



Superfund Record of Decision:

Ciba-Geigy (McIntosh Plant), AL

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16. Abstract (Limit: 200 words) The 1,500-acre Ciba-Geigy (McIntosh Plant) site is in southern Washington County, northeast of McIntosh, Alabama. The plant's initial operations, which began in 1952, were devoted solely to the manufacture of DDT. In 1970, the facility expanded its manufacturing operations to include herbicides, insecticides, and chelating and sequestering agents. Other products produced by Ciba-Geigy include resins and additives used in the plastics industry. Wastes and residues generated during production operations were managed onsite. In 1985, EPA issued Ciba-Geigy a RCRA Part B permit for active waste management units onsite. The permit included a corrective action plan requiring Ciba-Geigy to remove and treat contaminated ground water and surface water at the site. In 1987, as part of this plan, Ciba-Geigy installed a ground water pumping and treatment system which has been effective in addressing the ground water contamination. This first of three planned operable units addresses ground water contamination in the shallow Alluvial aquifer. The second operable unit will address the deeper Miocene aquifer and the final operable unit will address contamination of soil at eleven former waste management areas. The primary contaminants of concern affecting the ground water are VOCs including benzene and toluene; other organics including pesticides; and metals including arsenic. (Continued on next page)				
17. Document Analysis a. Descriptors Record of Decision - Ciba-Geigy (McIntosh Plant), AL First Remedial Action Contaminated Medium: gw Key Contaminants: VOCs (benzene, toluene), other organics (pesticides), metals (arsenic) b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
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16. Abstract (Continued)

The selected remedial action for this site includes no further action for the shallow aquifer beyond continued ground water pumping and onsite treatment using an existing biological wastewater treatment system, followed by discharge to the Tombigbee River under an NPDES permit; and ground water and effluent monitoring. The estimated annual O&M cost for this remedial action is \$325,000.

DECLARATION
of the
RECORD OF DECISION

SITE NAME AND LOCATION

Ciba-Geigy Site
McIntosh, Washington County, Alabama

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Ciba-Geigy Site, McIntosh, Alabama, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) 42 U.S.C. Section 9601 et seq., and to the extent practicable, the National Contingency Plan (NCP) 40 CFR Part 300.

The following documents form the basis for the selected Remedial Action:

- Evaluation of the impact of the waste disposal operations on the Alluvial aquifer with recommendations for Remedial Action at the Ciba-Geigy Corporation Plant site. Ciba-Geigy Corp., August 27, 1984.
- Ciba-Geigy Corporation, McIntosh, Alabama - Remedial Investigation Report, Volumes I and II Appendices A thru O.
- Draft Hydrogeological Assessment Report, Dynamac Corporation, April 28, 1989.
- Ciba-Geigy Corporation, McIntosh Plant Groundwater Review and Update, June 1989.
- Groundwater Risk Assessment for the Record of Decision, July 26, 1989.

The State of Alabama has concurred on the selected remedy.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF SELECTED REMEDY

This site will be addressed as three separate operable units. This Record of Decision (ROD) will only address the first operable unit.

The first operable unit is "No Further Action" for the shallow Alluvial aquifer. The Agency concurs with the previous remedial action taken at the site by Ciba-Geigy as required by the Resource Conservation and Recovery Act (RCRA). Future RODs to be issued will address the second and third operable units. The second operable unit will address the deeper Miocene aquifer. The third operable unit will address the contamination source (contaminated soils). Operation and maintenance activities will be required to ensure the continued effectiveness of the groundwater treatment system required by Operable Unit 1.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes a permanent solution and alternative treatment technology to the maximum extent practicable. Because this remedy will not result in hazardous substances remaining on-site above health-based levels, the five year review will not apply to this action.

EPA will ensure continued protection of human health and the environment through the RCRA permit process during the implementation for this operable unit.



GREER C. TIDWELL, REGIONAL ADMINISTRATOR

SEP 28 1989

DATE

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

CIBA-GEIGY SITE
MCINTOSH, WASHINGTON COUNTY, ALABAMA

PREPARED BY:
U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

TABLE OF CONTENTS

1.0	Introduction.....	1
1.1	Site Location.....	1
1.2	Site History and Operations.....	1
1.3	Enforcement Activities.....	3
2.0	Community Relations.....	6
3.0	Scope of Operable Unit within Site Strategy.....	6
4.0	Site Characteristics.....	7
4.1	Geology/Soils.....	7
4.2	Hydrogeology.....	8
4.3	Surface Water.....	9
4.4	Former Waste Management Areas.....	9
4.5	Summary of Groundwater Sampling Activities For the Alluvial Aquifer.....	10
5.0	Site Risks.....	10
5.1	Summary of Site Risks.....	10
5.2	Exposure Assessment.....	15
5.3	Toxicity Assessment.....	16
5.4	Risk Characterization.....	16
5.5	Clean Up Goals.....	18
6.0	Description of Alternatives.....	20
6.1	Alternative 1 - No Action.....	20
6.2	Alternative 2 - No Further Action.....	20
7.0	Summary of Comparative Analysis of Alternatives.....	21
7.1	Implementability.....	21
7.2	Cost.....	21
7.3	State Acceptance.....	22
7.4	Community Acceptance.....	22
7.5	Protectiveness of Human Health and the Environment.....	22
7.6	Compliance With Applicable or Relevant and Appropriate Requirements.....	22
7.7	Reduction of Toxicity, Mobility or Volume.....	22
7.8	Long-term Effectiveness.....	22
8.0	Selected Remedy.....	23
9.0	Statutory Determination.....	23
9.1	Protective of Human Health and the Environment.....	23
9.2	Attainment of ARARs.....	24
9.3	Cost Effectiveness.....	24
9.4	Utilization of Permanent Solutions to the Maximum Extent Practicable.....	24
9.5	Preference for Treatment as a Principal Element.....	24
10.0	Responsiveness Summary.....	24

LIST OF TABLES

Table 4-1	Contaminant Levels In Corrective Action Monitoring Wells at Ciba-Geigy Site for the Last Three Quarters.....	12
Table 5-1	Hazardous Substances Found in the Groundwater at the Ciba-Geigy Site.....	14
Table 5-2	Critical Toxicity Values and Risk Characterization for Groundwater Contaminants at the Ciba-Geigy Site.....	17
Table 5-3	Clean Up Goals for Hazardous Substances Found in Groundwater at Ciba-Geigy Site.....	19

LIST OF FIGURES

Figure 1	Ciba-Geigy Corporation, Vicinity Map.....	2
Figure 2	Site Locations.....	4
Figure 3	Plate 1 - Water/Surface of Alluvial Aquifer June 16, 1989.....	11

