MINNESOTA POLLUTION CONTROL AGENCY
SITE REMEDIATION SECTION

DRAFT GUIDELINES
REMEDY SELECTION

WORKING DRAFT, September 1998

Comment Period Ends December 31, 1998

Send Written Comments to:
Guidance Coordination Team
Minnesota Pollution Control Agency
Site Remediation Section
520 Lafayette Road
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NOTICE

THIS DOCUMENT IS A WORKING DRAFT. The Site Remediation Section of MPCA is developing guidelines for evaluating risks to human health and the environment at sites that may require investigation or response actions pursuant to the Minnesota Environmental Response and Liability Act, Minn. Stat. § 115B.01 to 115B.24 (MERLA).

DEVELOPMENT OF A SITE REMEDIATION SECTION SITE EVALUATION MANUAL. The attached document and other documents not yet developed will be incorporated into a Site Remediation Risk-Based Site Evaluation Manual which will contain guidelines for conducting MERLA-related evaluations, including risk evaluations under the State Superfund program and the MPCA Voluntary Investigation and Cleanup (VIC) Program.

MPCA staff intend to use the policies and procedures in the proposed manual as guidelines to evaluate the need for investigation or remedial actions to address releases and threatened releases of hazardous substances or pollutants or contaminants under MERLA, and the scope and nature of such actions. These policies and procedures are not exclusive and do not have the force and effect of law. MPCA staff may use other policies or procedures to evaluate the need for or adequacy of response actions under MERLA, including procedures set forth in outstanding MPCA Requests for Response Action and Consent Orders. The final standard for all such evaluations is the MERLA statutory requirement that such actions must be reasonable and necessary to protect the public health and welfare and the environment.

APPLICATION TO SITES MUST BE PRE-APPROVED. At this time, Site Remediation Section staff shall accept only written comments regarding this draft document (see comment period and address above). During guideline development, application of these guidelines or procedures shall be Site-specific, conducted in consultation with and upon approval of MPCA Site Remediation Section staff assigned to the specific site.

INTERIM CHANGES TO DRAFTS. Document users are responsible for contacting MPCA staff assigned to the site to get the latest unpublished changes to the document.

EXPLANATION:

[NOTE TO WORK GROUP: Include qualifying remarks specific to your document in this "explanation" box. For example, the following statement was provided by Draft Site Screening Evaluation Guidelines.]

Distribution List:

(NOTE TO PERSONS OTHER THAN THE SITE REMEDIATION SECTION (SF/VIC) STAFF: As necessary, please distribute this draft document to selected members of your staff for review and comment. Based on past interactions with SF/VIC, suggested staff are indicated in parenthesis)

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Note: For definitions of terms and concepts, please refer to the RBSE Glossary document.

EXECUTIVE SUMMARY

This document is a component of the Minnesota Pollution Control Agency (MPCA) Superfund and Voluntary Investigation and Cleanup Programs (SF/VIC) "Risk-Based Site Evaluation Manual" for managing sites where releases of hazardous substances, pollutants, or contaminants have occurred. Remedy selection is formally undertaken after characterization of soil and ground water contamination at a site has been completed, the risks to human health and the environment have been assessed, and it has been determined that an unacceptable risk exists and response actions are necessary.

Once it has been determined through risk-based decision-making that a remedy is needed to reduce risk to an acceptable level, remedy selection begins. Often this will occur very early in the investigative process or as soon as it is determined that an unacceptable risk is present. Information collected at the site from that point forward should focus on quantifying the risk and selecting a remedy acceptable to all interested parties.

As defined by the Minnesota Environmental Response and Liability Act (MERLA), all remedies must meet the threshold criterion of providing overall protection of public health, welfare, and the environment and consider the planned use of the property. With this in mind, the mission of the SF/VIC supports evaluation of potential remedies ranging from those that thoroughly destroy contaminants to those that include the use of engineering controls and/or institutional controls, depending upon site circumstances. The SF/VIC mission, as described in Section 2.0, was developed in an effort to effectively communicate the role of the SF/VIC programs and provide direction during the investigation and cleanup of contaminated land in Minnesota. Guidance is provided for assessing alternative remedies using the five balancing criteria: long-term effectiveness; implementability; short-term risk; cost effectiveness; and community acceptance.

Originally, remedy selection in the Superfund program was a "one-size-fits-all" process that included several phases of reporting and evaluation as outlined in the National Contingency Plan (NCP), 40 C.F.R. Part 300. Today the NCP-like approach to remedy is used at a relatively small number of sites and is referenced in this document as the "traditional remedy selection" approach. Remedy selection tailored to site-specific circumstances is referred to as "Streamlined Remedy Selection." This guidance is intended to provided the most appropriate approach to remedy selection based upon site specific circumstances.

The "Considerations" section of this document presents information on compliance with state and federal regulations and explores other issues that have historically slowed or complicated the remedy selection process. The section attempts to communicate specific remediation program policies on some of those issues. It also addresses areas where greater MPCA flexibility is now available. The final sections provide guidance on remedy planning, reporting, and tracking.

REMEDY SELECTION

1.0 INTRODUCTION

This document provides guidance for selecting and implementing remedies at contaminated Superfund (SF) or Voluntary Investigation and Cleanup (VIC) sites. This document is a component of the Minnesota Pollution Control Agency (MPCA) Superfund and Voluntary Investigation and Cleanup Programs (SF/VIC) "Risk-Based Site Evaluation Manual" for managing sites where releases of hazardous substances, pollutants, or contaminants have occurred. Remedy selection is formally undertaken after characterization of releases and threatened releases at a site has been performed, the risks to human health and the environment have been

assessed, and it has been determined that an unacceptable risk exists at the site. Using the site characterization data, remedial alternatives are developed that protect public health and welfare and the environment and are capable of reducing the identified risk to an acceptable level. The considerations that influence selection of a preferred remedy from the list of potential alternatives are the focus of this document.

Determining when an unacceptable risk is present at a site is accomplished through application of other SF/VIC guidance documents including:

- The Ground Water Policy Guidance;
- The Risk-Based Guidance for the Soil Leaching Pathway;
- The Risk-Based Site Evaluation Guidance for Human Health Based Soil Reference Values; and
- The Guidance on Incorporation of Planned Property Use into Site Decisions.

By statute, all remedies must meet the threshold criterion of providing overall protection of public health, and welfare, and the environment. The Minnesota Environmental Response and Liability Act (MERLA) defines remedy as "*those actions consistent with permanent remedy taken instead of or in addition to removal actions in the event of a release or threatened release of a hazardous substance, or a pollutant, or contaminant, into the environment, to prevent, minimize, or eliminate the release in order to protect the public health or welfare or the environment*" (Minn. Stat. § 115B.02, subd. 16).

In 1995, MERLA (§§ 115B.01 - .24) was amended to require the Commissioners of the MPCA and of the Minnesota Department of Agriculture (MDA) to "consider the planned use of the property" when selecting a remedy (Minn. Stat. § 115B.17, subd. 2a). Consideration of "planned use" allows differing human exposure scenarios (industrial versus residential, for example) to be incorporated into the assessment of risk and consequently into the remedy selection process.

Use of a risk-based approach that includes consideration of the planned use of the property has resulted in evaluation of a more diverse array of remedies that better reflect the concerns of the various stakeholders, communities, and property owners. In addition, risk-based decision making has led to the following developments that have changed the way that remedies are selected:

- Better answers to the question of "How clean is clean?" and what constitutes adequate risk management, thereby reducing the number of protracted debates about quantitative risk characterization and cleanup levels.
- Increased emphasis on community participation has encouraged citizens and regulators alike to become better acquainted with, and more effective at, communicating risk concerns and determinations.
- Changes in state law and policy initiatives at the federal level are allowing more "finality" for participants in site cleanup processes, allowing organizations to quantify or even to end their liabilities (if possible), with less risk of future re-evaluation of cleanup levels and remedy effectiveness.

