Five-Year Review Report

Moss-American Site
Milwaukee, Wisconsin

Pursuant to CERCLA

Prepared By:

U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

9/18/00
Date

William E. Muno, Director
Superfund Division

I. INTRODUCTION

A. Authority and Purpose

The United States Environmental Protection Agency (U.S. EPA), Region 5, conducted this statutory five-year review under Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The purpose of a statutory five-year review is to evaluate whether a completed remedial action remains protective of human health and the environment at sites where hazardous waste remains on site at levels that do not allow for unlimited use and unrestricted exposure.

There are three basic types of five-year review: Type I, II and III. Type II and III reviews are reserved for more complex cases, in which, respectively, either a recalculation of risk or a new risk assessment is performed. Although we have amended the Moss-American site decision documents, the amendments did not stem from any perceived lack of protectiveness in the cleanup goals previously adopted. Hence a Type II or III review is not applicable to the Moss-American site. Most reviews will be some variation of Type I.

A full Type I review assumes that a comprehensive discussion of applicable or relevant and appropriate (ARARs) attainment or at least trends in ARARs attainment will be included. In order to have such a discussion, all remedial construction should be complete. A special case of a Type I review is the Type Ia review, where remedial construction is underway but not complete. The Type Ia review conducted for this site is applicable to a site at which response is ongoing. This review will be placed in the Site files and local repository for the Moss-American Superfund Site (the "Site") in Milwaukee, Wisconsin.

B. Executive Summary

Remedial action at the Moss-American site consists of five phases of response: 1) free-product recovery, 2) contaminated groundwater collection and treatment, 3) treatment of more highly contaminated soils, 4) containment of lesser contaminated soils and treated soil residuals, and 5) sediment management. At this time, remedial construction related to the first three response phases has been completed or has begun. This review covers only the elements of remediation for which construction is completed or has begun. For those elements, we recommend continued monitoring of the site until all applicable cleanup standards are met on a consistent basis. Among other things, we should monitor groundwater quality and its relationship to the residual soil contamination and response to the dosage of oxygen and/or nutrients. Sections II and III of this report contain a more detailed explanation of this recommendation.

Subsequent five-year reviews will also discuss monitoring more strongly associated with containment and sediment management. Such reviews will likely discuss the need to insure containment integrity, the attainment of sediment goals and associated restoration efforts.

C. Site History

In 1921, the T. J. Moss Tie Company established a wood preserving facility west of the Little Menomonee River. The plant preserved railroad ties, poles, and fence posts with creosote, a mixture of numerous chemical compounds, derived from coal tar. While No. 6 fuel oil was also used, no evidence of pentachlorophenol usage was noted at the Moss-American site. Creosote plant operations often contain storage facilities for creosote and fuels, a boiler for making steam, heating the creosote and applying the creosote to the wood, areas for unloading and storing incoming timbers, rail cars for transporting the creosote, and a drying area for subsequent storage. Potential for release of materials exists throughout the storage, application, and drying processes.

Kerr-McGee purchased the facility in 1963 and changed the facility's name to Moss-American. The name was changed again in 1974 to Kerr-McGee Chemical Corporation - Forest Products Division. In 1998, the name of this company changed to Kerr-McGee Chemical LLC (KMC).

From 1921 to 1971, the facility discharged wastes to settling ponds that ultimately discharged to the Little Menomonee River. These discharges ceased when the plant diverted its process water discharge to the Milwaukee sanitary sewerage system. Production at the facility ceased in 1976.

Under WDNR order, KMC cleaned out eight former settling ponds and dredged about 1,700 feet of river to remove creosote-contaminated soil and sediment. During 1972 to 1973, three different dredging efforts were conducted in the Little Menomonee River within the first mile downstream of the facility.

In 1983, the facility was placed on the National Priorities List (NPL) pursuant to Section 105 of CERCLA. U.S. EPA initiated a negotiation period with potentially responsible parties (PRPs) associated with the site to determine if the performance of a Remedial Investigation/Feasibility Study (RI/FS) would be privately conducted. When those discussions did not result in a settlement, U.S. EPA determined in 1987 that it would conduct the RI/FS.

