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Remedial Response

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September 1987

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Superfund Record of Decision:

Conservation Chemical, MO

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The six-acre Conservation Chemical Company (CCC) site is situated on the flood plain of the Missouri River near the confluence of the Missouri and Blue Rivers within the city limits of Kansas City, Missouri. CCC initiated its activities at the site in 1960, beginning with construction of chemical treatment basins, the process area and a roadway ramp. Waste disposal operations began at the site soon after site construction was initiated and continued until approximately 1980. The exact nature and quantities of chemicals and wastes handled during the site's active operating period are unknown. Many site operating records are reported to have been destroyed in a 1970 fire. Operating records which are available indicate the primary materials accepted at the CCC site include: organics, solvents, acids, caustics, metal hydroxides and cyanide compounds. Reports also indicate that pesticides, herbicides, waste oils, organic solvents, halogenated compounds, arsenic and elemental phosphorous were handled at the site. In addition, there are reports and some evidence that pressurized cylinders and other metal containers were placed in the lagoons. The facility handled liquids, sludges and solids. The above totals include 48,000,000 gallons of liquids and sludges and 1,144 tons of solids. Because the records are incomplete, these figures are believed to understate the total quantity of materials brought to the site. Most of the materials brought to the site reportedly were disposed of onsite, with or without
(See Attached Sheet)

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16. ABSTRACT (continued)

treatment. CCC employed a variety of waste handling practices. Residual materials from the various treatment processes were generally disposed of onsite in the basins. Approximately 93,000 yd^3 of materials, including drums, bulk liquids, sludges and solids were buried at the site. In 1975, the Missouri Department of Natural Resources, Solid Waste Management Program (DNR/SWMP) investigated the site and found it to be operating as a solid waste disposal area. In 1977, the Missouri Clean Water Commission ordered the site closed and covered. At present, the site contains miscellaneous surface structures, such as tanks and buildings, and the six basins used for the storage, treatment, and disposal of a variety of chemicals, liquid wastes and sludges, which are presently covered. Soil and ground water are contaminated with 23 contaminants which include inorganics, organics, VOCs, metals and dioxin.

The selected remedial action for this site includes: surface cleanup including demolition and disposal of existing building and other tanks and debris; installation of a protective surface cap; ground water pump and treatment using sulfide precipitation with discharge to the Missouri River; and offsite ground water monitoring. The estimated capital cost for this remedial action is $8,626,000 with estimated present worth O&M of $12,774,111.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Conservation Chemical Company
Kansas City, Missouri

I am basing my decision concerning the appropriate remedial alternative for the Conservation Chemical Company (CCC) site on EPA staff and expert consultant recommendations, information provided and analyses performed by the public, including parties potentially responsible for the CCC site and review of the following documents, describing the analysis of the remedial alternatives and the factors in the National Contingency Plan. A substantial number of additional documents are included in the administrative record as well.

Among the documents that have been reviewed and documents and advice considered are:

1. Remedial Investigation Report on Conservation Chemical Company Site, Kansas City, Missouri, by Burns & McDonnell Engineering Company, 1984.

2. Focus Feasibility Study for the Conservation Chemical Company (CCC) site, Final Draft Report, February 1985, prepared by M. John Cullinane Jr. and James D. Crabtree, U.S. Army Engineer Waterways Experiment Station (WES).

3. Endangerment Assessment: Conservation Chemical Company, Kansas City, Missouri, May 1985, prepared by Clement Associates, 1985.

4. Addendum to the Focus Feasibility Study for the CCC Site, March 1987, prepared by John Cullinane, U.S. Army Engineer Waterway Experiment Station.

5. Alternative Remedial Action for the CCC site, Final Draft Report March 1987, prepared by Jacobs Engineering Group, Inc.

6. Numerical Simulation of Pumping and/or Injection Alternatives for Remedial Action at the CCC site, Final Draft, February 1987, prepared by Geo Trans, Inc.

7. Public Comments.

8. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Section 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986.

9. The National Oil and Hazardous Substances

Pollution Contingency Plan, 40 C.F.R. Part 300, November 20, 1985.

DESCRIPTION OF SELECTED REMEDY

The selected remedy consists of:

- Surface cleanup and preparation including demolition and disposal of existing building and other tanks and debris.

- Installation of a protective surface cap which will provide a two-layer cap over the existing fill and consist of geotechnically stable loess and top soil.

- Installation of a withdrawal well system to achieve an inward groundwater gradient to be measured by piezometer pairs along the perimeter of the site.

- Installation of a groundwater treatment system that will include sulfide precipitation. Enforceable operating rules will be established and any discharge must be protective of public health and meet all applicable and relevant or appropriate requirements, including any effluent limits that would be applicable under a NPDES permit.

- Perform offsite groundwater quality and water level monitoring to permit an assessment of changes in groundwater quality in the vicinity of the CCC site outside of the remedial action area.

DECLARATION

I have determined that remedial alternative selected for the CCC Site, is cost-effective, consistent with a permanent remedy, attains applicable or relevant and appropriate requirements, and provides adequate protection of public health and welfare and the environment and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization act of 1986 (SARA), and National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300;

I have determined that the action being taken applies permanent solutions and alternative treatment technologies to the maximum extent practicable. The State of Missouri has been consulted on the selected remedy.

This remedial action will require operation and maintenance activities to ensure continued effectiveness of the remedial alternative as well as to assure that the performance meets applicable federal and state surface and groundwater quality criteria.

Sept 30, 1987
Date

Regional Administrator

Attachment

1. Summary of Remedial Alternative Selection Conservation Chemical Company, Kansas City, Missouri

2. Index of Documents in the Record.

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
CONSERVATION CHEMICAL COMPANY
KANSAS CITY, JACKSON COUNTY, MISSOURI

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION VII

KANSAS CITY, KANSAS

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1. SITE LOCATION AND DESCRIPTION

a. Site Location

The Conservation Chemical Company (CCC) site is located at 8900 Front Street, within the city limits of Kansas City, Missouri. The site is located approximately 1.75 miles east of Interstate 435, along the Levee Road in Jackson County, Missouri, as shown on Figures 1 and 2. The site is approximately 6 acres in size and is situated on the floodplain of the Missouri River near the confluence of the Missouri and Blue Rivers, on the river side of the levee. The only access to the site is from the Levee Road.

The area in which the site is located is industrially zoned. Mobay Chemical Company (MCC) operates an agricultural chemical manufacturing plant southwest of the site and owns property northeast and east of the site, which is undeveloped, but a portion of which has in the past been used for agricultural purposes. Kansas City Power and Light (KCPL) operates the Hawthorne Power Plant to the northwest of the site and owns undeveloped land to the north and west of the site.

b. Topography

The site was undeveloped prior to startup of CCC's operation, and the initial site topography was that of the naturally occuring flood plain. As the site was developed, its topography was altered. Throughout the period of active operation, the process area had the highest elevation. By 1963, the area around basins 1 and 6 (Figure 3) had been built up to an elevation of approximately 739 feet above mean sea level (msl), the area around basin 4 was at elevation 735, and the northeastern portion of the site remained at elevation 730.

Beginning in approximately 1978, CCC initiated a site closure process which involved an attempt to stabilize the upper layer of waste materials in the basins, which was followed by placement of a soil cover over the basins. This process raised the surface elevation of the site to approximately current levels. A topographic map prepared from aerial photographs taken in March 1984 depicts the current topography (Figure 4). The surface of the site slopes generally from the southwest to northeast. However, slight irregularities in the surface result in depressions which collect precipitation. The area surrounding the site currently slopes to the northeast, northwest, and southeast, so that surface drainage from the site is in these three directions.

c. Hydrogeology

A detailed description of site hydrogeology is found in reports entitled "Hydrogeologic Characterization Conservation Chemical Company Site" by Crabtree and Malone (1984) and "Endangerment Assessment: Conservation Chemical Company" by Clement Associates (1985) (hereinafter the "Endangerment Assessment"). A brief summary of site hydrogeology is presented below.

Generally, the site is underlain by the Missouri River alluvium which is composed of silt, sand, and gravel. This aquifer is used as a source of drinking water by both private residents and public water supply companies. The water table is encountered below the site at depths ranging from 5 to 13 feet below the ground surface. The alluvium generally ranges in depth from about 70 to 110 feet. Recent investigations indicate the depth north of the site ranges up to 160 feet. The bedrock underlying the alluvium is comprised of interbedded shale, limestone, and sandstone.

Generally, the water table slopes towards the Missouri River and exhibits a low hydraulic gradient. During this condition, the groundwater in the upper layers of the aquifer provides recharge to the Missouri River. The water table gradient and groundwater flow direction can be altered during high stages of the Missouri River. Wastes at the site can become saturated by the water table.

d. Hydrology

The CCC site is southwest of the confluence of the Blue River and the Missouri River. The average annual discharge of the Missouri River, based on a

78-year average, is about 55,000 cubic feet/second (cfs) with extremes of 573,000 cfs and 1,500 cfs. Annual extremes are generally much less with a low flow occurring in late fall and winter and a high flow in the spring. The 7-day, 10-year low flow in the river is approximately 8,447 cfs.

