11/16/92

STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the Proposed Rules Governing the Management of Petroleum Contaminated Soil, Minn. Rules Ch. 7037 and Minn. Rules pt. 7035.0300

STATEMENT OF NEED AND REASONABLENESS

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I. INTRODUCTION

The subject of this proceeding is the proposed adoption of rules of the Minnesota Pollution Control Agency (MPCA) governing petroleum contaminated soil management. The primary focus of these rules is the treatment of excavated petroleum contaminated soil through its placement and incorporation into the surface of a native soil. This practice is referred to as land treatment (also known as land farming, land application, and land spreading). This practice utilizes native soil physical, chemical, and biological properties to degrade or immobilize the added petroleum constituents in order to diminish or eliminate their effect on the environment and on public health.

On January 6, 1992, the MPCA published a Notice of Intent to Solicit Outside Opinion in the State Register on the development of the land treatment rules (Exhibit 1). The notice was sent to each county government office in Minnesota, environmental consultants that are on a list kept by the Tanks and Spills Section of the MPCA, the Minnesota Petroleum Marketers Association, the Minnesota Service Station Association, and various individuals who previously indicated that they would like information relating to the MPCA's development of land treatment rules. In addition, this notice was sent to the Minnesota Association of Townships, the League of Minnesota Cities, the Association of Minnesota Counties, and the Soil Conservation Service with a cover letter requesting that the notice be included in any upcoming publication of these organizations or otherwise be shared with interested persons.

This notice yielded 36 responses. Four people expressed reservations about land treatment as a means of safely treating petroleum contaminated soil. Many people indicated that they felt that land treatment is a sound method for treating petroleum contaminated soil. Specific areas that were addressed by more than one person are the following:

(1) The rules should be clear on what constitutes an acceptable native soil at a land treatment site.

(2) The rules should clearly define what a land treatment site is with respect to number of sources and volume of petroleum contaminated soil allowed per site.

(3) The rules should contain laboratory analysis requirements that are appropriate for characterizing the soil before and after spreading.

(4) The rules should either require that land treatment sites be evaluated for nutrients that are necessary for the biodegradation of petroleum contaminated soil or require that land treatment sites apply nutrients.

(5) The rules should not require plastic covering on stored stockpiles of petroleum contaminated soil at land treatment sites since plastic tends to break down in wind and becomes a nuisance. Berms made out of soil should be used if run-off is considered a problem.

(6) The rules should address the problem of local governments disapproving or slowing down the approval of land treatment sites.

(7) The rules should require that the latest date when soil spreading may occur be at a date earlier than November 1, which is the date indicated in existing MPCA recommendations and general guidance.

(8) The rules should allow land treatment to be done more than once on the same parcel of land.

(9) The rules should allow for adequate flexibility since land treatment involves many wide-ranging factors.

These comments, as well as comments on other issues, were considered in the development of the proposed rules. Suggestions (1) through (5) have been wholly or partially incorporated into the proposed rules. Specific supporting information for these provisions is provided under parts IV and V. Suggestion

(6) concerns the issue of local versus state jurisdiction. The proposed rules make no requirements on local governments to act on land treatment proposals. The issues raised in suggestions (7) and (8) are specifically addressed under applicable provisions in part V. Suggestion (9) is a general comment that primarily expressed the concern that overly restrictive rules would unnecessarily limit certain land areas or land treatment management techniques. The comments on this issue indicated that evaluation of some sites and techniques on a site-specific basis is preferred. The MPCA believes that this concern has merit; however, the MPCA believes that it is critical that the proposed rules contain a high degree of specificity so that persons potentially affected by or concerned with land treatment will know what procedures and limitations to expect. This sentiment is evidenced by some of the other comments listed above regarding the need for clarity and consistency for certain criteria. Also, the limited resources that the MPCA is able to devote to the land treatment component of the tanks and spills program warrants that time-consuming, site-specific decisions be limited where feasible. Minn. Rules pt. 7000.0700 provides procedures for seeking exceptions to the rules through applications for variances. A discussion of the reasonableness of the individual parts of the proposed rules is provided in part V.B.

An advisory group was assembled that was composed of nine members who volunteered from county governments, the Minnesota Association of Townships, environmental consulting firms, and a group of land treatment operators. All members have been involved in land treatment in some capacity. The general purpose of the advisory group was to improve the quality of the rules through their suggestions and comments. Approximately two weeks prior to the first meeting, the members of the group were sent copies of a draft of the rules.

Summaries of comments and suggestions from the meetings are included as Exhibit 2. All comments and suggestions were considered in the development of the proposed rules. Several of the suggestions were either wholly or partially incorporated into the proposed rules. Two issues on which considerable discussion took place at the advisory group meetings were the contaminated soil volume limitations placed on land treatment sites and local government notification of land treatment.

There was a great deal of discussion regarding the amount of contaminated soil that could be accepted at a site before that site would have to meet the more stringent requirements of a facility. There was a concern that limitations on the amount of soil that could be accepted would impose unreasonable limitations on site operators and generators of contaminated soil. Suggestions were made to allow for exceeding the soil volume limits for sites under certain circumstances. MPCA staff acknowledge the concern raised but have drafted the rules to maintain a clear distinction between the two types of land treatment operations using a soil volume limit. The reasonableness of this approach is described further in the discussion in part V regarding part 7037.1000, subpart 1.