Record of Decision
Ciba-Geigy Site
McIntosh, Alabama

1.0 INTRODUCTION

1.1 SITE LOCATION

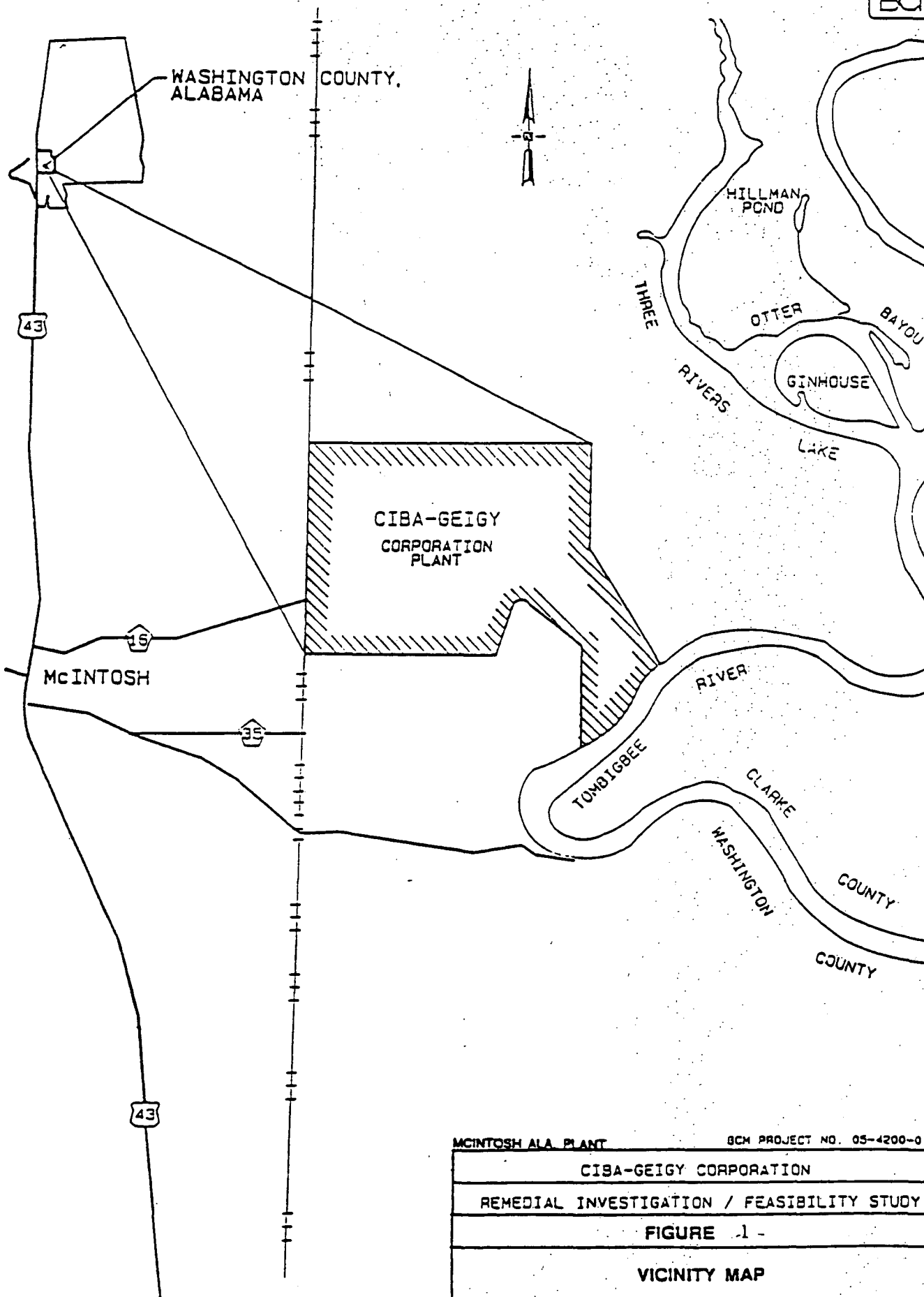
The Ciba-Geigy Corporation McIntosh Plant is located in southern Washington County, northeast of McIntosh, Alabama, approximately 50 miles north of Mobile, Alabama (Figure 1). The developed plant is located at 31° 15'00" north latitude and 87° 58'00" west longitude. The developed plant site, which encompasses approximately 2.4 square miles, is situated between the Southern Railroad right-of-way on the west and extends nearly to the escarpment separating the upland terrace from the floodplain of the Tombigbee River. The property boundaries extend beyond the railroad westward toward U.S. Highway 43. The northern edge of the property merges into a pine forest. To the south the property is bounded by Olin Corporation. The southeastern portion of the property extends to the banks of the Tombigbee River.

1.2 SITE HISTORY AND OPERATIONS

The Ciba-Geigy McIntosh facility, formerly owned by Geigy Chemical Corporation, began operations in October 1952, with the manufacture of one product, dichlorodiphenyl-trichloroethane (DDT). Through 1970, Geigy expanded its McIntosh facilities by adding the production of fluorescent brighteners used in laundry products; herbicides; insecticides; agricultural chelating agents; and sequestering agents for industry.

In 1970, Geigy merged with Ciba (Chemical Industry in Basel, Switzerland), forming the Ciba-Geigy Corporation. Since then Ciba-Geigy has continued to expand its present operations with the added production of resins and additives used in the plastics industry, anti-oxidants, and small-volume specialty chemical products (i.e. water treatment chemicals and fire fighting foams). The present facility occupies approximately 1,500 acres and employs about 1,200 workers. New facilities for resins and additives production are planned to be on-line in 1990, increasing the work force by about 140 workers.

BCM



MCINTOSH ALA PLANT

BCM PROJECT NO. 05-4200-01

CISA-GEIGY CORPORATION

REMEDIAL INVESTIGATION / FEASIBILITY STUDY

FIGURE 1 -

VICINITY MAP

The EPA Region IV Environmental Services Division (ESD) of Athens, Georgia conducted an investigation in August 1982 of the Olin Chemical Company adjacent to the Ciba-Geigy site, and sampled a drinking water well on Ciba-Geigy property. This sampling revealed information which warranted further evaluation of the site contamination problem at Ciba-Geigy. In June 1983, the Hazardous Ranking System (HRS) survey was completed and a ranking of 53.42 was given the site. The Ciba-Geigy McIntosh Plant was included on the National Priorities List (NPL) in September 1983.

The Ciba-Geigy McIntosh Plant is currently operating under a RCRA permit issued in 1985. A condition of Part VII, (Condition VII B), of the permit was to develop a Work Plan for the performance of a Remedial Investigation/Feasibility Study (RI/FS). Subsequent to the approval by EPA of the Work Plan, Ciba-Geigy was to conduct the RI/FS to develop remedial strategies for the eleven identified CERCLA-related subsites described in the next section. The RI/FS program is being conducted in coordination with the RCRA approved Corrective Action Program which addresses the capture and treatment of groundwater at the site. In addition to the collection and treatment of groundwater, the RCRA permit requires the removal of the existing wastewater collection and conveyance system, surface impoundments, and landfills. Two impoundments and two landfills have been closed to date. A total of ten additional units are affected by this program. The resulting waste materials are being solidified and/or incinerated and are being placed in a permanent RCRA above-ground land vault, measuring approximately 400' by 150', located on-site. Figure 2 depicts the location of CERCLA and RCRA sites within the Ciba-Geigy McIntosh plant.