U.S. Geological Survey records indicate that flow in the Blue River is generally 100 to 1,000 times less than that in the Missouri River. The Blue River responds more rapidly to precipitation than the Missouri River and under some conditions the flow in the Blue River may approach 10% of the flow in the Missouri River. Flow in the Blue River near its confluence with the Missouri River may range from less than 500 cfs to over 40,000 cfs.

The areas adjacent to the site flood with an annual probability of 7% or less. The 100-year floodplain has an elevation of 739.93 feet above msl. However, urban design in this area is for a 500-year flood having an elevation of 743.91 feet above msl. This has resulted in construction of the East Bottoms Levee unit to an elevation of 746.8 feet.

e. <u>Climate</u>

The following climatological data were recorded at the Downtown Airport in Kansas City, Missouri and are considered to be representative of the CCC site and surrounding area. These data were obtained from the National Oceanic and Atmospheric Administration (NOAA 1983) and represent a period of record from 1951 to 1980.

- Average annual normal monthly temperature is 56.3°F;

- Highest temperature on record is 109°F;

- Lowest temperature on record is -14°F;

- Annual average normal precipitation is 29.27 inches;

2. SITE HISTORY

a. Waste Disposal Practices

CCC initiated its activities at the site in 1960, beginning with construction of chemical treatment basins, the process area and a roadway ramp. The U. S. Army Corps of Engineers, Kansas City District, issued a permit to CCC pertaining to this site. The permit was expressly limited to issues related to the public rights of navigation.

Waste disposal operations began at the site soon after site construction was initiated and continued until approximately 1980. The exact nature and quantities of chemicals and wastes handled during the site's active operating period are unknown. Many site operating records are reported to have been destroyed in a fire in 1970 Operating records which are available indicate that the primary materials accepted at the CCO site included organics, solvents, acids, caustics, metal hydroxides, and cyanide compounds. Reports also indicate that pesticides, herbicides, waste oils, organic solvents, halogenated compounds, arsenic and elemental phosphorus were handled at the site. In addition, there are reports and some evidence that pressurized cylinders and other metal containers were placed in the lagoons. The facility handled liquids, sludges, and solids.

Based upon the available site operating records, it has been estimated that the following quantities of materials were brought to the site:

Acid metal-finishing wastes:	**32.6 million gallons**
Alkaline metal-finishing wastes:	**10.3 million gallons**
Cyanides:	0.4 million gallons + 38.44 tons

Solvents/organics:	1.7 million gallons
Miscellaneous wastes:	0.7 million gallons + 314 tons
Refinery wastes:	2.5 million gallons + 719 tons
Arsenic/phosphorus wastes:	2540 tons

The above totals include 48 million gallons of liquids and sludges and 1,144 tons of solids, i.e., roughly 300,000 tons in total. Because the records are incomplete, these figures are believed to understate the total quantity of materials brought to the site.

Most of the materials brought to the site reportedly were disposed of on site, with or without treatment. According to the site operator, the principal exceptions are the cyanides, some of which reportedly were converted to HCN and released or burned, and solvents, most of which reportedly were either incinerated or reclaimed. However, there is evidence from inventories that substantial quantities of organic solvents may have been disposed of on site.

CCC employed a variety of waste handling practices, including but not limited to solvent incineration, solvent resale, pickle liquor neutralization, cyanide complexation, chromic acid reduction, and ferric chloride/ferric sulfate recovery. Residual materials from the various treatment processes were generally disposed of on site in the basins. Drums, bulk liquids, sludges, and solids were buried at the site. Some wastes, such as drummed cyanide wastes and arsenic and phosphorus containing wastes, were disposed of on site without treatment.

Estimates based upon the surface areas of the lagoons (approximately 139,500 sq. ft.) and reported lagoon depths (up to 18 ft. below the surface of the site) indicate that approximately 93,000 cubic yards of materials are buried on site. Native materials beneath and adjacent to the disposal areas were probably contaminated by the waste disposal operations.

In 1975, the Missouri Department of Natural Resources, Solid Waste Management Program (DNR/SWMP) investigated the site and found it to be operating as a solid waste disposal area. On December 15, 1975 DNR/SWMP requested that CCC cease the disposal of solid wastes at the site and that remedial actions be taken to clean up the site.

In 1977 the Missouri Clean Water Commission ordered the site closed and covered. A plan for closure of the CCC site was submitted in June 1979 which called for the addition of absorbents and cementing materials to the waste in the uppermost 5 ft of each basin. Waste acids, predominantly pickle liquor, and fly ash were mixed with the upper layer of waste materials in the basins. Tests conducted on samples of the "stabilized" wastes in 1985 indicated that the desired pozzolonic cement-like properties had not formed. Also, there are indications that this material has deteriorated and will continue to deteriorate.

At present, the CCC site contains miscellaneous surface structures, such as tanks and buildings, and the six basins that were used for the storage, treatment, and disposal of a variety of chemicals, liquid wastes, and sludges, which are presently covered.

b. Current Site Conditions

The U. S. Army Engineers Waterways Experiment Station (WES) completed a report entitled "Focus Feasibility Study for Conservation Chemical Company Site" in 1985 and, in 1987, prepared a report entitled "Addendum to the Focus Feasibility Study" (hereinafter the "FFS" and "FFS Addendum", respectively). Data collected in previous studies, including investigations conducted by EPA, by Ecology & Environment, Inc. (E&E) under contract to EPA, WES, and a remedial investigation conducted by International Business Machines Corporation, AT&T Technologies, Inc., Armco Inc., and FMC Corporation (the Original Generator Defendants) were used to describe the nature and extent of contamination. Contamination sources, contaminant migration pathways, potential receptors, and potential risks posed by the contaminants are described in the FFS and the FFS Addendum. The following is a brief summary of the types and concentrations of contaminants at the site.

Among the potentially hazardous substances detected in groundwater beneath and near the CCC site, 21 substances have been detected at concentrations substantially in excess of applicable criteria or standards for water quality. These include six metals, cyanide, four phenolic compounds, and ten volatile organic compounds (VOCs). In addition, aluminum and total phenolics (including compounds other than the four compounds specifically listed) have been detected at levels sufficiently high to cause concern for aquatic life. These 23 substances are listed in Table 1, along with the highest concentrations for each compound reported in groundwater at or near the site. Trans-1,2-dichloroethylene has been detected at high concentrations (up to 47,100 ug/liter). These high concentrations may be of concern because of the chemical similarity between this substance and trichloroethylene, 1,1-dichloroethylene, and vinyl chloride.

Finally, 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD or dioxin) has been detected in several samples recovered from on site borings with concentrations up to 29 parts per billion being reported. The high toxicity of this compound is well established. A level of 1 ppb has been recommended as a guideline for permissible concentrations in soil at some sites where direct contact with dioxin contaminated soil is likely.

A number of other inorganic and organic compounds have been detected in soil and groundwater at or near the CCC site. The 23 contaminants listed in Table 1, together with trans-1,2-dichloroethylene and 2,3,7,8-TCDD, are the primary contaminants of concern at this site.

3. ENDANGERMENT ASSESSMENT

An assessment of the risks presented by the CCC site is presented in the Endangerment Assessment, which is an attachment to the FFS. This assessment indicates that the greatest exposure pathway is associated with the wastes buried at the site which are in contact with the aquifer. These wastes serve as a source for continued release of contaminants into the aquifier where they may migrate into and under the Missouri River, thereby threatening water supplies and inhibiting future aquifer development. The aquifer on the north side of the Missouri River currently is used as a residential drinking water source. Further development of or increased withdrawal from this aquifer may draw contaminants into municipal well fields downstream of the site.

The next greatest risk is presented by contaminated surface soils, which are a source of contamination that may be transported by precipitation runoff into surface water bodies or the groundwater. Contaminated soils also present hazards from direct contact and wind dispersion of particulates. Debris and machinery on the site surface also are potential contamination sources.

4. DEVELOPMENT OF ALTERNATIVES

The remedial alternatives for the CCC site were developed and evaluated in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. 9601 et seq., and the National Oil and Hazardous Substance Pollution Contingency Plan 40 C.F.R. Part 300 (the "NCP"). Section 121(b) of CERCLA provides that a remedy shall be selected that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b) also establishes certain preferences when considering remedial actions, including the following:

a. Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principal element over remedial actions not involving such treatment.

b. The offsite transport and disposal of hazardous substances or contaminated materials without treatment is the least favored alternative remedial action where practicable treatment technologies are available. As described below, these preferences were considered when evaluating various remedial alternatives.

- Alternatives specifying on- and-off site storage, destruction, treatment, or secure disposal of hazardous substances at a facility approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable EPA standards (e.g. Safe Drinking Water Act, Clean Water Act, Clean Air Act, Toxic substances Control Act, etc.).