Regarding local government involvement, a representative of the Minnesota Association of Townships emphasized the importance of having a local government notification process that avoided past problems, such as conflicts of interest and the lack of notification to all concerned government officials. In developing language for the applicable provisions of the proposed rules, the MPCA staff accepted a suggestion to designate specific government officials as the persons required to acknowledge notification of land treatment documents. The appropriate officials are those designated by statute as official clerks of their respective governmental bodies who routinely accept official

correspondence and notifications. At the request of the representative of the Minnesota Association of Townships, the designated official for townships is either the town clerk or town chair as determined by resolution of the town board. The general approach for local government involvement taken in these proposed rules is to require that the applicant notify the appropriate local government officials of their intention to propose a land treatment site. Also, the proposed rules state that the commissioner does not release the applicant from any duty to comply with applicable local ordinances. The MPCA staff believes that this is a sound approach that adequately addresses the concerns raised and also minimizes potential confusion or problems between the state and local governments relating to jurisdiction over land treatment.

Petroleum contaminated soil falls within the legal definition of a solid waste. To adopt new rules governing the management of petroleum contaminated soil, it is necessary to amend the existing solid waste rules of the MPCA (Minn. Rules ch. 7035) to exclude this soil (when treated at a land treatment site) from the definition of solid waste. Additional discussion regarding the need to adopt rules separate from the solid waste rules is provided in part IV.

The proposed rules for management of petroleum contaminated soil primarily address land treatment of this soil at locations defined as land treatment sites and establish technical standards and safeguards necessary to protect human health and the environment. The proposed rules include the following areas: 1) petroleum contaminated soil treatment options; 2) sampling and analysis of petroleum contaminated soil; 3) standards for land treatment sites; 4) approval procedures for land treatment sites; 5) operational requirements for land treatment sites; and 6) monitoring of land treatment sites and reporting requirements.

II. STATEMENT OF MPCA'S STATUTORY AUTHORITY

The MPCA's statutory authority to amend the solid waste rules and adopt the proposed rules for management of petroleum contaminated soil is set forth in Minn. Stat. § 116.07, subd. 4 (1990), which provides:

> Subd. 4. Rules and standards ... Pursuant and subject to the provisions of chapter 14, and the provisions hereof, the pollution control agency may adopt, amend and rescind rules and standards having the force of law relating to any purpose within the provisions of Laws 1969, chapter 1046, for the collection, transportation, storage, processing, and disposal of solid waste and the prevention, abatement, or control of water, air, and land pollution which may be related thereto, and the deposit in or on land of any other material that may tend to cause pollution ... Any such rule or standard may be of general application throughout the state or may be limited as to times, places, circumstances, or conditions in order to make due allowance for variation therein. Without limitation, rules or standards may relate to collection, transportation, processing, disposal, equipment, location, procedures, methods, systems, or techniques, or to any other matter relevant to the prevention, abatement or control of water, air, and land pollution which may be advised through the control of collection, transportation, processing, and disposal of solid waste ... and the deposit in or on land of any other material that may tend to cause pollution.

Under this statute, the MPCA has the necessary statutory authority to amend the solid waste rules and adopt the proposed rules.

III. BACKGROUND

Petroleum contaminated soil is created by surface spillage or subsurface leakage of petroleum products into the surrounding soil. There are over 40,000 petroleum storage tanks registered in Minnesota and to date there are over 5,000 tank locations where petroleum releases have been reported where soil has been contaminated. In addition, numerous releases of petroleum from sources other than storage tanks occur each year. Excavation of petroleum contaminated soil has been done as part of the corrective actions at most of these locations. The volume of contaminated soil at a given release site can range

from a few cubic yards up to several thousand cubic yards depending on site-specific conditions. The average volume of petroleum contaminated soil that was excavated per tank release site in 1989 through 1991 was approximately 320 cubic yards.

Treatment Options

The two primary methods of treating this soil are thermal treatment and land treatment.

Thermal treatment, also known as soil roasting, generally involves passing petroleum contaminated soil through a chamber of a thermal treatment unit where the petroleum hydrocarbons are thermally desorbed from the soil particles. Desorbed hydrocarbons are either collected or subjected to higher temperatures for combustion. Treated soil is often used for fill, roadbase, asphalt, or returned to the excavation from which it was taken. Thermal treatment facilities tend to be located in the major metropolitan areas where a certain economy of scale can be achieved with large volumes of soil to be incinerated.

Land treatment is a relatively simple technique that involves first spreading petroleum contaminated soil on suitable native soil at a spreading thickness no greater than approximately four inches. Next, the contaminated soil is incorporated into the native soil with a disk or other type of tillage implement and, periodically, additional tillage is conducted, providing more mixing and aeration (the Tanks and Spills Section general guidance regarding land treatment has included seeding the soil to a crop following soil

incorporation as an alternative to tillage). This overall process results in the treatment of petroleum hydrocarbons in the soil primarily through biodegradation. Volatilization of some of the hydrocarbons also occurs.

Land treatment is the primary option in most of the smaller communities and rural areas. Land treatment is generally considered to be less expensive than thermal treatment, although it does generally require more management and time to achieve the needed treatment.

Types of Land Treatment Operations

The types of land treatment operations that have been used in Minnesota fall into two main categories. The first being smaller sites, typically one to two acres that are generally located at privately owned farms. These small sites most often are used for the treatment of petroleum contaminated soil excavated from a single petroleum cleanup site. The second category is the larger operations that use several acres for land treatment. These also are primarily located on farms. These larger operations are used for land treatment of petroleum contaminated soil excavated from several different petroleum cleanup sites. In this proceeding and in the proposed rules the small and large operations are referred to as "land treatment sites" and "land treatment facilities", respectively. These terms are specifically defined in the proposed rules. Available data on the amount of petroleum contaminated soil land treated and the type of land treatment operation used for 1989 through 1991 is provided in the following table:

	1989	1990	1991
Cubic yards of soil land treated at land treatment sites	17,688	102,304	165,118
Cubic yards of soil land treated at land treatment facilities	4,866	47,694	8,233
Total cubic yards of soil land treated	22,554	149,998	173,351
Percent of soil treated at land treatment sites	78	68	95
Percent of soil treated at land treatment facilities	22	32	5

Characteristics of Petroleum and Petroleum Contaminated Soil

The characteristics of petroleum contaminated soil will vary considerably depending on such factors as the soil type and texture, the amount of material spilled and the age of the release; however, the type of petroleum product primarily determines the types of contaminants in the soil.

