SUPERFUND RECORDS CTR
Site: McKin OU2
Break: 5.4
Other: 14952

MCKIN COMPANY SUPERFUND SITE

OFF-SITE OPERABLE UNIT

FINAL DRAFT AMENDED RECORD OF DECISION

March 2001

U.S. Environmental Protection Agency - Region I

New England

MCKIN OU2
5.4
14952

DECLARATION FOR THE RECORD OF DECISION AMENDMENT

McKin Company Superfund Site
Gray, Maine

STATEMENT OF PURPOSE

This Decision Document presents the selected remedial action for the McKin Company Superfund Site in Gray, Maine developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601 et. seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 C.F.R. Part 300. The Director of EPA-New England Office of Site Remediation and Restoration has been delegated the authority to approve this Record of Decision (ROD) Amendment.

The State of Maine has concurred with the selected remedy.

STATEMENT OF BASIS

This decision is based on the Administrative Record which has been developed in accordance with Section 113(k) of CERCLA and which is available for public review at the Gray Public Library, Gray, Maine, and at the EPA-New England OSRR Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix B to the ROD Amendment) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

This ROD Amendment changes the remedy originally selected in the 1985 ROD for the off-site groundwater operable unit. This ROD Amendment does not include any surface water remedial action because EPA's risk assessment concluded that the surface water did not present an unacceptable human health or ecological risk either under current conditions or under a potential future use as a drinking water source.

The major components of the selected remedy include:

- Institutional controls to prevent the use of contaminated groundwater through a town zoning ordinance and restrictive covenants;

- Long-term monitoring of site groundwater and surface water on a regular basis to evaluate changes in site conditions over time. This long-term monitoring includes the installation of perimeter monitor wells to enhance the existing monitoring network;

- Contingencies for future action should the long-term monitoring reveal that contaminants have not decreased to State Water Quality Criteria in the Royal River by the agreed-upon date and river location (year 2009 at the downstream sampling location; year 2013 at the end of the contaminated groundwater discharge zone); and

- A review of the Site every five years to ensure that the remedy remains protective of human health and the environment.

In addition, as part of the selected remedy, EPA is waiving the attainment of federal and state drinking water standards which are applicable or relevant and appropriate requirements (ARARs) at this Site. EPA is waiving attainment of these ARARs on the basis that it is technically impracticable from an engineering perspective to restore groundwater to drinking water standards within a reasonable time frame.

DECLARATION

The selected remedy is protective of human health and the environment, attains or provides the basis for a waiver of federal and state requirements that are ARARs for this remedial action, and is cost-effective. EPA has determined that it is technically impracticable from an engineering perspective to attain federal drinking water standards at this Site, and is thus waiving attainment of these ARARs. Given the technical impracticability of restoring the groundwater, and that no active measures are necessary to contain the contaminated groundwater, this remedy does not satisfy the statutory preference for remedies that utilize treatment as a principal element to reduce the toxicity, mobility, or volume of hazardous substances. In addition, given these circumstances, EPA finds that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

As this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

3/30/2001
Date

Patricia L. Meaney, Director
Office of Site Remediation and Restoration

Table of Contents

Figures

Tables

Appendices

MCKIN COMPANY SUPERFUND SITE
OFF-SITE OPERABLE UNIT
AMENDED RECORD OF DECISION
March 2001

I. SITE NAME, LOCATION, DESCRIPTION AND RATIONALE FOR AMENDMENT

SITE NAME: The McKin Company Superfund Site.

SITE LOCATION: The McKin Superfund Site is located in Gray, Maine (Figure 1). The seven-acre McKin property is located on Mayall Road in a predominately residential neighborhood. The McKin Site, as defined by the presence of contamination which has spread beyond the property, encompasses approximately 660 acres of commercial, residential, agricultural, and undeveloped properties.

SITE DESCRIPTION: The McKin facility operated from 1965 to September 30, 1977 as a tank cleaning and waste removal business and as a transfer facility for waste oil and industrial process waste. Waste handling facilities included twenty-two above-ground storage tanks. In 1972, the company expanded with the addition of an asphalt-lined lagoon and an incinerator to handle a large volume of oily waste from a oil spill in Casco Bay. A McKin representative estimated the facility processed 100,000 to 200,000 gallons annually. The incinerator was primarily operated for the disposal of oil impregnated refuse from the oil spill and was used for two to three years. Prior to its use as a waste facility, the property was used intermittently as a sand and gravel borrow pit.

In 1973 and 1974, local residents began noticing chemical odors and offensive tastes in their well water as well as discoloration of laundry and notified the Town of Gray's Code Enforcement Officer. Over the next few years, health-related complaints were made by nearby residents. Epidemiological studies conducted in 1983 noted a high incidence of miscarriages in the East Gray area but could not determine whether these or other health issues were causally related to the Site because of the relatively small study population.

In the mid-1970s, laboratory analysis of groundwater samples from residential wells indicated unidentified organic compounds. In 1977 trichloroethylene and 1,1,1-trichloroethane were identified in the samples. On September 30, 1977 the facility was closed by order of the Town of Gray Code Enforcement Officer and in December 1977 the Town issued a clean-up order to the

McKin Company. Also in December 1977, sixteen private wells were ordered to be capped and emergency water supplies were brought into the community. In August 1978, affected homes were connected to the public water supply system which was extended into the East Gray area to serve these homes.

The following summer Maine Department of Environmental Protection (Maine DEP) removed approximately 33,500 gallons of liquid wastes from the above-ground tanks and began further investigative work. In April 1983 Maine DEP contracted to have all remaining above-ground tanks, barrels, and containers cleaned and removed from the facility and this was completed in September 1983. EPA listed the Site on the National Priorities List on September 8, 1983, designating it formally as a Superfund Site.

RATIONALE FOR AMENDMENT: On July 22, 1985, EPA, with concurrence from the Maine DEP, and in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC §§ 9601 *et seq.*, issued the Record of Decision ("ROD") for the McKin Site (USEPA, 1985). As described more fully below, the ROD selected remedies for source control and off-site groundwater restoration.

Under the ROD, the remedial action objective for the off-site groundwater was to restore the surficial aquifer and upper bedrock to drinking water quality. It was estimated that restoration could be achieved in five years, assuming source control was performed. This was based on a twenty-five extraction well system with surface water discharge, the cost of which was estimated to be $3,128,000. By the mid-1990s, it became apparent to EPA that this remedy would not restore the off-site aquifer within a reasonable time frame, necessitating an amendment to the ROD to select a different remedy for off-site groundwater. This ROD Amendment is issued in accordance with Section 117 of CERCLA 42 U.S. C. §9617, and Section 300.435(c)(2)(ii) of the National Contingency Plan ("NCP").

In working towards selection of an alternative remedy, EPA, Maine DEP and the private parties responsible for implementing the original off-site groundwater remedy under a 1988 settlement with EPA and Maine DEP (the "Settling Parties") engaged in mediated discussions which also included representatives of the Town of Gray, Maine, the Gray Water District, and interested community members. In September 1997, a community group comprised of individuals representing various interests within the community and the Royal River watershed joined the mediation. This group, the McKin Superfund Site Citizens' Advisory Group (SAG), provided an independent voice for the community's interests during the mediation as well as independent technical review of documents developed by the Settling Parties and by EPA.

Working with the mediation group, EPA agreed to study other options for addressing human health risks from groundwater and exceedance of Maine's State Water Quality Criteria ("SWQC") in the Royal River. This ROD Amendment addresses changes to the original 1985 ROD which are a result of both community input and additional research into plume containment alternatives for the Royal River.

This ROD Amendment and the documents which form the basis for the Amendment are available at the following Information Repositories:

EPA Records Center
1 Congress Street, Suite 1100
Boston, MA 02114-2023
(617) 918-1453
Hours: 10 a.m.-noon
2 p.m.-5 p.m.

Gray Town Public Library
Hancock Street
Gray, Maine 04039
(207) 657-4110
Hours: Tues - Wed: noon to 8 p..
Thurs: 8 a.m. to noon
Fri: 10 a.m. to 6 p.m.
Sat: 10 a.m. to 3 p.m.

Maine DEP
Ray Building
Hospital Street Augusta, Maine 04333
(207) 287-2651
Hours: (by appointment)
Mon - Thurs: 8:30 a.m to 12:30 p.m.
12:30 p.m. to 4:30 p.m.
Friday: 8:30 a.m. to 12:30 p.m.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Details of the earlier Site History and Enforcement Activities are presented in the 1985 ROD. The following is an update to the Site History and Enforcement Activities which have occurred since issuance of the ROD.

On May 22, 1985, EPA issued the ROD which set forth the selected remedy for the Site and the rationale for it. The selected remedy included on-site soil aeration, excavation of contaminated debris and buried drums with off-site disposal, and off-site groundwater extraction and treatment. In extracting groundwater from the surficial aquifer and in the uppermost portion of bedrock, the ROD sought to (*i*) reduce flow of contaminated groundwater to the bedrock aquifer; (*ii*) actively treat the surficial aquifer; (*iii*) treat a substantial portion of the bedrock aquifer; and (*iv*) restore, within a reasonable time and practical limits, the off-site aquifer to the ROD-established performance standards. Those performance standards were 28 µg/L (micrograms per liter, or parts per billion, ppb) for trichloroethylene (TCE) and 92 µg/L for 1,1,1-trichloroethane (TCA)

In 1988, the United States, the State of Maine, and 309 Potentially Responsible Parties ("PRPs") entered into a Consent Decree under which the PRPs agreed to reimburse the governments for certain past and future response costs and for natural resource damages, and to perform the

remedial actions selected in the ROD. The court approved and entered this Consent Decree on November 27, 1988.

During the early to mid-1990s, several changes were made to the remedy, although the fundamental nature of the remedy remained unchanged. In September 1990, EPA altered the discharge method of treated groundwater from surface water discharge to on-site reinjection. EPA issued an Explanation of Significant Differences explaining this change. (USEPA, 1990) Three amendments to the Appendix A to McKin Consent Decree, Remedial Action Work Plan were made in the early-to mid-1990s to reflect concerns regarding the feasibility of restoring off-site groundwater to drinking water standards.

