EXPLANATION OF SIGNIFICANT DIFFERENCES

FOR THE
MOSS-AMERICAN SUPERFUND SITE
MILWAUKEE, WISCONSIN

The purpose of this document is to explain and justify changes to the conduct of a portion of the remedy for the Moss-American Superfund site. In brief, the changes involve the manner in which contaminated groundwater at the site is collected and treated, and the estimate of time for which collection and treatment may be required. For further details on the nature of the changes, please refer to Section IV herein, concerning the "Description of the Significant Differences and the Basis for the Differences."

I. Introduction

The eighty-eight acre Moss-American site includes the former location of the Moss-American creosoteing facility, several miles of the Little Menomonee River - a portion of which flows through the eastern half of the former wood preservation facility - and adjacent flood plain soils. The site is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin, at the southeast corner of the intersection of Brown Deer and Granville Roads, at 8716 Granville Road. Approximately 65 acres of the site are undeveloped Milwaukee County park land. Approximately 23 acres are owned by the Union Pacific (formerly the Chicago and Northwestern) Railroad, and used as an automobile and light truck transport, loading/unloading, and storage area.

The Statement of Work (SOW) for the Remedial Design and Remedial Action (RD/RA) work plan developed for the Moss-American site identifies polycyclic aromatic hydrocarbons (PAHs) derived from creosote as being the major contaminants of concern at the site. Contamination was found in the soils at the former wood preserving facility, in the groundwater associated with the site, and in sediments of the Little Menomonee River at and below the former wood preserving facility.

The lead agency for the remedial action at this site is the United States Environmental Protection Agency (U.S. EPA). The State of Wisconsin's Department of Natural Resources (WDNR) is the support agency for the conduct of remedial activities at the Moss-American site under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980 PL 96-510, 42 U.S.C. 9600, et seq., commonly known as Superfund. In September 1990 the U.S. EPA, with the concurrence of WDNR, issued a Record of Decision (ROD) which outlined the remedy selection process and the selected remediation for this site. This document provides a discussion of significant changes to the manner in which the selected remedy will be carried out.

II. Requirement to Address Significant Changes

As the lead agency, the U.S. EPA mav determine that a significant change to the selected remedy, as described in the ROD, is necessary after the ROD is signed. Section 117 (c) of CERCLA requires that after adoption of a remedial action plan, as described in a ROD:

- (1) if any remedial action is taken,
- (2) if any enforcement action under Section 106 is taken, or
- (3) if any settlement or consent decrees under Section 106 or Section 122 is entered into, and if such action, settlement, or decree differs in any significant respects from the final plan, the lead agency shall publish an Explanation of Significant Differences (ESD) and the reasons such changes were made. (42 U.S.C. 9617(c))

The U.S. EPA, in consultation with the WDNR, has determined that significant changes should be made to the manner in which the remedial action plan, as described in the ROD, is carried out. These necessary changes are discussed further in Section IV.

The ESD will become part of the administrative record file. This record is located in both the seventh-floor Records Center at U.S. EPA offices at 77 West Jackson Boulevard, Chicago, Illinois and at the information repository and administrative record available locally for this site at the Mill Road Library, which is located at 6431 North 76th Street, Milwaukee, Wisconsin. Opportunity for review is available during normal business hours.

III. Background

A. 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. Operations at a creosote plant might involve storage facilities for both creosote and fuels, a boiler used to make steam to heat the creosote and aid in application to the wood through usage of heat and pressure, incoming timbers unloading/storage, transportation of timbers to the creosote application facility by rail car, and subsequent storage in a drying area. After these processes were complete, the treated timbers could be shipped to customers. Potential for release of materials exists throughout the storage, application, and drying processes.

Kerr-McGee Chemical Corporation (KMCC) 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.

For a time, 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.

KMCC cleaned out eight former settling ponds and dredged about 1700 feet of river to remove creosote-contaminated soil and sediment.

In 1983, the facility was placed on the National Priorities List (NPL) pursuant to Section 105 of CERCLA. Following discussions with potentially responsible parties concerning performance of a Remedial Investigation/Feasibility Study (RI/FS), U.S. EPA determined in 1987 that it would conduct such study.