Information from the U.S. Environmental Protection Agency (EPA; see reference EPA, 1992) indicates that a typical gasoline contains several hundred hydrocarbon compounds that fall into the following major chemical groups: paraffins, aromatics, and olefins. The aromatics include the specific compounds benzene, ethyl benzene, toluene, and xylene (BETX). Gasoline also contains a small portion of many different additives, including tetraethyl lead for regular gasoline. According to the EPA (EPA, 1992), the proportion of the hydrocarbon compounds in gasoline itself is not the same as the proportion in gasoline contaminated soil existing at a site were a release has occurred. Specifically, due to the high vapor pressures and solubilities of the BETX

compounds, these constituents are primarily released to the air and ground water, with less being retained by the soil matrix. The primary constituents released to the soil are the paraffins and the non-BETX aromatics. The information contained in the MPCA's petroleum release site files confirms that BETX levels in petroleum contaminated soil are low. Data from 14 selected petroleum release sites indicates that total BETX is approximately 5 percent of the total petroleum hydrocarbon (TPH) levels (this data was taken from the study described later in this part and in Exhibit 3); however, it is not clear whether significant BETX was volatilized during the collection of the soil samples.

According to the EPA (EPA, 1989) the middle distillate fuels (aviation fuels, kerosene, diesel, and fuel oils nos. 1 and 2) contain the following major chemical groups: paraffins, cycloparaffins, aromatics, and olefins. The compounds of these groups are mostly of a higher molecular weight than the hydrocarbons contained in gasoline. BETX levels in the middle distillate fuels are very low, particularly benzene. The residual fuel oils (fuel oils nos. 4, 5, and 6) are very complex in composition with primarily high molecular weight asphaltic compounds.

Used oil and used oil contaminated soil may contain various metal contaminants (including lead, chromium, cadmium, arsenic, and mercury). Also, past dumping of oil containing polychlorinated biphenyls (PCBs) into used oil tanks may result in low level PCB contamination.

As indicated previously, considerable variability in the contamination levels of petroleum contaminated soil exists due to many factors. However, it is important to note that for most situations the soil is not "saturated" or

dripping with petroleum. According to data of the MPCA Tanks and Spills Section, the average TPH level for petroleum contaminated soil that was land treated in 1989 through 1991 was approximately 980 parts per million (ppm). This corresponds to approximately 59 ounces of petroleum per cubic yard of soil (or 2.2 ounces per cubic foot of soil). Therefore, for most cases a relatively small amount petroleum is thinly distributed throughout a large mass of soil.

Potential Environmental and Health Concerns Related to Land Treatment of Petroleum Contaminated Soil

Whether or not adverse health effects occur following exposure to a substance depends upon the concentration and toxicity of the substance; the type, extent, and duration of exposure; and the susceptibility of the individual being exposed (EPA, 1992). Studies on the toxicity of pure petroleum products and their constituents have shown that serious health problems can result from either high levels over a short term or low level of exposure over a long term (EPA, 1989; EPA, 1992).

When petroleum contaminated soil is land treated some portion of the volatile fraction of the petroleum is subject to loss to the air as a gas. It is very likely that the potential for human health impacts from exposure to these petroleum vapors is extremely low. Exposure to petroleum vapors, particularly the constituent benzene, is an issue that mainly has been a concern involving persons whose occupation presents frequent exposure to these substances, such as terminal operators, truck drivers, and service station attendants (Halfer et al., 1986). In a summary of workplace exposures to benzene in the U.S., Runion and Scott (1985) indicated that 98.4 percent of the

workplace locations had benzene exposure levels below the Occupational Safety and Health Administration standard of 10 ppm time-weighted-average and 87.6 percent of these locations were below 1 ppm. The locations from which data were taken were work areas within companies considered as having some involvement with petrochemical operations and benzene or benzene-containing products. This report speculated that these data had relevance to the absence of reported benzene-induced leukemias that other researchers have documented within the petroleum industry.

It also is important to recognize that the nature of land treatment is such that most volatilization of petroleum compounds is generally very temporary, although very low levels of volatilization may occur over time. Experience within the tanks and spills program has shown that if petroleum odors are present, it is largely limited to the time that the contaminated soil is being spread. Since odors associated with petroleum are offensive to many people, maintaining certain separation distances between land treatment sites and adjacent properties and homes or other inhabited buildings can minimize or eliminate this occurrence.

Extensive research has been conducted on the land treatment of petroleum-containing wastes to ensure thorough treatment and protection of ground water supplies. Most published research focuses on land treatment of petroleum refinery wastes or petroleum spills that are land treated in place. While these wastes and situations differ in some respects from the land treatment situations addressed in the proposed rules, much of the information is applicable.

High rates of petroleum biodegradation for land treatment of oily wastes and spilled petroleum are well documented. In a review by Ryan et al. (1985), the results of 14 petroleum refinery land treatment facilities from various locations within the United States were summarized. The types of petroleum wastes varied, as did the soil and site properties (e.g. soil texture ranged from fine sand to clay and the seasonal high water table ranged from two feet to 42 feet below the ground surface). The estimated annual percentage of oil reduction ranged from 58 to 94 percent with typical ranges from 70 to 90 percent. Subsurface migration of hydrocarbons was limited. The maximum extent of oil constituents was less than 1.5 feet below the zone of incorporation. Similar limited migration of metals was observed. A study conducted in Oklahoma involving land treatment of viscous oily sands indicated no detectable downward migration of oil over the eight-year study period. The native soil texture was not given in this publication (Huddleston et al., 1984).