- Alternatives that meet all applicable or relevant federal public health or environmental standards, guidance, and advisories.

- o Alternatives that exceed all applicable or relevant federal public health or environmental standards, guidance, and advisories.

- o Alternatives that meet CERCLA goals but do not attain all applicable or relevant federal public health or environmental standards, guidance, and advisories.

- o No action alternatives.

Technologies Considered in FFS

Prior to the development of alternatives, an evaluation of general response actions and technology screening for the CCC site was performed. The general response actions considered are based on the findings of the Remedial Investigation, including the analysis of potential contaminant exposure pathways. The technology screening process considered the waste-limiting (waste characteristics that limit the effectiveness or feasibility of a technology) and site-limiting (site characteristics, such as soil permeability, depth to groundwater and to bedrock and location relative to the river, that preclude the use of a technology) factors unique to the site, and the level of technical development adequate for each technology. The screening of the various technologies in the FFS was based on the following criteria which were in effect prior to the enactment of SARA:

1. The technology must be reliable, based either on successful implementation at other hazardous waste sites, or in comparable applications;

2. The technology must be technically feasible, reliable, and applicable to site conditions and waste characteristics at the site, based on engineering judgement; and

3. The technology must be capable, either by itself, or in conjunction with

other technologies or alternatives, of addressing the objectives and the stated environmental goals.

To achieve these objectives, several technologies were evaluated for the removal, containment and treatment of wastes and contaminated soils and the containment, collection, treatment and discharge of contaminated groundwater. Technologies were screened as required by 40 C.F.R. Part 300.68(g) to eliminate those technologies of greater cost that would not provide substantially greater protection, that were not feasible or reliable and that would not effectively contribute to the protection of the public health and welfare and the environment.

The technologies that were reviewed in the FFS are listed in Table 2. The technologies that were eliminated from further consideration and the reason for their elimination are specified in Table 3. The remaining technologies were assembled into alternative remedies and analyzed in detail in the FFS. These technologies were reconsidered in the FFS Addendum.

The source removal technologies considered in the evaluation included excavation, chemical solidification/stabilization and treatment following excavation in conjunction with various on- and off-site disposal options. Source isolation technologies evaluated included surface treatment (capping, revegetation, floodproofing), vertical impermeable barriers and on site (interior) withdrawal wells. Technologies for enabling plume capture, such as downgradient withdrawal wells and subsurface drains, also were considered. Treatment of groundwater recovered by the withdrawal well would be required. The contaminants of concern are primarily heavy metals and organic compounds. Cyanide also is a potential problem. Heavy metals would be removed by precipitation and organics would be removed by biological treatment and activated carbon. Cyanide removal, if required, would be accomplished by using alkaline chlorination.

5. DETAILED EVALUATION OF ALTERNATIVES

Alternatives developed from combinations of the available technologies were initially screened in the FFS along with a no action alternative. This initial screening of alternatives provided the basis for selecting alternatives for further detailed analysis. The nine remaining alternatives are presented in Table 4. Detailed discussion of all nine alternatives is presented in the FFS.

In mid-1985, the Government adopted Alternative 4 (circumferential containment with interior pumping) of the FFS as the remedial action for the CCC Site. Additional geotechnical investigations performed in 1986, however, revealed that the depth to bedrock at the CCC Site ranged up to 160 feet, such that the construction of a circumferential impermeable barrier could be more difficult than originally believed. Furthermore, in late 1985 the NCP was revised and in 1986 the Superfund Amendments and Reauthorization Act (SARA) was enacted. Both of the regulatory changes affected EPA's review of remedial alternatives. In light of these changes, additional evaluations were undertaken by the EPA to reassess potential remedies at the CCC site.

To address the changes, especially SARA, additional alternative technologies and remedies were evaluated in the 1987 FFS Addendum. The additional technologies considered are listed in Table 5. The technologies excluded from detailed development in the FFS Addendum are listed in Table 6 and the additional remedial alternatives carried through for full evaluation in the FFS Addendum are listed in Table 7.

The FFS Addendum provides a comparative analysis of the following three alternative remedies:

- Alternative 4. Circumferential containment with on-site groundwater withdrawal and treatment of the extracted groundwater (original 1985 selected alternative)

- Alternative 10A. On-site containment of contaminants by on-site pumping; and

- Alternative 11. Excavation followed by soil treatment.

The alternatives selected for detailed comparative analysis were evaluated in the FFS Addendum according to the following criteria:

Reliability

Implementability

Technical Effectiveness

Environmental Concerns

Safety

Regulatory Requirements

Public Acceptance

Cost

Operation and Maintenance

a. <u>Reliability</u>

Alternative 4: The major advantage of Alternative 4 is the apparent structural containment of the waste materials within the circumferential barrier wall and the relative ease with which the effectiveness of this remedial action could be monitored. On the other hand, there are a number of uncertainties associated with the design and construction of such a wall at this site. These uncertainties are associated with the particular geology of the CCC site. However, because the interior withdrawal well system provides protection to the environment against leakage, these uncertainties primarily affect the cost of implementing this alternative rather than its reliability.

Alternative 10A: Alternative 10A relies on hydraulic, rather than structural, containment to prevent migration of contaminants from the site. Potential difficulties associated with the implementation of this alternative include reliance upon well-maintained water elevation instrumentation to monitor system performance, hydrogeologic uncertainties which may affect pumping rates and well locations, and the impact of the Missouri River on the withdrawal wells. Moreover, Alternative 10A is dependent on the long-term implementation of water treatment technologies to remove the contaminants from the groundwater pumped from beneath the site. On the other hand, it is anticipated that problems associated with this system can be resolved from an engineering standpoint by installing additional pumping and treatment capacity.

Alternative 11: The technology employed by Alternative 11 is relatively new and has not been tried on a large scale such as would be required at the CCC site. Extensive laboratory and pilot scale studies would be necessary to verify that this alternative could be successfully implemented. Assuming successful resolution of the technical issues associated with implementability, which are discussed below, during such studies, a reliable Alternative 11 could be constructed.

Conclusion: Both Alternative 4 and Alternative 10A could be implemented with a high degree of reliability. While it is believed that Alternative 11 could be implemented, extensive testing and studies would be necessary to verify this prior to implementation.

b. Implementability

Alternative 4. While geologic conditions at the site may make Alterntive 4 more difficult to construct than was believed in 1985, it is a technically feasible and constructable remedial alternative. Because the interior withdrawal well provides protection should leakage occur, the issue is one of cost rather than overall technical implementability.

Alternative 10A. Construction of extraction wells and a groundwater treatment plant are within the state of current practice. The major difficulty with implementation of Alternative 10A is the development of an adequate monitoring program to ensure that the containment goals are achieved. Monitoring of groundwater elevations around the perimeter of the site to verify constant inward flow is the most appropriate manner for evaluating performance of such a system. Specification of precise pumping rates as a control measure is inappropriate because the geologic and hydrogeologic uncertainties at the site make calculation of precise pumping rates necessary to ensure adequate capture impossible. Construction and operation of treatment facilities for recovered groundwater as required for implementation of this alternative are within the current state of commercially available technology.

Alternative 11. Alternative 11 is implementable at the CCC site assuming that the following problems are satisfactorily resolved:

1. Development of a safe methodology for excavation of the waste and contaminated soils.

2. Development of an appropriate method of soil washing that will remove all the contaminants.

3. Development of a scheme for disposal of the treatment fluids and other residuals produced by the treatment process.

4. Obtaining additional land adjacent to the site for construction of the treatment facilities.

Conclusion: Alternatives 4 and 10A are implementable based on existing technology. Although there are known technical problems with each, these problems can be resolved through application of well known engineering principles. On the other hand, Alternative 11 applies a new technology and, as a result, there are substantial uncertainties associated with implementation of this alternative which may take considerable time to resolve before this alternative could be implemented.

c. Technical Effectiveness

Alternative 4. Alternative 4 is technically feasible and, in combination with the interior withdrawal well, would result in physical containment of the waste materials on site. Wastes remaining on site would probably tend to concentrate somewhat; however, the interior withdrawal well system should protect the slurry wall from degradation by these chemicals. Alternative 4 could be modified to include a permeable cap that would allow infiltration to assist in the cleanup process. This modification would enhance the flushing process that would remove higher volume of contaminated groundwater from the site. There is no methodology available to estimate the length of time required for cleanup. The on-site cleanup would include the discharge of treated wastes containing acceptable levels of contaminants remaining in the groundwater after treatment to surface waters and the generation of solid wastes from the groundwater treatment processes. Contaminants that have already migrated beyond the containment barrier generally would not be captured by this alternative.

Alternative 10A. Alternative 10A is technically feasible, and should result in containment of the waste materials on-site. Although designed primarily for containing the on-site contaminants, Alternative 10A would also clean up a portion of the off site contamination, including some contaminants not contained under Alternative 4. However, while the treatment technologies that will be employed provide high levels of treatment, they do not remove 100 percent of the contaminants. Thus, discharges to the Missouri River from the treatment plant would be greater than with Alternative 4. Alternative 10A includes a permeable cap that would allow infiltration to assist in the cleanup process. Theoretically, this containment would result in eventual cleanup of the on-site and some portions of the off-site contamination, although this cleanup process could take a substantial time period.