After it issued the1990 ROD, U.S. EPA again entered into discussions with potentially responsible parties. On December 30, 1991, the United States lodged a consent decree with the Federal District Court for the Eastern District of Wisconsin in Milwaukee. This Consent Decree, which was signed by U.S. EPA, the State of Wisconsin and KMC, requires KMC to implement the Remedial Design and Remedial Action set forth in the ROD. The County of Milwaukee and the Union Pacific Railroad (formerly known as the Chicago and Northwestern Railroad) submitted comments on the Consent Decree. The County of Milwaukee filed objections to the

Consent Decree and sought to intervene in the proceeding in 1992. U.S. EPA responded to the comments and objections in its 1993 Motion to Enter. The County withdrew its objections in February 1996, after reaching an agreement with U.S. EPA on past costs. The decree was entered by the Court in March 1996.

Despite limited site access during the 1991-1996 time frame, KMC accomplished certain tasks called for in the Statement of Work, which is part of the decree. These included certain treatability study and predesign tasks that examined issues related to 1) verifying the presence and extent of free-product residues of creosote at soils just above the groundwater table or, as "pools," collecting at the soil/groundwater interface, 2) refining estimates on the extent of contaminated soil on site, and 3) further investigating and evaluating groundwater conditions on site, notably on the east side of the Little Menomonee River.

In September 1998, U.S. EPA issued a ROD Amendment which dealt primarily with site soils. WDNR conditionally concurred with this amendment. The ROD Amendment provided for use of thermal desorption as a treatment technology to deal with more highly contaminated site soils. EPA now considers thermal desorption a presumptive remedy for wood preservative treatment sites. The ROD Amendment also incorporated more recently developed State cleanup standards for soil related contaminants. In addition, it allowed for non-residential direct contact cleanup exposure scenarios if appropriate deed restrictions were secured. The ROD Amendment withdrew a waiver of State liner/leachate provisions, but provided for a Corrective Action Management Unit (CAMU). Based on review of groundwater monitoring network analyses and related soils data, the ROD Amendment also added some contaminants of concern, such as naphthalene.

II. DISCUSSION

A. Remedial Objectives

Remedial action has progressed with respect to 1) the extraction, collection, and disposal of free product, 2) the collection and treatment of contaminated groundwater, and 3) the treatment of more highly contaminated site soils. While subject to requirements such as those for tank storage, manifesting and selecting treatment/disposal facility, free product collection efforts were not expected to achieve the final cleanup standards for groundwater and soil quality. These efforts were undertaken in order to make it possible for subsequent groundwater and soil remediation measures to achieve the final ARARs.

The groundwater remedial action goals are: 1) to prevent release of contaminants through the surficial groundwater aquifer to the Little Menomonee River surface water or sediment; and 2) to reduce the groundwater contaminant levels in order to achieve levels established under ch. NR 140 of the Wisconsin Administrative Code. The Consent Decree allows for a demonstration,

based on technical/economic feasibility, of an alternative concentration limit to the Preventive Action Level after five years of groundwater treatment system operation. The alternative limit, however, may not exceed the enforcement standard for a given contaminant.

Soil treatment goals are established in ch. NR 720 of the Wisconsin Administrative Code, which provides specific contaminant cleanup standards or a method of calculating such values. The values in question are termed residual contaminant levels (RCLs). The thermal desorption treatment unit must also meet air emission levels as established by ch. NR 665, and regulation of hazardous waste management units as established by ch. NR 670 of the Wisconsin Administrative Code. The Wisconsin Administrative Code, at ch. NR 720.11(1)(c), discusses deed restriction measures for cleanup scenarios other than residential.

B. Remedial Action

Free-Product Collection Phase

Based on the November 1994 predesign results, U.S. EPA issued correspondence to KMC requesting that initial priority be given to removing the free product. The predesign report indicated that free product materials in extractable quantities were concentrated in an area of approximately one acre south of Brown Deer Road and west of the Little Menomonee River. In 1995, KMC undertook design, construction and installation of a removal system featuring extraction wells, conductivity probes to distinguish between creosote and groundwater, and supplementary storage tanks.