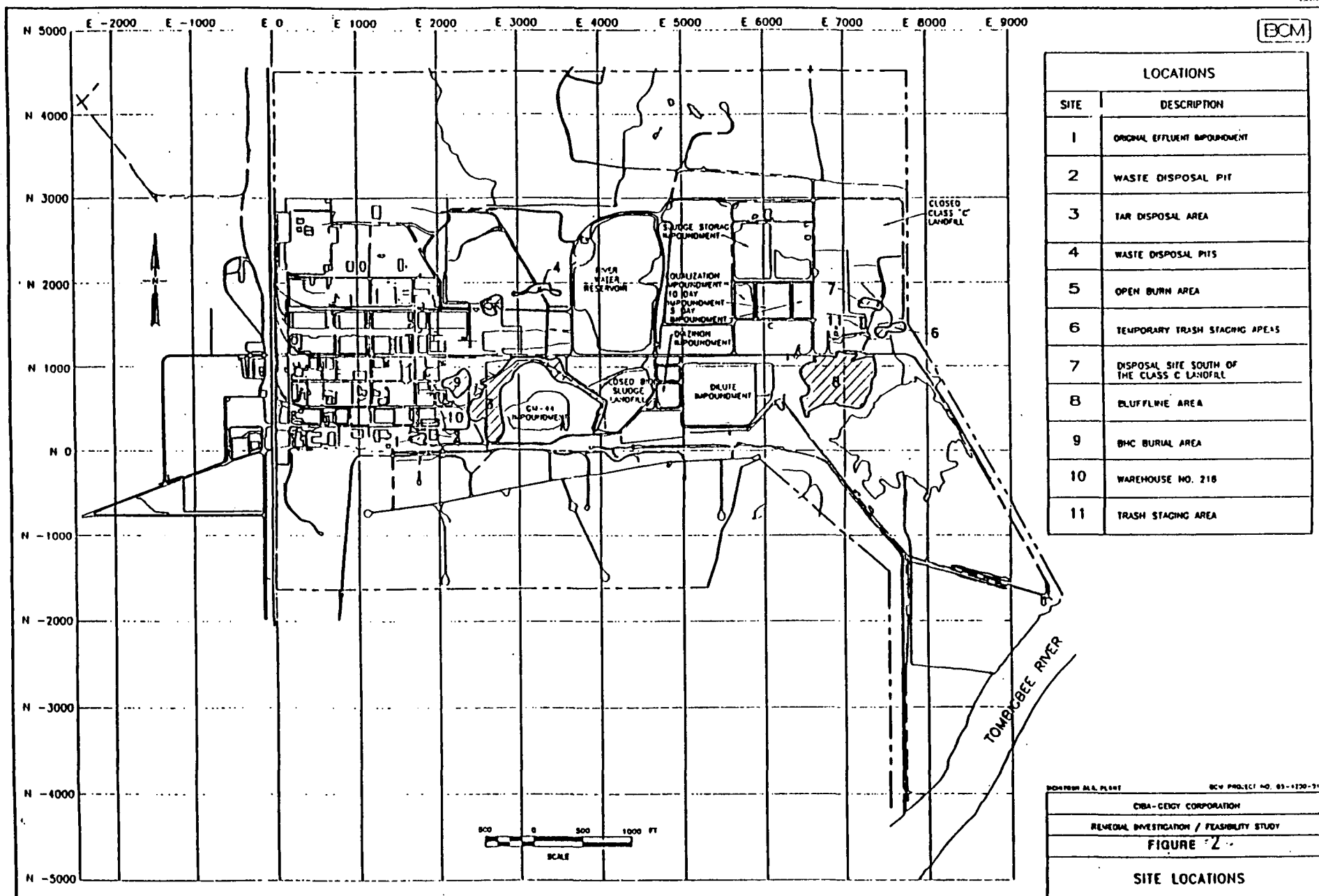
1.3 ENFORCEMENT ACTIVITIES

To date, extensive corrective action activities have been undertaken at the McIntosh Plant under RCRA authority. The RCRA Part B permit addresses the active units of the plant. Superfund authority is being utilized to investigate eleven former disposal areas and the resulting groundwater contamination.

In October 1985, EPA issued Ciba-Geigy a RCRA Part B permit, which included a corrective action plan requiring Ciba-Geigy to remove and treat contaminated groundwater and surface water at the site. The corrective action plan stipulated that Ciba-Geigy would prepare a Remedial Investigation/Feasibility Study (RI/FS).

In accordance with the corrective action plan, Ciba-Geigy retained BCM, a technical consultant, to perform the RI/FS, which began in October 1985. The principal finding of the RI study was the definition of eleven previous waste management areas within the study area.

The objective of the corrective action plan is source removal and the prevention of further migration of contaminants detected in the



groundwater. In accordance with this plan, two surface impoundments and two landfills at the sites were closed in 1986 and 1987. Final closure of an additional ten surface impoundments began in 1988 and is scheduled for completion in December 1989.

In addition to the eleven CERCLA waste management areas, a number of RCRA-regulated facilities are found at the McIntosh plant. Ten such facilities have been closed or are scheduled for closure under the RCRA Part B permit. The following is a brief description of the closed units.

- Diazinon Wastewater Sewer: Utilized to pipe Diazinon waste to the Diazinon Destruct Impoundment. Taken out of service in 1976.
- Triangular Impoundment: Constructed in the 1970s to decompose Diazinon residues. Closure completed in 1986.
- Rectangular Impoundment: Constructed in 1972-1973 to hold sludge from the dilute impoundment. Closure completed in 1987.
- Class C Landfill: Permitted by Alabama in 1973 and permitted under RCRA Interim Status regulations. Closure completed in 1987.
- Biological Sludge Landfill: Permitted by Alabama in 1978 and later operated under RCRA Interim Status for disposal of dewatered sludge. Closure completed in 1987.
- Diazinon Destruct Impoundment: Constructed in 1965. Closure in progress.
- GM-44 Impoundment: Put into service in early 1970s. Constructed for the GM-44 wastes high in nitrogen compounds. Its use was discontinued in the late 1970s. Closure in progress.
- Effluent Diffuser Line: Constructed in late 1968 to convey effluent for discharge into the Tombigbee River. Line was idled in 1973.
- Effluent Disposal Well: Installed in 1971. Used for the injection of biotreated effluent to reduce the quantity of NaCl discharged into the river. The use of the well was unsuccessful and it was plugged in 1983. ADEM required no post-closure monitoring.

- Dilute Ditch: This ditch collected dilute wastewater and surface water runoff to be conveyed to the Dilute Impoundment. Use ceased in 1971.

In 1987, Ciba-Geigy installed a groundwater pumping system consisting of ten fully penetrating, alluvial pumping wells to intercept and remove contaminated groundwater from the shallow alluvial aquifer. The water removed from these wells is treated by the plant's on-site biological wastewater treatment system that was completed in the fall of 1988. The treated water is discharged into the Tombigbee River in compliance with appropriate National Pollutant Discharge Elimination System (NPDES) Regulations. Ciba-Geigy has installed four (4) corrective action monitoring wells along the southern boundary of the property to monitor the effectiveness of the pumping well system. The effectiveness of the pump and treat system in addressing the groundwater contamination is well established; therefore, EPA is issuing the Record of Decision after any public comments were carefully considered. This ROD identifies the EPA selected remedy for site contamination for operable unit 1. The eleven sites identified in the RI will be the primary focus of the FS which is scheduled for completion in November 1989.

2.0 COMMUNITY RELATIONS

A public meeting was held on September 13, 1989 at 7:30 pm to present EPA's Proposed Plan for remediation of the shallow groundwater aquifer to the public. The meeting was conducted at McIntosh Town Hall in McIntosh, Alabama.