Groundwater modeling was performed to estimate the parameters necessary to capture the groundwater which originates in or passes through the space beneath the CCC site such as withdrawal well locations and pumping rates. Also, groundwater treatment processes were analyzed to provide a conceptual design for a treatment system and to assess anticipated levels of discharge into surface waters.

There is no methodology available to estimate the length of time required for cleanup. One could speculate that Alternative 10A, which allows continued migration of the groundwater through the site, might result in cleanup at a faster rate than Alternative 4, however there is no present methodology to predict how fast either alternative would remediate the site. This cleanup would include the discharge of acceptable levels of contaminants remaining in the groundwater after treatment to surface waters and the need to dispose of solid wastes resulting from the groundwater treatment processes.

Alternative 11. The technical effectiveness of this alternative would depend upon the successful resolution of the problems discussed above under Implementability. Theoretically, if coupled with a groundwater treatment program, both the on-site wastes and contaminated soils could be renovated, and a portion of the contaminated groundwater off-site could be remediated. However, the technical effectiveness of this alternative is not yet known.

Conclusion: Technically effective remedial actions based on the concepts contained in Alternatives 4 and 10A, could be constructed. There are still unresolved uncertainties associated with the technical effectiveness of Alternative 11.

d. Environmental Concerns

Alternative 4. Whereas technical effectiveness concerns the primary goal of contaminant containment, environmental concerns relate to the secondary impacts of a remedial alternatve. Alternative 4, although offering positive containment of the on site contaminants, results in several environmental concerns, including:

- Extraction of a large quantity of contaminated material during construction of the containment barrier, which would probably require disposal in accordance with RCRA requirements.

- Discharge of treated groundwater.

- Generation of sludges in the groundwater treatment processes that may require disposal in accordance with RCRA requirements.

Alternative 10A. Alternative 10A also poses environmental concerns similar to those associated with Alternative 4. However, under Alternative 10A, since the only construction into contaminated materials would be the on-site extraction wells, there would not be large amounts of contaminated material requiring disposal. This factor is offset by the greater discharges of extracted groundwater into surface waters and greater volumes of sludges generated by the water treatment processes.

Alternative 11. The environmental concerns associated with Alternative 11 are similar to those of Alternatives 4 and 10A. However, Alternative 11 would result in the greatest short-term impacts because the wastes and contaminated soils would be excavated, resulting in the potential for release of contaminants through the air and surface water pathways. Although the potential for release can be minimizd through proper planning and design, it cannot be eliminated. Alternative 11 would also involve the discharge of low levels of contaminants and generation of treatment plant sludges requiring disposal.

<u>Conclusion:</u> Each of the alternatives raises a number of environmental concerns. Efforts should be made during the remedial design to minimize environmental consequences of the remedial action selected.

e. <u>Safety</u>

Alternative 4. The construction operations associated with Alternative 4 pose the potential for contact with large quantities of contaminated materials. This potential contact presents the primary safety concern for this Alternative. Proper planning and design can minimize these concerns, but not eliminate them.

Alternative 10A. Alternative 10A involves some potential contact with contaminated materials during construction of the on-site extraction wells and, to a lesser degree, the monitoring wells. However, this potential for contact is much less for Alternative 10A than for the other alternatives. The handling and disposal of treatment chemicals, and sludges, would involve potential exposure to contaminants. The potential exposures could be minimized through proper planning and design. Also, potential hazards associated with the sulfide precipitation process would be minimized by proper planning and design.

Alternative 11. Implementation of Alternative 11 may result in the greatest potential for safety related problems because it involves the excavation of wastes and contaminated materials. The safety risks include direct exposure to toxic materials, exposure of elemental phosphorus to air (causing combustion), and rupture of pressurized gas cylinders. The quantity and nature of materials thought to be present on the CCC site make excavation of the materials potentially risky. Although detailed planning, design, and implementation can minimize the potential safety problems to on- and off-site personnel, they cannot be totally eliminated.

Conclusion: Alternative 4 and 10A can be constructed with an adequate margin of safety for both on- and off-site personnel. The potential safety risks for Alternative 11 appear to be greater.

f. Regulatory Requirements

Implementation of each of the three alternatives involves consideration of a number of regulatory requirements falling within the jurisdiction of a variety of regulatory agencies. Specific requirements which are applicable or relevant and appropriate to this remedial action are discussed in Section 7, below.

g. Public Acceptance

Alternative 4. Alternative 4 would result in the positive containment of the source of on-site contamination and address the major environmental and health problems created by the CCC site. Because existing off-site contamination including any potential migration of non-aqeous-phase liquids (NAPL), is not specifically addressed by this alternative, the public may not view this alternative alone as an acceptable remedy for the site.

Alternative 10A. Alternative 10A would result in the containment and some treatment of the primary source of on-site contamination and the cleanup of some contamination that has already migrated off-site. There may be some concern by the public regarding off-site contamination, but that level of concern should be less than for Alternative 4.

Alternative 11. Because Alternative 11 would result in the removal of the source of contamination and some cleanup of contamination that has migrated from the site, Alternative 11 probably would be viewed favorably by the public. This favorable view may be offset by concerns over the ability to excavate safely the waste materials and contaminated soils and to treat them properly prior to placement back on the site. The public concern regarding off-site contamination is expected to be comparable to that for Alternative 10A.

Conclusion: No major public acceptance problems have been identified or are expected with any of the three alternatives. Thus, the alternatives are generally equivalent based on anticipated public acceptance.

h. Cost

The estimated capital and operation and maintenance costs and present worth of each of the three alternatives is presented in Table 8. The present worth was calculated over a thirty-year time period using a discount rate of 10 percent. This cost estimates are based on the best engineering judgement using currently available information. There are a number of uncertainties associated with each of these alternative and are discussed in more detail below. The discount rate of 10 percent was used, based on United States Office of Management and budget (OMB) Circular No. A-94 (revised) dated March 27, 1972.

Alternative 4. The present worth estimate for this alternative is $17.09 million. The cost of Alternative 4 cannot be calculated at this time. Primary uncertainties which prevent such a calculation include the cost of constructing the containment barrier and the pumping rate which would be required to maintain an inward hydraulic gradient, and the requisite cost of treating the extracted groundwater prior to discharge. These uncertainties could substantially impact the actual cost of this alternative. As shown in Table 8, the estimated cost of Alternative 4 is primarily for capital expenditures.

Alternative 10A. The present worth estimate for this alternative is $21.4 million. The cost of Alternative 10A cannot be calculated at this time. Primary uncertainties which prevent such a calculation include the required pumping rate to maintain an inward hydraulic gradient and the requisite costs of treating the extracted groundwater. These uncertainties could substantially impact the cost of implementing this alternative. As shown in Table 8, the estimated cost of Alternative 10A is primarily for operation and maintenance of the remedial action.

Alternative 11. The present worth estimate for this alternative is $23.4 million. The cost of Alternative 11 cannot be calculated at this time. The primary uncertainty associated with Alternative 11 is the cost of excavating the contaminated soils and sludges and the cost of handling residuals from the soil treatment process. Furthermore, since this alternative employs a relatively new technology which has not been implemented on as large a scale as required at the CCC site, the data base upon which this estimate is based is much less complete than those for Alternatives 4 and 10A. These uncertainties could substantially impact the cost of implementing this alternative. As shown in Table 8, the estimated cost of Alternative 11 is approximately the same for capital expenditures and operation and maintenance.

Conclusion: The estimated costs for each of the alternatives are similar. While there are a number of uncertainties for each alternative, in relative terms, the uncertainties are probably the least for Alternative 10A and the greatest for Alternative 11, with Alternative 4 lying somewhere in between.

i. Operation and Maintenance

This section addresses the skill levels and potential time periods required for operation and maintenance activities, rather than the cost of operation and maintenance, which are addressed above.

Alternative 4. Operation and maintenance activities associated with Alternative 4 involve maintenance of the surface cap and containment wall, and operation and maintenance of the groundwater treatment system and groundwater monitoring system. With the possible exception of maintenance of the barrier wall involving repair of a breach in the wall, each of these activities require skill levels which are generally available. Repairing a breach in the barrier wall would be a specialized process. Operation and maintenance for this alternative would be required until the wastes no longer need to be contained, i.e. all applicable or relevant and appropriate requirements ("ARARs") have been met.