Soil monitoring data collected from land treatment sites of the MPCA's petroleum release site files generally indicates that near complete reduction of petroleum hydrocarbons in gasoline contaminated soil occurs in the zone of incorporation within approximately one year. Soil contaminated with middle distillate fuels may take up to two years and residual fuels may take even longer for near complete reduction. As with the studies cited above, substantial degradation has been reported for even the heavier petroleum types in the first year of land treatment.

In 1991 the MPCA contracted a study involving soil sampling at 14 sites used for land treatment of petroleum contaminated soil (Exhibit 3). Sites were selected from various locations within the state and an effort was made to

choose sites in which relatively high levels of either gasoline or fuel oil contamination were present in the original contaminated soil (i.e. greater than approximately 1500 ppm TPH). These sites receiving relatively higher levels of contamination were targeted in order to develop a clear understanding of degradation and hydrocarbon migration involving contaminated soil with a higher potential for movement below the surface soil. Sampling was done once at each site at dates ranging from three to twelve months after the date of soil spreading. Samples were taken from depths from the surface to 48 inches below the surface. The sampling results indicated the following: 1) Very low to nondetectable levels of TPH, toluene, and xylenes were indicated in the surface soil. No detectable benzene or ethylbenzene was present at this sampling depth; and 2) 13 of the 14 sites had no detectable TPH or BETX at sampling depths below the surface. (The one site with reported detectable levels of petroleum had low levels of TPH. The native soil at this site is rich in organic matter and it is likely that the reported hydrocarbons actually represent natural background organics.) More complete details of the study are given in Exhibit 3.

An experiment in New York conducted by Loehr et al. (1985) included the effects on earthworms by land-applied oily wastes. The researchers observed that both the applied wastes and the rototilling of the soil affected the numbers and mass of earthworms, but over time the numbers and mass recovered to levels similar to control plots (i.e., no waste or rototilling). Also, the earthworms did not accumulate napthalenes, alkanes, or specific aromatics that were in the wastes.

The impact of petroleum on plants has been studied by various researchers. McGill (1978) indicated that when crop growth is adversely affected by oil that the effect is due primarily to oil preventing soil from wetting, rather than the oil causing toxicity to the plants. Also, Rowell (1975) cited nutrient immobilization in the soil as an important limiting factor for crop growth. Experiments with oats by Rowell (1975) showed that germination of seeds was inhibited only at oil contents that were high enough to saturate the soil. Slight decreases in root and shoot growth and dry matter production were observed for oats grown in soil with lower oil contents. Toogood and McGill (1977) tested the growth and quality of various grain and vegetable crops in soil with various amounts of crude oil added. Results showed over time with proper reclamation normal crop yields could be restored. In the short term, yields of the crops tested were reduced on the "medium" and "heavy" oil-spill plots. At one test location potatoes grown in the medium and heavy oil plots had an unpleasant mineral oil after-flavor. The three other vegetables tested (carrots, beets, and parsnips) had no appreciable difference in taste, flavor, or color.

IV. STATEMENT OF NEED

Minn. Stat. § 14.14, subds. 2 and 14.23 (1990) require the MPCA to make an affirmative presentation of facts establishing the need for and the reasonableness of the proposed rules. In general terms, this means that the MPCA must set forth the reasons for proposing rules and the reasons must not be arbitrary or capricious. However, to the extent that the need and reasonableness are separate, need has come to mean that a problem exists that

located on a one to two acre parcel of a farm in a rural area. Land treatment as outlined in existing MPCA general guidance documents and in the proposed rules involves only a one-time use of the land for land treatment. Given the large number of relatively small land treatment operations that are likely to be proposed in the next several years and the limited applicability that existing solid waste rules have with land treatment sites, it is necessary to adopt specific rules relating to land treatment of petroleum contaminated soil at land treatment sites. To do so, it is also necessary to amend the solid waste rules to exempt from these rules petroleum contaminated soil that is stored or treated at land treatment sites.

V. STATEMENT OF REASONABLENESS

The MPCA is required by Minn. Stat. ch. 14 (1990) to make an affirmative presentation of facts establishing the reasonableness of the proposed rules. It means that there is a rational basis for the MPCA's proposed action. The reasonableness of the proposed rules is discussed below.

A. Reasonableness of the Rules as a Whole

The proposed rules establish a program for treatment of petroleum contaminated soil at land treatment sites. The proposed rules provide technical standards for safe land treatment and the administrative tools to manage the land treatment component of the tanks and spills program of the MPCA. The MPCA believes that the proposed rules establish a reasonable scheme for providing specific technical standards to land treatment owners and persons

responsible for releases in Minnesota while allowing the MPCA to ensure that the environment will be protected from petroleum contaminated soil that is spread on the land.

Moreover, the MPCA is presenting reasoned determinations using scientific results and applying comments from persons with substantial interest or experience in land treatment to justify why the specific procedures and criteria were selected.

B. Reasonableness of Individual Rules

The following discussion addresses proposed amendments to the solid waste rules of the MPCA, Minn. Rules ch. 7035.

Part 7035.0300 Definitions

Subpart 79a. Petroleum contaminated soil. This subpart states that "petroleum contaminated soil" has the meaning given it in part 7037.0100, subpart 15.

Subpart 79b. Petroleum contaminated soil land treatment site. This subpart states that "petroleum contaminated soil land treatment site" has the meaning given the term "land treatment site" in part 7037.0100, subpart 8.

Subpart 100. Solid waste. This subpart has been amended to state that "solid waste" does not include petroleum contaminated soil that is stored or land treated at a petroleum contaminated soil land treatment site.

The change to the solid waste definition provides an exemption that matches the scope of the proposed new rules. It is reasonable to amend the definition in this manner so that those aspects of petroleum contaminated soil

management that are not addressed in ch. 7037 are still governed under the provisions of Minn. Rules ch. 7035. The definitions under subparts 79a and 79b are provided since these terms are included in the amendment to the definition of solid waste.