Section 2.0 of this document presents the SF/VIC mission and briefly attempts to put it into the context of remedy selection. Section 3.0 discusses the "streamlined" approach to remedy selection and the more "traditional" approach which is still used at more complex sites. In Section 4.0 the Balancing Criteria that are used to weigh remedial alternatives that meet the threshold criterion of protecting public health and welfare and the environment are presented. Other considerations involved in remedy selection and the SF/VIC's policies with regard to these considerations are presented in Section 5.0. Finally, the reporting requirements for the remedy selection process are discussed in Section 6.0, followed by information on remedy approval and tracking in Section 7.0.

2.0 PROGRAM MISSION

The SF/VIC mission is to protect human health, public welfare, and the environment by conducting or overseeing investigations and response actions in order to return land to economic or other beneficial use under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act, and the Minnesota Environmental Response and Liability Act (including the Land Recycling Act).

In fulfilling this mission, the SF/VIC will work in partnership with its various customers to make site investigation and cleanup decisions based on: a) protection of human health and ecological health as determined using a risk-based decision making process; b) planned use of property; c) a preference for detoxification and treatment; and d) a minimization of cross media transfer of contaminants. Such decisions shall be made so as to not pose unacceptable risk to human health, public welfare, and the environment, and may incorporate concepts of cost-effectiveness, pollution prevention, and natural resources damages.

Taken as a whole, the MPCA SF/VIC mission supports evaluation of potential remedies ranging from those that thoroughly destroy contaminants to those that include the use of engineering controls and institutional controls, depending upon site specific circumstances. Item a) in the "Mission Statement" refers to the risk based decision making process. Guidance for this process is presented in other SF/VIC documents as referenced in Section 1.0. Item b) refers to consideration of the planned use of the property and is discussed further in Section 5.0 of this document and in the "Guidance on Incorporation of Planned Property Use into Site Decisions". Item c) communicates the SF/VIC policy to prefer remedies that result in detoxification or treatment of contaminants after balancing other factors. Item d) references cross media contamination that occurs when contaminants are moved from one media to another as part of a remedy, such as from soil to air. This issue is discussed further in Section 5.0 of this document.

3.0 THE REMEDY SELECTION PROCESS

Traditionally, remedy selection for sites in the state Superfund program was approached through the Remedial Investigation/Feasibility Study (RI/FS) process. This process includes several phases of evaluation and reporting that culminate in selection of a remedy. Over time, experience has shown that the full RI/FS process is cumbersome and unnecessary for the majority of sites, which tend to be smaller in scale and complexity than the early sites for which the Superfund program was anticipated. Accordingly, a more flexible remedy selection process has evolved that can be tailored to address the concerns posed by small sites as well as those posed by sites with extensive environmental problems. The streamlined remedy selection process used at most sites today is described below, followed by a brief discussion of cases where the traditional Superfund remedy selection process continues to be used. The two approaches are presented for general comparison in Figure 3.1.

3.1 Streamlined Remedy Selection

Sites requiring a remedy to reduce risk to acceptable levels are found in many settings and span several scales of size and complexity. The issues and challenges involved in choosing a remedy that will address risk and be acceptable to the affected parties vary widely and are unique to each site. The site-specific concerns and the need to obtain regulatory approval and community acceptance for a proposed remedy are key elements

that influence the remedy selection process. Another important consideration involves potential future cost recovery actions. If a responsible party/voluntary party (RP/VP) is considering cost recovery from other potentially responsible parties under CERCLA, careful evaluation of the remedy selection process is recommended to ensure consistency with the NCP regulation.

At the simplest sites, where the volume of contaminated media is low and effective treatment is available, remedy selection may involve proposal of a single remedial plan that will reduce the identified risk to acceptable levels. In other words, the RP/VP evaluates and proposes only one remedial option for regulatory approval. Usually at sites like these, the remedial technology is known to be effective, the remedial strategy is non-controversial and has little or no impact on the surrounding community, and the cost of the remedy is acceptable to the RP/VP. An example would be excavation and thermal treatment of a small volume of non-chlorinated volatile organic compound-contaminated soil from a near surface location. The cost for this remedy will be low, and absent community-related or unique site-related issues rendering it undesirable, it is an obvious choice. For simple remedies such as this, only a brief Remedial Action Plan (RAP) is needed to describe how the remedial action will be conducted for MPCA staff review and approval (see Section 6.0). VPs/RPs often submit the site investigation report and the RAP together to streamline regulatory review and ultimately speed up the pace of the cleanup process.

Sites with small scale environmental concerns are commonly identified through due diligence investigations performed for property transfers. RPs/VPs commonly decide to remediate small areas of contamination identified at properties where sale or transfer is imminent even when preliminary data indicate a remedial action may not be necessary, simply because it makes business sense to eliminate a potential environmental concern up front. In addition, when a business transaction is pending, the time available to select and implement a remedy is usually short, so that implementation concerns drive remedy selection (all other things being equal).

Sites that involve significant volumes of contaminated material, more complex technical issues, and/or have land-use or other community issues that must be addressed during remedy selection, constitute the next step up in complexity. At these sites, two or more remedial options are generally evaluated in order to assess the effectiveness and cost of the different strategies and to provide choices in addressing the broader issues posed by the site remediation. When evaluation of more than one remedial alternative is performed, the MPCA requires that a Focused Feasibility Study (FFS) be prepared. The FFS describes the remedial alternatives, evaluates each alternative in relation to the balancing criteria, and provides the rationale for selection of the proposed remedy (see Section 6.0). With the FFS, the remedial alternatives or combination of alternatives that best meets the needs of the RP/VP, MPCA, and the community can be selected. At sites where the alternative proposed for the site is non-controversial, the FFS is often submitted to the MPCA with the RAP. Where this is not the case, it is generally wise to submit the FFS separately to the MPCA and other stakeholders so that outstanding issues can be identified and resolved and any modifications to the proposed remedial alternative can subsequently be incorporated into the RAP.