Alternative 10. Operation and maintenance activities associated with Alternative 10A involve maintenance of the surface cap and operation and maintenance of the groundwater monitoring system. Surface cap maintenance would require similar skill levels to that required for maintenance of the surface cap for Alternative 4. The operation and maintenance requirements for the groundwater monitoring system similarly would be much greater than that required for Alternative 4 because the water level differentials being measured are much smaller and would therefore require much more sensitive water level instrumentation than required for Alternative 4. Since there would not be a barrier wall to maintain, there would not be a potential need to repair a breach in the wall. The overall skill levels required for Alternative 10A are generally available. Operation and maintenance for this alternative would be necessary until all ARARs have been met. Since this is an active pumping system, the time period to meet ARARs might be shorter than for Alternative 4.

Alternative 11. Operation and maintenance activities associated with Alternative 11 include excavation and treatment of contaminated soils and sludges. These activities require significant skill levels during operation of the active remediation process. The needed skill levels are believed to be less readily available for this alternative than for the others in that fewer contractors have experience with this technology. Long term operation and maintenance requirements for Alternative 11 would be minimal.

Conclusion: Each of the alternatives considered would require persons with some level of specialized skills for operation and maintenance activities. In relative terms, Alternative 4 and Alternative 10A would require approximately the same level of skills. Alternative 11 would require a higher skill level but over a shorter time period.

Alternative 4 probably would require the longest period for operation and maintenance. Alternative 10A might require a somewhat shorter operation and maintenance period than Alternative 4. Alternative 11, if feasible, should require a substantially shorter period of operation and maintenance than either Alternative 4 or Alternative 10A.

6. SELECTED ALTERNATIVE

Based upon the evaluation of remedial alternatives described in Section 5 and consideration of the applicable or relevant and appropriate legal requirements, described in Section 7, below, an active pumping containment system, which was evaluated as Alternative 10A, is selected as the remedial alternative for this site. This alternative is consistent with the general requirements of Section 121(b) of CERCLA that a remedial action shall be selected which is "protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable."

A remedy employing an active pumping system would be protective of human health and the environment. Contaminants present at the site will be contained at the site, thereby eliminating further uncontrolled releases into the environment. Contaminants present in the groundwater extracted to achieve hydraulic containment will be properly treated prior to discharge. Potential environmental impacts of wastes generated during construction of the remedial action are also less than those presented by the other alternatives considered. Finally, because an active pumping system relies upon the use of currently available technology, which can be constructed in the shortest time frame, this alternative would provide expeditious implementation of the remedial action with substantial certainty as to its effectiveness in protecting public health and the environment.

Furthermore, an active pumping system containment system would provide a cost effective remedy for the site. Given the uncertainties associated with implementation of any remedy at the CCC site, Alternative 10A may prove to be the least costly remedy that would meet the environmental goals and requirements of CERCLA. Treatment of hazardous substances to reduce their volume, toxicity and mobility by treating the extracted groundwater is the principal element of Alternative A. Alternative 11 also involves treatment which reduces the volume, toxicity and mobility of the hazardous substance present at the site. However, the uncertainties of its technical feasibility at this site raise substantial question as to its practicability. Extensive research would be necessary prior to its implementation to resolve this question. For these reasons, Alternative 10A offers treatment to the maximum extent practicable.

A more detailed discussion of the applicable or relevant and appropriate legal requirements is presented in Section 7 below.

The selected remedy would incorporate the following features:

a. <u>Surface Cleanup/Surface Preparation</u>

- The on-site building will be demolished and its basement filled to grade.
- The septic system will be demolished or grouted. All other depressions will be properly graded in such a manner that the cap integrity will be maintained.
- All existing tanks and solid debris remaining on site from of CCC's past operation the facility either will be cut into pieces for incorporation under the cap or decontamination and disposed of off-site.
- The existing surface of the CCC Site will be regraded utilizing on-site soils to the fullest extent practicable to fill in localized depressions prior to installation of the cap.

b. <u>Protective Surface Cap</u>

A two-layer cap for the CCC Site will be constructed as follows:

- The lower layer of the cap will be constructed over the existing fill and will consist of at least 18 inches of geotechnically stable loess, locally available.
- The upper layer (vegetated top cover) will be at least 6 inches of top soil, able to support persistent vegetation, and will be

planted. The cap will have a final slope not less than 3% and will have a surface drainage system capable of conducting runoff across the cap without erosion rills.

- Provision will also be made for paved chutes, flumes or rigid downpipes to transport water down the steep sided embankments. These embankments will have a slope not greater than 5:1 (horizontal:vertical).

- The embankments of the cap and site will be protected from floods with a layer of riprap.

- At the end of the remedial action, a permanent cap to meet the then-existing regulatory requirements will be provided.

c. Withdrawal Well System

An on-site groundwater withdrawal well system designed to capture all of the groundwater emanating in or passing through the site will be installed. This system will be designed so that its performance can be verified by determining differences in water levels at paired piezometers surrounding the site.

If the withdrawal wells installed are not capable of meeting the performance standards, then additional wells will be installed to provide sufficient pumping and treatment capacity as needed to achieve the performance requirement as soon as practicable.

d. Ground Water Treatment System

- A system for treating water extracted by the withdrawal well system will be constructed and operated in such a way that the effluent from the facility is discharged at a level that will meet any effluent limits established under the Missouri Clean Water Law or the Federal Water Pollution Control Act. The treatment system will include, at a minimum, such treatment processes as metals precipitation (utilizing both hydroxide and sulfide precipitation), filtration, biological treatment, and carbon absorption. Treatment processes that provide an equivalent level of performance may be substituted for those listed above. The metals precipitation units will be designed and operated in a manner which seeks to attain the following levels:

METAL	DESIGN VALUES, ug/l
Al	100
As	50
Cd	2
Cr	20
Fe	20
Pb	5
Ni	150
Zn	30

Additional studies will be performed of the contaminated groundwater to determine whether alkaline chlorination is capable of reducing the level of cyanides at the site.

- All State of Missouri requirements which are applicable or relevant and appropriate, including applicable Missouri effluent limits, will be met.

- All sludges generated by groundwater extraction and treatment facility operations shall be managed in accordance with all applicable regulations.

- Discharges of contaminants to the air by the groundwater extraction and treatment facility construction, operation, and maintenance will be in accordance with the Clean Air Act and all applicable regulations.

e. Off-site Groundwater Quality Monitoring System

- A number of monitoring wells (approximately 12) will be installed to monitor water quality and groundwater elevations. The location of these wells will be determined in the design phase.

- The water quality and groundwater elevation surveys will be conducted quarterly for the first three years with analysis for priority pollutants and other selected water quality parameters.

- o After the first three years the groundwater quality and groundwater elevations will be monitored according to the following schedule:

Years 4-5	Quarterly
Years 6-20	Annual
Years 21-30	Biennial (every two years)
Years 30	Complete reevaluation of water monitoring program; determination of need for future.

These schedules may be adjusted depending on the data developed during the monitoring program. All analyses of samples will be performed using EPA approved protocols, handling, reporting and chain of custody procedures, all of which will be described in detail in a groundwater monitoring plan, to be developed during the planning or design phase of the remedial program.

f. <u>Operation and Maintenance Program</u>

- o An Operation and Maintenance (O&M) Plan will be developed and implemented for the CCC Site which provides a schedule and description of maintenance activities.

- o The O&M Plan will include provisions for the cap, perimeter fence, monitoring wells, water level recorders, wastewater treatment system, sewer lines and any other structures constructed or installed pursuant to this remedial program.

7. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The discussion in the sections above and the data and discussions presented in the Remedial Investigation Report and the FFS and FFS Addendum establish that substantial amounts of hazardous substances currently are present on site, in the groundwater and in the soil; that many of these hazardous substances are present in high concentrations; and that several of these hazardous substances are potential carcinogens. The presence of these hazardous substances at such high concentrations potentially poses several types of risks. First the groundwater is not suitable for use as a drinking water source because of the contamination. Second, the contaminated soil may pose a risk through direct contact. Third, the contaminated soil also poses an indirect risk in that, if it is left unremediated, the contaminants will continue to migrate into the groundwater and prolong and exacerbate the groundwater contamination. This contamination prevents the present use and will prevent the future use of the groundwater as a drinking water source. In short, the site in its current condition presents a threat to human health and the environment in several ways.

The applicable or relevant and appropriate requirements for these three areas are discussed below.

a. Groundwater Contamination

The goal of this remedial action is to restore groundwater to drinking water quality for possible use as a drinking water supply. The Agency has considered seven sets of standards for groundwater quality: maximum contaminant level goals (MCLGs), maximum contaminant levels (MCLs), water quality criteria, health advisories, the concentration limits calculated from potency factors and verified reference doses (RFD), and RCRA groundwater protection standards.

Recommended cleanup levels were selected from those seven categories according to four basic criteria:

1. Where a chemical causes both carcinogenic and noncarcinogenic effects, the cleanup levels must be set within the 10^{-4} to 10^{-7} risk range.

2. Where two standards or criteria describe the same effect for the same chemical, the more recently derived standard (based on more recent scientific information) was chosen.