As part of off-site groundwater treatment requirements under the Consent Decree and the ROD, the Settling Parties constructed a four-well groundwater extraction and treatment system ("GETS") west of Mayall Road. Full-time operation of the GETS began in April 1991. The Settling Parties were required to submit an evaluation of the performance of the groundwater remediation system within fifty-six months of operation of the GETS. In late 1995, EPA and Maine DEP agreed to a proposal by the Settling Parties that they submit a Technical Impracticability ("TI") Evaluation Report in place of the fifty-six month report. The agencies also agreed to a suspension of the GETS. The Settling Parties submitted two revisions of their initial TI report, but after several months of discussions between the Settling Parties and the agencies, EPA proposed that resolution of this issue be attempted through mediation. In May 1997, mediated discussions began and were opened to include the Town of Gray, the Gray Water District and interested community members.

As a result of the mediation, EPA agreed to prepare a Technical Impracticability Evaluation ("TI Report") and to amend the 1985 ROD based on that evaluation. The January 2001 TI Report documented that aquifer restoration within a reasonable time frame was not technically feasible. The TI Report also documented that TCE concentrations in Boiling Springs, an area of springs located next to the Royal River, did exceed human health and ecological risk levels. The Report further concluded that while containment of the plume prior to its discharge into the Royal River was feasible, the low TCE concentrations present in the River did not constitute an unacceptable ecological or human health risk, and that the State Water Quality Criteria could be met within four to six years. These conclusions were based on groundwater and surface water data which indicated decreasing concentrations in both media.

III. COMMUNITY PARTICIPATION

This ROD amendment meets the criteria for community involvement specified in Sections 300.435(c)(2)(ii)(A) through(H) of the NCP.

Community participation in the decision-making process has always been and continues to be at a high level for this Site. Several meetings were held in 1985 to discuss the RI/FS and proposed

alternatives for the Site. Extensive comments were made during the public comment period (see pages 8-10 of the 1985 ROD, and its Final Responsiveness Summary, including Attachment A for details). EPA provided periodic site updates as the Source Control activities occurred and during the design and implementation of the GETS. Additionally, because the Settling Parties included a large number of small businesses, churches, and school districts, Site updates were often presented in the Portland newspapers.

The mediation, which began in 1997, included representatives of local government and the community, including property owners who could be affected as the direction of the remedy moved from active reduction of toxicity in the groundwater to elimination of public exposure to the contamination. Community members living and working within the area impacted by the Site contamination were solicited for their participation. Within two months of the first mediation meeting, EPA approved an application for a Technical Assistance Grant to a community group (SAG) comprised of individuals representing various interests within the community and watershed.

The primary consideration in the mediated discussions was how to achieve protectiveness of remedial actions at the Site if the GETS as implemented was not going to restore the off-site aquifer within a reasonable time frame. Through their participation in the mediation process, community members were informed of the possible options, and had the opportunity to express their concerns and ideas regarding the available options. The involvement and cooperation of the affected property owners was critical to the success of the mediation effort.

In September 2000 EPA published a Proposed Plan to amend the 1985 ROD. (USEPA 2000) The Proposed Plan called for institutional controls to prevent exposure to contaminated groundwater, covering Boiling Springs to prevent contact by wildlife and people, long-term monitoring of groundwater and the Royal River, and a contingency response approach if the River does not attain SWQC within a specified time frame. The amended cleanup plan was recommended because EPA believed it offered the best balance among the nine criteria required to be reviewed under the NCP, including the protection of human health and the environment. EPA held a public informational meeting on September 27, 2000 and a formal public hearing on October 18, 2000. The public comment period ran from September 27 to October 27, 2000. All formal comments received on the September 2000 Proposed Plan and the Technical Impracticability Report are summarized and responded to in the Responsiveness Summary, which is included as Appendix A of this ROD Amendment.

Pursuant to Section 300.825(c) of the NCP, EPA updated the Administrative Record in September 2000 to add the documents which EPA relied on to form the basis for the decision to modify the response action for the McKin Site.

IV. SCOPE AND ROLE OF OPERABLE UNIT

The McKin Company Superfund Site has been divided into two operable units, or phases of Site cleanup: The On-Site Source Control Unit, which is Operable Unit 1, and the Off-Site Groundwater Restoration Unit, which is Operable Unit 2. The 1985 ROD addressed both operable units. Operable Unit 1 was completed in 1987; this ROD Amendment pertains to Operable Unit 2.

The off-site operable unit consists of three areas: first, where groundwater contamination is known to be present, based on ongoing groundwater monitoring in the overburden soils and shallow bedrock; second, where groundwater contamination is inferred, based on flow paths, monitoring well data, and historic residential well data; and third, where groundwater contamination could be drawn if new pumping wells are installed. Combined, these three areas comprise the Institutional Control Zone (Figure 2).

The first area includes the overburden and shallow bedrock groundwater beneath the McKin facility and downgradient properties in the Mayall/Depot Road triangle, the eastern plume which discharges into the Royal River, and the northern plume which flows toward Collyer Brook. The second area includes the deep bedrock beneath the overburden plumes, extending to Collyer Brook near its confluence with the Royal River, the area between the two overburden plumes, and the deep bedrock beneath the eastern plume. The third area includes properties adjacent to the first two where it is considered possible that contamination may be induced should a pumping well be installed. The scope of this area was determined based on groundwater gradients and the site conceptual model which theorized that the northern plume was induced/ extended by pumping of residential wells along Depot Road. Together these three areas total close to a thousand acres.

V. DESCRIPTION OF CHANGES TO THE 1985 ROD

DESCRIPTION OF 1985 REMEDY

The remedy selected by the 1985 ROD was developed to satisfy the following six remedial action objectives (RAO):

1. maintain safe drinking water for the population that could be affected by the groundwater contamination;

2. prevent exposure of the public to inhalation of harmful amounts of airborne contamination;

3. prevent skin contact or ingestion of contaminated soil by the public;

4. prevent the subsurface discharge of contaminated groundwater from the Site to off-site aquifers;

5. restore, within a reasonable time and practical limits, the off-site groundwater in the overburden soils and shallow bedrock that had been contaminated by groundwater moving out from the McKin facility; and

6. protect State-designated Royal River surface water uses and aquatic life in the River.

The first RAO was achieved in the short-term in August 1978 when the public water supply system was extended into the East Gray area. At the time of the 1985 ROD, the expectation was that the off-site groundwater would be restored in five years through active extraction and treatment. EPA therefore did not require any institutional controls to prevent exposure to contaminated groundwater, but requested "the State and Town to take measures to ensure that the contaminated aquifers are not to be used as a water supply during the period of aquifer restoration" (page 26 of the 1985 ROD).

The second and third RAO were to be achieved through the performance of the remedy selected for the on-site operable unit. The design and specifications for this were completed in 1986 (Canonie Environmental Engineers, 1986) and called for the following major activities:

- On-site aeration of soils in Site areas of identified hazardous substance contamination to achieve soil quality levels protective of public health and the environment;

- Off-site disposal of drums found on the Site and their contents; and

- Performance of soil test in petroleum contaminated areas to further characterize the nature of petroleum contamination to be followed by the same treatment as that noted above.

The last three RAO were to be achieved through the performance of the remedy selected for the off-site operable unit. Following amendments to the Statement of Work, Appendix A of the Consent Decree, these RAO were to be approached through a phased effort where a groundwater extraction and treatment system would be installed first in the area west of Mayall Road and evaluated for its effectiveness. Subsequent to this evaluation, the decision would be made whether expansion of the GETS to the eastern side of Mayall Road would occur. The design and specifications for the first phase were completed in December 1989 (Sevee & Maher Engineering, December 1989) and called for the following major activities:

- Installation of a four-well groundwater extraction and treatment system (GETS);

- Construction of an on-site infiltration system consisting of two separate trenches to recharge the treated groundwater into the subsurface, aiding in the flushing of contaminants; and

- Quarterly monitoring of groundwater and surface water for VOCs.

This ROD amendment addresses the long-term effectiveness and permanence for the first RAO, changes the fourth and fifth RAO, and sets up monitoring and a contingency response approach for the final RAO.

1985 REMEDIAL ACTIVITIES COMPLETED TO DATE

The first three RAO specified in the 1985 ROD have been achieved. The extension of the public water supply, as noted above, was completed in 1978 and has since provided a safe drinking water supply to the population which otherwise would be at risk from contamination present in the overburden and bedrock aquifers in the East Gray area.

From July 1986 to February 1987, a group of PRPs undertook the source control remedial action. Approximately 9,500 cubic yards of VOC-contaminated soil from five locations and the lagoon were excavated. The excavations ranged from five to forty-two feet below the ground surface, stopping either when the performance standard had been reached or the water table was reached. These soils were processed through a low temperature thermal desorption system in an enclosed environment. Following sampling which demonstrated that the Record of Decision performance standard of 0.1 mg/kg (or 0.1 ppm) for TCE for treated soil had been attained, the soils were mixed with water and cement and backfilled. Excavation continued outward toward the property perimeter until soil TCE concentrations were below 1.0 ppm, the performance standard set during remedial action for excavation.

From November 1986 to April 1987, approximately 2,500 cubic yards of petroleum-contaminated soil from four locations were excavated and similarly treated, sampled, and backfilled. Final perimeter sampling of the excavations indicated concentrations were less than 1.0 ppm of polycyclic aromatic hydrocarbons and total extractable hydrocarbons.

Laboratory tests of samples collected from the perimeter of the excavation demonstrated that the excavation had removed all of the contaminated soil to the performance standards set in the ROD. Testing of the soils after treatment demonstrated that the soils had been successfully cleaned to the same standards. This action eliminated the risk to public health from contact with the soil.

A more complete description of the source control activities can be found in the Canonie Environmental Engineers October 1987 Addendum to Soil Remediation, Site Closure.

The last three RAO specified in the 1985 ROD have not been achieved following the implementation of the GETS. Although the GETS design projected a flow rate of 20 gpm from Extraction Well EW-503, once installed and in operation, it averaged only 1-2 gpm. Consequently its zone of influence was considerably restricted and as EW-503 was the only extraction well situated in the main (eastern) plume, it had little impact on VOCs migrating toward the Royal River.

In July 1993, the Settling Parties submitted a report on the viability of expanding the GETS east of Mayall Road. This report included computer modeling simulations estimating the effect on the eastern plume by several possible systems of additional extraction wells. This groundwater modeling indicated that regardless of the number or location or orientation of additional extraction wells, none of these systems would restore the aquifer faster than natural attenuation, which was projected to be greater than two hundred years. Therefore, the Settling Parties concluded that groundwater restoration of the impacted aquifer was not technically practicable. Monitoring in the Royal River, at a location approximately a half-mile downstream from the TCE-discharge zone, indicated that the State Water Quality Criteria was routinely exceeded.