The free product was mostly concentrated at a depth of 6 to 12 feet below the ground surface. The free product is composed primarily of a mixture of creosote and #6 fuel oil, which was used during past site operations. This mixture has a greater specific gravity than water, and due to its relatively insoluble nature would constitute a dense non-aqueous phase liquid, or DNAPL. DNAPLs tend to complicate and prolong groundwater remediation efforts.

There were three main components of the free product recovery system. These are: 1) the recovery well network, 2) the piping/storage tanks, and 3) the necessary instrumentation. KMC installed six recovery wells. Each well was equipped with an individual pump capable of generating a maximum flow of 8 gallons per minute. Well boreholes went 13-16' below the ground surface. Wells were screened at the bottom with 5' screens. Piping consisted of a 1" inner pipe inside a 2" outer pipe. Materials collected were conveyed to the first of two 10,000 gallon steel tanks. The first tank received a combination of free product and groundwater. As water separated from the mixture, it was decanted to the second 10,000 gallon tank.

The system utilized the notable difference in conductivity between petroleum based free product and water. Each well was linked to a conductivity probe. When the probe detected an increase in conductivity, indicating that the liquid in the well was changing from mostly free product to

mostly water, pumping would cease. KMC sent collected materials to Rhodia, Inc., a disposal facility in Indiana.

The following list describes the quantity of liquids recovered during the primary years of operation of the free product recovery system:

1996 - 3100 gallons
1997 - 7500 gallons
1998 - 1080 gallons
1999 - 900 gallons

KMC estimates that on average 10% of the extracted liquids were creosote, and 90% were contaminated groundwater.

Extraction wells installed for free product recovery were designated as part of the "PW" series. Some temporary groundwater monitoring wells were also installed, and were designated as "TW". During 1997, KMC observed that wells PW - 5 and PW - 6 were not yielding creosote. To improve recovery, pumps from wells PW - 5/6 were removed and installed into wells TW-6/7. This did not significantly improve yield, such that over the life of the free product recovery system wells PW - 1 through 4 collected the overwhelming volume of material.

In terms of lessons learned, a schedule of intermittent pumping was found to be more productive than continuous operation. Also, peristaltic pumps seemed best suited for the task. KMC estimates that capital cost for construction of the free product recovery system at $ 250,000. Including disposal fees, operation and maintenance costs averaged approximately $ 20,000 per year over the four year life of the system.

In fall 1999, the free product recovery system was dismantled, as construction of the funnel and gate groundwater collection and treatment system began.

Groundwater Remediation Phase

In 1997, U.S. EPA issued, and WDNR concurred with, an Explanation of Significant Differences (ESD) which would allow KMC to utilize an in-situ form of groundwater treatment known as a funnel and gate system. This system involves placing more porous soils to preferentially direct groundwater flow, and introducing air/oxygen, microbes, and nutrients if necessary so as to enhance biological degradation of organic contaminants within groundwater. The polycyclic aromatic hydrocarbon (PAH) content of the groundwater appears to consist of mostly 2-3 ring PAH compounds, which may be successfully treated by a biological approach. In contrast, the more complex 4-6 ring PAH compounds are more strongly associated with site soil. Such heavier compounds tend to resist biological attack. The funnel and gate concept is considered innovative. Accordingly, U.S. EPA will monitor treatment results to gauge treatment efficiency.

The Design calls for three tiers of two gates each where treatment will occur. Should results indicate that supplementary groundwater control measures may be necessary, U.S. EPA will require KMC to conduct further action. The funnel and gate system and in-situ treatment may provide an operation and maintenance cost advantage compared to other more conventional approaches. Given that the presence of residuals of free-product creosote may lengthen the time needed to accomplish groundwater management goals, which remain unchanged from the 1990 ROD, U.S. EPA believes it is appropriate to allow an innovative approach in this circumstance. In 1998, KMC finalized the design for the groundwater collection/treatment portions of the cleanup project, and the agencies indicated design approval subject to certain conditions. In November 1998, a small portion of the groundwater system remediation got underway with the construction of a pad to be used for temporary storage of some of the more contaminated soils that would require excavation during construction of the groundwater treatment system.