The following discussion addresses specific provisions of the proposed new rules, Minn. Rules ch. 7037.

Part 7037.0100 Definitions

This part of the proposed rules sets forth definitions of key words or phrases used within the rules. The definitions are discussed below.

Subpart 1. Scope. This subpart states that this part lists definitions for key words and phrases within the rules.

Subpart 2. Agency. "Agency" is defined in the proposed rules as the Minnesota Pollution Control Agency. It is reasonable to define this term in order to define which agency within Minnesota state government is responsible for implementation of the proposed rules.

Subpart 3. Batch of petroleum contaminated soil. "Batch of petroleum contaminated soil" means the entire volume of soil removed or planned to be removed from a property that has had one or more releases of petroleum. It is reasonable to define this term because it is used frequently in the proposed rules and it provides a clear distinction between petroleum contaminated soil from different release sites.

Subpart 4. Commissioner. "Commissioner" means the commissioner of the Minnesota Pollution Control Agency. It is the official title of the MPCA's chief executive officer. On behalf of the MPCA the commissioner and the commissioner's delegates will administer and implement the proposed rules.

Subpart 5. Generator. "Generator" means a person who is responsible for or assumes responsibility for the removal of petroleum contaminated soil. It is reasonable to define this term because a generator has many responsibilities under the proposed rules.

Subpart 6. Land treatment. "Land treatment" means the placement and incorporation of petroleum contaminated soil into the native soil surface for the purpose of biodegradation of organic waste components. It is reasonable to define this term because it is the primary focus of the proposed rules and it indicates that the primary goal of this process is treatment through biodegradation.

Subpart 7. Land treatment facility. "Land treatment facility" means a facility for the land treatment of petroleum contaminated soil that is permitted under Minn. Rules ch. 7035. "Facility" is a word that can have different meanings to different people, so it is reasonable to provide it with specific meaning and distinguish it from land treatment operations defined as land treatment sites, which are the primary focus of the proposed rules.

Subpart 8. Land treatment site. "Land treatment site" means a parcel of land that is used for land treatment of petroleum contaminated soil and that operates or is proposed to operate within the limits in part 7037.1000. "Site" is a word that can have different meanings to different people, so it is reasonable to provide it with specific meaning. In addition, land treatment sites are the type of land treatment operations that are the primary focus of the proposed rules.

Subpart 9. Native soil. "Native soil" means the soil of a land treatment site prior to the spreading of petroleum contaminated soil. It is reasonable to define this term because it is within this soil that treatment of

petroleum contaminated soil occurs. Also, this term prevents confusion by distinguishing this soil from the petroleum contaminated soil that is spread on it.

Subpart 10. Operator. "Operator" means the person responsible for the overall management of the land treatment site. It is reasonable to define this term because an operator has many responsibilities under the proposed rules.

Subpart 11. Ordinary high water level. "Ordinary high water level" has the meaning given it in Minn. Rules pt. 6120.2500, subp. 11. It is reasonable to define this term to provide consistency among rules addressing Minnesota's environment and natural resources.

Subpart 12. Owner. "Owner" means a person who is the fee owner of real property where a land treatment site is proposed or operated. It is reasonable to define this term because an owner has many responsibilities under the proposed rules.

Subpart 13. Person. "Person" is defined as an individual, partnership, association, public or private corporation, or legal entity, including the United States government, an interstate commission or other body, the state, or any agency, board, bureau, office, department, or political subdivision of the state, but does not include the agency. This definition encompasses the definitions in Minn. Stat. chs. 115C and 116 (1990). It is reasonable to define this term to clarify its meaning and provide for program consistency.

Subpart 14. Petroleum. "Petroleum" has the meaning given it in Minn. Rules pt. 7150.0030, subp. 36. "Petroleum" does not include a fraction of crude oil or constituents of gasoline if they were used or were intended for use in virgin or pure form including but not limited to benzene, toluene, and

Subpart 18. Recreational area. "Recreational area" means any public park, trail, campground, playground, athletic field, picnic ground, botanical or zoological garden, swimming beach or pool, fairground, or wayside and any commercial campground, resort, tourist court, amusement park, riding stable, or golf course. It is reasonable to define this term in order to concisely and specifically indicate the list of features encompassed by the phrase "recreational area".

Subpart 19. Release. "Release" means the spilling, leaking, emitting, discharging, escaping, leaching, or disposing of petroleum into the environment but does not include discharges, designed venting, or land treatment at an approved land treatment site allowed under agency rules. This is consistent with the definition of "release" in Minn. Stat. ch. 115C (1990) except that it is broadened to include releases from sources other than tanks and it does not include land treatment as a release.

Subpart 20. Residential development. "Residential development" means ten or more places of habitation concentrated within ten acres of land. The term also includes schools, churches, hospitals, nursing homes, businesses, offices, and apartment buildings or complexes having ten or more living units. It is reasonable to define this term in order to concisely and specifically indicate the list of structures encompassed by the phrase "residential development".

Subpart 21. Rivers and streams. "Rivers and streams" means any watercourses defined as natural watercourses or altered natural watercourses and public waters in Minn. Stat. § 103G.005, subds. 3, 13 and 15 (1990). It is reasonable to define this term to provide consistency among laws addressing Minnesota's environment and natural resources.

Subpart 22. Run-off. "Run-off" means a liquid that drains over land from any part of an approved land treatment site or area for storage of petroleum contaminated soil. It is reasonable to define this term because run-off is among the concerns at land treatment sites that the proposed rules address.

Subpart 23. Run-on. "Run-on" means a liquid that drains over land onto any part of an approved land treatment site or area for storage of petroleum contaminated soil. It is reasonable to define this term because run-on is among the concerns at land treatment sites that the proposed rules address.