CHANGES TO THE 1985 REMEDY

As provided in the 1988 Consent Decree, the Settling Parties were required to submit an evaluation of the performance of the groundwater remediation system within fifty-six months of operation of the GETS. This evaluation was to address adjustments or modifications that would noticeably improve the system's performance in achieving the groundwater performance standards and otherwise protect public health, welfare and the environment. In late 1995, EPA and Maine DEP agreed to a proposal by the Settling Parties that they submit a Technical Impracticability Evaluation Report in place of the fifty-six month report. The agencies also agreed to a suspension of the GETS.

In January 1997, following two revisions of the Settling Parties' October 1995 TI Report, EPA recommended to the other signatories to the Consent Decree, Maine DEP and the Settling Parties, that resolution of the issues be attempted through mediation. The parties agreed and EPA contracted for a convening process which identified McKin stakeholders. The stakeholders selected a mediation company in May 1997 and the formal mediation process began the next month.

Following an unsuccessful attempt to reach resolution in December 1997, in the spring and summer of 1998 EPA performed an investigation of the Royal River Discharge Zone. This investigation was designed to evaluate the technical practicability of intercepting a sufficient portion of the groundwater plume so as to meet the State Water Quality Criteria. Simultaneously, the Settling Parties' consultant, Sevee & Maher Engineers, Inc., ("SME") performed an investigation of the overburden in the Gray Depot area following discovery of TCE in exploratory well GWD-2 on the north side of Collyer Brook. With the completion of these studies, a mediation committee developed recommendations for an institutional control zone and long-term monitoring plan for groundwater and surface water.

In October 1999, owners of sub-dividable properties within the Institutional Control Zone ("ICZ") joined the mediated discussions to work out an allocation for funding the purchase of their water rights by the Settling Parties. With this resolved, all parties agreed to the framework of a settlement.

This ROD Amendment selects institutional controls and long-term monitoring of groundwater and surface water and formally terminates the operation of the GETS. It is issued within the context of three separate agreements which the Settling Parties have entered into with the Town of Gray, the Gray Water District, and property owners of sub-dividable parcels within the ICZ.

This ROD Amendment recognizes the technical impracticability of achieving the fourth and fifth RAO noted above (i.e , preventing the subsurface discharge of Site groundwater to the off-site aquifers, and restoring the off-site aquifers within a reasonable time frame). The amended remedy replaces the activities associated with the fourth and fifth RAO of the 1985 ROD with the following major activities:

1. Developing a combination of institutional controls to prevent exposure to the contaminated groundwater.

2. Monitoring the groundwater to demonstrate that the contaminant plume will not expand and that natural processes will continue to decrease the concentrations of the contaminants.

3. Monitoring the Royal River to demonstrate that the continuing decrease in groundwater concentrations will result in further decreases of TCE in the River. If TCE exceeds the SWQC at a specified date and location, a contingency response approach will be followed that will allow for development of an active remediation plan for the River.

4. Evaluating the cleanup approach to confirm that it is protective of human health and the environment.

A comparison of the original 1985 remedy and the modified remedy is provided in Table 1.

VI. SUMMARY OF SITE CHARACTERISTICS

This section of the report provides a description of the existing conditions of the off-site operable unit for the McKin Site. This includes the overburden and bedrock aquifer, the Royal River and Collyer Brook.

EXISTING SITE CONDITIONS - GROUNDWATER

The overburden plume extends northerly from the McKin facility toward the intersection of Mayall and Depot Roads. In this area, the overburden plume bifurcates with the majority of groundwater flow and contamination flowing eastward where it ultimately discharges through a 500 -700 feet wide zone into the Royal River. The remainder of groundwater flow and contamination flows northeasterly toward Collyer Brook and its confluence with the Royal River. Sampling of the overburden in this area indicates that the VOC contamination attenuates

prior to reaching Collyer Brook and no reproducible detections of VOCs have been measured in the Brook. See Figure 3 for a representation of the overburden plume.

Overburden Groundwater

As liquid waste from the facility contaminated the soils beneath the property, it migrated through the unsaturated soils to the overburden groundwater. Based on contaminant concentrations measured in the excavated soils, it is believed that the waste migrated to the water table as a free-phase, dense, non-aqueous phase liquid (DNAPL). Once in the groundwater, the DNAPL continued to spread, until it became bound up by the finer grained silts in the overburden soil or in fractures in the bedrock, and it no longer flowed as a liquid under the normal hydraulic gradients present at the Site. At this point, the liquid waste is termed residual DNAPL, and it continues to act as a long-term source of VOCs by slowly dissolving into the ambient groundwater.

Groundwater that has come into contact with this residual DNAPLs has created a plume of dissolved VOCs which has spread from the McKin property to the north and east. The overburden pathway for the plume is not precisely known, since it is not known whether there is a continuous overburden plume extending to Collyer Brook from the McKin property nor has a centerline of the overburden pathway been identified in the portion of the Royal River plume. It is inferred from residential bedrock well water quality data, monitoring well data, and measurement of vertical gradients that groundwater flows from overburden to bedrock in the area between Mayall and Depot Roads, and then further from the McKin property, the groundwater flows back into the overburden. The eastern plume discharges along an 800-foot wide stretch of the Royal River (Figure 4). Based on the available data, the northern plume attenuates in the overburden prior to Collyer Brook (Figure 5).

Bedrock Groundwater

Residential wells downgradient of the McKin property were found to be contaminated with TCE in the 1970s. These wells ranged in total depth from 70 to 660 feet. Depth to competent bedrock, assuming the well casing was installed through the overburden soils and the more heavily fractured upper bedrock, ranged from 37 to 200 feet. Penetration into the competent bedrock, derived by assuming it equals the total well depth minus the casing length ranged from 30 to 460 feet.

The 1985 Record of Decision set as an remedial action objective the restoration of the off-site aquifer, within a reasonable time and practical limits. This was to be accomplished by extracting groundwater from the overburden aquifer and in the uppermost portion of bedrock, with the expectation that the groundwater extraction system would reduce flow of contaminated groundwater to the bedrock aquifer and treat a substantial portion of the bedrock aquifer. Systematic recovery of contaminated groundwater from the fractured bedrock to clean the bedrock aquifer was deemed to be technically infeasible. Consequently, further investigation of the deep bedrock, which had served as the drinking water source for the area, was not performed

and therefore there is no current data to establish the extent of contamination in the deep bedrock. Indirect evidence, such as the groundwater gradient data, the presence of TCE at GWD-2 (see Figure 5) near the confluence of the Royal River and Collyer Brook without any other detections in this area of overburden, as well as mass flux calculations, combined with the direct overburden and shallow bedrock data, provide sufficient comfort to view the bedrock plume as generally the same as the overburden plume.

Review of the water quality data has enabled the agencies, the Settling Parties' consultant, and the community group's technical consultant to reach consensus on the attenuation rate of the groundwater plume. TCE concentrations in most monitoring wells have been steadily decreasing for several years. Table 2 presents data from representative wells from the eastern plume. This decreasing trend continued after the GETS was turned off in October 1995. While there has been limited rebound in some wells, these concentrations did not approach the maximum concentrations and have stabilized. Overall, concentrations continued to decrease. The lack of any significant rebound is attributed to removal actions by Maine DEP, the effective clean-up of the soils by the Settling Parties, the natural breakdown of the contaminants, and operation of the GETS. Consequently, there are areas in the off-site overburden soil which already meet the ROD standards.

Projections of the TCE concentrations indicate that the groundwater in the overburden soils and shallow bedrock will attain drinking water quality over a period of time, ranging from five to fifty years. (See Tables 3a and 3b for projections made by EPA contractor during the mediation process and for later projections made by SME)

EXISTING SITE CONDITIONS - SURFACE WATER

Royal River

When the 1985 ROD was signed, TCE was detected in springs (called Boiling Springs) near the Royal River but it was not detected in the River itself, nor in Collyer Brook. As noted earlier, the remedial action objective in the ROD was to protect State-designated Royal River surface water uses and aquatic life in the River.

The contaminant plume spread with the groundwater in its natural flow direction toward the Royal River (and to a lesser extent toward Collyer Brook). TCE enters the Royal River from groundwater seeps in the river bank and river bottom and from runoff from Boiling Springs. The 1997 U.S. Geological Survey ("USGS") sampling identified a zone of approximately 800 feet where TCE-contaminated groundwater is discharging in the River (Figure 4). Within the 800 feet, the discharge is concentrated near the confluence of an unnamed stream and the bend in the Royal River. Downstream sampling by SME in 1997 detected low levels of TCE as far downstream as Yarmouth, a distance just under twelve miles (Figure 6). Sampling by SME and USGS/EPA has not detected TCE in the unnamed stream nor in any gullies or ephemeral streams in the land between the McKin facility and the Royal River.

TCE was first detected in the Royal River in 1989. Concentrations in the River increased until1992, then started to decrease. This pattern mimics the pattern seen in the groundwater - as is expected because the TCE is dissolved in the groundwater and travels through the soils and bedrock, discharging into the River along with the groundwater. Therefore, as the TCE concentrations in the groundwater decrease, so does the amount of TCE entering the River decrease.

In 1999, the technical representatives involved in the mediation process developed projections for TCE concentrations in the Royal River. These projections indicated that the concentrations in the Royal River would continue to decrease and that the SWQC could be attained within the next six to eight years (2005 to 2007). EPA believes that the decrease in groundwater concentrations will continue at a regular rate until at least the concentrations in the Royal River are below the SWQC. See Table 4 and Figure 7 for the surface water projection.

It should be noted that there are uncertainties with these projections and therefore the time to attain the SWQC is presented as a range. While the data indicate SWQC compliance in approximately six to eight years, the uncertainties expand the range in both directions, making the range two to ten years. In addition, as the amount of TCE entering the River decreases, both the portion of the River and the amount of time each year that these surface waters will be out of compliance (exceeding the SWQC) will decrease as well. Depending on river level and time of year, TCE currently is measurable at very low levels, but still above the SWQC for several miles downstream.