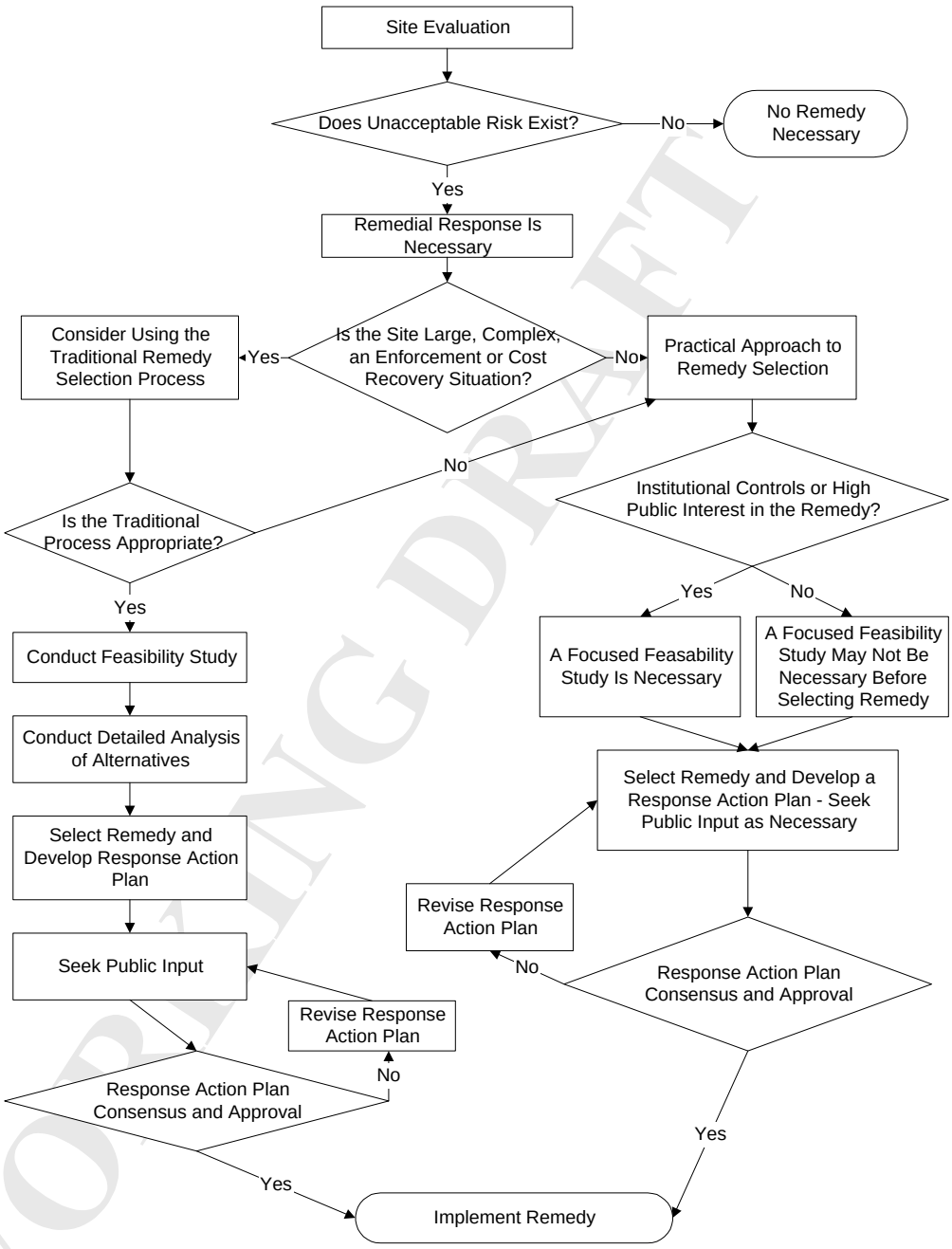

Figure 3.1 Two approaches to Remedy Selection.

At the most complex and/or challenging sites, the FFS and RAP vary in content depending upon the specific site characteristics, number of remedial alternatives evaluated, and nature of the remedial technology proposed. Commonly used, well-documented remedial technologies are typically approved with less supporting data than newer, more experimental technologies. MPCA staff encourages VP/RPs to evaluate and select innovative remediation technologies whenever site conditions are suitable. At sites where key stakeholders have opposing viewpoints or where complex issues must be evaluated prior to selecting a remedy, the FFS should be

submitted to the MPCA and other stakeholders for review prior to proceeding further in the remedy selection process. Sometimes the remedial alternatives presented in the FFS are modified and redeveloped several times before a proposed remedy is accepted by all stakeholders.

Highly complicated sites with numerous areas and/or types of contamination, technical challenges, and/or community-related concerns generally require a higher level of evaluation and documentation in order to select a remedy. The level of effort generally increases in proportion to the number and breadth of the issues that need to be addressed. It may be that the site conditions demand preparation of documents on a par with the traditional Superfund remedy selection process to adequately evaluate the remedial options (see section 3.2).

Sites associated with commonly encountered contaminant groups such as wood-treating chemicals or polychlorinated biphenyls (PCBs) may be able to take advantage of the United States Environmental Protection Agency (EPA) guidance for presumptive remedies. This guidance has been developed by EPA with the intent of assisting RPs/VPs and their consultants in selecting appropriate remedial technologies for specific contaminant types. The available guidance is discussed further in section 5.10 below. To take advantage of the presumptive remedy guidance, it is necessary to have an appropriate level of site characterization to assess whether the site conditions fit the criteria under which the presumptive remedy was shown to be effective. Note that it may be possible to incorporate elements of the presumptive remedy guidance information into the FFS, which may enable the consultant to reduce the amount of information that is provided in the report and expedite MPCA review.

Regardless of the complexity of the site, regular communication with MPCA project staff is encouraged to ensure that all pertinent site issues have been incorporated into remedy selection and implementation. The general steps in practical remedy selection approach discussed above are presented in figure 3.1.

3.2 Traditional Superfund Remedy Selection

Today, sites undergoing remedy selection using the traditional RI/FS process tend to be sites that have been listed on the Permanent List of Priorities for a number of years and are midway through the process, or sites that are undergoing investigation and cleanup under the federal Superfund program. In recent years, MPCA staff has streamlined and simplified the traditional RI/FS and remedy selection process to expedite cleanup of less complex sites. Critical elements of the investigation and cleanup process, such as seeking public input, are retained but many of the lengthy and cumbersome investigation, reporting and review steps have been by-passed. However, MPCA staff and a small number of RPs/VPs continue to select remedies following the more traditional Superfund process primarily in three situations, as described below.

The first situation is state-lead sites where the MPCA is conducting the site investigation and cleanup because there is no identified or viable RP to do so. In these cases, the MPCA generally adheres to the traditional Superfund remedy selection process as outlined in the NCP in order to maximize the opportunity for recovery of MPCA's costs from RPs at a future date under federal Superfund law (42 U.S.C. § 9607(4)(A)), the actions taken by the MPCA must be "not inconsistent" with the NCP. Another situation is when an RP/VP wishes to ensure their ability to pursue a cost recovery action under federal Superfund law. For example, an RP/VP may choose to begin site investigation and cleanup even though there are other persons that are legally responsible for participating in costs of site investigation and/or cleanup but are unwilling to do so. In this case, in order to pursue a future cost recovery action under federal Superfund law (42 U.S.C. § 9607(4)(B)), the RP/VP should follow a RI/FS process that is "consistent with" the NCP. It is advisable for the RP/VP to consult

with a qualified attorney knowledgeable in Superfund law before committing to this approach as this area of case law is still developing.

The MPCA also has the authority to issue a Request for Response Action (RFRA) to an RP that may require the RP to follow the RI/FS remedy selection process. Besides requiring the RP to follow defined steps to select a remedy, the RI/FS process includes a strict timeline for completion of each step that can be used as an enforcement tool. If at a later date the RP becomes more cooperative, there may be opportunity to deviate from the RFRA specified traditional process to a more practical approach if site conditions merit. The MPCA must issue a RFRA and a Determination of Inadequate Response (DIR) if it intends to spend state Superfund money for site cleanup where the RPs are unwilling or unable to do so.

Detailed information about the traditional RI/FS remedy selection process can be obtained from the MPCA by contacting MPCA SF/VIC support staff and requesting a copy of Attachments A and B to the MPCA's Generic RFRA.

4.0 BALANCING CRITERIA IN SELECTING REMEDIES

Once a set of remedial alternatives meeting the threshold criterion of providing overall protection of public health, and welfare, and the environment has been developed, the most appropriate remedy for a specific site can be evaluated by weighing the balancing criteria described below.

4.1 Short-term Risk

The purpose of evaluating short-term risk is to consider and address the potential effects on human health and the environment during construction and implementation of each remedial alternative. Protection of the community, protection of on-site workers, and prevention of additional environmental impacts to ecological receptors must be considered when evaluating short-term risk. For example, short-term risks might be created by exposing nearby residents or on-site workers to hazardous constituents via windblown dust and/or volatilization of contaminants during excavation and grading. Transport of hazardous materials to remote disposal and/or treatment facilities may also pose a risk to sensitive populations along the transport route. Surface transport of exposed contaminated soil via runoff into wetlands, streams, or rivers may expose sensitive ecological receptors. Another aspect of short-term risk is the overall time required to complete the remedial action during which short-term exposures may occur.

When evaluating short-term risk, it is important to consider the various exposure routes for the contaminants identified at the site and how exposure routes might change during implementation of the remedial alternative. Some contaminants are significantly more hazardous in one form (e.g., liquid versus gas), or through one exposure route (e.g., dermal versus inhalation), than another. It is also important to consider the dimension of time, and how long any exposures caused by remedy implementation could occur.

4.2 Long-term Effectiveness

The purpose of considering long-term effectiveness is to evaluate the magnitude of the residual risk that will remain after completion of the remedy and to assess the adequacy and reliability of the mechanisms proposed to reduce, eliminate, or control the residual risks over time.

Examples of the issues to examine when evaluating long-term effectiveness are: 1) reduction of total mass of contaminants in the environment; 2) transfer of the pollutants or contaminants to another media or location; 3) long-term impact on current and future uses of the property; 4) level of confidence in future use of the property; and 5) the length of time needed to achieve the desired threshold criteria.