3. MCLs and non-zero MCLGs were taken as the point of departure for evaluating cleanup levels.

4. Total risk from all carcinogens should be between 10^{-4} to 10^{-7}.

Section 121 of SARA outlines the cleanup standards for remedial actions at Superfund sites. The primary standard is that remedial actions must assure protection of human health and the environment. SARA further requires that a remedial action meet applicable or relevant and appropriate standards, criteria, or limitations. SARA specifies that: "Such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals and water quality criteria where such goals or criteria are relevant and appropriate under the circumstances of the release or threatened release" (SARA 121(d) (2)).

As noted above, seven groups of federal standards, criteria and other health-based levels might be used for cleanup standards for groundwater at the CCC Site. Potential cleanup standards include the following:

Maximum Contaminant Level Goals (MCLG), established under the Safe Drinking Water Act. MCLGs are nonenforceable health goals, set at levels where no known or anticipated adverse health effects will occur to exposed populations, and which allow a margin of safety.

Maximum Contaminant Levels (MCL), established under the Safe Drinking Water Act. These are the maximum contaminant concentrations allowed in regulated public water supplies. MCLs represent a balance between the MCLGs and technical limitations: they are based on a chemical's toxicity, treatability, cost effectiveness and the analytical limits of detection. All MCLs are set for non-carcinogens at no adverse effects levels, and for carcinogens within the 10^{-4} to 10^{-7} risk range.

Health Advisories (HA), developed under the Safe Drinking Water Act for contaminants not having a MCL. Health Advisories may apply to short term exposure, long term exposure or chronic exposure.

Water Quality Criteria (WQC), for Human Health established under the Clean Water Act. The original WQC assumed that people drank contaminated surface water and ate contaminated fish that grew in that water.

The criteria for freshwater aquatic life are relevant to this site since groundwater discharges to surface water.

Verified Reference Doses (RFD), developed by an intraagency EPA workgroup. These values represent an acceptable daily intake of noncarcinogenic chemicals (or, for a carcinogen, an acceptable daily intake of that chemical considering its noncarcinogenic toxicity). The corresponding acceptable concentration of a contaminant in drinking water is calculated by assuming that a typical 70 kg person drinks 2 liters of water per day.

Potency Factors (PF), developed by EPA to characterize the potency of a given carcinogen. These factors are used to estimate the incremental increase in cancer in a large group of people due to chronic exposure to a carcinogen at a given concentration. The calculations assume that a typical person weighs 70 kg and drinks 2 liters of contaminated water per day.

Groundwater Protection Standards - Established under the Resource Conservation and Recovery Act (RCRA). These standards directly apply to the groundwater at regulated facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, or landfills after November 19, 1980. If contaminant concentrations exceed the standard, the facility owner/operator must begin corrective action.

MCLs were the first set of standards considered for cleanup levels. MCLs have been proposed for a number of the contaminants of concern at the CCC site. MCLs represent safe contaminant concentrations in public water supplies. Most public water supplies should be fairly clean, even before treatment. In contrast, groundwater at the CCC site contains many toxicants.

Ambient Water Quality Criteris (AWQC), were the next set of standards considered, as specified in SARA. These levels were calculated from the criteria for exposure to both contaminated water and fish listed in the 1980 water quality criteria documents. EPA updated the water quality criteria in 1986. The 1986 Water Quality Criteria states that for the maximum protection of human health from potential carcinogenic effects, the ambient water concentration of carcinogens should be zero. However, the document acknowledges that the zero level may not be achievable and presents a range of concentrations associated with an incremental increase in cancer risk between 10^{-4} and 10^{-7} for each carcinogen. For contaminated groundwater at the Superfund sites, the 10^{-6} level is the starting point for evaluating risks. Table 9 lists the water quality criteria for human health for the 1×10^{-6} risk level.

For noncarcinogens, water quality criteria, Health Advisories, and contaminant concentrations calculated from verified reference doses (RfD) may be appropriate cleanup levels. For carcinogens, Health Advisories suggest concentration limits that guard against noncarcinogenic health effects. For example, vinyl chloride is a known human carcinogen with a long term health advisory of 46 ug/l. Vinyl chloride may cause liver damage and other noncancerous disorders after long term exposure. The health advisory of 46 ug/l should prevent these effects, but will not preclude an increase in cancer incidence in a population exposed for a lifetime to vinyl chloride at that level. The MCL for Vinyl Chloride is 2 ug/l.

Contaminant levels calculated from verified reference doses also refer to noncarcinogenic health effects after chronic exposure. For example, methylene chloride is a probable human carcinogen. The concentration limit calculated from the RfD is 2100 ug/l. This limit represents an acceptable daily intake from drinking water which should prevent (noncarcinogenic) damage to the central nervous system and the heart associated with exposure to methylene chloride. However, lifetime exposure to 2100 ug/l methylene chloride in drinking water may cause an increase of 17 cases of cancer in an exposed population of 20,000 (8.4×10^{-7} risk level).

Verified reference doses represent a recent consensus among EPA scientists on acceptable daily intakes of toxic chemicals. Therefore, more weight was given to reference doses than to the older water quality criteria for human health and Health Advisories when evaluating possible cleanup levels. Of the few noncarcinogtens which have nonorganoleptic criteria, the 1986 Water Quality Criteria specifies that RfDs should replace the older water quality criteria for human health.

Groundwater protection standards set under RCRA were the last set of standards considered for the site. These standards, which apply to hazardous waste treatment, storage or disposal facilities, do not legally apply to the site but may be considered relevant and appropriate.

Portions of 40 C.F.R. Part 264, Subpart F, are relevant and appropriate because they address situations similar to the site, notably, situations where hazardous wastes are present in both the soils and the groundwater. Subpart F provides that groundwater must be cleaned up to background, to MCLs, or to risk-based alternate concentration limits (ACLs). The Agency thinks it appropriate to restore the groundwater on-site, as well as the groundwater off-site, to drinking water quality. As noted above, this is an aquifer that is used as a drinking water source now, and the use of which can be expanded by cleaning up this site to ensure that all potentially usable groundwater is of drinking water quality.

The Agency's Groundwater Protection Strategy (GWPS) promulgated by the Office of Groundwater Protection in August 1984, provides guidance concerning how different groundwaters throughout the country should be classified and to what extent cleaning up a particular groundwater is appropriate, given where it fits in the classification scheme.

The GWPS provides that EPA's policy on groundwater protection should consider the highest beneficial use to which particular groundwater can presently or potentially be put. It defines protection policies (i.e., policies concerning levels of protection and cleanup) for three classes of groundwater, based on their respective value and their vulnerability to contamination. Class I groundwater is special groundwater that is irreplaceable (i.e., no reasonable alternative source of drinking water is available to substantial populations) or ecologically vital (i.e., the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat). Class II groundwaters include groundwaters that are current or potential sources of drinking water and waters having other beneficial uses. Class III groundwater is not considered to be a potential source of drinking water and to be of limited beneficial use (i.e., groundwater that is heavily saline or is otherwise contaminated beyond levels that could be cleaned up). To fit into Class III, groundwater also cannot migrate to Class I or II groundwater or have a discharge to surface water that could cause degradation.

The groundwater that underlies the CCC site is Class II groundwater. This groundwater is considered to be a current drinking water source since groundwater is used for drinking water within a two mile radius of the site. The natural condition of the groundwater makes it possible to develop the area, including installation of drinking water wells in the future. This groundwater also migrates to and is part of a Class II groundwater aquifer that is being used as a drinking water source now.

Based upon the above considerations, until such time as alternate concentration limits for those contaminants of concerns are established, EPA has determined that the appropriate levels for groundwater cleanup are those levels noted in Column 2 of Table 9.

b. Discharge to the Missouri River

The selected remedial alternative involves discharging groundwater withdrawn from beneath and adjacent to the CCC Site into the Missouri River. Therefore, appplicable or relevant and appropriate requirements pertaining to this discharge must be considered. Both the Federal Water Pollution Control Act, 33 U.S.C. 1251 et. seq., commonly referred to as the Clean Water Act (CWA), and the Missouri Clean Water Law, RSMo Chapter 204, are applicable or relevant and appropriate to such discharges.

The State of Missouri has identified, on a preliminary basis, applicable effluent limitations for discharge into the Missouri River as part of this remedial action. (See Attachment 1). The final effluent limitations will be established during the actual permit issuance process and will be met. In addition, the effluent limits set forth in Attachment 1, at a minimum, will be required for any discharge. The State of Missouri has been authorized to administer the National Pollutant Discharge Elimination System (NPDES) permit program within its state boundaries. Thus, the State is required to set effluent limitations based upon effluent guidelines promulgated by EPA, if applicable. In this instance, EPA has not promulgated effluent guidelines for discharges from hazardous waste sites and the preliminary effluent limitations are based upon best professional judgment, including consideration of effluent guidelines for industries with effluent streams similar to the CCC Site. These effluent limits will be reviewed and, if appropriate, revised at least every five years.