Boiling Springs Pilot Study

The area known as Boiling Springs is a group of springs which created an irregular cavity with dimensions of about four feet deep and within a sixty-five feet long by forty-five feet wide area. Together the springs flow at about 35 gpm, coalescing into a fifteen feet overland flow to the Royal River. TCE concentrations in the springs have decreased from over 1000 µg/L in the early 1990s to 200 - 300 µg/L currently. As these concentrations still create a risk to human and wildlife receptors, it was determined that exposure to the springs should be prevented. EPA determined that the gain achieved by treating the spring water prior to its discharge would be minimal since once the flow enters the Royal River, the TCE is diluted to non-detectable levels. Also, EPA noted that there was potential harm to constructing and operating a long-term treatment facility in the flood plain and associated wetlands. Therefore EPA decided to cover the springs. The cover was designed so that the spring water would flow uninterrupted to the River rather than attempting to block the springs as this would likely result in springs developing elsewhere in the flood plain.

Three concerns were identified with this conceptual remedy for Boiling Springs: whether the cover material would subside into Boiling Springs; whether new springs would emerge elsewhere once Boiling Springs were covered.; and whether the cover would be washed away by

seasonal flooding. To resolve these concerns, EPA decided to go forward with a pilot study. EPA sought comment on the pilot study during the mediation process and in the public comment period.

The Boiling Springs pilot study was completed in September 2000. The cavity was "squared-off" to allow for easier application of the cover. The cover consisted of a woven geotextile fabric to help spread the weight and minimize subsidence into the cavity and its quicksand-like consistency, gravel to allow for the flow of the spring water to the Royal River, and a non-woven geotextile to separate the gravel from the final layer of topsoil. The river bank was rebuilt with a six-feet wide by nine-feet high gabion wall and protected by rip rap on the River side. Following construction, the area was graded, erosion mats were placed above the cover and along the entire access route through the flood plain and hillside slope, and then seeded.

Monitoring of the cover began in October 2000 and will continue through the next flood season (spring 2001) to assess the three concerns noted above.

VII. SUMMARY OF SITE RISKS

HUMAN HEALTH

Human health and environmental risk assessments were conducted as part of the Feasibility Study leading up to the 1985 Record of Decision. These assessments identified current and potential future receptors and evaluated the risks posed by the Site contaminants. The ROD stated that the current human receptors included persons coming in contact with on-site soils and recreational users of the Royal River. Two potential future receptors were identified: workers and the public to inhalation exposure from soil remediation activities; and residential well water use (this was considered potential because at the time of the risk assessment, there were no known users of the contaminated groundwater as a drinking water supply after the extension of the public water supply system). Of these current and potential receptors, unacceptable risk was only associated with future residential well water use as engineering controls would be expected to maintain contaminants below ambient air levels during the soil remediation.

As part of the review of the evaluation of technical impracticability, EPA reviewed the human health and environmental risk assessments. With the completion of the soil remediation, recreational users of the Royal River are the only current human receptors. Potential future receptors include users of groundwater, Royal River, or Boiling Springs as a drinking water supply. Of these receptors, unacceptable risk is associated with the drinking water use of groundwater and Boiling Springs but not with the Royal River.

With the implementation of the institutional controls and covering of Boiling Springs, ingestion of contaminated water is prevented and these exposure pathways are eliminated. The long-term monitoring and contingency response approach ensure protectiveness, providing long-term

effectiveness. Together they provide an acceptable alternative to active groundwater restoration and address these risks.

ENVIRONMENTAL RISK

The environmental risk assessment conducted as part of the 1985 Feasibility Study identified aquatic species in the Royal River as current and future receptors and concluded that there was not a significant risk associated with the observed concentrations of contaminants. The 1985 ROD stated that the contaminated aquifer caused a loss of an environmental resource which would be inadequately protected by a No Action Alternative.

A review of research data was performed to update the environmental risks. In addition to aquatic species in the Royal River, terrestrials species using Boiling Springs were identified as current and future receptors. The literature indicated contaminant concentrations measured in Boiling Springs could have a negative impact on some species, but that the contaminants at the concentrations detected in the Royal River did not pose a risk to aquatic species. (McDonald, 1996)

VIII. TECHNICAL IMPRACTICABILITY DETERMINATION

Water quality data suggested restoration of the groundwater using the GETS might not be feasible. Consequently, EPA and Maine DEP agreed to a proposal by the Settling Parties to evaluate whether it would be technically practicable to restore contaminated groundwater to drinking water standards. including Maximum Contaminants Levels (MCLs) and Maine Maximum Exposure Guidelines (MEGs).

Restoration of contaminated groundwater is one of the primary objectives of the Superfund program. The NCP states that "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site." Section 300.430(a)(1)(iii)(F) of the NCP. Generally, restoration cleanup levels in the Superfund program are established by applicable or relevant and appropriate requirements (ARARs), such as the use of Federal or State standards for drinking water quality.

Further, under CERCLA, an alternative selected to address contamination at a Site must achieve the ARARs identified for the action, or provide the basis for waiving the ARARs. ARARs may be waived for any of six reasons, including where compliance with the requirement is technically impracticable from an engineering perspective. See Section 121(d)(4) of CERCLA and Section 300.430(f)(1)(ii)(C) of the NCP.

The primary considerations for determining the technical impracticability (TI) of achieving ARARs are engineering feasibility and reliability. See NCP Preamble, 55 Fed. Reg. 8748 (March 8, 1990).

EPA's Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, (OSWER Dir. 9234.2-25, September 1993, Interim Final) specifies the following components as necessary for a TI evaluation:

1. Specific ARARs or media standard for which TI determinations are sought;

2. Spatial area over which the TI decision will apply;

3. Conceptual model that describes site geology, hydrogeology, groundwater contamination sources, fate and transport;

4. An evaluation of the restoration potential, including predictive analyses of the time frames to attain required cleanup levels and a demonstration that no other remedial technologies could be capable of achieving groundwater restoration; and

5. Cost estimates of the proposed remedy options.

Following a TI evaluation, EPA's goal of restoring contaminated groundwater within a reasonable time frame will be modified where restoration is found to be technically impracticable. In such cases, EPA will select an alternative remedial strategy that is technically practicable, protective of human health and the environment, and satisfies the requirements of CERCLA and the NCP. Where groundwater ARARs are waived at a Superfund site due to technical impracticability, EPA's general expectations are to prevent further migration of the contaminated groundwater plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction measures as appropriate. See Section 300.430(a)(1)(iii)(F) of the NCP. These expectations should be evaluated along with the nine remedy selection criteria provided in the NCP.

The results of the TI Evaluation for McKin are provided below.

1. ARARs

Under the EPA Groundwater Protection Strategy, EPA has classified the aquifer beneath the Site as a Class II aquifer, i.e., groundwater formerly used as a drinking water source and potentially a source for drinking water in the future. Thus, Maximum Contaminant Levels (MCLs), and non-zero Maximum Contaminant Level Goals (MCLGs), established under the Safe Drinking water Act, are ARARs.

The state Maximum Exposure Guidelines (MEGs) are chemical-specific ARARs that are health-based guidelines intended to determine drinking water quality for private residential wells. MEGs may be used as relevant and appropriate requirements in establishing groundwater remediation goals and surface water remediation goals for Boiling Springs.

The MCLs and MEGs for which a technical impracticability waiver will apply are as follows:

Contaminant of Concern	1999 Maximum Groundwater Concentration [1] and Location	MCL	1992 MEG	1985 ROD Performance Standard
trichloroethylene	3,200 - MW-206A	5[2]	5	28 ppb
1,1,1-trichloroethane	94 - MW-206A	200	200	92 ppb
cis-1,2-dichloroethene	42 - MW-206A	70	70	no ROD standard
1,1-dichloroethene	1.1 - B-1A	7	7	no ROD standard
tetrachloroethene	2.3 - B-1B	5	5	no ROD standard
vinyl chloride	non-detect at all monitoring locations[3]	2	0.15	no ROD standard

[1] all concentrations/standards are in micrograms per liter (µg/L) or parts per billion (ppb)
[2] established after the ROD
[3] detection limit varies with location and are generally greater than the 1992 MEG

2. Spatial Extent of the Technical Impracticability Zone

This section describes the proposed horizontal and vertical extent over which the Technical Impracticability decision would apply (TI Zone). This includes the portion of groundwater known to contain VOCs above federal MCLs and State MEGs that would require substantial time frames to remediate using currently available technologies, as well as areas where VOC contamination above MCLs is inferred (bedrock aquifer). Section VIII.5 below provides the estimated cleanup time frames for groundwater containing VOCs.

The proposed TI Zone covers horizontally the same area designated as the Institutional Control Zone (Figure 2) and vertically, extends to the deep bedrock. The proposed TI Zone includes the McKin property, extends to the west past Depot Road, north to Collyer Brook along Merrill Road, east to the Royal River and immediately beyond it, and south to Yarmouth Road from the intersection with Mayall Road to the intersection with Depot Road. Once these areas were identified, the boundaries of the TI Zone were then adjusted as much as possible to match geographic locations and current property boundaries.

The presence of TCE in the overburden north of Collyer Brook, near the confluence with the Royal River, led to the expansion of the TI Zone beyond Collyer Brook. An overburden

investigation of properties west of this area and along both banks of Collyer Brook up to Merrill Road did not detect any VOCs on these properties. (see Figure 5) However, because the extent of dissolved TCE in the bedrock is not known, EPA cannot rule out the possibility that it could be induced by pumping. Therefore, based on discussions held during the mediation, EPA agreed that all of these properties should have restrictions preventing the installation of water wells. The restrictions will be accomplished through inclusion in the ICZ and conservation easements.

The TI Zone does not include the Royal River or Collyer Brook. Projections of the water quality data collected from the Royal River indicate that the SWQC could be met by 2005 - 2007. There is no reproducible data to suggest that TCE has impacted Collyer Brook.

3. Conceptual Model

The conceptual model serves as a foundation for evaluating the restoration potential of the Site and, thereby technical impracticability as well. It includes the Site geology and hydrogeology, nature and extent of Contaminants of Concern in soil and groundwater, fate and transport processes, and current or potential receptors. This conceptual model has been developed through review of reports of previous investigations and previous conceptual models. As may be expected for a site with an extensive history of analytical data and computer modeling, the conceptual model developed for the Site has evolved through several iterations. The current model should be seen therefore as a continuing refinement of previous models, reflecting the analytical data and subsurface investigations. It forms the basis for evaluating potential remedial actions.