An example of how the above issues can affect remedy selection can be seen when comparing the remedial alternative of soil removal to monitored natural attenuation. Soil excavation with off-site thermal treatment can be implemented quickly, with the assurance that all material contaminated above a risk-based standard is removed from the site. Thus, this alternative has a high degree of long-term effectiveness. However, there may be significant short-term impacts related to exposure and/or property use during the removal process, and the contaminants are ultimately transferred to another location. Monitored natural attenuation, on the other hand, requires a long period of time over which contaminant concentrations are monitored with the expectation that the contaminants eventually decline to acceptable levels. With no disturbance of the ground surface, the short-term risks associated with excavation would be avoided, but the magnitude of the residual risk and hence the long-term effectiveness may be difficult to quantify. This example illustrates the importance of determining future land use and assessing local government and community plans for a property before determining what remedy provides the best long-term solution for the site.

4.3 Implementability

The purpose of evaluating implementability is to consider how technical and administrative factors and the availability of services and materials affect the ability to implement each remedial alternative. Technical feasibility includes assessing issues of technical difficulty as well as the degree of uncertainty associated with construction and operation of a particular remedy. It may also include consideration of the reliability of a remedial action, the ability to monitor its effectiveness, or the relative ease of taking additional future actions, if appropriate.

Technical feasibility involves considering whether the desired outcome can be achieved with the proposed technology for the contaminants of concern and in the media in which they are present and consideration of whether the technology is speculative or experimental or has been demonstrated to work. Some remedies that are effective in sandy soil, for instance, may be ineffective in clay soil. An example of how technical feasibility might be assessed in selecting an alternative is provided by the case of deep aquifer contamination, where a technology to detoxify or treat the contaminants does not appear to exist, and a pump-and-treat technology is implemented to control the spread of the contaminants, pending identification or development of a technology to remediate the release.

Administrative feasibility involves evaluating the time and resources needed to coordinate with other offices and agencies, and the ease of obtaining any necessary approvals and permits from them (e.g., for off-site actions, etc.). Administrative feasibility may also relate to whether the technology can be approved or permitted in the state. An example would be the question of whether permits could be obtained to use incineration or thermal desorption to treat certain contaminants at the location where treatment is proposed, and what allotment of time would be needed before the permits could be obtained.

The availability of services and materials needed to implement a remedy must also be considered. Examples are the availability of adequate off-site treatment, storage, and disposal capacity and services; availability of necessary equipment, specialists, and supplies; or availability of prospective technologies.

4.4 Cost Effectiveness

A cost-effective remedy is one that achieves the desired degree of long-term effectiveness for the least total cost. To identify a cost-effective remedy, it is necessary to establish a clear understanding of the desired remedial outcome. The vision of an effective remedial outcome may differ among stakeholders involved in the remedy selection process. Therefore, it is necessary to establish "common goals" for the site that are reflective of the needs of all parties. Without common goals, it may be impossible to determine what alternative is relatively most cost-effective. Begin by developing "effectiveness goals" for the site. These might include:

- addressing short-term risk;
- addressing long-term risk;
- reducing liability;
- addressing community needs/desires;
- limiting restrictions on future property use; or
- addressing effective pollution prevention processes.

The various stakeholders involved in the remedy development process will likely favor different effectiveness goals. Property owners will want to maximize property marketability and value, and responsible parties may want to reduce future liability. Local units of government and other community representatives may establish future property use based on zoning and community development goals. The effectiveness goals identified by the stakeholders must be prioritized and the remedial alternatives that will best achieve the goals (as prioritized) can be developed.

When evaluating costs, consider not only short-term costs of feasibility studies, engineering, and construction, but also estimate any long-term costs, such as those of monitoring, operation, and maintenance (O&M) and liability insurance. It may not be possible to quantify all long-term costs accurately. What is important is to consider the relative magnitude of the long-term costs for each alternative, and to "add" these relative costs to the shorter-term implementation costs of each alternative, allowing a truer comparison of total costs among the alternatives. It is also important to express the total cost of each alternative in current dollars, in order to provide a baseline for more objective cost comparison among the alternatives, especially when significant future costs are expected.

Valuation of on-going and long-term costs in current dollars is done using a "discount rate." The discount rate is a percentage that represents a number of financial and economic factors, but is based primarily on interest rates. Interest rates, in turn, are based largely on expectations regarding inflation. For purposes of this discussion, use of the term "discount rate" implies a "real discount rate" based on a "real interest rate" and accounting for inflation. If the discount rate used is too high, the cost estimate for a remedy will be too low, and vice versa. Use of a reasonable rate is thus essential to accurately compare the cost of a remedy using containment or other exposure control methods to the cost of one consisting mainly of short-term actions. A reasonable discount rate may be developed using a variety of sources, such as large financial institutions, a U.S. Federal Reserve Bank, or current literature on costing public works projects (e.g., from the U.S. Army Corps of Engineers).

The following equation uses a discount rate of 3.11 percent and illustrates how to calculate the total infrastructure implementation costs of a remedy requiring maintenance:

$$\text{Total Cost} = \text{Initial Cost} + \sum_{1}^{N} \frac{\text{Projected Annual Cost}}{(1.0311)^{N}}$$

For example, for a remedy requiring an initial expenditure of $500,000 and annual maintenance costs of $10,000 (priced in the current year) for 30 years, the total cost in today's dollars of the remedy would be $693,246.60. The annual maintenance costs in today's dollars for each of the first 3 years (beginning the year after implementation), are: $9,698.38; $9,405.86; and $9,122.16, respectively. Put another way, in order to set aside enough money now to pay for this remedy over the 30-year period, one would have to come up with $693,246.60.

Reliability of the cost-estimate depends upon the accuracy of the underlying assumptions. For example, in the case described above, it is assumed that the cost of annual maintenance has been properly determined and will not vary, and that inflation will not change dramatically over the 30 year period. Furthermore, potential replacement costs have not been included.

It is important to consider the potential need for additional response actions (such as remedy repair, replacement, or enhancement) in the future for each remedial alternative and the likely magnitude of the associated costs. If this is not done, it is unlikely that the estimated remedy implementation costs will provide an accurate picture of the total, long-term remedy costs. The uncertainty of future needs is best handled by evaluating the cause of the uncertainty. For example, is the uncertainty related to the long-term reliability of the remedy, potential changes in land use, or some combination of factors? Identifying the causes of the uncertainty can be helpful in defining additional factors to be weighed in evaluating the relative merits and costs of the remedial alternatives. At a minimum, it is helpful to rank the alternatives on a relative basis on the issue of likely future costs and then consider this factor in the selection process.

Stakeholders may select a remedy because it defers a portion of remedy costs into the future, but in doing so, they should understand the true magnitude of costs and their distribution over time. They must also be clear on who will pay for such costs, and should make legal and financial provisions accordingly.

When estimating and evaluating remedy costs, also consider any other relevant cost factors, such as:

- changes in property value associated with different cleanup levels, compared to the costs of achieving the different levels of cleanup;
- natural resource restoration or replacement;
- potential benefits/costs to the community of a change in business viability or development; or
- ability to pay for or finance the remedy by the responsible or voluntary parties or availability of resources in the Superfund Account.

After estimating total, short- and long-term costs, compare the costs among the alternatives. If the costs of the most effective alternative appears prohibitive, it may be possible to meet with interested and affected parties to re-evaluate the effectiveness goals identified earlier in the process. Alternatively, it may be possible to amortize costs over a longer period of time to avoid compromising the effectiveness goals, or to

implement an alternative response action to manage risk differently, either permanently or until sufficient funds can be obtained to implement a more appropriate remedy.

4.5 Community Participation

Community participation often will influence the selection of the remedy when multiple technically and economically feasible options are being evaluated, if proposed remedies are not consistent with community goals, or if controversial remedies are proposed. Public concerns must be considered during the remedy development and selection process. Community participation is encouraged as early as possible in the site investigation process for larger sites or sites where there is pre-existing community interest. For sites on the PLP, a public notice and comment period is required. Community participation should be viewed as a resource to the remediation decision making process, rather than as a hindrance. Moreover, in the current policy context of broadened remedy selection goals, it is more important than ever to understand any community goals and values concerning a site, and how they relate to land use and development issues. Specific guidance on "Community Involvement in Risk-Based Site Decision-Making" is available from MPCA SF/VIC support staff.