In addition, to ensure adequate protection of public health and the environment EPA has determined that the use of sulfide precipitation and filtration technologies are necessary for maximum removal of certain metals from the discharge. The expected discharge levels to be achieved by the metals treatment processes are as follows:

METAL	DISCHARGE VALUES, ug/l
Al	100
As	50
Cd	2
Cr	20
Fe	20
Pb	5
Ni	150
Zn	30

The treatment levels required by the effluent limitations and to be met using the treatment technologies selected for this site are both achievable and protective of public health and the environment. This conclusion was reached after analysis of the applicable literature and review of other treatment plants currently in operation. Also, this conclusion was reached after comparison of cleanup levels to the levels of contamination posing a threat at the site as described in the Endangerment Assessment.

c. Soil contamination

Remedial action is necessary to prevent endangerment posed by direct contact with contaminated surface soils. RCRA closure requirements are relevant and appropriate for addressing such soil contamination. (See 40 C.F.R. Part 265).

Remediation of surface soil contamination will be approached in two phases. During the course of the pump and treat phase of the remedial action, a permeable cap will be in place over the site. This permeable cap will protect against direct contact with the contaminants while allowing infiltration through the surface. This infiltration will increase leaching of contaminants from the soils, thereby allowing capture and treatment of the released contaminants. Upon completion of the pump and treat program, i.e. completion of groundwater cleanup, the site will be capped in accordance with the RCRA closure requirements in effect at that time.

d. Conclusion

The soil and groundwater at the CCC Site contain high concentrations of a wide variety of hazardous substances. Because these hazardous substances are present, the site poses a threat to human health and the environment. The remedy selected by EPA minimizes the risks posed by direct contact with the contaminants by limiting site access and capping the site. Furthermore, the selected remedy minimizes the actual or potential endangerment posed to human health by ingesting contaminated groundwater or to aquatic life by movement of contaminated groundwater into the Missouri River by containing the contaminated groundwater on the site and allowing a discharge to surface waters only after proper treatment. Since all TCDD containing samples were obtained from sludge and surface soil samples, the waste containment strategy and surface cap will minimize possible contact with TCDD.

8. SCHEDULE

EPA anticipates that the remedial design and remedial action will be completed according to the following time frame.

1.0 Remedial Design:

A. Final design Plans and specifications for Surface Cleanup and Surface Protection Cap will be completed in seven months.

B. Final design plans and specifications for withdrawal well and groundwater monitoring system will be completed in eight months.

C. Final design plans and specifications for water treatment facility will be completed in twelve months.

2.0 Remedial Actions:

A. Surface Cleanup and installation of the Protective Cap will be completed in seven months.

B. Installation of withdrawal well, monitoring system and water treatment plant will be completed in ten months.

9. COMMUNITY RELATIONS

The public has been informed of the status of EPA's activities regarding this site on several occasions. Generally, few comments have been received in response to the various public notices and press releases issued regarding the site, which indicates a low level of community concern. No major public concerns have been received at this time. Specific community relations ativities are summarized as follows.

On April 23, 1985, EPA issued a public notice requesting comments from the public on the draft Remedial Investigation Report prepared by the Original generator Defendants and a draft Focus Feasibility Study prepared on behalf of the EPA.

On August 2, 1985, EPA issued a press release announcing that an agreement had been reached with the Original Generator Defendants whereby those parties would implement the remedial action.

On October 8, 1985, EPA issued a public notice announcing that a hearing open to the public, would be held before the U. S. District Court Judge presiding over the litigation concerning the CCC site. The issue considered was the approval by the Court of the Preliminary Agreement reached by the government and the Original Generator Defendants.

On March 26, 1987, EPA issued a public notice as to the availability of the FFS Addendum and other documents relevant to selection of a remedy and requested public comment on remedial alternatives. The public comment period, which was originally scheduled to close on May 4, 1987, was extended as the result of requests received during the comment period. The public was advised of this extension during the comment period. Written comments were received from three persons, which comments are a part of the record considered in selecting a remedial action for this site. The nature of these comments and EPA's response to them are presented in Section 11 of this document.

On April 10, 1987, a public notice was issued announcing that EPA was going to hold a public meeting to receive comments regarding remedial alternatives for the site. A public meeting was held on April 23, 1987, during which one person offered comments. This comment and EPA's response thereto are presented in Section 11 of this document.

10. ENFORCEMENT ANALYSIS

Remediation of this site has been the subject of ongoing litigation since September 1980, when the United States first sued Conservation Chemical Company. In November 1982, a separate complaint was filed against not only Conservation Chemical Company but also its President, a related corporation, and four companies believed to be the largest contributors of the contaminants of greatest concern at the site. The 1980 complaint was subsequently dismissed.

In 1984, approximately 250 third party defendant generators, insurance companies and government agencies were brought into the lawsuit by the original defendants. Most of the claims involving third party defendants have now been settled. A settlement agreement between the United States and the parties it sued is currently under consideration.

11. RESPONSIVENESS SUMMARY

A public hearing was held regarding the remedy selected in 1985 and a public meeting was held on April 23, 1987. The FFS Addendum was released to the public for review and comment on March 26, 1987, with the comment period extending to May 8 1987, and a public meeting was held on April 23, 1987 to receive comments. One oral comment and three written comments on remedial alternatives for the CCC site were received by EPA Region VII during this comment period. The following is a summary of the comments and EPA's responses. (The comments have been edited and, in some cases, paraphrased to summarize the major points of each commenter.) The transcript of the public meeting and the original texts of written comments are a part of the administrative record.

Oral comment by Dan DeCarlo of Coalition for the Environment, Kansas City, MO: The Coalition for the Environment requests clarification of the kinds of environmental impacts the barrier wall alternative would have. Specifically, to clarify if the remedy would involve pumping and treatment of groundwater and return of the treated water to the river and whether the soil washing alternative would return the treated soil to the site or would it be moved elsewhere. For the groundwater pump and treat alternatives, what would the groundwater withdrawal rate be and how long would it continue. Finally, what is the extent of both the aquifer and the area of water contamination.

EPA Response: The groundwater would be treated and discharged into the Missouri River in a manner which is protective of the public health and the environment and the treated water would meet the applicable or relevant and appropriate requirements for such discharges. The soil washing alternative would return the treated soils to the original excavation. Groundwater pumping would occur in several of the alternatives considered by the EPA, although the rate of withdrawal would depend upon the means of hydraulic isolation used. The interconnection between the Missouri River and the alluvial aquifer underlying the CCC site would result in little, if any, change in groundwater availability under any of the groundwater pumping scenarios envisioned for a CCC remedy. The length of time necessary to achieve the desired cleanup under the active pump and treat alternative cannot be determined precisely. A thirty year time period was used for purposes of cost estimation only. Regarding the boundaries of the aquifer and the contamination, it is known that both extend off site. Monitoring wells have been installed off the site and several of the remedies considered for CCC site, including the selected alternative, would address at least some of the off-site contamination.

Written comment by counsel for Original Generator Defendants: In accordance with the order entered April 28, 1987, by Judge Scott O. Wright in the civil action entitled United States of America v. Conservation Chemical Company, et al., they maintain that the administrative proceedures which EPA is purporting to follow are extra-legal, redundant, and inappropriate for remedy selection under the circumstances of the CCC litigation. Moreover, an administrative proceeding deprives the potentially responsible parties of due process of law.

EPA Response: The administrative process for selection of a remedy is both appropriate legally required under CERCLA and the NCP.

Written comment by William C. Ford, P.E., Director, Division of Environmental Quality, Missouri Department of Natural Resources: The Missouri Department of Natural Resources recommends the alternative incorporating excavation of the wastes and soil washing with downgradient groundwater pumping and treatment be utilized for the remedial action at the CCC site. The commentor stated that this recommendation is consistent with the final recommendation contained in an EPA contractor's report on alternative remedial action technologies at the CCC site.

EPA Response: A comparison of the three alternatives and EPA's rationale for selection of Alternative 10A is set forth in Section 6 above.

Written comment by Clark A. Ridpath, Manager, Legal Services, Mobay Corporation of Kansas City, MO: Mobay Corporation has studied the documents describing the remedial alternatives for the CCC site which have been made available for public review. The commentor stated that their review reflects that little, if any, discussion is contained in these documents relative to the protection of adjoining property owners, particularly pertaining to the health and safety of personnel in close proximity to the CCC site, to be afforded during the implementation of a remedy. Mobay is concerned about the health, safety, and well-being of its personnel, which exceed 1000 workers at its facility near the CCC site.

EPA Response: The FFS and FFS Addendum evaluated potential remedies on the basis of several criteria, including environmental impact and safety. Safety encompasses both the safety of the workers engaged in the remedial action and the safety of the general public outside of the site boundaries. In fact, safety is a major factor in the decision to use the containment by onsite pumping alternative at the CCC site, since it involves minimal disturbance of the buried wastes. A much more detailed safety analysis will be performed during the remedial design phase, during which the adjacent property owners, other interested members of the general public, and other federal, state, and local agencies will be consulted as appropriate. Safety will always be of utmost concern to the EPA in evaluating and implementing remedies at Superfund sites.