The RI was placed in the repository and was available to the public August 15, 1989. The Proposed Plan and public notice were sent out August 28, 1989 and September 6, 1989 respectively. A public meeting was held on September 13, 1989, to present the findings of the RI and EPA's preferred remedial alternatives. The public comment period started August 30, 1989 and ended September 27, 1989.

A responsiveness summary has been prepared to summarize community concerns and to provide a response. A transcript of the public meeting is available for review in the repository.

3.0 SCOPE OF OPERABLE UNIT WITHIN SITE STRATEGY

As with many Superfund sites the problems at Ciba-Geigy Site are complex. As a result EPA organized the work into three (3) operable units (OUs). The operable units at this site are:

- O.U. #1 Contamination of the shallow (Alluvial) groundwater aquifer

- O.U. #2 Contamination of the deep (Miocene) groundwater aquifer, if contamination is found during additional sampling.
- O.U. #3 Contamination of soils at the eleven (11) former waste management areas.

Operable Unit #1 which will address the alluvial aquifer is now under consideration. As part of the Groundwater Corrective Action Program under Part VIII of Ciba-Geigy's RCRA Permit, a groundwater intercept, removal and treatment system with surface water discharge was constructed by the Ciba-Geigy Corporation. This system provides for recovery and treatment of groundwater at the site. Since the groundwater from the "CERCLA" site cannot be distinguished from the RCRA facility groundwater, EPA has evaluated the existing system and the risks being posed by the groundwater in the alluvial aquifer as it relates to the "CERCLA" site. Based on this evaluation, EPA will determine if the present system is achieving the CERCLA clean-up objective to prevent current or future exposure to contaminated groundwater. This operable unit is consistent with plans for future work to be conducted at the site.

4.0 SITE CHARACTERISTICS

4.1 GEOLOGY/SOILS

The Ciba-Geigy property is located within the Southern Pine Hills, which are elevated features that regionally slope southward toward the Gulf of Mexico. These hills are dissected by various river systems that feed into the Gulf. The plant is located upon a low terrace adjacent to the floodplain of one of these rivers, the Tombigbee River. The property lies within the Mobile Graben, a downthrown fault block paralleling the river.

The surficial and shallow geology can be broken into three distinct features. The uppermost layer is a relatively continuous clay layer containing sand and silty sand lenses and layers that range from only a few feet to over 50 feet in thickness. Underlying the clay layer are Pleistocene-age alluvium and low terrace deposits of interbedded gravel, silt, and clay with thicknesses ranging from 60 to 100 feet. These deposits outcrop throughout the area.

Underlying the low terrace deposits are alternating layers of Miocene-age gravels, sands, and clays. Regionally, Upper Miocene clay hydraulically separates the Miocene and Pleistocene deposits.

Erosion and redeposition of these sediments reflect dynamic depositional environments which are common on a regional scale. This has resulted in a complex subsurface stratigraphy. Variations of physical characteristics (e.g. porosity, grain size, hydraulic conductivity) both vertically and laterally within the strata complicate the movement of water in the subsurface.

Nine different soil series are located within the area of the plant. These soils are generally loamy clays and sands that range from well drained to poorly drained. Permeability ranges from moderate to low.

4.2 HYDROGEOLOGY

Both the Pleistocene and Miocene strata are water bearing and represent two distinct aquifers, the Alluvial and Upper Miocene. They are separated by a number of shale and clay aquitards and aquicludes.

The Alluvial aquifer is composed of the Recent and Pleistocene terrace and alluvial deposits. The thickness of the aquifer and the water level depend on the thickness and configuration of the overlying clay layer. Under natural, semi-confined conditions, the saturated thickness of the Alluvial aquifer ranges from less than 30 feet to over 50 feet. Recharge of the Alluvial aquifer comes locally, from rainfall, streams, and reservoirs. Approximately 15 to 25 percent of the annual rainfall contributes to recharge. High floods also act as recharge mechanisms.

The Alluvial aquifer water level normally slopes gently to the south-southeast toward the Tombigbee River. However, this pattern is modified by the pumping and capture of groundwater by the plant, recharge from the site reservoir, and by the Corrective Action Program described previously. The EPA and Alabama Department of Environmental Management (ADEM) approved program was designed to reduce the level of contaminants in the groundwater below the facility and has reversed the direction of ground water flow as a result of the pumping.

The Upper Miocene underlying the plant is a confined aquifer of sands and gravels capped by a clay layer about 100 to 130 feet in thickness, according to reports completed by Ciba-Geigy contractor PELA, Inc. Recharge of this aquifer is believed to come from regional infiltration in outcrop areas up-dip to the north. In contrast to the Alluvial aquifer, the quality of Upper Miocene water can be effected by regional influences such as salt domes or saltwater intrusion from the Gulf of Mexico.

It has been reported that the Upper Miocene aquifer and the Alluvial aquifer are hydraulically connected in some areas. Additionally, paleo-channeling has been found to exist in the surface of the Miocene clay. During the investigation for the Groundwater Corrective Action Program, and as a part of the RI/FS oversight contract, it was determined that the two aquifers are not hydraulically connected.

4.3 SURFACE WATER

The Ciba-Geigy property lies within the Tombigbee River Basin which has a drainage area of 8,378 square miles. The Tombigbee River flows past the site, converging further south with the Alabama River to form the Mobile River.

Surface water features at the Ciba-Geigy plant include the diverted Johnson Creek on the northern edge of the property, and a large, man-made reservoir between the manufacturing area and the waste management facilities. Surface water runoff on the northern, undeveloped corner of the developed portion of the property drains off-site into the Tombigbee River. The surface water system on the southern portion of the site below Johnson Creek is undergoing extensive change. In addition to a new wastewater treatment system, a new stormwater management system has been constructed to replace the old combined dilute wastewater/stormwater system, which used stormwater sewers, open surface ditches, and the dilute ditch to convey mixed dilute wastewater and stormwater to the dilute impoundment. The new system segregates all wastewater, dilute and process, to the wastewater collection and transfer system and then on to the treatment system. All stormwater sewers have been renovated and all open ditches have been replaced with stormwater sewers draining to stormwater retention tanks capable of holding a one-inch rainfall over the entire developed manufacturing area of the plant. All initial rainwater retained is transferred to the biological wastewater treatment plant. All stormwater overflow (rainfall above one inch) is diverted to established drainageways discharging to the Tombigbee River.

4.4 FORMER WASTE MANAGEMENT AREAS

The Ciba-Geigy McIntosh plant has been in operation since 1952. Since that time, portions of the facility have been used for management of waste and residues generated by production operations. A total of eleven CERCLA sub-sites have been identified and will be the subject of a subsequent ROD on the contaminated soils. The subsites to be addressed are:

1. - Original Effluent Impoundment
2. - Waste Burial Area
3. - Tar Disposal Area

4. - Waste Disposal Pits
5. - Open Burn Area
6. - Temporary Trash Staging Area
7. - Disposal Site South of Class "C" Landfill
8. - Bluff Line Area
9. - BHC Burial Area
10. - Warehouse 218
11. - Trash Staging Area

4.5. SUMMARY OF GROUNDWATER SAMPLING ACTIVITIES FOR THE ALLUVIAL AQUIFER

As a result of EPA's investigatory findings at the Ciba-Geigy site, the company hired P.E. LaMoreaux and Associates, Inc., (PELA) to install groundwater monitoring wells at the site and to perform a hydrological investigation. Based on the presence of a large variety of chemicals, mainly from the manufacture of insecticides, pesticides, herbicides and various industrial and agricultural chemicals, (Shown in Table 5-1) in the soil and groundwater, EPA issued Ciba-Geigy a RCRA Part B permit, which included a corrective action plan requiring Ciba-Geigy to remove and treat contaminated groundwater and surface water at the site.