5.0 CONSIDERATIONS

5.1 Compliance with State and Federal Regulations

Remedial actions for releases and threatened releases of hazardous substances, and pollutants or contaminants, must be selected and carried out in compliance with State and Federal legal requirements. The general legal standard that must be met by any remedial action selected and implemented under MERLA is that the remedial action must protect public health and welfare and the environment. Risk-based selection of remedial action, by focusing on reduction of risk to public health and the environment, is intended to assure that a remedy meets the protectiveness standard of MERLA. However, remedial actions selected under MERLA must also comply with other environmental laws and rules such as air quality, water quality, and hazardous waste management laws and rules. These other environmental laws and rules, both substantive and procedural, must be considered and addressed as part of the selection and implementation of a remedial action.

Other environmental laws and rules may apply to a remedial action in two ways. First, environmental laws and rules may apply to the release itself, by requiring actions to address that type of release, or by setting remediation or cleanup standards that must be achieved by whatever remedy is selected for that release. An examples would be the Water Pollution Control Act provision requiring recovery of discharges that may cause water to become polluted under Minn. Stat. § 115.061. Second, environmental laws and rules may apply not to the release itself, but to the operation of the remedial action that is selected to respond to the release. Examples include regulations on air emissions or water discharges produced from ground water pump and treatment remedies. Legal requirements applicable to remedy operation include substantive standards, such as concentrations of air or water pollutants that may be discharged by a remedial installation, and procedural requirements such as permitting and reporting processes that must be followed as a condition for commencing or continuing the operation of the remedy.

If cost recovery under CERCLA is an issue for a particular remedial action (see discussion earlier in this Guidance), there are additional legal requirements that will need to be addressed in selecting and implementing the remedial action. CERCLA, and the EPA National Contingency Plan, require that remedial actions comply not only with applicable environmental laws and rules, but also with legal requirements that are "relevant and appropriate." Generally, an environmental law or rule may be relevant and appropriate if it

addresses circumstances sufficiently similar to those of the release so that compliance would be a reasonable way to assure protection of public health and welfare and the environment.

It is important to recognize that cleanups conducted with MPCA SF/VIC oversight must be administered in compliance with applicable statutes and rules. Compliance with statutory and regulatory provisions is considered to be directly relevant in determining whether a remedial action adequately protects public health and the environment. At sites with EPA involvement, CERCLA provides for waiving of necessary permits for on-site work provided the work is conducted in compliance with the substantial conditions of such permits. Some of the primary state and federal laws pertaining to site remediation activities in Minnesota are listed in Attachment 1.

5.2 Planned Use of the Property

Future planned use of the site and adjacent properties must be considered when selecting a remedy. Planned use is not limited to just the "land" it could include both surface and ground water associated with the "land." Over time, land use may change, thus potentially changing exposure risks and associated liability. In cases where risk-based decisions result in contamination remaining on-site, it is important to consider the potential long-term legal and financial liabilities related to the presence of the contamination and how changing land use or site alteration could affect these liabilities. Actions as simple as utility installation or repair can result in contact with contaminants left at depth. Also, these liability concerns must be balanced against the risks of potential off-site liability, if the contamination is removed and placed in an off-site facility. Consequently, before selecting a remedy relying heavily on institutional controls, it is important for the user of this document to evaluate the potential limitations and outcomes of such a choice. This precaution is not intended to mandate a certain type of cleanup. Rather, it helps to ensure that an informed decision is made when selecting a remedy.

The MPCA recognizes the difficulty of predicting future uses of property. Furthermore, the MPCA does not have authority to make local property use decisions. Accurate information on this subject is critical, however, to making informed, cost-effective decisions during the remedy selection process. Therefore, it is essential to involve local government and the affected community when assessing planned property use. In the absence of a collaborative, clear property use determination, the MPCA will generally select cleanup goals and response actions that allow for flexible and beneficial use of the property. For additional information on this subject, please refer to the MPCA SF/VIC "Guidance on Incorporation of Planned Property Use into Site Decisions" (Property Use Guidance).

5.3 Institutional Controls

Institutional controls provide a means to control exposure to contamination as part of a remedial action. The purposes of incorporating an institutional control in an MPCA approved response action are to: 1) ensure that response actions remain protective of public health and the environment by limiting uses or activities on the property that could result in exposure to hazardous substances remaining on the property after response actions are completed; 2) serve as mechanisms to notify appropriate parties (e.g., local units of government, prospective purchaser, lenders, tenants, etc.) of the presence of residual contamination and accompanying controls; and/or 3) ensure that long-term mitigation measures or monitoring requirements (e.g., engineering controls) are carried out and maintained.

In developing remedial actions that include institutional controls, the following issues should be evaluated: 1) the type of institutional control to be used; 2) the effectiveness of the institutional control; and 3) the authority, capability, and willingness of the appropriate entity (or entities) to implement, maintain, and monitor the institutional control.

Among the variety of institutional controls, the one(s) recommended will depend on the type of receptor and the potential for exposure to the residual contamination. The MPCA's Property Use Guidance provides additional guidance on the use of institutional controls which the MPCA has authority to enforce including contractual agreements (including consent orders), easements, and environmental restrictive covenants.

The Property Use Guidance does not provide guidance regarding application of other types of institutional controls which are enforced by other agencies, units of governments or other entities (e.g., zoning, well drilling restriction areas, etc.). If entities responsible for other institutional controls agree to implement and maintain the controls to ensure protectiveness of a remedy, such controls can be considered as alternatives to the institutional controls enforced by the MPCA.

If the remedial action (or no action) is based on the implicit or explicit assumption that the use of the property is such that exposure to contaminated soil is limited/controlled this must be clearly articulated. Institutional controls are recommended to ensure that the site situation (i.e., limited exposure) does not change without an accompanying evaluation of risk. If institutional controls, engineering controls, monitoring, or maintenance are utilized to limit or interrupt exposure an evaluation of the potential for the control/monitoring mechanism to fail must be considered. The magnitude of the potential risk posed as a result of control failure should be evaluated and considered in the remedial response action/no action decision.

Institutional controls, as defined and applied in the state Superfund law, are measures that enhance or ensure the integrity of response actions, but are not themselves considered remedial actions. Institutional controls will not be used as the sole method of addressing a release, if there are remedial actions that are cost-effective and technically feasible. The MPCA will continue to have a preference for measures that eliminate or reduce the need for use restrictions and long-term monitoring/maintenance activities. In addition to the discussion in the Property Use Guidance, a discussion of institutional controls pertinent to ground water contamination is found in the MPCA document entitled Ground Water Risk-Based Decision Making Guidance.

5.4 Source Control

For purposes of this document a source is an area of contaminated soil, ground water, or aquifer that poses an unacceptable risk or is contributing to related contamination that poses an unacceptable risk. Buried waste material or containers may also be considered sources of contamination. Source control is an important part of site remediation especially if the identified sources are the origin of on-going releases to soil or ground water. Decisions regarding source control must take into account site-specific factors that include community acceptance, long-term and short-term risks, the technical feasibility of removing source material, as well as cost-effectiveness.

Defining a "source" of environmental contamination in conceptual terms is often easy when compared to determining the exact extent of what constitutes a source in the field. The following discussion focuses on the most common sources of contamination and important factors to consider when evaluating source control options. In the context of this discussion, "source control" is defined as any action that controls, removes, destroys, or detoxifies contamination and results in site-associated risk being reduced to acceptable levels.

5.4.1 Tanks and Drums

Removing sources of contamination clearly makes sense when they are "point sources" such as tanks or drums and removal is easily achievable. Removal of containers is generally a very effective method of source removal when compared to contaminated soil or ground water cleanups, because the mass of contaminated media is much smaller. In all instances, where containers are known to exist, and are suspected of causing environmental degradation, removal should be fully evaluated.

5.4.2 Soil

Contaminated soil can pose a risk to human or ecological health via the direct contact exposure route, vapor migration into buildings, or by leaching into ground water, resulting in exposure at a drinking water well or surface water body. The decision to remediate or contain contaminated soil that is known or suspected to pose an unacceptable risk, based upon estimated numeric risk criteria, should be evaluated on a site-by-site basis.