TABLE 2

TECHNOLOGIES CONSIDERED IN FFS

- Increased monitoring
- Excavation
- Chemical solidification/stabilization
- Off-site disposal
  - RCRA landfill
  - Special landfill
- On-site disposal
  - Existing location
  - RCRA cell above floodplain
- Surface treatment
- Circumferential impermeable barrier
- Downgradient impermeable barrier
- On-site (interior) withdrawal wells
- Downgradient withdrawal wells
- Hydraulic Barrier
- On-site subsurface drain
- Downgradient subsurface drain
- Diversion pumping
- Treatment of extracted groundwater
- Treatment of impacted water supplies
- Bottom sealing
- Incineration
- Permeable treatment beds

TABLE 3

TECHNOLOGIES EXCLUDED FROM DETAILED DEVELOPMENT IN THE FFS

Technology	Reason for Exclusion
In-situ Stabilization	Technology attempted and found not feasible at other similar sites. Technology is not sufficiently developed.
Bottom Sealing	Technology has not been adequately demonstrated at the project level. Process is expected to be very costly and of questionable effectiveness.
Incineration	Technology for amenable wastes already used at site. Technology inappropriate for remaining wastes, particularly the destruction of cyanide and heavy metal wastes.
Diversion Pumping	Technology not appropriate due to high aquifer transmissivities, other site geological characteristics and high cost of O&M.
Permeable Treatment Beds	Technology most appropriate where contamination is at low levels. Inability to regenerate medium without physical removal and, with the high contaminant concentrations onsite, medium exhaustion would occur rapidly.
On site/Off site Subsurface Drain	Technology prohibitive due to the required depth of excavation and pumping rquirements for recovery of groundwater at the CCC site. Withdrawal wells determined to be more feasible.

TABLE 4

DESCRIPTIONS OF REMEDIAL ALTERNATIVES EVALUATED IN FFS

Alternative 1	-	Increased monitoring
Alternative 2	-	Excavation of wastes/soil
	-	Chemical solidification/stabilization
	-	Disposal offsite in licensed landfill or site in special cell above floodplain
Alternative 3	-	Surface treatment includes RCRA capping, revegation, floodproofing
Alternative 4	-	Surface treatment
	-	Circumferential impermeable barrier
	-	Onsite (interior) withdrawal well
	-	Groundwater treatment
Alternative 5	-	Surface treatment
	-	Circumferential impermeable barrier
	-	Onsite withdrawal well
	-	Downgradient withdrawal wells
	-	Groundwater treatment
Alternative 6 (A & B)	-	Surface treatment
	-	Onsite withdrawal well
	-	Downgradient withdrawal wells
	-	Groundwater treatment
Alternative 7	-	Surface treatment
	-	Downgradient impermeable barrier
	-	Onsite withdrawal wells
	-	Downgradient withdrawal wells
	-	Groundwater treatment
Alternative 8	-	Surface treatment
	-	Downgradient impermeable barrier
	-	Onsite withdrawal well
	-	Downgradient withdrawal wells
	-	Groundwater treatment
	-	Additional treatment of
	-	impacted water supplies

TABLE 5

ADDITIONAL TECHNOLOGIES EVALUATED IN RESPONSE TO SECTION 121 OF SARA

Technology	Applicability Yes	Applicability No
Volume Reduction		
Recycle/Reuse		X
Waste Minimization		X
Toxicity		
Waste Biodegradation	X	
Detoxification		X
Incineration		X
Soil Flushing	X	
Soil Washing	X	
Heating		X
Freezing		X
Mobility		
Contaminant Immobilization		X
Vitrification		X

TABLE 6

TECHNOLOGIES EXCLUDED FROM DETAILED DEVELOPMENT IN FFS ADDENDUM

In-situ Immobilization	Technology would not effect organic and other non-metallic contamination; thus, these substances would continue to be a source of contamination. Immobilization reactions are reversible.
In-situ Detoxification	Technology is not feasible in presence of multiple contaminants. Chemicals used in the process are pollutants or yield toxic byproducts.
In-situ Vitrification	Technology is not feasible for deep zones of contamination and in areas with high moisture content. Process would not treat contaminated groundwater. Process has high energy requirements.
In-situ Heating	Technology would not affect inorganic contaminants. Process has high energy requirements which are greater in presence of soil moisture.
In-situ Freeze Thaw	Technology does not affect VOC contamination, is not feasible at the CCC site due to shallow water table, and could increase mobility of some metals.

TABLE 7

DESCRIPTIONS OF REMEDIAL ALTERNATIVES EVALUATED IN FFS ADDENDUM

Alternative 10(A)	-	Surface treatment
	-	On-site withdrawal wells
	-	Groundwater treatment
Alternative 11	-	Excavation of wastes/soil
	-	Downgradient impermeable barrier
	-	Injection/withdrawal wells
	-	Soil Washing
	-	Groundwater treatment
Alternative 12	-	Surface treatment
	-	Injection/withdrawal wells
	-	Downgradient impermeable barrier
	-	In-situ bioreclamation system
Alternative 13	-	Surface treatment
	-	Injection/withdrawal wells
	-	Circumferential impermeable barrier
	-	Groundwater treatment
	-	In-situ soil flushing system
Alternative 14	-	Surface treatment
	-	Injection/withdrawal wells
	-	Circumferential impermeable barrier
	-	Groundwater treatment
	-	In-situ biroeclamation/soil flushing system.

TABLE 8

COMPARISON OF COSTS FOR ALTERNATIVES 4, 10A, and 11A

Alternative	Capital ($)	O&M Present Worth ($)	Total Present Worth ($)
Alternative 4: Source Containment with Slurry Wall	12,354,000	4,733,000	17,087,000
Alternative 10A: Site Pumping	8,626,000	12,774,111	21,400,000
Alternative 11: Excavation and Soil Washing	11,751,000	11,625,000	23,376,000

A Present worth evaluated at 10 percent discount rate.

TABLE 9

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) FOR CONTAMINATION OF CONCERN AT THE CCC SITE

Contaminants of Concern	Concentration	Source of ARARs
Arsenic	50 ug/l	MCL
Cadmium	10 ug/l	MCL
Chromium (Total)	50 ug/l	MCL
Nickel	13.4 ug/l	AWQC for Human Health
Zinc	5000 ug/l	AWQC for Human Health
Iron	300 ug/l	MCL (Secondary)
Aluminum	None	None
Cyanide (Total)	220 ug/l (long term, child)	Health Advisory
Lead	50 ug/l	MCL
Chloroform	0.19 ug/l	AWQC for Human Health (10^{-6})
Trichloroethylene	2.7 ug/l	AWQC for Human Health (10^{-6})
Trichloroethylene	5.0 ug/l	MCL
Benzene	5.0 ug/l	MCL
Vinyl Chloride	2.0 ug/l	AWQC (10^{-6})
Vinyl Chloride	2.0 ug/l	MCL

TABLE 9

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
FOR CONTAMINATION OF CONCERN AT THE CCC SITE
(Concluded)

1,2-Dichloroethane	5.0 ug/l	MCL
1,1,2-Trichloroethane	0.6 ug/l	AWQC (10^{-6})
1,1-Dichloroethylene	0.033 ug/l	AWQC (10^{-6})
1,1-Dichloroethylene	7.0 ug/l	MCL
Trans-1,2-Dichloroethylene	70.0 ug/l	MCLG
2,4 Dichlorophenol	0.3 ug/l	AWQC
2,4 Dimethylphenol	400 ug/l	AWQC
Phenol	300 ug/l	AWQC (Organoleptic)
2,4,6-Trichlorophenol	1.2 ug/l	AWQC (10^{-6})
Carbon tetrachloride	5.0 ug/l	MCL
Carbon tetrachloride	0.4 ug/l	AWQC (10^{-6})
Toluene	14.3 mg/l	AWQC
Methylene Chloride	0.19 ug/l	AWQC (10^{-6})
2,3,7,8-Tetrachloro-dibenzodioxin (TCDD)	1.3×10^{-8}	AWQC (10^{-6})

CONSERVATION CHEMICAL COMPANY SITE
KANSAS CITY, MISSOURI

INDEX OF DOCUMENTS IN THE ADMINISTRATIVE RECORD
FOR THE RECORD OF DECISION

U.S. Environmental Protection Agency
Contract No. 68-01-7351 (TES IV)
Work Assignment No. 413

September 4, 1987

INTRODUCTION

This Index of Documents in the Administrative Record for the Record of Decision describes documents considered by the U.S. Environmental Protection Agency in determining appropriate response actions with respect to the Conservation Chemical Company Superfund Site in Kansas City, Missouri.

Administrative Record documents for the Conservation Chemical Company Site are indexed chronologically in ascending order, with undated documents following all dated entries. This sorting scheme corresponds with the arrangement of documents in the Administrative Record itself. In cases where documents contain only partial dates, the Index of Documents defaults to the first month of the year and/or first day of the month, as appropriate.

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