Subpart 24. Seasonal high water table. "Seasonal high water table" means the highest level the water table reaches during a given year or the highest level it has reached in the recent past as indicated by soil mottling or color changes. Methods for determining the seasonal high water table are given in part 7037.3300, subp. 6. It is reasonable to define this term because it is among the criteria for determining the suitability of a land treatment site.

Subpart 25. Soil texture. "Soil texture" means the relative portion of sand, silt, and clay in soil, as determined using the methods specified in part 7037.3300, subp. 4. It is reasonable to define this term because it is among the criteria for determining the suitability of a land treatment site.

Subpart 26. Tank. "Tank" has the meaning given in Minn. Stat. § 115C.02, subd. 14. It is reasonable to define this term to provide for program consistency.

Subpart 27. Ten-year floodplain. "Ten-year floodplain" means any land that is subject to a ten percent or greater chance of flooding in any given year from any source. It is reasonable to define this term because it is among the criteria for determining the suitability of a land treatment site.

Subpart 28. Treatment zone. "Treatment zone" means the total thickness of native soil above the seasonal high water table or bedrock, whichever is closest to the surface of the native soil. If the thickness of native soil existing above both of these features exceeds five feet, then the treatment zone is established as five feet. "Treatment zone" is a term that has been used by researchers and others involved with land treatment of petroleum wastes (Ryan et al., 1986). It is reasonable to define this term because it is among the criteria for determining the suitability of a land treatment site.

Subpart 29. Used oil. "Used oil" has the meaning given in Minn. Rules pt. 7045.0020, subp. 100a. It is reasonable to define this term to provide consistency among rules addressing Minnesota's environment.

Subpart 30. Waste. "Waste" has the meaning given it in Minn. Stat. § 115A.03, subd. 34. It is reasonable to define this term because information is requested from an applicant regarding past waste applications at a proposed land treatment site.

Subpart 31. Water table. "Water table" means the surface of the ground water at which the pressure is atmospheric. Generally this is at the top of the saturated zone. It is reasonable to define this term because it is among the criteria for determining the suitability of a land treatment site.

Subpart 32. Wetland. "Wetland" means a surface water feature classified as a wetland in the publication entitled "Classification of Wetlands and Deep Water Habitats of the United States," published by the United States Fish and Wildlife Service. It is reasonable to define this term to provide consistency among laws addressing Minnesota's environment and natural resources.

Part 7037.0200 Purpose and Scope

This part explains the general purpose and scope of the proposed rules. This is reasonable because it defines the limits of the proposed rules for the regulated community.

Part 7037.0300 Variances

This part references the appropriate laws that variances from the rules of Minnesota. This part provides a formal and structured means of seeking exceptions to the proposed rules. Inclusion of this part in the proposed rules serves to remind or inform the regulated community that these established procedures exist.

Part 7037.0400 Petroleum Contaminated Soil Treatment Options

Subpart 1. Treatment and disposal options. This subpart states that a generator shall treat or dispose of petroleum contaminated soil in accordance with one of the methods in items A to D: A. land treatment at an approved land treatment site, as provided under this chapter; B. land treatment at a land treatment facility that has received a solid waste management permit in accordance with Minn. Rules pts. 7001.0010 to 7001.0210 and Minn. Rules ch. 7035; C. thermal treatment by a soil roaster that received an agency air emission permit in accordance with Minn. Rules pts. 7001.0010 to 7001.0210 and chs. 7005, 7010, and 7035; or D. an alternative type of treatment or disposal allowed by agency rules. It is reasonable to include this subpart so that generators are aware of the general MPCA regulatory requirements that apply to treatment of petroleum contaminated soiland the permissible options available.

Item D is included to allow treatment by unspecified technologies that may prove as environmentally sound as land treatment or thermal treatment. These technologies will be allowed if the technology can comply with existing agency rules that may apply.

Subp. 2. Generator responsibility. This subpart states that nothing in this chapter relieves the generator from responsibility under Minn. Stat. § 115.061 to ensure the proper treatment or disposal of petroleum contaminated soil. This subpart is reasonable because it clarifies the fact that the generator is ultimately responsible for the petroleum contaminated soil. In the event that the soil is not treated at the proposed land treatment site, it is the responsibility of the generator to arrange for an alternative site or treatment option.

Part 7037.0500 Sampling and Analysis of Petroleum Contaminated Soil

Subpart 1. Sampling procedures. This subpart requires that to characterize the type and level of contamination of soil that has been or will be excavated, a generator shall take soil samples from a stockpile generated during a cleanup of a release or from subsurface soil borings conducted in locations that are representative of soil contaminated by the release. This subpart also states that the volatile parameters must be collected as grab samples and that the nonvolatile parameters must be collected as separate composite samples. It is reasonable to require that the petroleum contaminated soil be characterized because the proposed rules impose limits on land treatment based on the contaminant types and concentrations. It is reasonable to collect this information from either the stockpiled petroleum contaminated

soil or from soil borings since either will provide the needed information. In most instances in the MPCA tanks and spills program, soil borings are not done prior to excavation; however, some environmental consultants and tank owners choose to conduct several soil borings in the area of underground storage tanks that will be removed in order to develop a cleanup plan if contamination is present. The MPCA staff supports such planning and believes it is reasonable to provide this opportunity by allowing soil characterization from borings. It is reasonable to collect the samples as specified (grab vs. composite) because composite sampling results in very representative characterization of the contaminated soil; however, since composite sampling involves more sample handling there is a greater potential for losing to the air the volatile constituents. Therefore, grab sampling was the method selected for characterization of volatile parameters.

