 (November 13, 1985)

TABLE 1
(continued)

CLEAN-UP LEVELS
FOR
GROUND WATER

MASON CITY COAL GASIFICATION PLANT SITE

Analyte	Clean-Up Level	Clean-Up Level Reference
PAH's	Refer to the attached Table "High Performance Liquid Chromatography Conditions and Method Detection Limits" which lists the detection limit (DL) for each PAH listed as a Priority Pollutant. Site ground water should be cleaned to not-detected (ND) for all compounds which have DLs greater than 0.2 ug/l. For the compounds with DLs less than 0.2 ug/l, the sum of these compounds in site ground water should be clean-up to less than 0.2 ug/l. In this summation, any ND compound will be counted as a zero in the summation.	WQC

TABLE 2

CLEAN-UP LEVELS
FOR
SOILS AND ON-SITE WASTE

MASON CITY COAL GASIFICATION PLANT SITE

Analyte	Maximum Concentration Detected in Site Soils	Clean-Up Level	Clean-Up Level Reference
Total PAH's[1]	1500 mg/kg	500 mg/kg	Memorandum from Department of Health and Human Services to Mr. Carl R. Hickman USEPA Region VI dated January 17, 1987
Carcinogenic PAH's[2]	198 mg/kg	100 mg/kg	
Cyanide	83 mg/kg	1000 mg/kg	ATSDR Recommendation September 23, 1987

NOTES: [1] Refers to the total of the Priority Pollutant PAH compounds.

[2] Refers to the total of the following compounds; Benzo-(a)-pyrene, Dibenzo-a,h-anthracene, Benzo-a-anthrancene, Indeno-1,2,3-cd-pyrene, Benzo-b-fluoranthene, and Chrysene.

High Performance Liquid Chromatography Conditions and Method Detection Limits

Parameter	Retention Time (min)	Capacity Factor (k')	Method Detection Limit (μg/L)[a]
Naphthalene	16.6	12.2	1.8
Acenaphthylene	18.5	13.7	2.3
Acenaphthene	20.5	15.2	1.8
Fluorene	21.2	15.8	0.21
Phenanthrene	22.1	16.6	0.64
Anthracene	23.4	17.6	0.66
Fluoranthene	24.5	18.5	0.21
Pyrene	25.4	19.1	0.27
Benzo(a)anthracene	28.5	21.6	0.013
Chrysene	29.3	22.2	0.15
Benzo(b)fluoranthene	31.6	24.0	0.018
Benzo(k)flouranthene	32.9	25.1	0.017
Benzo(a)pyrene	33.9	25.9	0.023
Dibenzo(a,h)anthracene	35.7	27.4	0.030
Benzo(ghi)perylene	36.3	27.8	0.076
Indeno(1,2,3-cd)pyrene	37.4	28.7	0.043

HPLC conditions: Reverse phase HC-ODS Sil-X 2.6 mm x 250 mm Perkin-Elmer column; isocratic elution for 5 min using acetonitrile/water (4 + 6), then linear gradient elution to 100% acetonitrile over 25 minutes; flow rate is 0.5 mL/min. If columns having other internal diameters are used, the flow rate should be adjusted to maintain a linear velocity of 2 mm/sec.

[a]The method detection limit for naphthalene, acenaphthylene, acenaphthene, and fluorene were determined using a UV detector. All others were determined using a fluorescence detector.

JANUARY 17, 1986 MEMO

ASSESSMENT OF PROPOSED CRITERIA
FOR PROTECTION OF HUMAN HEALTH
AT THE UNITED CREOSOTING SITE
CENTER FOR DISEASE CONTROL

BASIS: JULY 31, 1985 CDC MEMO

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

January 17, 1986

m Acting Director
Office of Health Assessment

bject: Health Assessment: United Creosote Site
Conroe, Texas

Mr. Carl R. Hickam
Public Health Advisor
EPA Region VI

EXECUTIVE SUMMARY

The United Creosote Site contains residual polynuclear aromatic hydrocarbons (PAH's) and pentachlorophenol from the former wood-preserving activities on the site. These residues are primarily subsurface; however, there are isolated "tar mats" located in various residential yards. The Environmental Protection Agency (EPA), Region VI, requested an acceptable cleanup level for these residues. During an October 10, 1985 conference call with Region VI, a value of 100 ppm for total PAH in surficial residential soil was suggested as a value that is unlikely to result in a ublic health risk.

STATEMENT OF PROBLEM

After Region VI reviewed the July 31, 1985 Superfund Implementation Group memorandum evaluating the potential health hazard presented by the chemical contamination, they requested assistance in developing a design value for the planned cleanup of the site.

DOCUMENTS REVIEWED

1. Memorandum from Don Williams, EPA Region VI, October 10, 1985.
2. Memorandum from Georgi A. Jones, Superfund Implementation Group, July 31, 1985.
3. ATSDR United Creosote site file.