In 1987, Ciba-Geigy installed a groundwater pumping system consisting of ten (10) fully penetrating, alluvial pumping wells to intercept and remove contaminated groundwater from the shallow alluvial aquifer. Ciba-Geigy has installed four (4) corrective action wells along the southern boundary of the property to monitor the effectiveness of the pumping system. It has been determined by data collected from the four (4) corrective action monitoring wells and the forty-three (43) monitoring wells that the ten (10) pumping wells are successfully reversing the hydraulic gradient.

Data is collected from selected monitoring wells five (5) days a week and is used to insure that contaminated groundwater does not migrate off-site. As shown in Figure 3, water level contours indicate a continuous capture zone has been established across the southern boundary of the facility.

In addition to Figure 3, data extracted from three consecutive groundwater quarterly reports clearly demonstrate that the levels of the contaminants of concern are decreasing with respect to time. This data is shown in Table 4-1.

5.0 SITE RISKS

5.1 SUMMARY OF SITE RISKS

CERCLA directs that the agency must protect human health and the environment from current and potential exposure to hazardous substances at the site. In order to assess the current and potential

PLATE 1. WATER-SURFACE (DYNAMIC)
OF ALLUVIAL AQUIFER,
JUNE 16, 1989.

FIGURE 3

EXPLANATION
ALLUVIAL WELLS

- MP-1 PARTIALLY PENETRATING OBSERVATION WELL LOCATION AND NUMBER
- MP-2 FULLY PENETRATING OBSERVATION WELL LOCATION AND NUMBER
- WS-1 WATER SUPPLY WELL LOCATION AND NUMBER
- M-1 MONITORING WELL LOCATION AND NUMBER
- PM-1 DEMATERING WELL LOCATION AND NUMBER
- CA-1 CORRECTIVE ACTION MONITORING WELL LOCATION AND NUMBER
- AB-1 ABANDONED WATER SUPPLY WELL LOCATION AND NUMBER
- 13.70 GROUND-WATER SURFACE ELEVATION FEET MSL

MIOCENE WELLS

- MO-1 OBSERVATION WELL LOCATION AND NUMBER
- MS-1 WATER SUPPLY WELL LOCATION AND NUMBER
- 40 GROUND SURFACE CONTOUR, INTERVAL IS 10 FEET. (CIBA-GEIGY DATUM)
- EFFLUENT AND COOLING WATER DITCH
- 5 WATER SURFACE CONTOUR, NOTE VARYING CONTOUR INTERVALS, DATUM IS MEAN SEA LEVEL (DASHED WHERE INFERRED)

NOTE: WATER LEVEL (DYNAMIC) EFFECTED BY PUMPING OF WELLS PM-1 THROUGH PM-6, PA-BA, PM-8, AND PM-108

Well location coordinates provided by Ciba-Geigy Corporation: maps D-895-0035 (8/22/84), D-895-0045 (8/22/84), D-895-0071 (9/3/85), and D-49879 (1986).

SCALE IN FEET



PREPARED
JULY 1989

Prepared by:
P.E. LAMOREAUX & ASSOCIATES, INC

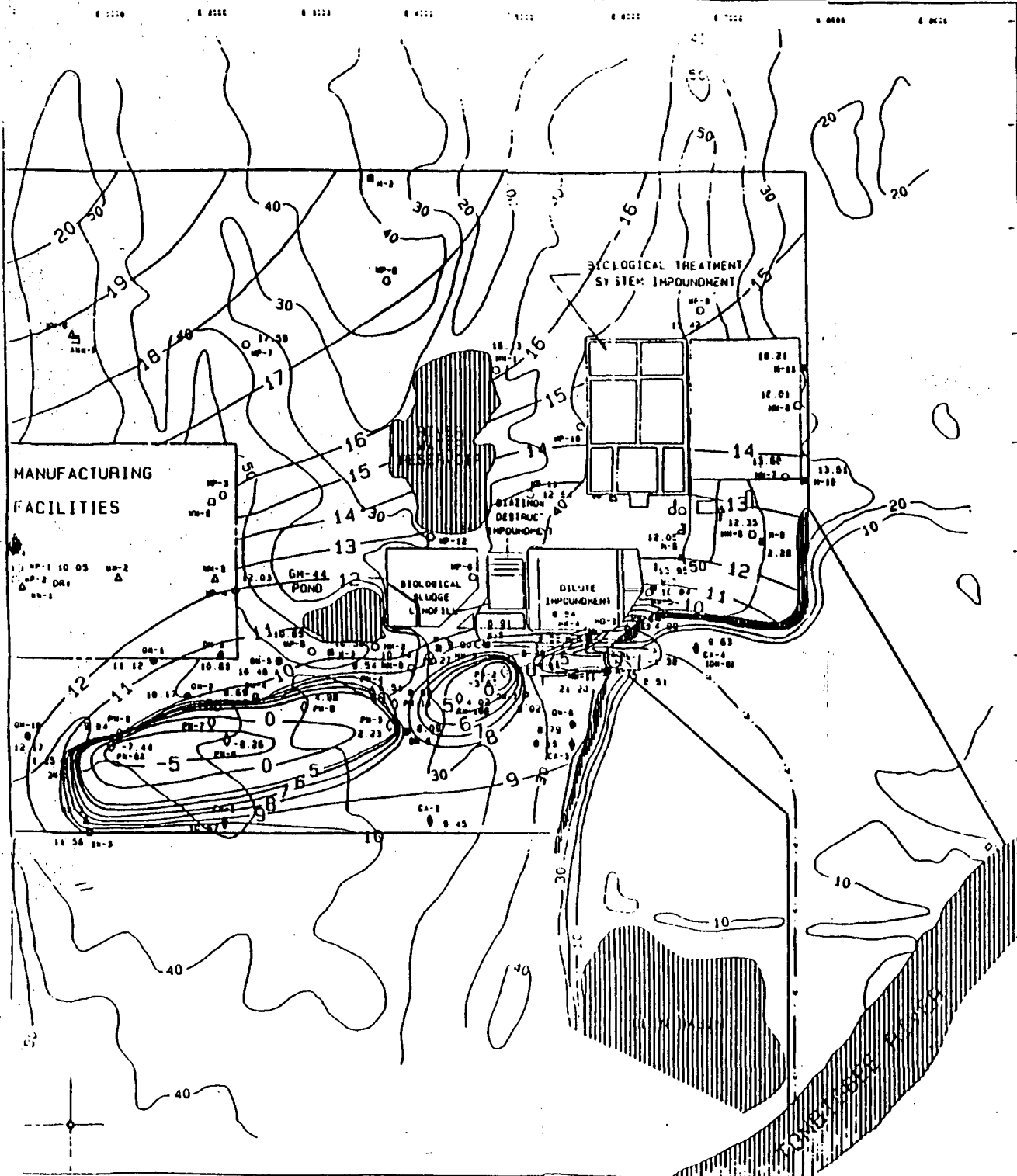


Table 4-1
Contaminant Levels In Corrective Action (CA) Wells
Over Last Three Quarters (ug/l)