Subpart 2. General analysis requirements. This subpart lists contaminants (or petroleum types) and the parameters that must be analyzed. This list was taken from MPCA general guidance that has been used for several years in the tanks and spills program for analysis requirements. This subpart is reasonable because analysis of the parameters listed provides a clear documentation and characterization of the petroleum contaminated soil.

The parameter "total petroleum hydrocarbons" as gasoline, fuel oil, or crude oil provides a general indicator of the amount of petroleum contained in the soil and is used in the proposed rules for limiting the amount of petroleum that may be applied at a land treatment site.

The parameters benzene, toluene, ethyl benzene, and xylenes are all aromatic compounds that are very volatile and are relatively soluble in water. In addition, because these compounds are known or suspected carcinogens and

because of their solubility in water, they are the petroleum constituents of greatest concern with respect to soil and ground water contamination. Accurate sampling of these compounds is difficult due to their high vapor pressures; however, it is reasonable to include these compounds in the analysis list so that approximate concentrations are documented.

Methyl tertiary butyl ether (MTBE) is an anti-knock agent added to gasoline. The presence or absence of MTBE can be useful in distinguishing the source of a petroleum release on a site-specific basis since it has been added to gasoline only since 1978.

Lead is a component of leaded gasoline and aviation gasoline. It is important that proper analysis of this parameter be done since management of petroleum contaminated soil containing a leaded petroleum product is dependent on the lead content.

The parameters required for used oil contaminated soil reference or include the specific required parameters of Minn. Rules ch. 7045 (the hazardous waste rules of the MPCA). These parameters are required in the hazardous waste rules as a part of the process of evaluating whether the used oil contaminated soil contains a hazardous waste. The volatile organic compounds listed in Minnesota Department of Health method 465D are included in the list of used oil contaminated soil parameters since some of the compounds are used for hazardous waste evaluation and since this broad analysis indicates whether non-petroleum contaminants may be present (that may have been added to the used oil).

Subpart 3. Additional evaluation of soil contaminated with leaded petroleum products. This subpart cites requirements of the hazardous waste rules as they apply to evaluation of petroleum contaminated soil that may be

expected to contain lead. Lead is reasonably expected to be present in soil contaminated with leaded gasoline and aviation gasoline. The generator of this contaminated soil has an existing duty under the hazardous waste rules to evaluate this soil with regard to lead to determine if it exceeds the hazardous waste standard. It is therefore reasonable to include this subpart as proposed in these rules to notify the regulated community of this existing requirement of the hazardous waste rules and to ensure proper evaluation of the waste.

Data contained in the MPCA's petroleum release site files indicates that few batches of petroleum contaminated soil are contaminated with lead that would exceed the hazardous waste standards.

Subpart 4. Additional evaluation of soil contaminated with used oil. This subpart cites requirements of the hazardous waste rules as they apply to evaluation of soil that is contaminated with used oil. These requirements include evaluation of the presence of listed hazardous wastes, halogenated compounds, and specific toxic compounds that may be expected to be contained in soil that is contaminated with used oil. As provided in the hazardous waste rules, this subpart considers chemical analyses of the soil and personal knowledge of the generator regarding the contents of the waste released to the soil. It is therefore reasonable to include this subpart as proposed in these rules to notify the regulated community of this existing requirement of the hazardous waste rules and ensure proper evaluation of the waste.

Data contained in the MPCA's petroleum release site files indicates that few batches of petroleum contaminated soil are significantly contaminated with the specified compounds such that they would exceed the hazardous waste standards.

Part 7037.0600 Management of Petroleum Contaminated Soil Containing a Hazardous Waste

This part cites the management requirements of the hazardous waste rules as they apply to petroleum contaminated soil that has been determined to contain a hazardous waste. This part specifically references the evaluation procedures under part 7037.0500, subps. 3 and 4 (that are based on the hazardous waste rules). It is therefore reasonable to include this subpart as proposed in these rules to notify the regulated community of this existing management requirements of the hazardous waste rules and ensure proper management of the waste.

Part 7037.0700 Exemptions

Subpart 1. Small quantities of petroleum contaminated soil. This subpart provides for exemption from parts of the proposed rules for management of petroleum contaminated soil that has a volume less than ten cubic yards (approximately one truckload) if the commissioner finds that compliance with the part is not needed to protect human health and the environment. In determining whether to grant the exemption, the commissioner shall consider the actual or potential level of contamination; soil volume; proposed treatment; proposed treatment location; and the potential for presence of PCBs, halogens, metals, and other contaminants in the petroleum contaminated soil. This subpart is reasonable since small volumes typically contain less petroleum than larger volumes and since they can be handled relatively quickly, oftentimes at the same location that the release occurred. This subpart provides for obtaining enough information to make an informed and technically sound

decision, while not taxing the time and resources of the MPCA and the regulated community. The selection of ten cubic yards as the soil volume cut-off was based on the experience of the MPCA spills response team.

Subpart 2. Emergency actions. This subpart states the commissioner shall grant an exemption to this chapter for the storage, transportation, and treatment or disposal of petroleum contaminated soil if the commissioner determines that such an exemption is necessary to expedite the proper management of the soil or spilled material and to prevent, abate, or control pollution as a response to an emergency. However, following the spreading and incorporation of the soil, certain follow-up management practices and documentation is required. Specifically, the soil must be tilled or cropped following its incorporation and soil monitoring must be done, as outlined in the proposed rules. This provision is reasonable because the quick action required in response to an emergency may require following procedures other than those required in the proposed rules. It is reasonable to require the specified follow-up management and monitoring since these stages follow the period of emergency and compliance should be possible.