Quality assurance documents for the groundwater system installation were finalized in 1999. KMC and its design consultant selected principal construction contractors subject to agency approval as explained in the Consent Decree. In October 1999, field construction began. Primary installation steps included:

- Installing temporary structural sheet piling
- Excavating treatment gate areas
- Dismantling wells/piping associated with the free product recovery system
- Staging of more highly contaminated excavated soils in Staging Area #1; such soils are to undergo thermal desorption treatment along with certain other designated site soil areas. Less contaminated soils, which exceed naphthalene RCLs but not necessarily CPAH RCLs and are not contaminated with free product materials were put into Staging Area #2. (Pilot level evaluation of treatment of Staging Area #2 soils through biodegradation/landfarming is underway.)
- Preparing a blend of clean sand and other clean soils for gate backfill
- Collecting contaminated runoff with oil/water separation pretreatment followed by on-site sanitary sewer discharge or off-site hauling and disposal as necessary
- Grading gate areas after backfill
- Replacing temporary sheet piling with permanent Waterloo sheet piling
- Grouting the joints of the Waterloo sheet piling
- Pouring a concrete slab as a foundation for treatment building that was assembled on site.
- Drilling new injection wells for introduction of nutrient, air/oxygen, and/or microbe sources into the gate areas to enhance groundwater contaminant degradation.
- Drilling new monitoring wells to help determine gate performance and supplement existing monitoring wells to judge aquifer response in attaining goals
- Installing piping runs to convey nutrients from the treatment building to the individual gates.

KMC completed most of the construction phase in April 2000. However, the last three tasks noted above were delayed when KMC indicated that excessively wet site conditions prevented their completion. In response, U.S. EPA conferred with both its oversight contractor and with

WDNR, and sent KMC and its consultant several recommendations and suggestions on field techniques that could be employed to overcome this problem. KMC resumed construction in late May 2000. They completed injection/monitoring well installation first. Piping runs were then completed. By July 26, 2000, U.S. EPA's oversight contractor was able to report that all regrading had been accomplished, final inspection of the electrical connections had been made by the City of Milwaukee, and that all needed decontamination measures associated with groundwater system construction had occurred. Work is now ongoing to continue to develop dosage rates of nutrients/air needed for optimal performance. KMC submitted a QAPP addendum to develop a monitoring plan which will yield information on removal efficiency. After appropriate response to the agencies' comments, the addendum was approved.

Soils Treatment Phase

As discussed in the 1998 ROD amendment, the most highly contaminated soils at the Moss-American site are to undergo treatment utilizing thermal desorption. Initial design documents were received for review in 1999. After several iterations, the agencies conditionally approved the final design package in Spring 2000. During June 2000, KMC and their design firm solicited for bids to perform needed thermal desorption work. An opportunity for interested vendors to see the site was conducted June 13, 2000. Following review of bids received in July 2000, KMC awarded a contract for thermal desorption work on August 29, 2000. Before starting work on a full scale basis, proof of performance tests must be conducted in order to demonstrate that air emission goals will be attained and to refine operating conditions necessary to attain soil cleanup standards.

Soils which will be subjected to thermal desorption treatment include all soils that:
- contain free product
- exceed a total carcinogenic polynuclear aromatic hydrocarbon level of 78 mg/kg
- exceed groundwater residual contaminant levels (RCL) of 2.9 mg/kg for ethylbenzene; 1.5 mg/kg for toluene; 4.1 mg/kg for xylene(s); 5.5 ug/kg for benzene; 48 mg/kg for benzo(a)pyrene; and 100 mg/kg for fluorene
- exceed 100 mg/kg for naphthalene (Note - in this instance, the groundwater RCL is 0.4 mg/kg. However, KMC was able to demonstrate to the agencies that over 96% of the naphthalene loading in site soils was associated with areas having over 100 mg/kg of naphthalene. Hence, provided that the agencies can see that future groundwater monitoring shows a favorable trend in naphthalene levels, the agencies will accept pick up and treatment of naphthalene at the 100 mg/kg contour line. Once subjected to treatment, soils thus treated must attain 0.4 mg/kg naphthalene. Should subsequent groundwater monitoring not indicate a favorable improvement in naphthalene levels in groundwater, the agencies reserve the right to require stricter naphthalene contaminated soil cleanup.)