CONTAMINANTS AND PATHWAYS

The principle contaminants at this site are creosote and pentachlorophenol. The exposure pathways are direct contact with contaminated soils and creosote residues, and the consumption of contaminated groundwater. The highest levels of creosote contamination reported are located in "tar mats" at various locations near the site, both on and beneath the surface the soil. Except for the few reportedly isolated "tar mats," the predominate contamination at the site is subsurface. Without substantial effort on the part of the human population, this subsurface contamination presents little opportunity for contact. The local groundwater is contaminated with both pentachlorophenol and the more soluble PAH's; however, this water, reportedly, is not currently being used for domestic purposes.

DISCUSSION

In a published article[1], the Centers for Disease Control (CDC) derived an action level at which to limit human exposure for 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8,-TCDD) contaminated residential soil. This derived value was based upon extrapolations from animal toxicity experiments (including carcinogenicity and reproductive effects) to possible human health effects in order to estimate a reasonable level of risk for 2,3,7,8-TCDD. A 10^{-6} excess lifetime risk was used in the development of this TCDD soil level.

The Environmental Protection Agency's Carcinogen Assessment Group has derived a relative potency index for more than 50 chemicals[2]. The order of magnitude potency index for 2,3,7,8-TCDD is eight, while that for benzo(a)pyrene is only three. Thus, 2,3,7,8-TCDD is considered to be five orders of magnitude more potent as a carcinogen than benzo(a)pyrene. Using only this order of magnitude difference in potency between the two chemicals and the CDC-derived residential soil action level, gives 100,000 ppb of benzo(a)pyrene equivalent to 1 ppb of 2,3,7,8-TCDD in soil.

In the model used to derive the 2,3,7,8-TCDD soil value, the assumption concerning the amount of soil ingested has been shown to be high. A recent unpublished study by CDC has shown the amount of soil ingested by children of the soil-eating age ranges from 0.1 to 1 gram per day (S. Binder personal communication). Thus, the model estimate for soil ingestion during the period of minimum hygiene is excessive by at least an order of magnitude. Since the other soil ingestion rates in the model are also estimates, there is a good likelihood that they are also in error, possibly by more than an order of magnitude. Thus, the model very likely overestimates the total lifetime soil ingestion exposure by at least one order of magnitude.

In addition, the model contains a factor to account for the environmental degradation of the specific chemical. The factor for 2,3,7,8-TCDD assumed a 12-year half-life in soil. While the numerous PAH's have a range of half-life values in surface soil, which will be dependent upon the specific soil and climatological conditions encountered, even the maximum half-life for the most degradation-resistant compound is less than the value assigned for 2,3,7,8-TCDD in the model. Even with a six year half-life, a persons lifetime exposure would be substantially reduced when compared to that estimated with the longer half-life used in the TCDD risk assessment.

Thus, considering only these two areas for modifications to the soil exposure model used to develop the 2,3,7,8,-TCDD risk assessment, it can be seen that a residue of 100 ppm of PAH's in soil is not likely to present a significant human health hazard.

In addition, when considering the significance of contamination at the site, the facts that all PAH's are neither carcinogenic nor (for these suspected carcinogens) as potent as benzo(a)pyrene must be a part of the evaluation. As a first approximation of a site, it may be valid to use the total PAH concentration to determine an estimate of the significance of the contamination. However, when determining cleanup action, the use of isomers and compounds, which are truly hazardous, would be most appropriate when that information is available.

The application of the model to obtain the 100 ppm cleanup concentration has assumed that all PAH's are as potent as benzo(a)pyrene, generally considered to be the most potent carcinogen of the PAH's. This is, in fact, not valid, as those PAH compounds which are considered to be suspected or probable carcinogens, comprise less than half of the total PAH concentration at any site. In addition, many of these compounds designated as suspected or probable carcinogens, are much less potent than benzo(a)pyrene[3].

The Environmental Protection Agency recently released a Draft Health Advisories[4] for pentachlorophenol in drinking water. The life-time value for adults in this document is 1050 ug/l. This value is substantially greater than the 21 ug/l discussed for use in evaluating the groundwater contamination at this site. Based upon this new evaluation for pentachlorophenol in drinking water, the need for and extent of groundwater renovation for this site should be reconsidered.

RECOMMENDATIONS

Polynuclear Aromatic Hydrocarbon (PAH's) concentrations in residential soil less than 100 ppm should present no significant acute or chronic health threat to human health through any normal route of exposure.

The need for and extent of groundwater renovation should be reconsidered based upon the recent EPA Health Advisory for pentachlorophenol.

We hope this information is useful to you.

(for) Stephen Margolis, Ph.D.