In general, source control should be a priority if there is a completed pathway resulting in actual exposure to receptors. In terms of direct-contact soil exposure, this means there is contaminated soil that is accessible, and that the impacted or adjacent properties are associated with land use activities that could result in exposure. In terms of the soil-to-ground water pathway, this means that the impacted ground water plume is not stable, and is likely to impact receptors. In situations where it can be demonstrated that a stable ground water plume exists and receptors are not going to be impacted, source removal may not be necessary. However, associated institutional controls will be necessary when source material is left in place.

Source containment remedies, such as capping or near-source ground water extraction, may be acceptable without source removal provided the likelihood of exposure is small, should the containment controls fail. In addition, soil-leaching-driven source removal must be evaluated in the context of the overall risk reduction and cost-effectiveness. In instances where non-aqueous phase liquids (NAPLs) are present in a aquifer, it is possible that source removal in the unsaturated zone will not result in significant reduction of ground water contaminant concentrations, and, therefore, that it will not significantly reduce ground water associated risk. NAPLs are given further consideration below.

5.4.3 NAPLs

Light, non-aqueous phase liquids (LNAPLs) and dense, non-aqueous phase liquids (DNAPLs), when present in soil and/or ground water, represent a serious source of contamination and warrant specific discussion in the context of source removal. Removal of non-aqueous phase liquid (NAPL) impacted soil (soil containing product) is often very beneficial in reducing overall levels of contamination, and, therefore, risk. However, defining NAPL extent and implementing effective removal technologies can prove problematic. This is especially true of DNAPLs, which can be located deep in an aquifer or spread vertically or horizontally over large areas. If there is indication that NAPL exists at a site, investigation and removal is strongly encouraged, when technically feasible and cost-effective. However, as discussed above, removal must be evaluated in terms of the likelihood of success and the resultant overall reduction in risk.

5.5 Containment

Whereas containment as a remedial action or remedy is not specifically mentioned in MERLA, the term "confinement" is defined as an acceptable action when implemented as part of a remedy to "prevent, minimize or eliminate the release in order to protect the public health or welfare or the environment" (Minn. Stat. § 115B.02, subd. 16). The term "containment" is more commonly used in the context of environmental cleanup, and for purposes of this guidance, "confinement" and "containment" are considered synonymous.

When properly designed and maintained, containment based remedies can minimize or prevent migration of a contaminant, and, therefore, can interrupt or reduce the risk to potential receptors. However, containment based remedies tend to be more maintenance intensive and longer in duration than remedies that actively treat or remove the source of the contamination.

5.6 Cross-media Contamination

As stated in the MPCA SF/VIC mission statement, cleanup decisions should consider the potential for cross-media transfer of contaminants. Cross-media contamination issues arise when remedial technologies are considered that may produce waste materials containing hazardous constituents and/or transfer contaminants from one media to another without a reduction in contaminant volume/mass.

Soil venting is a commonly used technology that removes VOCs from subsurface soil and often discharges the VOCs directly into the atmosphere. Although this technology works very well at some sites, the potential cross-media issues (soil to air) should be evaluated. Cross-media contamination concerns may also be raised by selection of remedial technologies that require relatively great expenditures of energy or resources for nominal environmental gain. Examples might be use of an on-site high temperature soil roaster for the treatment of a small quantity of contaminated soil, or trucking a small quantity of marginally contaminated soil a long distance to a landfill.

Ultimate fate of contaminants and the potential exposure pathways and magnitude are important in assessing response options. When evaluating remedies involving cross-media transfer, consider whether:

- natural processes in the new media are more effective or expeditious in reducing the toxicity, volume, or exposure;
- the new media has existing problems with non-attainment;
- the change in media will allow reuse, recycling, or treatment of wastes;
- the energy resources used by the remedy are reasonable; and
- possible future liability associated with the media to which the waste was transferred.

5.7 Reduction, Reuse, and Recycling

Historically, Superfund has been oriented toward abating uncontrolled past releases, with little consideration given to prevention of future releases. Experience in working with the public has shown that communities are often as concerned about the prevention of future releases as they are with abatement of past releases. MPCA staff may pursue or encourage implementation of pollution prevention, waste reduction, or reuse (PPWRR) strategies as part of a selected remedy to protect against threatened releases from site operations.

Options for incorporating PPWRR strategies at hazardous waste sites with active operations are under development. The strategies will rely largely on authorities or programs of affiliated divisions or agencies, such as the Office of Environmental Assistance (OEA) and the Minnesota Technical Assistance Program (MNTAP). To date, pollution prevention plans based on requirements in the Minnesota Toxic Pollution Prevention Act have been included in remedies at the insistence of the surrounding community. In other instances, the RP/VP has voluntarily taken specific pollution prevention measures to provide some assurance that future releases will not undo the significant efforts that went into the original cleanup. Whatever the circumstances, it makes little sense to spend tremendous resources implementing a remedial action, only to re-create a contaminated site.

In some instances soil, water, and even contaminants and waste materials are potential resources which may be reused or recycled using currently available, relatively low-cost methods. Waste materials such as scrap metal, tires, and demolition materials are routinely recycled or, in some cases, reused in on-site construction. For example, lime sludge, waste tar, or crushed waste concrete may be used as road base or incorporated into asphalt roads and parking lots. Certain contaminants can be recycled, as in the case of mercury, which can be recovered from soil using thermal desorption.

A number of low-cost remedies are available for reuse or recycling of soil and ground water. Soil, after treatment, may be reused as clean fill. When treatment is not practical, contaminated soil may be recycled in asphalt and concrete, or reused as landfill daily cover, depending on soil type and contaminant concentrations. Ground water and surface water from pump-and-treat systems may be reused to maintain landscaping vegetation and retention pond levels, use of infiltrating retention ponds allows treated ground water to return to the ground water system, and in some instances treated ground water is supplied through municipal systems as drinking water.

5.8 Natural Resource Damages

Federal Superfund law (the Comprehensive Environmental Response and Liability Act (CERCLA)), MERLA, and other federal and state laws authorize natural resource trustees to recover damages for injury to, destruction of, or loss of natural resources resulting from release of a hazardous substance. Section 115B.04 subdivision 1(c) of MERLA states, in part that, "... any person who is responsible for a release or threatened release of a hazardous substance from a facility is strictly liable, jointly, and severally, for ...[a]ll damages for any injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss." The MPCA and the Minnesota Department of Natural Resources (DNR) act as the designated state trustees for natural resources.

Although consideration of natural resource damages (NRD) is not a required component of the remedy selection process, the responsible party, the regulatory agency, and the general public may benefit from evaluating whether natural resource damages may have occurred at the same time the remedy is being selected. Essentially, the possibility that the MPCA, DNR, or other federal trustee may claim NRD following a clean-up is a potential liability for the Responsible Party. Eliminating this future liability by incorporating the resolution of NRD into the remedy may be in the long-term interest of responsible parties.

The formal procedure through which NRD are compensated involves preparing a Natural Resource Damage Assessment (NRDA), which provides the basis for calculating a NRD claim. The RP is required to pay for the cost of the NRDA and to pay for the replacement or restoration of the damaged resources.

In summary, RPs are encouraged to consider the following three points when selecting a remedy:

1. For a site involving significant NRDs, the RP should meet with MPCA staff to discuss damages, and possible future NRD liabilities before the MPCA selects a remedy.
2. The RP should consider that other trustees (e.g., the DNR or a federal department or agency) can also initiate an NRD assessment and claim. Also, RPs must be aware that citizens, or groups, could raise NRD as an issue, but cannot directly bring a claim for NRD.
3. RPs may wish to consider negotiating an NRD settlement during remedy selection in order to limit future liability.

The MPCA has limited experience working with the DNR on NRD settlement but can offer help to facilitate such settlements for an interested RP.

5.9 Contingency Planning

Contingency plans are increasingly incorporated in remedies in case additional hazardous substances are encountered at a site during implementation of an RA, during site re-development, or in instances where there are uncertainties associated with the site or selected remedial option. The increasing use of contingency plans acknowledges that it is often difficult or impossible to fully characterize or identify all contamination before remedy selection and implementation, or to be certain that a selected remedy will be fully adequate to address all contamination.