Site Geology

The Site geology has been described in the EPA's 2001 TI report as well as numerous other documents. The prominent points include the following:

- The surficial materials present at the McKin Site include fine-grained glaciomarine deposits, coarse-grained glaciomarine deposits, flood plain alluvium, and glacial till (Figures 8 and 9);

- The fine-grained glaciomarine sediments (Presumpscot Formation) are present at land surface in most places. These sediments consist of massive to finely laminated, gray to dark-bluish gray silt, clay, and minor fine sand that locally interfingers with the coarse-grained deposits, but mostly overlies it (deposited after the coarse-grain). The glaciomarine silts and clays range in thickness from a few feet to more than 100 feet;

- The irregular land surface of the fine-grained sediments is the result of erosion and downcutting in post-glacial time by the Royal River, Collyer Brook, and the many tributary streams and seasonal stream gullies. In some places, post-glacial streams have cut through the entire thickness of the fine-grained sediments, leaving coarse-grained

materials at or near the surface;

• The flood-plain alluvium consists of silt, sand and gravel, and variable amount of organic material. These materials are present on the flood plains of the Royal River, Collyer Brook, and the unnamed tributary entering the Royal River from the west about 350 feet upstream from the railroad trestle. The alluvial deposits are 10-12 feet thick along the Royal River, and thinner along the smaller streams. It overlies glacier material in most locations;

• The glacial till lies between the coarse-grained glaciomarine sediments and the bedrock. It is nonsorted and nonstratified, a compact mixture ranging from clay to large boulders, with a matrix of fine sand containing up to twenty-five percent silt and clay. The till is absent in places and is typically less than twenty feet in thickness when present;

• The surficial materials are underlain by granitic bedrock of the Sebago pluton. The bedrock surface lies at depths of 50 to 100 feet beneath the eastern edge of the glaciomarine delta and slopes eastward toward the Royal River to a depth of nearly 200 feet beneath surficial materials;

• The bedrock is fractured in various directions. Major joint sets strike in a northeast direction and two minor joint sets strike in northwest and north-northwest directions; and

• Two bedrock troughs have been identified from geophysical data. One trough trends in a southeasterly direction from the junction of Mayall and Depot Roads towards the Royal River; and the other trough, located just west of the Royal River, trends in a southerly direction. The bedrock troughs are expected to have higher transmissivity due to the increased thickness of the saturated surficial materials and enhanced bedrock fracturing.

Site Hydrology

The prominent points of the Site hydrology include:

• Groundwater is recharged by infiltration of precipitation above an elevation of 240 feet and by leakage from the Presumpscot Formation. The direction of groundwater flow is generally from west to east toward the Royal River (Figure 10). Vertical upward gradients along the Royal River, and the presence of contaminants in the River that are the same as those in the groundwater plume, indicate groundwater from the Site discharges to the Royal River;

• Groundwater flow is driven by the approximately 200-foot elevation difference between the McKin property and the Royal River and Collyer Brook. Detailed directions of groundwater flow in both the overburden and fractured bedrock are uncertain due to the heterogeneity of the overburden deposits and the location, orientation, and extent of the

bedrock fractures;

• The Royal River is presumed to form the downgradient boundary of the regional aquifer system. In this area, upward hydraulic gradients are present where groundwater flow from both the east and west sides of the River converges. The actual boundary is a conceptual surface where the two lateral flows meet, roughly defined by the River position. There will also be some mixing of contaminants across this boundary due to diffusive and dispersive fluxes;

• Paired monitoring wells installed in the overburden and the underlying shallow bedrock indicate downward hydraulic gradients from the overburden into the bedrock at the higher topographic elevations. At the lower elevations of the Site, vertical gradients are upward from the bedrock into the overburden. These gradients provide the driving force to transport groundwater and VOCs away from the McKin property downward into the coarse-grained glaciomarine deposits and bedrock and then back up into the overburden in the southerly trending bedrock trough and flood plain of the Royal River;

• The primary hydrostratigraphic unit of the surficial aquifer consists of sand and sand-gravel deposits. The hydraulic gradients are controlled by the transmissivity (saturated thickness times the hydraulic conductivity) of the units and the elevation of the River;

• Horizontal hydraulic conductivity values for the coarse-grained overburden deposits range from ten to fifty feet/day. Vertical hydraulic conductivity is estimated to be ten to fifty times lower than the horizontal;

• The hydraulic conductivity at the Royal River Discharge Zone ("RRDZ") is calculated to be 170 ft/day at MW-1 (see Figure 11) rated thickness was determined to be 87 feet. In addition, the vertical hydraulic conductivity is 61.8 ft/day;

• In-situ density testing and saturated soil water content testing indicated the total porosity of the overburden aquifer ranged from 0.27 to 0.45 with an average of 0.36. The average TCE soil distribution coefficient (K_d) was calculated from batch studies to be 0.28 mL/gm. Using this value, a retardation coefficient of 2.3 was calculated;

• Additional analysis of the RRDZ investigation determined the transmissivity of the surficial aquifer ranged from 14,740 ft^2/day to 15,810 ft^2/day and storativity ranged from 0.001 to 0.003 based on Neuman's method, which accounts for delayed drainage from alluvial sediments in the upper portion of the aquifer; and

• Based on the RRDZ investigation, approximately 295 gpm of contaminated groundwater discharge to the Royal River from the Site. It was previously estimated that between 180 to 270 gpm of contaminated groundwater was discharged to the river system from the Site with approximately one-third discharging to Collyer Brook, and the remaining two-thirds discharging to the Royal River. Boiling Springs discharges

approximately 35 gpm to the Royal River.

Nature and Extent of Contamination

Contamination from the McKin facility entered the overburden and bedrock groundwater beneath the facility and traveled northward toward the intersection of Mayall and Depot Roads. At this location, the overburden plume is believed to bifurcate, with the majority of the contamination and groundwater flowing east toward the Royal River and the remaining contamination and groundwater flowing toward Collyer Brook.

TCE has been detected in the northern plume primarily in overburden wells, B-1B, B-2B, B-2C, B-5B, and MW-203B, and bedrock wells, B-1A, B-2A, B-5A, and MW-202A, since sampling began in 1984. In addition, TCE has been detected a Mitchell Spring (see Figure 12 and Table 5). Because of the relatively few monitoring locations within this northern plume, the location where the hydraulic vertical gradient changes from a recharge to discharge condition is not known. Review of the available data indicates there is still a downward component of flow at the B-5 well cluster. At the MW-203 well cluster, the hydraulic vertical gradient fluctuates, possibly in reaction to seasonal precipitation fluctuations.

The configuration of the bedrock surface serves as a major control on the eastern plume. A bedrock knoll near the intersection of Mayall and Depot Roads has created an area of limited saturation in the overburden and in effect has acted as a wedge separating the overburden plume. Similar to the northern plume, the eastern plume moving to the Royal River has had detected VOCs, primarily TCE, in the overburden wells MW-212C, B-3B, B-4A, and B-102 and SW-5 (Boiling Springs) since sampling began in the mid-1980s. (see Figure 12 and Table 2)

The centerline of the eastern plume appears to follow the identified bedrock trough which begins on the south side of the bedrock knoll and trends easterly 400 - 500 feet toward the Royal River. As this trough plays out, the plume widens as it continues toward the river, following the direction of groundwater flow. Approximately 400 - 500 feet further east, the plume enters a steeply sloping bedrock trough, this one trending south. This zone of increased transmissivity flattens out the gradient as the plume approaches the Royal River. The overburden plume discharges from this trough through the flood plain alluvium into the Royal River.

Fate and Transport Processes

Throughout the mediation process, there was disagreement as to the apportionment of flow through bedrock and through overburden in the eastern plume. Nonetheless, there was agreement that the Royal River serves as the regional discharge zone for the TCE-contaminated groundwater in both flows. Water quality data from the microwells installed in the flood plain during the RRDZ investigation showed that the highest concentrations were in a zone 15 to 60 feet below the surface. Yet the study also showed contamination was present all the way down to the bedrock at 100 feet below the ground surface (Figure 13).

As part of the assessment on the fate of the TCE during its movement from the facility to its surface water discharge area, SME evaluated the potential degradation of TCE in the overburden. The dissolved oxygen, E_H, metals, and methane data indicated that mildly reducing redox conditions exist and therefore reductive dechlorination of TCE was limited. It was noted that biodegradation may have played a larger role early in the site history as the chlorinated solvents were commingled with petroleum waste which provided a carbon source to naturally-occurring microbes.

EPA reviewed the cis-1,2-dichloroethylene (DCE) data collected from May 1996 to the present (prior to May 1996, only total DCE data was reported) to assess its extent and whether the concentrations were increasing as TCE concentrations were decreasing. DCE was present in fourteen wells, or about one-third of the wells sampled. At all locations, DCE is decreasing. In some wells, such as the MW-803 cluster, there appears to be a downward cyclical pattern. At MW-206A and B, the decrease appears to be slower. Of note is that at MW-401C and MW-403C, both installed on the facility, and at MW-801B and C, installed at the southern edge of the plume near the Royal River, concentrations have dropped below 2 ppb. Therefore EPA concluded that degradation of TCE to DCE is minimal and unlikely to create additional risk.

In addition, EPA reviewed the vinyl chloride groundwater data. Vinyl chloride has not been detected in any of the monitoring wells. It is noted that in some locations, because of dilution necessary to measure the higher TCE concentrations, the detection limit for vinyl chloride is elevated. Yet for those wells with a detection level of 1 ppb, vinyl chloride is not detected. The MCL for vinyl chloride is 2 ppb while the MEG is 0.15 ppb.

Vinyl chloride was detected in one of six groundwater seeps at the edge of the Royal River during EPA's RRDZ investigation. It is believed that biodegradation of TCE occurred in the relatively rich organic soil present in the flood plain. As this organic soil is limited both horizontally and vertically, EPA therefore concluded that degradation of TCE to vinyl chloride is minimal and unlikely to create additional risk.