Following development of the 1990 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 in Milwaukee. This agreement calls for implementation of the remedy as set forth in the ROD by the KMCC. The decree was entered by the Court in March 1996. KMCC had previously moved on with the accomplishment of certain tasks called for in the SOW and made a part of the decree. One such task involved verifying the presence and extent of free-product residues of creosote associated with soils just above the groundwater table, or as "pools" collecting at the soil/groundwater interface.

B. Summary of Site Contamination Regarding Groundwater

Indications of groundwater contamination were greatest at monitoring wells 4S and 8S as collected during the course of the RI. Well 4S is located near the former wood treating plant's processing and drip tracks. Well 8S is several hundred feet to the east of well 4S and is near the Little Menomonee River. Contaminants at well 4S found in the greatest concentrations were naphthalene at 5500 ug/l, phenanthrene at 2000 ug/l, and acenaphthene at 1400 ug/l. Free product was observed at well 8S. Relatively small concentrations of xylene and ethyl benzene, about 45 and 27 ug/l, respectively, were also detected at monitoring well 4S. These compounds are sometimes referred to as the BTEX class of compounds.

In 1994, pre-design monitoring efforts conducted at the site attempted to deal with the questions of whether there was significant groundwater contamination on the east side of the Little Menomonee River, as well as degree of interconnection between shallow aquifers on the east and west sides of the Little Menomonee River. Findings indicated that although there is a connection between aquifers on either side of the river, there was negligible groundwater contamination to the east of the river. Hence, groundwater remediation efforts will focus on the west side of the river. Pre-design monitoring efforts, conducted in June and September of 1994, indicated that the

two most contaminated wells were monitoring wells 4S and 7S. Well 7S is located slightly south of the railroad tracks and west of the Little Menomonee River near the northern edge of the site. Naphthalene was the leading contaminant in both wells, occurring at a level of 1100 ug/l in well 4S and 3000 ug/l in well 7S.

C. ROD Provisions

The Record of Decision (ROD) for the site was signed on September 27, 1990. The ROD addressed the collection and treatment of contaminated groundwater, excavation and treatment by soil washing/bioslurry techniques of more highly contaminated soils and sediments, consolidation of the treatment residuals with and containment of other contaminated soils, and the creation of a new river channel with subsequent filling in of the existing channel. The ROD envisioned some flexibility in groundwater treatment by providing the option of using granular activated carbon or a comparable method demonstrated in the predesign phase to remove semi-volatiles in the description of the design of the treatment system at page 16. However, it is specified that contaminated groundwater would be collected by a series of supplemental drains, leading into an interceptor drain, and that a vertical barrier would be placed along the east wall of the main drain trench to prevent discharge to and recharge from the river (pp. 16 and 39) and did not provide an alternative to oil water separation for removing nonaqueous phase liquids (p.16).

Since signing the ROD, the U.S. EPA and the WDNR have determined that there is a need to make changes in the execution or conduct of the remedy with regard to groundwater. These changes are discussed in the following section.

IV. Description of the Significant Differences and the Basis for the Differences

A. Description

As described in the ROD, site groundwater problems were to be addressed by installing a system of drains on the west side of the Little Menomonee River, and having these drains lead to a collection sump. A vertical barrier was to be placed to the east of the main collection system so as to preclude discharge of contaminated materials into the river as well as prevent river recharges from reaching the collection system. The ROD also envisioned usage of an extraction system to aid in groundwater collection, as evidenced by language on page 37 of the ROD.

Collection/treatment of free-product which may have moved with the groundwater was to be provided by usage of an oil-water separator. It should be noted that the original ROD did not emphasize means of optimizing free-product recovery. Once sufficient quantity was collected, such free-product material was to undergo incineration. Granular activated carbon was to be used to remove other organic contaminants.

The alternative selected in the ROD also envisioned addressing risks posed by soil contamination through a combination of treatment and containment of residuals derived therefrom plus lesser contaminated soils. Containment was to have consisted of a relatively permeable soil cap.