The contingency plan should provide instructions to follow and contact names for on-site contractors, if hazardous substances including contaminated soil, underground tanks, barrels, or similar types of waste that pose a potential hazard to human health or the environment are encountered, or the necessary course of action, if a selected remedy is determined to be ineffective at reducing risk to an acceptable level over time. A contingency plan can be a stand-alone document that is distributed to on-site workers and maintained at the work site for reference as needed, similar to the way site health and safety plans are used, or it can be a section in a RAP that specifies necessary actions when cleanup objectives are not met.

Contingency plans can contain information concerning: obvious signs and indications that hazardous materials may have been encountered; appropriate responses to the detection of potentially hazardous materials; health and safety information; contact names and telephone numbers of the Minnesota Duty Office, emergency response teams, environmental consultants and RPs; waste handling and storage; and site security issues.

5.10 Partial Site Cleanups

The Land Recycling Act provides opportunity for a non-responsible party to undertake response actions at a site addressing some, but not all, of the release(s) at the site (Minn. Stat. § 115B.175, subd. 2). In return for such actions, the party may be eligible for liability protection under a certificate of completion of partial response actions (more commonly called a Partial Certificate).

Several conditions must exist for a Partial Certificate to be issued. First, all releases or threatened releases must be investigated so that the extent and magnitude of contamination of the site is well understood. As a practical matter, this has proven difficult for many VPs, particularly at sites with complicated commercial or industrial histories.

Secondly, conditions at the site after the partial cleanup takes place must allow for site re-use in a manner consistent with protection of human health or the environment. That is, if there are direct exposure health risks associated with site re-use, a partial cleanup cannot be approved. Usually, partial cleanups involve source removal or treatment of soil contamination, and some recognition that residual contamination of ground water will be evaluated by the MPCA on the basis of its relative risk to human or ecological health.

In addition, RAs and activities associated with site re-use must not aggravate or contribute to any releases not remedied by the RAs conducted, and must not interfere with, or substantially increase the cost of, future RAs (Minn. Stat. § 115B.175, subd. 2). Finally, a partial certificate cannot be issued unless the owner of the property agrees to cooperate with the MPCA or other persons taking response actions at the site and to avoid any action that interferes with the response actions. This agreement must apply to, and be binding upon, successors and assigns of the owner (Minn. Stat. § 115B.175, subd. 2(c)).

5.11 Presumptive Remedies and Innovative Technologies

RPs/VPs selecting remedies for sites that have specific, commonly encountered contaminant groups such as wood-treating chemicals or polychlorinated biphenyls (PCBs) may be able to take advantage of the EPA's guidance for presumptive remedies. This guidance has been developed by EPA with the intent of assisting RPs/VPs and their consultants in evaluating appropriate remedial technologies for specific contaminant types. The guidance provides documentation of the effectiveness of selected remedial technologies under the particular conditions described in the documents. To be able to take advantage of the presumptive remedy guidance, it is necessary to have an appropriate level of site characterization to assess whether the site conditions fit the criteria under which the presumptive remedy is effective.

When available, the presumptive remedy guidance can speed up the remedy selection process by helping RP/VPs more quickly identify the remedial technologies that are most likely to be effective at their sites. In addition, MPCA review and approval of a presumptive remedy will typically be quicker.

EPA guidance on presumptive remedies currently exists for several contaminant groups, including wood treating chemicals, municipal landfills, and sites with volatile organic compound affected soil; EPA is developing guidance on remedies for PCBs, grain storage, manufactured gas plants, and contaminated ground water sites. Final and/or draft versions of these documents are available from the EPA home page at **www.epa.gov/superfund/oerr/techres/index.htm**. The MPCA guidance on presumptive remedies includes "Presumptive Remedies for Closed Landfills" and guidance associated with investigation and closure of unpermitted dumps (VIC guidance # 19).

The MPCA urges consultants, responsible parties, and voluntary parties to apply innovative remedial technologies whenever feasible. When more than one remedial technology or approach could reasonably be selected, SF/VIC staff will support innovative technologies if it appears that significant cost or time savings could be realized. The MPCA is committed to assisting in the evaluation and the prudent application of new remedial approaches whenever possible.

5.12 Sources of Information Concerning Remedial Technologies:

There are several useful resources that focus on remedial technologies. The list that appears below is not an exhaustive one, but is intended to provide general reference material on a wide variety of remedial approaches.

- EPA CLU-IN database. This database is found over the Internet at **http://clu-in.com/** and contains useful information on emerging remedies and references to a wide variety of other information sources on remedies.
- EPA SITE Program
- *Remediation Technologies Screening Matrix.* This 600-page document provides critical information on commercially available alternative treatment technologies and combines selected features of several EPA, U.S. Department of Defense, and U.S. Department of Energy publications. It can be downloaded directly from the Internet at **http://clu-in.com/matrix.htm** or ordered from the U.S. Department of Commerce's National Technical Information Service at (703) 487-4650 or by fax at (703) 321-8547. Request document number PB95-104782. NTIS
- EPA Environmental Technology Verification Program. This is a new program designed to verify the performance of innovative technical solutions to problems that threaten human health or the environment. It can be found on the Internet at **http://www.epa.gov/etv/**
- EPA Bioremediation in the Field database. Updated annually, this database contains a list of bioremediation projects implemented around the United States. Contacts for individual projects are provided.
- EPA. 1993. Innovative Site Remediation Technology. EPA 542-B-93-011. Each volume of an eight volume series focuses on a particular technology area including thermal desorption, bioremediation, soil washing, stabilization, vacuum vapor extraction, solvent extraction, chemical treatment, and thermal destruction.

6.0 REMEDY REPORTING

The following sections describe the purpose and general content of the reports that are submitted to document remedy selection, and provide guidelines to determine when certain reports will be required.

6.1 Focused Feasibility Study

The purpose of the FFS is to outline the key elements of the remedial alternatives that were considered for the site and to provide the rationale for selection of the proposed alternative. The FFS permits MPCA staff and other stakeholders concerned with the site to evaluate each alternative and assess whether the proposed alternative best meets the needs of all interested parties. Note that the FFS may be a relatively brief document or several pages in length, depending upon the number of factors that must be considered at the Site. A detailed description of the types of information that should be included in the FFS is available in VIC Program Guidance Document #16.

Note that at highly complex sites, it may be necessary for the RP/VP to prepare a more detailed FFS that is more like the Feasibility Study (FS) in the traditional Superfund RI/FS process (see Section 3.0). The purpose of the FFS in this case would be to identify a number of potential remedial alternatives, screen them, and select a subset of these alternatives for further detailed evaluation in a subsequent report. The content of the FS would follow that of the traditional Superfund FS report, although the RP/VP has the discretion, with MPCA consultation, to eliminate any elements that do not pertain to the specific site. Typically, under the RI/FS process, when an FS is prepared, it is followed by preparation of a Detailed Analysis Report (DAR), then a RAP, and finally a Remedial Design (RD). Detailed guidance on the purpose, content, and considerations to be included in

these reports is set forth in Attachments A and B to the MPCA's RFRA, copies of which may be obtained by contacting the MPCA's SF/VIC support staff.

6.2 Remedial Action Plan

For a simple site, the RAP will be the only document prepared to obtain regulatory approval of the proposed remedy, and can be as brief as three to five pages in length. The purpose of the RAP is to provide details of the proposed remedy. The RAP should include, at a minimum, the following information: a description of the key elements of the proposed remedy (e.g., excavation of contaminated soil and thermal treatment); a description of how the remedy will be physically implemented (e.g., backhoe with environmental technician performing field screening); for ex-situ remedial technologies, a description of how the contaminated material will be treated and/or disposed of (thermal treatment facility treatment and disposal guidelines); methodology for evaluating the effectiveness of the remedy (e.g., methods for collecting confirmation samples and proposal for sample chemical analysis); a description of site restoration/closure; and a proposal for remedy implementation documentation.

At a site that is somewhat more complex, where there are community concerns or where more than one remedial alternative is evaluated, an FFS must be prepared to document the rationale for selecting the remedy and submitted for regulatory approval prior to (and sometimes concurrently with) the RAP (see Section 3.0). Additional detail concerning the content of the RAP is available in VIC Program Guidance Document #18.