	CA 1	CA 2	CA 3	CA 4
Alpha BHC	* 5.1 ** 1.7 *** 1.3	13 6.8 8.0	ND ND ND	ND ND ND
Analine	* ND ** ND *** ND	ND ND ND	ND ND ND	ND ND ND
Arsenic	* 11 ** BMDL *** ND	7 BMDL BMDL	145 94 104	30 10 18
Benzene	* ND ** ND *** 44	43 29 22	15 13 11	ND ND ND
Cresols (-0-m`p)	* ND ** ND *** ND	ND ND ND	ND ND ND	ND ND ND
Chlorobenzene	* 4700 ** 59 *** 860	ND 78 76	31 25 18	ND ND 5.2
Chloroform	* 410 ** 6.4 *** 150	ND ND 20	ND ND ND	ND ND ND
Lindane	* 0.6 ** 0.27 *** 0.3	ND 0.5 ND	ND ND ND	ND ND ND
Methel Ethyl Ketone	* ND ** ND *** ND	ND ND ND	ND ND ND	ND ND ND
Naphthalene	* ND ** ND *** ND	ND ND ND	ND ND ND	ND ND ND

Table 4-1
(continued)

	CA 1	CA 2	CA 3	CA 4
Toluene	* ND	1.0	ND	ND
	** ND	ND	5.6	ND
	*** ND	ND	ND	ND

ND - None Detected

BMDL - Below Method Detection Limit

*** First Quarter '89
** Fourth Quarter '88
* Third Quarter '88

Table 5-1

Hazardous Substances Found in the Groundwater
at the Ciba-Geigy Site

<u>Carcinogens</u>	<u>Maximum Concentration (ug/l)</u>	<u>Mean of Detected Concentrations (ug/l)</u>
Aniline	150	80
Arsenic	196	100
Benzene	8900	1200
Alpha-BHC	51	10
Gamma-BHC(Lindane)	24	10
* Carbon tetrachloride	620	290
Chloroform	53	40
<u>Noncarcinogens</u>		
Gamma-BHC(Lindane)	24	10
* Carbon tetrachloride	620	290
Chlorobenzene	230,000	22,350
Chloroform	53	40
Cresols(m-,p-)	18	18
Naphthalene	12	12
Methy ethyl ketone	63	60
Toluene	5700	600

* Data from the Comprehensive Monitoring Evaluation conducted by ADEM, June 1988; all other data are from February, 1989 Quarterly Samples.

risks from this site, a risk assessment was conducted as part of the Remedial Investigation. The groundwater exposure pathway was not addressed in that risk assessment because groundwater is currently being remediated under the RCRA Corrective Active Plan. Therefore, this section discusses the potential risk via the groundwater pathway if the groundwater remediation program was discontinued.

The contaminants of concern in the groundwater were determined from the 1989 First Quarter Groundwater Monitoring conducted by Ciba-Geigy in February, 1989. The data from the pumping and observation wells were used to select the groundwater contaminants of concern. The risk assessment was based on both the maximum concentration detected and the mean of each well containing a detectable level for each contaminant of concern. Table 5-1 summarizes the contaminants of concern and the maximum and mean concentrations.

5.2 EXPOSURE ASSESSMENT

The groundwater in the surficial aquifer in this area is classified as a Class I aquifer based on EPA's Groundwater Protection Strategy. This aquifer was originally classified as a Class II aquifer indicating that the groundwater within the site classification review area is either a current or potential source of drinking water, which requires protection of human health. However, based on additional site information the aquifer has been reclassified as a Class I aquifer. This reclassification is based on the fact that the groundwater at the site is highly vulnerable to contamination from surface sources and discharges to a sensitive ecological system that supports a unique habitat, which may present an endangerment to the environment.

As shown in Table 5-1, the surficial aquifer downgradient of the hazardous waste facilities contains elevated levels of site related hazardous constituents. Although the surficial aquifer was used at one time to supply potable water for the plant, the potable water is now supplied by either the river water reservoir or the deeper Miocene Aquifer. Due to the fact that the surficial aquifer is no longer being used as a source of potable water at the Ciba-Geigy plant and that the ongoing Groundwater Corrective Action Program is pumping and treating the contaminated groundwater, there does not appear to be an immediate public health danger at this time from groundwater consumption. However, if the Corrective Action Program was discontinued, there could be a future potential for exposure to these hazardous constituents via the ingestion of contaminated groundwater, which may pose an imminent and substantial endangerment. According to the Remedial Investigation report, the nearest downgradient domestic well is 1.9 miles to the south of the facility.

Exposure assumptions in the risk assessment are that an exposed individual consumes two liters of water daily for 70 years. Risks resulting from this consumption level were determined for exposure to both the maximum and mean of the detected chemical concentration levels.

5.3 TOXICITY ASSESSMENT

Toxicity values are used in conjunction with the results of the exposure assessment to characterize site risk. EPA has developed critical toxicity values for carcinogens and noncarcinogens. Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(\text{mg/kg/day})^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day , to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. The CPFs for the carcinogenic groundwater contaminants of concern at the site are contained in Table 5-2.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day , are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The RfDs for the noncarcinogenic groundwater contaminants of concern at the site are contained in Table 5-2.

5.4 RISK CHARACTERIZATION

Human health risks are characterized for potential carcinogenic and noncarcinogenic effects by combining exposure and toxicity information. Excessive lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under

Table 5-2

Critical Toxicity Values and Risk Characterization for
Groundwater Contaminants at the Ciba-Geigy Site

Carcinogens	CPF	Risk Level	Maximum Concentration Level
	mg/kg/day ⁻¹	max./mean conc.	MCL (ug/l)
Aniline	5.7 x 10 ⁻³	2.4x10 ⁻⁵ /1.3x10 ⁻⁵	NE*
Arsenic	1.8	9.9x10 ⁻³ /5.0x10 ⁻³	50.
Benzene	2.9 x 10 ⁻²	7.2x10 ⁻³ /9.7x10 ⁻⁴	5.
Alpha-BHC	6.3	9.0x10 ⁻³ /1.8x10 ⁻³	NE
Gamma-BHC(Lindane)	1.3	8.7x10 ⁻⁴ /3.6x10 ⁻⁴	4.(0.2)**
Carbon tetrachloride	1.3 x 10 ⁻¹	2.2x10 ⁻³ /1.1x10 ⁻³	5.
Chloroform	6.1 x 10 ⁻³	9.0x10 ⁻⁶ /6.8x10 ⁻⁶	100***
Noncarcinogens	RfD	Hazard Quotient	MCL
	mg/kg/day	max/mean conc.	(ug/l)
Gamma-BHC(Lindane)	3 x 10 ⁻⁴	2.2/0.93	4.(0.2)**
Carbon tetrachloride	7 x 10 ⁻⁴	24.8/11.6	5.
Chlorobenzene	3 x 10 ⁻²	215./20.86	NE
Chloroform	1 x 10 ⁻²	0.15/0.11	NE
Cresols(m-,p-)	5 x 10 ⁻²	0.01/0.01	NE
Methyl ethyl ketone	5 x 10 ⁻²	0.04/0.03	NE
Naphthalene	4 x 10 ⁻¹	0.0008/0.0008	NE
Toluene	3 x 10 ⁻¹	0.50/0.06	2000

* None established

** Proposed MCL

*** MCL for total trihalomethanes

the assumed specific exposure conditions at a site. The Agency considers individual excess cancer risks in the range of 10^{-4} to 10^{-7} as protective; however, the midpoint risk (10^{-6}) is generally used as the point of departure for setting cleanup levels at Superfund sites. This approach is consistent with Agency policy for the implementation of SARA (Federal Register December 21, 1988, Volume 53 No 245 51425). Table 5-2 contains the excess lifetime cancer risks associated with the maximum and mean concentrations of groundwater contaminants. This table also contains the concentration equivalent to a 10^{-6} risk level. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs of all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. Table 5-2 contains the hazard quotients for the maximum and mean groundwater concentrations for noncarcinogens. This table also contains the concentration that is equivalent to the reference dose.