A perceived advantage of the combination of soils treatment plus usage of a relatively permeable cover was that a flushing action would be promoted through the remaining soil mass, such that contaminants would be flushed into and removed from the site groundwater within a relatively short time - on the order of 10 years. Alternatives that featured only containment, or treatment followed by soils containment using an impermeable type cover were estimated to require at least an order of magnitude longer in order to restore the contaminated aquifer at the site.

Both the ROD and the RD/RA SOW made allowance for modification of groundwater treatment system with a demonstrated alternative (ROD at p.16, SOW at p. 5). The SOW echoed the flexibility of the ROD and provided the added opportunity to demonstrate during the predesign that an alternative collection and treatment system will be equally as effective and reliable (SOW at p. 5).

What the ROD did not appear to contemplate was the added challenge posed to groundwater management through the presence of significant, extractable deposits of free-product creosote. The means of groundwater collection and treatment on which design now focuses is a method known as the funnel and gate system. Basically, a funnel and gate system would redirect groundwater flow through usage of sheet piling driven into a silty clay till confining soil layer underneath the contaminated aquifer. Sections of piling would be interconnected and sealed. Flow would be directed to open parts of the funnels, called "gates", where in place degradation of organic contaminants would occur. Treatment would be accomplished by introducing air and nutrients within the gates. Air and nutrients are expected to facilitate the growth of indigenous bacteria in the treatment zones. The bacteria would degrade the organic contaminants, facilitating their removal from the groundwater flowing through the gates.

B. Basis

In 1994, technical consultants working on behalf of the KMCC conducted predesign field work which noted the presence of extractable quantities of free product creosote on a portion of the site some 9-10' below the ground's surface. KMCC is a signatory party to the RD/RA Consent Decree, along with U.S. EPA and WDNR.

Based on the predesign results, U.S. EPA issued correspondence to Kerr-McGee requesting that initial priority be given in removing the free product and to begin the overall design for the groundwater collection/treatment portions of the cleanup project. At this point, removing the free product consists of installation of several extraction wells, conductivity probes to distinguish between creosote materials and groundwater, and storage vessels for creosote materials and predominantly water waste. During the 1995-1996 operating seasons, approximately 3100 gallons of free product creosote was collected and removed from the site. Subsequent attention

may be given to consideration of steps to supplement or enhance free-product collection. U.S. EPA notes that free product creosote constitutes a subset of a class of contaminants known as "dense nonaqueous phase liquids," or DNAPLs.

Compared to the means of groundwater management as originally described in the ROD, the funnel and gate system may offer certain advantages. While exhibiting certain heterogeneity, soils at the Moss-American site generally tend to be relatively fine-grained. This condition tends to lead to relatively slow groundwater movement; hence there would appear to be opportunity for adequate time for contaminant treatment as water is directed through a given gate. Design information indicates that once optimum nutrient/air dosages are established, that groundwater contaminants such as those that occur at the Moss-American site may undergo effective aerobic degradation.

Basically, a funnel and gate system would redirect groundwater flow through usage of sheet piling driven into a silty clay till confining soil layer underneath the contaminated aquifer. Sections of piling would be interconnected and sealed. Engineered soil media (gates) would be introduced so as to preferentially direct groundwater flow. Treatment would be accomplished by introducing air and nutrients in-situ in the zones of preferential groundwater flow so as to bring about the biological reduction of BTEX and PAH compounds in the groundwater.

Design envisions two parallel lines of funnel and gate systems eventually in operation. The western most line would be placed near the boundary line between Railroad and County property. Another line would run roughly parallel to the Little Menomonee River, just west of the river. An effective monitoring scheme consisting of several groundwater wells is an essential part of the system as well.