6.3 The Remedial Action Implementation Report

Following implementation of the remedy as described in the RAP, a Remedial Action (RA) Implementation Report must be prepared and submitted to the MPCA. The purpose of the RA Implementation Report is to document remedy implementation and provide the results of sampling and other tasks to enable MPCA staff to evaluate whether the RA has been satisfactorily completed. Note that follow-up actions such as ground-water monitoring or remedial system monitoring are often part of a complete RAP. Where on-going follow-up actions will be occurring at a site, the RA Implementation Report should provide an overview of these tasks and a schedule for reporting on these activities.

The RA Implementation Report is the mechanism by which MPCA staff will evaluate whether the RAP has been satisfactorily completed. If it is determined that the remedy is incomplete, MPCA staff will notify the RP/VP of the deficiencies needing correction. Site delisting or the issuance of specific assurances related to performance of the remedy will typically not occur until MPCA staff approve the final RA Implementation Report and the remedy has been completed. For remedies that involve long-term monitoring or operation of a remedial system, it may be possible to negotiate an agreement with the MPCA that enables the RP/VP to obtain liability assurances prior to the completion of long-term monitoring or operation of a remedial system, where the agreement creates a legally enforceable obligation upon the RP/VP to complete monitoring or remediation in accordance with the approved RAP.

Additional detail concerning the contents of the RA Implementation Report is available in VIC Program Guidance Document #18. The purpose, content, and considerations to be included in the reports mandated by the traditional RI/FS remedy selection process are described in Attachments A and B to the MPCA's RFRA. RPs/VPs that perform remedy selection using the RI/FS process must submit justification and obtain specific MPCA approval for deviations from the requirements specified in the RFRA attachments. Copies of the RFRA attachments are available from MPCA SF/VIC support staff.

7.0 REMEDY TRACKING

To assess the effectiveness of implemented response actions over time, MPCA staff will record important information on all RAs, institutional controls, and assurances issued or approved by the SF/VIC in the SF/VIC Information System. Under certain circumstances, the MPCA will also require completion of the attached Site Status Update Form (Attachment 2). Completion of the form by the property owner may be required if community concern over the planned use or implemented institutional controls is high or if the potential for a change in the property land use is anticipated. Other tracking mechanisms may be incorporated into the approved RAP or the institutional control mechanism itself in order to monitor future compliance with the terms and conditions of the approved remedy.

ATTACHMENT 1: State and Federal laws and rules that relate to site remediation

Minnesota Environmental Response and Liability Act (MERLA):	Minn. Stat. §§ 115B.01 - 0.241	State Superfund Law
Release Reporting- Duty to Notify	Minn. Stat. § 115.061	Requires notification and recovery of discharge pollutants to minimize or abate pollution of the waters of the state
Permits Required	Minn. Stat. § 115.03	MPCA may require a permit for any discharge to the waters of the State
Ground Water Protection Act	Minn. Stat. ch. 103H	Non-degradation goal, promotion of best management practices
Water Pollution Control Act	Minn. Stat. ch. 115	
Pollution Control Agency	Minn. Stat. ch. 116	
Air Release Reporting	Minn. Stat. § 116.061	Duty to notify and abate excessive or abnormal unpermitted air emissions
Petroleum Tank Release Cleanup Act	Minn. Stat. ch. 115C	Establishes Petrofund
Prohibitions	Minn. Stat. § 116.081	Air emissions and waste management permits
Permits and Certifications	Minn. Rules ch. 7001	MPCA permit requirements (except air quality)
Certification of Environmental Laboratories	Minn. Stat. § 144.98	Authority to certify environmental laboratories (MDH)
Air Pollution Standards	Minn. Rules chs. 7005, 7007, 7009, 7011,7017, 7019	Air quality rules
MERLA Site Listing	Minn. Rules ch. 7044	Establishes Permanent List of Priorities
Underground Waters	Minn. Rules ch. 7060	Nondegradation goal, prohibition of discharge to saturated zone, limitation on discharge to unsaturated zone, remediation requirements

Standards for Surface Waters	Minn. Rules ch. 7050	Classifies waters of the state and establishes standards
Health Risk Limits (HRLs)	Minn. Rules pts. 4717.7100 to 4717.7800	Establishes human health based ground water standards (MDH)
Public Water Supplies	Minn. Rules ch. 4720	Regulates public water systems (MDH) and incorporates Federal Primary Drinking Water Regs.
Special Well Construction Areas Designation	Minn. Rules pt. 4725.3650	Allows for designation of Well Construction Areas (MDH)
Water Well Code	Minn. Rules ch. 4725	Well and boring construction, use, maintenance, and sealing information (MDH)
Solid Waste	Minn. Rules ch. 7035	Requirements and Standards for Solid Waste Facilities
Hazardous Waste	Minn. Rules ch. 7045	Hazardous waste listing and generator, transport, and facility standards
Plumbing Code	Minn. Rules ch. 4715	Use of public sewer and water systems and plumbing materials and methods (MDH)
Water Supply Management	Minn. Stat. § 105.405	Water Appropriation Permits (DNR)
Protected Waters/Water Appropriation	Minn. Rules ch. 6115	Classifies lakes and wetlands, appropriation permitting (DNR)
Shoreland Management	Minn. Rules ch. 6120	Shoreland alterations or structures (DNR)
Endangered species	Minn. Rules ch. 6134	Protection of endangered species (DNR)
Wetlands Conservation Act	Minn. Stat. §§ 103G.221-.2373	Protection of wetlands
Health and Safety	Minn. Rules ch. 5205	Standards for worker health, safety, and training (DLI)

Licensing of Hazardous Waste Transporters	Minn. Rules ch. 8870	License, identification decals, training, and reporting requirements (MNDOT)
Agricultural Chemical Control	Minn. Stat. § 18B, 18C, 18D	Pesticide permitting and disposal (MN Dept. of Agriculture)
Agricultural Chemical Incident Payment and Reimbursement	Minn. Stat. ch. 18E	Chemical application liability, reporting, inspection, sampling enforcement procedures (MN Dept. of Agriculture)
Comprehensive Environmental Response Compensation and Liability Act (CERCLA)	42 U.S.C. §§ 9601 et seq.	Federal Superfund Law
National Oil and Hazardous Substances Pollution Contingency Plan (NCP)	40 C.F.R. pt. 300	Requirements for investigating and remediating contaminated property
Safe Drinking Water Act	42 U.S.C. §§ 300f to 300j-26	
National Primary and Secondary Drinking Water Regulations	40 C.F.R. pts. 141-143	Establishes Federal Drinking Water Standards
Clean Water Act	33 U.S.C. §§ 1251 et seq.	
Resource Conservation and Recovery Act	42 U.S.C. §§ 6901 et seq.	Establishes RCRA Program and Regulations
Clean Air Act	42 U.S.C. §§ 7401 et seq.	

ATTACHMENT 2: Property Owner Site Status Update

Reason for update

☐ Periodic Update — Date ☐

☐ Sale of Property — Due Date ☐

Site Remediation Program ID Number ☐

Facility\Project Name _____

Contact for Facility _____

Contact Phone Number _____

Contact Address _____

Land Use Classification:

☐ Residential
☐ Recreational
☐ Unlimited Commercial
☐ Limited Commercial
☐ Industrial
☐ Agricultural

Land Use Changed To:

☐ Residential
☐ Recreational
☐ Unlimited Commercial
☐ Limited Commercial
☐ Industrial
☐ Agricultural

Restriction Basis:

☐ Soil
☐ Ground Water

Restriction Type:

☐ Deed Notification
☐ Restrictive Covenant
☐ Environmental Easement
☐ Other

General Description of Restrictions

(Note: a description of restrictions are found on the property deed or can be obtained by contacting the MPCA staff person noted below)

Have any changes in Site conditions or activities occurred which may affect compliance with restrictions, exposure to or mobility of residual contaminants?

☐ Yes. If yes, please explain.
☐ No

Change in Ownership?

☐ Yes. If yes, please provide the date of sale, facility name, contact for the facility, contact phon, and contact address.
☐ No

Please return by date noted above to:
Minnesota Pollution Control Agency
Data Base System Administrator
Site Remediation Program
520 Lafayette Road
Saint Paul, Minnesota 55155
Phone:

Signature date

Address