The cumulative carcinogenic risk level and the individual risk level for many chemicals exceed the 10^{-6} risk level for both the maximum and mean exposure scenarios. In addition, the cumulative hazard index and the individual hazard quotients for several chemicals exceed unity for both scenarios. At the present time, individual exposure via ingestion of contaminated groundwater is not occurring due to the Groundwater Corrective Action Program. However, the unacceptable risk levels indicate that the pump and treat program is necessary to prevent the potential exposure to unacceptable levels of contaminants in the groundwater in the future.

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

5.5 CLEAN UP GOALS

Cleanup goals for groundwater remediation have been established for the RCRA Groundwater Corrective Action Program. To remain consistent with the RCRA Permit, Maximum Contaminant Levels (MCLs) or proposed MCLs will be used as clean up goals for groundwater contamination. Contract Required Quantitation Limits (CRQLs) will be used when MCLs or proposed MCLs are not available. Standard analytical detection limits (e.g. CRQL's) are appropriate as opposed to detection limits requiring extraordinary analytical protocols. The Region has discretion for long term remedial actions to say that detection limits will change and must track the change on cleanup goals. Table 5.3 shows the cleanup goals for the contaminants of concern.

Table 5-3

Clean Up Goals For Hazardous Substances
In Groundwater At Ciba-Geigy Site

<u>Chemical</u>	<u>MCL</u> <u>(ug/l)</u>	<u>CRQL</u> <u>(ug/l)</u>	<u>CLEAN UP GOAL</u> <u>(ug/l)</u>
Aniline		10*	10
Arsenic	50	10	50
Benzene	5	5	5
Alpha - BHC		.05	.05
Gamma BHC (Lindane)	4(0.2)**	.05	0.2**
CarbonTetrachloride	5	5	5
Chlorobenzene		5	5
Chloroform	100***	5	5
Cresols (m-p-)		10	10
Methyl Ethyl Ketone		10	10
Naphthalene		10	10
Toluene	2000**	5	2000**

* Practical quantitation limit, as specified in the groundwater monitoring list for the Appendix IX constituents, 52 Federal Register, July 9, 1987. The PQLs will be used for chemicals not on the Target Compound List.

** Proposed MCL

*** MCL for Total Trihalomethanes

Contract - Required Quantitation Limit. (CRQLs) Chemical - specific levels that a CLP laboratory must be able to routinely and reliably detect and quantitate in specified sample matrices.

6.0 DESCRIPTION OF ALTERNATIVES

The following alternatives for remediation were evaluated as a result of the Remedial Investigation.

1. No Action
2. No further action (existing groundwater corrective action program).

6.1 Alternative #1 No Action

Construction Cost	\$0
Annual Operation & Maintenance	\$0

The first alternative is no-action as required by Section 117(B) of the National Contingency Plan (NCP). This would entail shutting down the existing groundwater Corrective Action Program, resulting in reverting the groundwater flow direction toward the Tombigbee River, increasing the likelihood of exposure via ingestion of groundwater and enhancing the risk to aquatic life. The only reduction of contaminant levels would be via natural processes such as dispersion.

6.2 Alternative #2 No Further Action (Existing Groundwater Corrective Action Program)

Construction Cost	0
Annual Operation & Maintenance Cost	\$325,000

This Alternative includes:

- * Continued use of the existing groundwater corrective action program.
- * Surface water discharge to Tombigbee River.
- * Monitoring of effluent, groundwater concentrations and pumping rates.

Alternative 2 involves the Groundwater Corrective Action Program which is currently in operation at the Ciba-Geigy Corporation, McIntosh Plant. Groundwater is pumped from a 10 well pumping system designed to intercept, remove, and treat contaminated groundwater from the shallow alluvial aquifer. The water is being treated by the plant's on-site biological wastewater treatment system (which consists of neutralizers, pre-clarifiers, equalization, aeration, chemical conditioning, secondary clarifiers, sludge thickeners and sludge dewatering) and discharged to the Tombigbee River along with other treated wastewaters through the plant's NPDES permitted discharge system. The on-site biological treatment system commenced in September 1988, at a total cost of \$72,000,000. The concept of the waste water treatment system is to treat unit process waste water, storm water and groundwater. The effectiveness of the hydraulic barrier to movement of groundwater contaminants is well established and contaminated groundwater is being withdrawn from the

alluvial aquifer and treated at a rate of approximately 2 million gallons per day.

At one time the shallow aquifer near the center of the plant was being used to supply potable water to the Ciba-Geigy plant. However, at the present time potable water is supplied by a surficial aquifer well, located in the north plant property well which is upgradient of active manufacturing or waste management operations. According to collected data, the surficial aquifer downgradient of the site contains elevated levels of site related constituents. The cumulative carcinogenic risk level and the individual risk level for many of these chemicals exceed the one in a million risk level for both maximum and mean exposure scenarios. Due to the fact that the surficial aquifer is no longer being used as a source of potable water at the Ciba-Geigy plant and that the ongoing groundwater treatment system is pumping and treating the contaminated groundwater, there does not appear to be an immediate public health danger at this time. However, the unacceptable risk levels indicate that continuation of the pump and treat program is necessary to prevent potential exposure to unacceptable levels of contaminants in the groundwater in the future, which may pose an imminent and substantial endangerment to public health and the environment.

7.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The major objective of this analysis is to provide the basis for determining the most appropriate remedy with respect to the evaluation criteria. A summary of the relative performance of both alternatives with respect to the nine selecting criteria is listed below, for those actions which meet ARARs and can achieve protectiveness of human health and the environment. The "No Action" alternative is not protective and therefore is not discussed in the comparative analysis. The no further action alternative is on-going and is the best means of achieving remediation. A nine criteria discussion of this alternative follows.

7.1 IMPLEMENTABILITY

The implementability of an alternative is based on technical feasibility, administrative feasibility and the availability of services and materials. The alternative is readily implementable using available materials and methods.

7.2 COST

There would be no construction cost associated with the No Further Action alternative since the Corrective Action Program is already in place. The annual operation and maintenance is estimated at \$325,000 per year. No benefit could be provided by an alternative remediation method which would be cost-effective for this operable unit as compared to the No Further Action alternative.

7.3 STATE ACCEPTANCE

The State has concurred in the remedy.

7.4 COMMUNITY ACCEPTANCE

The Community, in general, favors the selection of the recommended alternative for Operable Unit 1 of the Ciba-Geigy site.

7.5 PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT

The No Further Action alternative has demonstrated adequate protection of human health and the environment by eliminating, reducing or controlling risk through treatment, engineering controls or institutional controls.