4.0 Evaluation of the Restoration Potential

Aquifer restoration for the McKin Site is defined as the attainment of drinking water quality throughout both the overburden and bedrock aquifers in a time-effective manner. EPA and Maine DEP disagreed with much of the GEI's May 1996 Evaluation of Technical Impracticability but did agree that restoration of the bedrock aquifer is not practical for the following reasons:

- The presence of contaminants in residential wells demonstrated there was a pathway from the McKin property to the bedrock aquifer;

- Vertical gradient data indicate that the potential DNAPL entry zone into the bedrock could extend for several hundred feet north from the McKin property, making the

identification of the actual pathway(s) difficult to locate;

- The presence of TCE in shallow bedrock wells several thousand feet from the McKin property suggest the lateral extent of the bedrock contamination;

- While the trend analysis of the monitoring wells shows TCE concentrations are decreasing in a majority of the wells at comparable rates to the half-life seen at other sites for TCE, other wells, such as shallow bedrock well MW-206A, have not. This suggests the presence of a nearby residual source;

- The December 1998 discovery of TCE in well GWD-2 in the overburden east of Collyer Brook in the vicinity of the Gray Depot area without an identified overburden plume connecting it to the McKin Site suggests bedrock transport; and

- The presence of contaminants in GWD-2, (see Figure 5) more than twenty years after use of the residential wells was stopped, indicates that contaminants remain in the bedrock and have not been flushed out by natural groundwater flow.

In addition to these realities relative to restoration of the bedrock, EPA also agreed that restoration of the overburden aquifer is not practical for the following reasons:

- The saturated thickness of the overburden varies from a few feet near the facility and the bedrock knoll to over one hundred feet in the southerly trending bedrock trough. Any well placed within a limited thickness area would have limited effectiveness as demonstrated by EW-501 and EW-503 of the current system;

- Drilling logs indicate a discontinuous glacial till unit above the bedrock. Composed of nonsorted and nonstratified material, DNAPL adsorbed onto the lower permeability till will act as a source for the more permeable units;

- As noted previously, it is likely that DNAPL in residual form is present in the bedrock. Given the uneven bedrock surface, there are likely to be multiple areas where seepage occurs from the bedrock into the overburden.

As part of the mediation process, technical representatives of the agencies, the Settling Parties, and the SAG technical consultant evaluated the groundwater TCE data to develop time frame estimates for achieving drinking water standards for TCE (See Tables 3a and 3b). Extrapolation of the data trends from each monitoring well showed that the perimeter of the plume would achieve these standards in about twenty years and the interior of the plume would reach the standards in about fifty years. These extrapolations were for the overburden and shallow bedrock only and did not take into consideration any asymptotic relationship that could be occurring. Some wells currently meeting the standards did not demonstrate this relationship while others remaining above the standards have. For the purpose of this ROD Amendment, it is assumed

that the bedrock water quality will follow a similar pattern of declining concentrations with the perimeter achieving drinking water standards in about twenty years and the interior in about fifty years.

5. Cost Estimates

The cost estimates of the remedy relying on institutional controls are described in Section XI below.

More detailed information regarding the technical impracticability of restoration of the off-site aquifer can be found in the *Final Draft Technical Impracticability Evaluation Report.* (US EPA, 2001)

IX. DESCRIPTION OF AMENDMENT ALTERNATIVES EVALUATED

This section provides a description of remedial alternatives evaluated for the purpose of amending the 1985 ROD. These evaluations were done within the context of a determination by EPA that it is technically impracticable to restore the groundwater within a reasonable time frame. As a result, alternatives for groundwater and surface water were evaluated which were either first, alternatives to restoration (no action, limited action/institutional controls) or second, containment alternatives.

Remedial alternatives to the 1985 ROD were presented in the 1996 Technical Impracticability Evaluation Report (GEI, 1996) and the McKin Royal River Discharge Zone Feasibility Study (Tetra Tech NUS, 1999). In its January 2001 TI Report, EPA selected options described in the two prior reports which EPA considered as alternatives to the active restoration of the off-site aquifer through pump and treat. EPA developed one option for groundwater and three options for surface water for the TI report. In addition, for this ROD Amendment, No Action alternatives for groundwater and surface water are provided. These options are summarized below. More detailed information on each option and a comparative analysis of the options can be found in the Feasibility Study Addendum Report.

Groundwater

A. Alternative GW-1: No Action with Monitoring. The McKin facility would be operated and maintained as it is today. This includes maintenance of the building, the current institutional controls of fencing and Site security, and continuation of the groundwater water monitoring program.

B. Alternative GW-2: Institutional Controls and Long-Term Monitoring. In this alternative, EPA recognizes that first, the groundwater in the East Gray area (see Figure 2) will not be of drinking water quality for an extended period of time, fifty years or so. Second, EPA also recognizes that

this area faces continuing development pressure. Therefore, established, formal controls are needed to prevent use of the groundwater until the TCE concentrations attenuate to drinking water quality. This can best be accomplished through the controls developed in the mediation process, which include passage of a zoning ordinance by the Town of Gray to prevent use of the groundwater in the impacted area and an agreement between the Settling Parties and owners of sub-dividable properties, in exchange for compensation by the Settling Parties, to impose restrictive covenants to prohibit use of the groundwater. EPA and Maine DEP are the signatories to the restrictive covenants with the property owners.

Long-term monitoring of the groundwater would allow EPA and Maine DEP to track the TCE concentrations within the plume and along the plume boundary. Additional monitoring wells would be installed in both bedrock and overburden beyond the known area of groundwater contamination.(see Figure 7 for location of new monitoring wells, labeled 900-series) This data from existing and new monitoring locations will allow the agencies to evaluate whether the concentrations are continuing to decrease at the rates projected and to ensure that the plume has not expanded.

Surface Water

A. Alternative SW-1: No Action with Monitoring. The ongoing surface water monitoring would continue. There would be no institutional controls or remedial actions planned for the Royal River. The contamination in Boiling Springs would not be addressed.

B. Alternative SW-2: Cover Boiling Springs, Monitoring, and Contingency Response Approach. In this alternative, Boiling Springs would be covered to prevent ingestion or contact with the contaminated spring water. The cover would be designed to allow the spring water to continue to flow into the Royal River. It would not be built to stop the flow of the spring water as that would only cause springs to reappear somewhere else in the flood plain, creating a new risk. Water quality at several locations in the Royal River would be monitored (see Figure 2 for compliance monitoring points SW-1 and SW-201). If the SWQC were not met at SW-1 by 2009, or at SW-201 by 2013, a remedial plan would be developed and remedial activities would be undertaken in the River to achieve compliance with SWQC.

C. Alternative SW-3: Groundwater Interception in the Flood Plain and Cover Boiling Springs. In this alternative, Boiling Springs would be covered as described in Alternative SW-2 above and a groundwater interception system would be constructed to capture a sufficient amount of the contaminated groundwater so that the SWQC would be attained in the Royal River. The wells would be located in the Royal River flood plain in an area where the greatest volume of TCE-contaminated groundwater was moving through the soil. A treatment plant which would remove the contaminants from the pumped groundwater would be located in an upland area to prevent damage from seasonal flooding. It is expected that the SWQC would be met within a year of operation.

Two discharge options for the treated groundwater were evaluated: reinjection back into the ground or a direct discharge into the Royal River. Both were considered feasible and cost estimates were developed for them.

It is anticipated that it would take approximately one year to design and construct the system. For costing purposes, it was planned that the system would be operated for thirteen years. TCE concentrations in the groundwater are expected to continue to decrease so that within thirteen years the remaining amount of TCE entering the River would meet SWQC and further use of the groundwater interception and treatment system would not be required.

D. Alternative SW-4: Groundwater Interception in the uplands and Cover Boiling Springs. This alternative is similar to SW-3, except that the location of the interception system and treatment plant would be in the uplands, west of the pipeline Right-Of-Way, rather than in the flood plain. The two discharge options were also determined to be feasible for this alternative.

EPA developed these alternatives based on information contained in the 1999 Feasibility Report prepared by Tetra Tech NUS, the trend analyses developed by the technical representatives of the mediation, and the 1996 TI Evaluation Report prepared by GEI, Inc. for the Settling Parties.

X. COMPARATIVE ANALYSIS OF THE ORIGINAL REMEDY AND AMENDMENT ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing remedial alternatives. These criteria are as follows:

Threshold Criteria

In accordance with the NCP, two threshold criteria must be met in order for the alternative to be eligible for selection:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection, and describes how risks posed through each exposure pathway are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all of the ARARs of promulgated state and federal environmental and facility-siting requirements, and if not, provides the grounds for invoking a CERCLA waiver(s) for those requirements.

Primary Balancing Criteria

The following five criteria are used to compare and evaluate those alternatives which fulfill the two threshold criteria.

3. **Long-term effectiveness and permanence** assesses alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will be successful.

4. **Reduction of toxicity, mobility or volume through treatment** addresses the degree to which alternatives employ recycling or treatment to reduce toxicity, mobility or volume, and how treatment is used to address the principle threats posed by the site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the alternative until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital as well as operation and maintenance costs, on a net present-worth basis.

Modifying Criteria

The two modifying criteria discussed below are used in the final evaluation of remedial alternatives generally after EPA has received public comment on the RI/FS and Proposed Plan

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the feasibility study and Proposed Plan.

The following is a comparison of the 1985 ROD remedy and the alternatives evaluated for this ROD Amendment, contrasting each remedy's strength and weaknesses with respect to the nine evaluation criteria.

1. Overall Protection of Human Health and the Environment

This criterion considers whether the remedy, as a whole, will protect human health and the environment. This includes an assessment of how public health and environmental risks are properly eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The original remedy was centered on the belief that the off-site aquifer could be restored within a reasonable time frame using pump and treat technology. In 1997, EPA concluded that restoration was not feasible. Therefore, without achieving restoration or having a means to prevent exposure to the contaminated groundwater, the original remedy was not protective of human health and the environment. Similarly, Alternative GW-1 does not prevent exposure to the contaminated groundwater.

The combination of Alternative GW-2 with any of the SW-2, SW-3, or SW-4 alternatives would protect human health and the environment by addressing present and future risks associated with the groundwater and Boiling Springs. Any of the combinations would prevent exposure to contaminated groundwater through the use of overlapping institutional controls and prevent exposure to contaminated surface water by the covering of Boiling Springs. Long-term monitoring of groundwater and surface water would ensure the protectiveness of the remedy.

2. Compliance with Applicable and Relevant and Appropriate Requirements

This criterion addresses whether or not a remedy complies with all promulgated state and federal environmental and facility siting requirements that apply or are relevant and appropriate to the conditions and remedy at a specific site. If an ARAR cannot be met, the analysis of a remedy must provide the grounds for invoking a statutory waiver.

The original remedy was written before the reauthorization of CERCLA and the development of ARARs. Yet as noted in the 1985 ROD (page 2 of the ROD declaration and page 10 of the text) the selected remedy was consistent with CERCLA, the NCP, and the two other federal standards considered relevant, RCRA and NPDES.