Design information available to U.S. EPA and WDNR recommends that a pilot-scale system be constructed at the site prior to full-scale implementation, consistent with predesign tasks 19 and 20 of the SOW, so as to evaluate the short-term performance of the treatment system and to provide for improvements as may be necessary in full-scale application. U.S. EPA and WDNR believe opportunity for such demonstration is appropriate. Should unforeseen difficulties arise in such matters as adequate capture of contaminated groundwater or sufficient removal efficiency in dealing with site groundwater contaminants, U.S. EPA and WDNR would seek other approaches to groundwater management.

During the course of the pilot work, the funnel and gate system would attempt to develop those conditions of oxygen and nutrient addition necessary to bring about optimum performance. One gate would be operated as a "control" gate to serve as a baseline comparison to the active treatment gates. No oxygen enhancement nor nutrient addition would occur at the control gate. A second gate would be subdivided into two smaller "active" gates where varying dosages of oxygen and nutrients would occur for comparison and system optimization.

Velocity of groundwater flow through the gates should be low enough so as to allow for

sufficient treatment. In order to help prevent free-product migration into the treatment gates, it is proposed to install engineered sumps on the upgradient side of the gate. An extraction system similar in concept to the currently operating free-product removal system could be activated and operated so as to remove and manage any residual free-product thus collected.

Performance monitoring of the pilot system would be necessary to evaluate the effectiveness of the treatment gates in bringing about biodegradation of groundwater contaminants, and in ensuring that the system properly bounds the groundwater contaminant plume and directs it toward the treatment gates. A system of upgradient, in-gate, side gradient and downgradient monitoring wells is envisioned for such purposes. Parameters to undergo periodic evaluation would include, but not necessarily be limited to, such constituents as oxygen-demanding substances, BTEX compounds, and PAHs.

As noted elsewhere in this document, effective DNAPLs management, in terms of efficient recovery, is now seen as an important element of overall groundwater management.

KMCC has proposed to conduct the pilot-scale evaluation of the system for 18-24 months. (This time estimate is based on the relatively low hydraulic conductivity of the site soils and groundwater flow velocity.) U.S. EPA and WDNR believe this may be an excessively long period of time for this type of work, and will work with KMCC to complete the evaluation in a shorter time frame, if possible.

The ROD contains a remedial goal of preventing contaminated groundwater from migrating from the site into the Little Menomonee River. Currently available information, including predesign investigation efforts to define the extent of contamination, on the site conditions appears to show evidence of contaminated groundwater and possibly DNAPLs migrating into the Little Menomonee River. The most recently available groundwater data for the site is a November 1996 sampling event. This data indicates that in some monitoring wells the contaminant levels exceed groundwater standards for the site (ARARs). The agencies must be assured that during the course of funnel and gate groundwater treatment no discharge to the Little Menomonee River that exceeds groundwater standards or contains DNAPLs. Qualitative observation during the 1994 prc-design work noted the presence of a sheen on the river which may be attributable to the movement of DNAPL into the river. Since that time, a free-product collection system has been installed. However, the operation of this system is on a seasonal basis. While some free-product extraction wells showed evidence of diminishing product layer thickness as 1996 progressed - notably wells PW-1 and PW-3 - this trend was not uniform. There has been no consistent, ongoing groundwater monitoring effort at the site to determine with certainty if contaminated groundwater and/or DNAPLs are entering the river. Hence, there appears to be the need to conduct further groundwater monitoring to confirm if this is occurring. To resolve this matter, KMCC will be asked to conduct a further investigation of groundwater conditions, with the installation of additional monitoring wells and a geoprobe (temporary probe monitoring wells) investigation, existing nested/clustered monitoring well review and additional groundwater monitoring. The purpose of this investigation would be to shed more light on DNAPL presence

at depth, and to determine if DNAPL and/or contaminated groundwater are entering the river. The exact scope of the investigation would be worked out in advance with appropriate U.S. EPA and WDNR hydrogeology specialists. This groundwater investigation will be conducted as soon as possible. The agencies will require that, if necessary, based on the results of the additional groundwater investigation, the pilot groundwater action be designed so as to prevent such migration, if it is confirmed to exist. This containment effort, if required, would begin at the time the pilot scale evaluation begins, and would continue during the evaluation. It may be necessary to continue to design and operate such a containment system as part of the full scale groundwater remediation system.