7.6 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The existing groundwater corrective action program (No further action) complies with applicable or relevant and appropriate requirements. (See Section 9.2)

7.7 REDUCTION OF TOXICITY, MOBILITY OR VOLUME

The No Further Action alternative will continue to reduce the toxicity, mobility, and volume of the groundwater contamination by decreasing the size of the plume and/or eliminating part of the source.

7.8 LONG-TERM EFFECTIVENESS

Long-Term effectiveness and permanence will be provided by the No Further Action alternative. Extraction and treatment of the sources of contamination in the alluvial aquifer would produce a permanent remedy. The No Action alternative is not effective in the long-term.

8.0 SELECTED REMEDY

The preferred alternative for groundwater remediation at the Ciba-Geigy site is Alternative 2 - No Further Action. EPA concurs with the previous actions that have been taken to remediate the alluvial aquifer by the Ciba-Geigy Corporation. It has been determined from the data from the four (4) corrective action monitoring wells and the 43 monitoring wells that the existing ten (10) pumping wells are successfully reversing the hydraulic gradient. Data is collected from selected monitoring wells five (5) days a week and is used to ensure that contaminated groundwater does not migrate off-site.

Based on current information and the analysis of the RI and other related reports, EPA believes that the preferred alternative for the Ciba-Geigy site is consistent with the requirements of Section 121 of CERCLA and the National Contingency Plan. The preferred alternative would reduce the mobility, toxicity, and volume of contaminated groundwater on-site. In addition, the preferred alternative is protective of human health and the environment, will attain all Federal and State applicable or relevant and appropriate public health and environmental requirements, is cost effective and utilized permanent solutions to the maximum extent practicable.

9.0 STATUTORY DETERMINATION

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

9.1 PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through continued pumping and treating of the shallow alluvial aquifer. No unacceptable short term risks will result from the implementation of this remedy since the shallow aquifer is no longer being used as a source of potable water.

9.2 ATTAINMENT OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This remedy assures that the drinking water supplied to current or future well users will meet available MCLs under the Safe Drinking Water Act (SDWA). For those chemicals which do not have assigned MCLs, Contract Required Quantitation Limits (CRQLs) will be attained. The CRQLs are in the to be considered (TBC) category. Discharge from the groundwater corrective action system will meet NPDES permit discharge limits under the Clean Water Act (CWA). The CWA Section 121(d)(2)(b)(i) of CERCLA is an applicable requirement, while the SDWA (MCLs) 40 CFR Part 141 and 142 and RCRA 40 CFR 268 are relevant and appropriate. Land Disposal Restrictions (LDR) for process residuals from the water treatment system is under a RCRA permit and complies with this ARAR.

9.3 COST EFFECTIVENESS

The recommended remedial alternative is cost effective. The groundwater pump and treat system has been installed and is operating effectively. The primary costs associated with this remedy are operating and analytical costs.

9.4 UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

The U.S. EPA believes this remedy is the most appropriate cleanup solution for the shallow alluvial aquifer at the Ciba-Geigy site. This remedy provides effective protection in both the short and long term to potential receptors. The system is in operation and data shows that it is effective.

9.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The statutory preference for treatment will be met because the selected remedy treats the groundwater, one of the principal threats posed by the site. The remaining operable units will address the source of contamination and the deeper aquifer.

10.0 RESPONSIVENESS SUMMARY

The United States Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management (ADEM) established a public comment period from August 30, 1989 through September 27, 1989 for interested parties to comment on EPA's and ADEM's Proposed Plan for the remediation of the shallow groundwater aquifer at the Ciba-Geigy site. A public meeting was conducted by EPA on Wednesday, September 13, 1989. The public meeting was held at the McIntosh Town

Hall in McIntosh, Alabama. The meeting presented the studies undertaken and the preferred remedial alternative for the site.

A responsiveness summary is required by Superfund policy to provide a summary of citizen comments and concerns about the site, as raised during the public comment period, and the responses to those concerns. All comments summarized in this document have been factored into the final decision of the preferred alternative for cleanup of the Ciba-Geigy site.

This responsiveness summary for the Ciba-Geigy site is divided into the following sections:

- I. Overview This section discusses the recommended alternative for remedial action and the public reaction to this alternative.
- II. Background on Community Involvement and Concerns This section provides a brief history of community interest and concerns regarding the Ciba-Geigy site.
- III. Summary of Major Questions Received During the Public Comment Period and EPA's or ADEM's Responses This section presents both oral and written comments submitted during the public comment period, and provides responses to these comments.
- IV. Remaining Concerns This section discusses community concerns that EPA should be aware of in design and implementation of the remedy.

I. Overview:

The preferred remedial alternative was presented to the public in a public meeting held on September 13, 1989. The recommended alternative for remediation of the shallow groundwater aquifer is presented in the Record of Decision (ROD). The major components of the recommended alternative include:

- Continued operation of the existing groundwater corrective action program.
- Continued monitoring of effluent, groundwater concentrations and pumping rates.
- Surface water discharge to the Tombigbee River.

The community, in general, favors the selection of the recommended alternative.

II. Background on Community Involvement and Concern:

The McIntosh community and Washington County have been aware of the contamination problem at Ciba-Geigy site for several years.

Ciba-Geigy semi-annually sponsors Open House tours for interested citizens. Every three or four years a major site tour is held. The last major tour was held in April 1989 and approximately 5000 people took advantage of this service.

III. Summary of Major Questions and Comments Recieved During the Public Comment Period and EPA's or ADEM's Responses:

There were no questions (written or oral) recieved during the comment period. However, the Mayor of McIntosh, Carroll Daugherty, expressed positive comments and commended Ciba-Geigy for their time, efforts and money used in research and construction of remediation activities at Ciba-Geigy.

IV. Remaining Concerns:

The community's concerns surrounding the Ciba-Geigy site will be addressed by continuing community relations support until operable units 2 and 3 have been completed.

Community relations should consist of making available final documents in a timely manner, to the local repository, and issuance of fact sheets to those on the mailing list to provide the community with project progress and a schedule of events. The community will be made aware of any principal design changes made during the project. At any time during the remedial design or remedial action, if new information is revealed that could affect the implementation of the remedy, or, if the remedy fails to achieve the necessary design criteria, the Record of Decision may be revised to incorporate new technology that will attain the necessary performance criteria.

Community relations activities will be an active aspect of the remaining phases of this project.

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



Guy Hunt
Governor

leigh Pagues, Director

September 28, 1989

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Mr. Arthur L. Collins
Chief, AL/G/MS Unit
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345 Courtland Street, N. E.
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Dear Mr. Collins:

We have reviewed the decision document regarding the selected remedial action for the CIBA-GEIGY site at McIntosh, Alabama. It is our understanding that the selected remediation by EPA will be conducted in three separate operable units. The first operable unit entitled "No Further Action" involves the continued pumping of the shallow alluvial aquifer. As part of the groundwater corrective action program under Part VIII of CIBA-GEIGY's RCRA permit, a groundwater intercept, removal and treatment system resulting in a surface water discharge was constructed by the CIBA-GEIGY corporation. Therefore, this office concurs in the selection of operable unit Number One, the preferred remedy which is the continued operation of the corrective action system.

Should you have any questions please do not hesitate to contact me.

Sincerely,

Daniel E. Cooper, Chief
Special Projects

DEC/dgc