Alternatives GW-1 and GW-2 include a TI waiver of attaining drinking water standards and would comply with all other identified Federal and State regulations. Except for Alternative SW-1 which does not address the exceedance of the SWQC, all of the other surface water alternatives would comply with Federal and State regulations. Covering Boiling Springs and installation of the groundwater interception system in the flood plain (Alternative SW-3) would require additional efforts to minimize impact to the flood plain and associated wetlands.

3. Long-term Effectiveness and Permanence

This criterion refers to the ability of a remedy to maintain reliable protection of human health and

the environment over time once the remedial action is complete.

The original remedy would have provided long-term effectiveness and permanence once the off-site aquifer had been restored to drinking water quality. However, since it was demonstrated that the GETS could not restore the aquifer within the anticipated time frame of five years, the original remedy did not have the ability to provide and maintain reliable long-term effectiveness. As noted previously, the original remedy did not include any formal institutional controls to prevent exposure. U.S. Census data shows that the population increased by 100% in the Town of Gray from 1970 to 1990 and that housing units were expected to increase by 30% from 1990 to 2000 (Cumberland County, 1998). While these figures reflect the entire town rather than just East Gray, it is expected that further development in the East Gray area will continue. Consequently, Alternative GW-1, because it would not provide any restrictions to prevent exposure to contaminated groundwater, would not meet the long-term effectiveness and protection criterion.

The long-term effectiveness and protection criterion would be met by any combination of Alternative GW-2 with SW-2, SW-3 or SW-4. The institutional controls will remain in effect and the monitoring will continue as long as the TCE concentrations remain above drinking water quality. Alternative SW-2 includes a contingency that if the River does not attain the criteria within the specified time, a remedy will be developed to allow for active remediation of the River. Interception of the groundwater (Alternatives SW-3 and SW-4) would prevent contaminant discharge into the Royal River and would continue until the remaining amount of TCE could meet the SWQC in the River without interception and treatment.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion contains three measures of the overall performance of a remedy. The 1986 amendments to the Superfund statute emphasize that, whenever possible, EPA should select a remedy that uses a treatment process to permanently reduce the level of toxicity of contaminants at the Site, inhibit or eliminate the spread of contaminants away from the source of contamination, and reduce the volume, or amount of contamination at the Site.

The original on-site remedy used a proven treatment technology, on-site aeration, to reduce the toxicity, mobility and volume of contaminants in the on-site soils. Aeration effectively removed the contaminants from the soil so that the performance standards set in the 1985 ROD were met. The original remedy for the off-site operable unit used a proven technology, pump and treat, to reduce toxicity, mobility, and volume in the off-site overburden aquifer. However, as noted elsewhere, the widespread TCE contamination prior to implementation of the pump and treat system greatly limited its effectiveness in reducing toxicity, mobility, and volume.

Alternatives GW-1 and GW-2 would not employ active remedies and therefore would not reduce the toxicity, mobility, or volume through treatment. Alternatives SW-3 and SW-4 would employ active remedies and therefore would reduce the toxicity, mobility, and the volume of TCE through treatment relative to the Royal River whereas Alternatives SW-1 and SW-2 do not.

However as SW-3 and SW-4 would be located over 4,000 feet from the McKin facility, these alternatives would not effect the substantial portion of the groundwater plume and therefore would not meet this criterion relative to groundwater. The covering of Boiling Springs, a component of SW-2, SW-3, and SW-4, does reduce the toxicity but not the mobility or volume. It was designed specifically to not reduce the mobility of the TCE but rather to prevent contact with the TCE-contaminated water before it enters the Royal River.

5. Short-term Effectiveness

This criterion refers to the likelihood of adverse impacts on human health or the environment that may be posed during the construction and implementation of a remedy.

EPA does not believe that the original remedy posed significant short-term effectiveness concerns. The potential exposure of Site workers and area residents to contaminated air emissions during implementation of the on-site aeration was minimized by using safety plans that included air emissions controls and a network of ambient air monitors to assess potential releases to the air during cleanup operations. The construction and implementation of the off-site aquifer restoration system, GETS, likewise did not pose significant short-term effectiveness concerns.

Alternative GW-1, and proposed alternatives GW-2 and SW-2 meet the short-term effectiveness criterion. The implementation of institutional controls reduces Site risks quickly. Short-term risks to workers, the community, and the environment are minimal as the only construction activity with these alternatives is the installation of the boundary set of monitoring wells. Alternative SW-1, consisting of only continued monitoring of the Royal River, meets the short-term effectiveness criterion.

Alternatives SW-3 and SW-4 would require standard engineering precautions to minimize short-term risks during the installation of the groundwater interception systems. Operation of either of these systems could require the disposal of carbon used to remove TCE from the pumped groundwater. In addition, the operation of the SW-3 system would require a certain amount of vehicular and pedestrian traffic in the flood plain and associated wetlands which would be expected to have some negative impact on these areas.

6. Implementability

This criterion refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the remedy.

The original remedy was implementable as demonstrated by the successful conclusion of the on-site aeration and the operation of the GETS from its start-up to the agreed upon suspension. All of the alternatives evaluated for the ROD amendment can be built or implemented. The materials and equipment needed for installing monitoring wells, covering Boiling Springs, and installing the groundwater interception systems are all readily available. The institutional controls, a Town ordinance and restrictive covenants on private properties, have the support of

the Town of Gray and the affected property owners and therefore can be implemented.

7. Cost

This criterion includes the net present worth estimates for capital (up-front) and operation and maintenance costs of implementing each remedy. The costs described below do not include previous costs which are substantial. The cost estimates only reflect those costs that would be incurred henceforth to implement the alternatives evaluated.

The capital costs associated with the 1985 ROD off-site aquifer restoration component were based on a twenty-five well extraction system with an estimated system withdrawal rate of 125 gpm and a surface water discharge. No operation and maintenance costs were developed as restoration was expected to be achieved in five years. The FS capital costs net present worth estimate for the original off-site remedy was $3,128,000. Ongoing groundwater monitoring was projected at $37,300 per year for the first five years and $38,900 for the next five.

In evaluating the amendment alternatives for costs, EPA estimates GW-1 will cost $350,000 for monitoring. GW-2 will cost $1,600,000 for the duration of the long-term monitoring and institutional controls. Alternative SW-2 is estimated to cost $400,000 for the covering of Boiling Springs and conservation easements. In addition, potential remediation of the River could cost up to $2 million if the contingency response approach is implemented. Alternative SW-3 is estimated to cost $3.0 to $3.2 million (surface water discharge and reinjection to groundwater, respectively) and Alternative SW-4 is estimated to cost $3.3 to $3.5 million (surface water discharge and reinjection to groundwater, respectively).

8. State Acceptance

This criterion addresses whether, based on its review of the data derived from the Site and the Proposed Plan, the State concurs with, opposes, or has no comment on the Amendment that EPA has selected for the Site.

The Maine DEP has reviewed the September 2000 Proposed Plan to Amend the 1985 Cleanup Plan and a draft of this Amendment. The Maine DEP concurs with the remedy change. The Maine DEP has provided a letter of concurrence which is provided in Appendix C.

9. Community Acceptance

This criterion addresses whether the public concurs with EPA's proposed Amendment. Compliance with this criterion is based on the comments received at the public hearing, and the participation of community members and local officials in the mediation process.

As discussed in Section III, EPA's proposed Amendment is also the consensus recommendation of the mediation committee. Based on the Public Information and Public Hearing meetings and

comments received during the public comment period, it appears that the proposed Amendment has broad community support. The proposed Amendment is also supported by the Town of Gray and the Gray Water District.

XI. THE SELECTED REMEDY

After an extensive process of identifying alternatives to address the risks associated with the off-site aquifer and developing a consensus among Site stakeholders, EPA has selected the remedy described below as the best balance between the nine criteria. The selected remedy, a combination of Alternatives GW-2 and SW-2 (described in Section IX above) relies on institutional controls with long-term monitoring of groundwater and surface water. This remedy was selected within the context of the determination by EPA that it is technically impracticable to restore the groundwater within a reasonable time frame. The cleanup operations will include the following activities:

1. A combination of institutional controls to prevent exposure to the contaminated groundwater. These include:

   • Town of Gray zoning ordinance to prevent use of groundwater within the Institutional Control Zone (ICZ; see Figure 2)

   •An agreement between the PRPs and property owners with sub-dividable lots within the ICZ to not install wells. EPA and Maine DEP are the signatories to these restrictive covenants.

2. Monitoring the groundwater to demonstrate that the contaminant plume will not expand and that natural processes will continue to decrease the concentrations of the contaminants.

   • Install a series of wells along Collyer Brook and the Royal River to monitor the boundary of the contaminant plume. Wells will be installed in both the overburden soils and in the bedrock. (900-series wells on Figure 2)

   • Initiate a long-term groundwater monitoring program. This program is a modification of the current monitoring program.

   • Track the progress of attenuation by monitoring contaminant levels in the groundwater. This monitoring data will be used to verify that contaminant concentrations are decreasing, refine the time estimates necessary to reach federal and state standards, and support data from the new wells that the contaminants are not expanding through the aquifer.

3. Monitoring the Royal River to demonstrate that the continuing decrease in groundwater concentrations will result in further decreases of TCE in the river.

- Monitor surface water to verify that TCE concentrations continue to decline. Because the amount of TCE moving from the groundwater into the Royal River is greatly diluted by river flow, it is projected that the TCE concentrations will meet the State Water Quality Criteria (SWQC) within four to six years, 2005 to 2007.

- Provide for a contingency response approach which will allow development of active remediation in the River if SWQC are not met in 2009 or 2013 at SW-1 and SW-201 respectively (see Figure 2 for the sampling locations).

- Cover Boiling Springs with a fabric/stone/soil layer cover to prevent contact with the contaminated spring water by humans and wildlife.

4. Evaluating the cleanup approach to confirm that it is protective of human health and the environment.

- As long as contamination remains onsite, the Superfund law requires reviews every five years to evaluate the effectiveness of the implemented cleanup plan.

- As part of each five year review, EPA will review the Site conditions to determine if the cleanup action is protecting public health and the environment.