Design documentation indicates that a range of soil volume of from 42,000 to 66,000 cubic yards of contaminated soils may undergo thermal desorption treatment. Once begun, treatment duration time for this volume range is estimated to take from 4-6 months. As of the preparation

of this document, it is presumed that proof of performance tests will be conducted during September 2000, and that full scale application of thermal desorption will begin in October 2000.

At this time, we will note two other items regarding site soils management, although it will not be possible to discuss them fully until future five year review updates:

1. After soil treatment efforts take place, a subsequent step is appropriate containment of treated residuals, and containment of less contaminated soils not picked up in other site activity, such as earthwork which was necessary as a part of groundwater system construction. The 1998 ROD amendment allowed for containing such soils such that capping over areas resulting in direct contact exposure to total carcinogenic PAHs of levels higher than the residential exposure scenario of 1.9 mg/kg was possible, provided that deed restrictions to industrial or recreational exposure levels were obtained by KMC from the affected site property owner. In this case, the property owners in question are the Union Pacific Railroad, and Milwaukee County. In July 2000, these property owners provided U.S. EPA with copies of deed restrictions submitted for recording that allow for recognition of land usage other than residential on the Union Pacific property and on certain portions of County property associated with the site. Hence, the industrial and recreational exposure scenarios for cleanup of 3.1 mg/kg and 15 mg/kg, respectively, of total carcinogenic CPAH levels may be allowed for certain site areas as described in the deed restrictions. U.S. EPA will base future soil containment design reviews on the premise that cleanup to other than residential exposure scenario is acceptable.

2. The agencies have recently indicated approval of a work plan which would call for conducting a pilot test to determine if soils which have been picked up, but contain predominantly naphthalene and little of the heavier PAHs, might be candidates for treatment through biodegradation/landfarming so as to attain the naphthalene groundwater RCL. This pilot test is to be conducted in the field from August-November 2000, with results known by December 2000. Should the test be successful, then soils stockpiled in storage area #2, derived from groundwater system construction, and relatively high in naphthalene content but low in other heavier PAHs, may be managed through larger application of the biodegradation/landfarming technique. Should the pilot be unsuccessful, then thermal desorption activity would still be on-going, and storage area #2 soils would be treated using thermal desorption.

III. RECOMMENDATIONS

The performance of free product recovery steps triggered a clause in the Consent Decree which governs conduct of remedial design/remedial action work to commence quarterly sampling and analysis of the site groundwater monitoring network. I recommend that such quarterly data collection continue to evaluate the effectiveness of the soil excavation and treatment efforts and the groundwater funnel and gate system. Such effort should now be coupled with review of all pertinent data related to groundwater funnel and gate system performance, including such items

as nutrient and/or oxygen dosing necessary to bring about optimal performance, levels of change observed in groundwater quality as it passes through the treatment gates and the quality of the groundwater at the sides of the funnels to determine if all the contaminated groundwater is being captured by the funnels. Determination of soil naphthalene levels after soil treatment steps have been completed, coupled with observation of naphthalene levels in site groundwater, will be important to help determine if continued reliance on achieving the naphthalene RCL through a performance standard is warranted. I expect that the next five-year review report will be able to draw initial conclusions about the prospects for success in attaining ch. NR 140 groundwater cleanup goals. I understand that the agencies reserve the right to require adoption of contingency measures for collection and treatment of contaminated groundwater should it become apparent that the current means of funnel and gate usage is not performing adequately. Should such lack of adequate performance of the funnel and gate system become apparent prior to passage of a five year time interval from the time of signature of this review, then I recommend that the next such review be accelerated as necessary.

IV. STATEMENT ON PROTECTIVENESS

I certify that the remedies selected for this site remain protective of human health and the environment.

V. NEXT FIVE-YEAR REVIEW

The next five-year review will be completed by September 30, 2005, which is 10 years from the date on-site construction mobilization first began for free product recovery remedial action at the Moss-American site, and approximately five years after the preparation of this initial review. As discussed in the "Recommendations" section above, a review report may be prepared on an accelerated schedule should site conditions warrant.