One possible way to augment and supplement funnel and gate treatment would be to install a system of sumps at certain points if the area of the groundwater/DNAPLs problem is relatively small. If the problem is broader, then another possible design to contain the contaminated groundwater and DNAPL is to construct the funnel parallel to the Little Menomonee River and cover (or "plug") the gates so the funnel acts as a containment wall. Hydraulic controls, likely in the form of groundwater trenches, would be installed on the upgradient side of the wall. Contaminated groundwater and free product from this collection system would be managed appropriately, either through treatment and discharge to the sanitary sewer or to the River after appropriate discharge standards are met, or by hauling the liquid wastes to an approved hazardous waste management treatment, storage or disposal facility.

Design information indicates that capital construction cost for the funnel and gate system described above is nearly identical to those for the more conventional groundwater treatment approach discussed in the ROD. However, operation and maintenance costs for the funnel and gate approach appear to offer a considerable cost advantage in comparison to the conventional approach. Since the presence of a larger quantity of free product creosote than anticipated by the ROD may complicate groundwater management on at least a portion of the site, and offer the potential for a considerably longer period of time in which groundwater collection and treatment must occur, differentials in operation and maintenance costs take on increasing importance.

U.S. EPA does not propose to modify overall groundwater management goals for the site at this time. U.S. EPA continues to believe that attainment of applicable or relevant and appropriate regulations (ARARs) regarding groundwater quality are important for the Moss-American site. Information is needed to show whether this revised approach will achieve groundwater restoration goals in a suitable timeframe. Therefore, one of the goals of the pilot-scale work is to show if the revised approach will meet state and federal groundwater ARARs. Should the pilot work show that the approach will not achieve those standards, a revised approach will be developed that will meet such standards.

U.S. EPA believes that adoption of the funnel and gate means of groundwater collection and treatment merits serious consideration and opportunity for demonstration of usage on a full-scale application based on the expected reduced operating costs of this system, and the potential need to require operation of this system on at least a portion of the site for a longer period of time than

originally predicted by the ROD, due to the presence of a relatively large amount of free-product creosote.

DNAPLS pose a particular challenge to groundwater management in that they are not dissolved within groundwater, may act as continuing sources of groundwater contamination, and may have movement patterns different from the overall aquifer. DNAPLs may migrate into less-accessible regions of the aquifer, or may tend to adhere to certain soils, and only slowly desorb into groundwater so as to allow capture. It is expected that the proposed funnel and gate system, with proper design elements, in conjunction with the current or expanded free product recovery system, will contain and remove the DNAPL at the site. It is expected that the design will assure that the DNAPL will not enter the treatment gates, which would likely cause problems with their operation.

V. Affirmation of the Statutory Determination

Considering the new information that has been developed and the change which may be required in the execution of the selected remedy, the U.S. EPA and the WDNR believe that this change is protective of human health and the environment, complies with state and federal requirements that are legally applicable or relevant and appropriate to this remedial action and is more cost effective. In addition, this revised remedy approach continues to utilize permanent solutions and treatment technologies to the maximum extent practicable for this site.

VI. Support Agency Comments

The WDNR, as the support agency, has had an opportunity to comment on this ESD. WDNR comments have been addressed and WDNR concurs with the modification to remedial action as described in this ESD.

VII. Public Participation Activities

The ESD will be added to the administrative record for the Moss-American site. U.S. EPA and WDNR will prepare a Fact Sheet type summary of this ESD for distribution to those persons already on the Moss-American site mailing list, and other interested parties. The Fact Sheet will note that if members of the public would like to discuss Moss-American site issues pertaining to this ESD at greater length, they should contact the staff members noted in that document. U.S. EPA and WDNR will monitor the results of funnel and gate system pilot-scale work, and will provide interested persons with a summary of such findings before making recommendations as to full-scale utilization of the funnel and gate groundwater management approach for the Moss-American site.

Wm. E. Muno

4/29/97

William E. Muno, Director
Superfund Division
U.S. Environmental Protection Agency

Date