It is expected that institutional controls will be implemented within 90 days after entry of a Consent Decree covering implementation of this remedy. The long-term monitoring of groundwater and surface water will continue until EPA determines that the ROD performance standards have been met. The time necessary for this is estimated to be fifty years for the center of the eastern groundwater plume, twenty to thirty years for the northern plume, and four to six years for the Royal River. Costs for the long-term monitoring and institutional controls are estimated to be $1,600,000. Costs for the covering of Boiling Springs and purchase of conservation easements are estimated to be $400,000. Additionally, the contingency response approach for the River, if necessary, could cost up to $2 million.

XII. STATUTORY DETERMINATIONS

The remedial action selected herein for implementation at the McKin off-site operable unit is consistent with CERCLA and, to the extent practicable, the NCP.

A. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy will be protective of human health and the environment. Exposure to

contaminated groundwater will be prevented through institutional controls. Long-term monitoring of the groundwater will allow EPA to track the decreasing concentrations present in the overburden and shallow aquifer. Water quality data from new bedrock monitoring wells to be installed in downgradient locations will be used by EPA to demonstrate that the plumes are not expanding. The covering of Boiling Springs prevents either human or wildlife direct contact with the contaminated spring water. There are no significant short-term risks to human health or the environment during implementation of the selected remedy. The potential exposure of Site workers and area residents during the installation of new monitoring wells will be monitored by ambient air monitors to assess potential releases to the air during cleanup operations.

B. The Selected Remedy Attains or Appropriately Waives ARARs

Section 300.430 (e) of the National Contingency Plan (NCP) requires that on-site remedial actions at CERCLA sites must meet ARARs under federal or state environmental or facility siting laws unless there are grounds for invoking a waiver. A waiver is required if ARARs cannot be achieved. Other federal and state advisories, criteria, or guidance, as appropriate (to be considered – TBCs), should be considered in formulating the remedial action.

ARARs are promulgated, enforceable federal and state environmental or public health requirements. There are two categories of requirements: "applicable" and "relevant and appropriate". CERCLA does not allow a regulation to be considered as both "applicable" and "relevant and appropriate". These categories are defined below:

Applicable Requirements - Section 300.5 of the NCP defines applicable requirements as "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site".

Relevant and Appropriate Requirements - Section 300.5 of the NCP defines relevant and appropriate requirements as "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site."

To be considered (TBCs) guidelines are non-promulgated criteria, advisories, and guidance issued by the federal or state governments. Along with ARARs, TBCs may be used to develop the interim action limits necessary to protect human health and the environment.

ARARs and TBCs are divided into three categories: chemical-specific, location-specific, and action-specific. This section briefly summarizes the most significant chemical, location and action specific ARARs for the remedy and identifies those for which a technical impracticability

waiver is sought.

Chemical-Specific ARARs

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the determination of numerical values that establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. In general, chemical-specific requirements are set for a single chemical or a closely related group of chemicals. These requirements do not consider the mixture of chemicals. A summary of chemical specific ARARs is presented in Table 6.

The Maine Water Classification Program sets standards for the classification of state waters. The Royal River is a Class B river/stream and Maine standards for Class B water prohibit discharge of TCE in excess of 2.7 µg/L (or ppb) based on human health for consumption of water and organisms. The state water quality standard may be used to establish relevant and appropriate requirements in establishing surface water remediation goals for the McKin Site.

The federal Maximum Contaminant Levels (MCLs) are chemical-specific ARARs that govern the quality of drinking water provided by a public water supply. MCLs are relevant and appropriate requirements in establishing groundwater remediation goals and surface water remediation goals for Boiling Springs.

The state Maximum Exposure Guidelines (MEGs) are chemical-specific ARARs that are health-based guidelines intended to determine drinking water quality for private residential wells. MEGs are relevant and appropriate requirements in establishing groundwater remediation goals and surface water remediation goals for Boiling Springs.

The MCLs and MEGs for which a technical impracticability waiver will apply are noted in the table in Section VIII above.

Location-Specific ARARs

Location-specific ARARs are restrictions placed on the concentrations of hazardous substances, or the conduct of activities solely because they are in specific areas. The general types of location-specific ARARs that may be applied to the McKin Site are briefly described below and are presented in Table 7.

Several federal and state ARARs regulate activities that may be conducted in wetlands and flood plains. These regulations and requirements may apply because the boundary of the 100-year flood plain encompasses the level terrace behind the steep banks on the Royal River's channel. Wetlands are situated in eroded channels and depressions on the flood plain terrace. The Wetlands Executive Order (E.O. 11990) and the Flood Plains Executive Order (E.O. 11988), incorporated into 40 CFR Part 6, Appendix A, require that wetlands and flood plains be protected

and preserved, and that adverse impacts be minimized. Section 404 of the Clean Water Act and State wetland protection regulations restrict activities that adversely affect wetlands and waterways. The RCRA location standards outline the requirements for construction of a RCRA facility located in a 100-year flood plain.

Additional location-specific ARARs include the Fish and Wildlife Coordination Act, which requires that any federal agency proposing to modify a wetland or body of water must consult with the U.S. Fish and Wildlife Service. Regulations governing endangered species at the federal and state levels would need to be considered for any proposed on-site actions. Regulations governing historical and archeological resources would need to be considered should such resources be encountered during the remedial action.

The Maine Natural Resources Protection Act governs activities that may occur in or adjacent to wetlands or surface water bodies.

No waiver of location-specific ARARs is being sought for the McKin technical impracticability evaluation. Location-specific ARARs were met during the Boiling Springs pilot study conducted by EPA during the summer, 2000. EPA determined that there was no alternative to working in the flood plain and wetlands to address the risk posed by Boiling Springs and therefore took steps to minimize the impact, scheduling the work for when precipitation and river stage are normally at their lowest. Standard erosion control devices were placed in the work area, including the wooded slope down to the flood plain. The size of the Boiling Springs cover was within the range allowed under the permit by rule regulations of the Maine Natural Resources Protection Act, but because of the proximity to the Royal River, the work required review by Maine DEP. The Maine DEP approved the pilot study work plan with modifications. Public comments on the pilot study were solicited by EPA during the mediation process, at regular meetings with the SAG, and through the Proposed Plan public comment period.

Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are generally focused on actions taken to remediate, handle, treat, transport, or dispose of hazardous wastes. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be implemented. The general types of action-specific ARARs that may be applied to the McKin Site are briefly described below and are presented in Table 8.

Potential action-specific ARARs include federal and state criteria that may be applied as action levels for surface water response actions if the contingency response approach for the Royal River is implemented. For example, ambient air quality standards may be applied to actions that could result in air emissions of specific VOCs.

A number of RCRA regulations govern emissions from process vents, equipment, tanks, and

containers. These requirements may be considered depending on the response actions selected. The Clean Air Act's National Emission Standards for vinyl chloride would need to be considered for actions that could release this hazardous air pollutant to the ambient air.

The Maine Hazardous Waste Management Rules regulate treating, storing, and disposing of hazardous wastes. Other state regulations that govern solid waste, particulate emissions, discharges that affect water quality, and air pollution may need to be considered.

Barring a contingency action for the Royal River, it is expected that the only Action-Specific ARARs triggered by this ROD Amendment will relate to RCRA groundwater monitoring and the handling, transporting, and disposal of waste that may be encountered during the drilling of the new monitoring wells to be installed around the perimeter of the ICZ.

No waiver of action-specific ARARs is sought for the McKin Site technical impracticability evaluation.

C. The Selected Remedial Action is Cost-Effective

The selected remedy is cost-effective since it provides overall effectiveness proportional to its cost.

The estimated costs for the amendment alternatives evaluated range from $0.35 million for monitoring performed under GW-1 and SW-1 to $5.1 million for the combination of GW-2 and SW-4. Except for GW-1 and SW-1 which do not require any action beyond monitoring, all of the other alternatives rely on institutional controls to prevent exposure to contaminated groundwater and the covering of Boiling Springs to prevent contact and ingestion of the contaminated spring water. The selected remedy GW-2/SW-2 at $2.0 million does not treat or remove contamination from the groundwater which alternatives GW-2/SW-3 ($4.6 to 4.8 million) and GW-2/SW-4 ($4.9 to $5.1 million) would do. Implementation of either SW-3 or SW-4 would allow for attaining the State Water Quality Criteria within a year as opposed to the projected four to six years needed under SW-2. However, since EPA has not identified any current public health or environmental risk associated with the TCE in the Royal River, EPA determined that the short-term gain does not justify the increased costs.

D. The Selected Remedy Does Utilize Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy provides a permanent solution and alternative treatment or resource recovery technologies to the maximum extent practicable for the groundwater plume and Boiling Springs through institutional controls and long-term monitoring. It isolates the groundwater from human receptors and by applying a cover over Boiling Springs, prevents exposure to human and environmental receptors. Extrapolations of groundwater monitoring data indicate that the plume will continue to reduce in size and concentration toward the performance standard over

the next fifty years. Extrapolation of data from Boiling Springs indicate the springs will achieve drinking water standards in about twenty years.

Alternatives involving on-site extraction and treatment of the groundwater plume prior to its discharge into the Royal River were considered, but as there was no identified human or environmental risks with the TCE concentrations in the Royal River, EPA determined these alternatives did not provide sufficient improvement to merit the increased costs.

E. The Selected Remedy Does Not Satisfy the Preference for Treatment as a Principle Element

The selected remedy does not use treatment of the TCE-contaminated groundwater and surface water as a principle element of the remedy. EPA determined that it was technically impracticable to restore the off-site overburden and bedrock aquifers through treatment.

F. Five Year Reviews

Because this Amendment would result in contaminants remaining on-site, EPA will review the Site at least once every five years after the initiation of the remedial action at the Site to assure that the remedial action continues to be protective of human health and the environment. This review will be consistent with the CERCLA §121.(c) applicable for five-year site reviews in effect at the time of the review.

XIII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

The Proposed Plan to Amend the 1985 Cleanup Plan was released for public comment in September 2000. The proposed change calls for attaining protectiveness of human health through institutional controls and long-term monitoring rather than restoration of the off-site aquifers through active remedial action. The amended cleanup plan also includes covering Boiling Springs, surface water monitoring with a contingency response approach for the Royal River, purchase of conservation easements, and five-year reviews.

EPA determined that, based on comments received during the public comment period which concluded on October 27, 2000, no significant change is needed to the proposed amended cleanup plan.

XIV. STATE ROLE

The Maine Department of Environmental Protection has reviewed the remedy change and concurs with the selected remedy described in Section XI of this Amendment. A copy of the State concurrence letter is attached as Appendix C.