Part 7037.0800 Overview of the Standards and Approval Procedures for Land Treatment Sites

This part states that the commissioner shall approve only those sites that meet the standards and limitations established in parts 7037.0900 and 7037.1000. Parts 7037.1100 and 7037.1200 establish the procedures for obtaining approval of a land treatment site from the commissioner. This part also establishes that the approval provided in part 7037.1100 constitutes a

preliminary finding by the commissioner that the site is suitable for the treatment of petroleum contaminated soil. This part further states that petroleum contaminated soil storage or spreading at a land treatment site that has received preliminary approval under part 7037.1100 may not occur until information regarding the specific batch of petroleum contaminated soil has been submitted and approved by the commissioner as provided under parts 7037.1300 and 7037.1400. The reasonableness of the standards referenced is described in the specified parts. The approach established for approving land treatment at a land treatment site is reasonable because it allows a land owner who wishes to operate a land treatment site to seek a preliminary finding from the commissioner that indicates that the site meets the criteria of these rules. This can be done prior to the land owner contracting to receive specific batches of petroleum contaminated soil to be treated. Once arrangements are made for specific batches of petroleum contaminated soil, then a separate application to the commissioner can be made. This separate approval stage for batches is reasonable because it assures an opportunity for the commissioner to determine that the limits established in the rules are being followed.

Part 7037.0900 Prohibited Areas for Land Treatment Sites

This part states that land treatment sites are prohibited in the following areas: A) a ten-year floodplain; B) 200 feet of an intermittent stream, drainage ditch, tile drain inlet, and the ordinary high water level of a stream, river, lake, pond, wetland, or flowage; C) 200 feet from a sinkhole, exposed bedrock, and known underground cave; D) 200 feet from any private

water supply well and 1000 feet from any public water supply well; E) 200 feet from a place of habitation, unless written permission to spread soil closer is obtained from the owner of the place of habitation, and 500 feet from a residential development or recreational area; and F) 200 feet from property lines, unless written permission to spread soil closer is obtained from the adjacent land owner.

The potential for adverse effects from petroleum contaminated soil can be greatly reduced by maintaining certain separation distances between the land treatment area and the area or feature that may be affected. The requirement of item A protects adverse impacts to surface water due to potential flooding. The requirements of item B minimize the potential for adverse impacts to surface water by run-off from a land treatment site. Both surface waters and features that flow directly into surface waters are protected under this provision.

The requirements of item C and D are designed to protect ground water quality. While there is no evidence that petroleum contaminants migrate from land treatment sites to wells, the MPCA staff believe that is is important that rules governing land treatment are highly protective of drinking water supplies. Public water supply wells have the largest separation distance as these wells generally have the largest zone of hydrologic influence in order to supply the larger quantities of water needed for municipal supplies. Public wells also serve larger populations so contamination in a municipal well would affect more people.

Items E and F provide separation distances for minimizing potential odor and aesthetic concerns, as well as potential run-off. Although odor from petroleum contaminated soil is not a public health threat, many persons find it objectionable.

The distances selected in the items above are reasonable in that environmental protection is assured without removing from consideration large areas of suitable native soil. The MPCA believes that the separation distances in the proposed rules are conservative. However, including additional detail and provisions for exceptions to these separation distances would hinder the MPCA's ability to efficiently review proposed land treatment site applications.

Part 7037.1000 Criteria for Land Treatment Sites

Subpart 1. Operational limits. This subpart establishes that to be operated as a land treatment site under this chapter, a site must operate within the following criteria: A. No more than 1500 cubic yards of petroleum contaminated soil may be accepted for treatment; B. No other land treatment site currently in operation or that has been operated within the past five years may be located within a radius of one quarter mile, unless the total volume of the proposed land treatment site and any land treatment site within a one quarter mile radius is less than 1500 cubic yards; and C. Spreading or storage of petroleum contaminated soil may only occur until November 1 of the year following the date of the first letter of approval issued under part 7037.1300.

The result of these limitations is that persons who wish to operate beyond these limits must obtain a solid waste management facility permit under Minn. Rules ch. 7035 and operate as a land treatment facility.

The decision to establish specific limits is partially based on comments received, as discussed in part I of this proceeding. With few exceptions, land treatment sites, as compared to land treatment facilities, are smaller

operations with a shorter duration of operation. Therefore, land treatment sites have less potential for causing an environmental impact. With this as a basis, it is reasonable to impose different regulatory requirements for land treatment sites and facilities and it is reasonable to provide specific and clear limits with regard to size, location, and approval duration to distinguish the two types of land treatment operations.

The selection of the 1500 cubic yard upper limit is reasonable since this volume will accommodate the amount of soil excavated at most petroleum release sites. The "quarter mile radius" limitation is reasonable since this avoids an arbitrary and variable distinction such as the land area owned by a land owner. Given that 1500 cubic yards spread at a thickness of four inches covers approximately three acres, the one-quarter mile separation provision establishes that on average no more than about 7.5 percent of the land area would be used as a land treatment site. It should be noted again that more intensive land use for land treatment may be done; however, this requires meeting the requirements for operation as a land treatment facility.

The approval duration established in this provision effectively allows at least one complete working season for spreading and storing petroleum contaminated soil, with a limit of two working seasons. This limit provides consistency within the proposed rules in that the November 1 end date is consistent with the last date that spreading may occur within any given year, as indicated in part 7037.1700. This provision is reasonable since it provides at least one complete working season, yet does not extend the period of operation into several seasons. The MPCA believes that approval of a period longer than the established duration requires the regulatory oversight established in a permit required for operation of a land treatment facility.

Subpart 2. Filter strips. This subpart states that a land treatment site must have a downgradient filter strip (i.e., strip or area of vegetation) with a minimum width of 50 feet if the land treatment site is within 500 feet of any of the following: A. the ordinary high water level of either a trout stream designated by the Department of Natural Resources Commissioner's Order No. 2294 or a trout lake designated by the Department of Natural Resources Commissioner's Order No. 2443; B. the ordinary high water level of any outstanding resource value water as defined in Minn. Rules pt. 7050.0180, subp. 2, item A; and C. Any intermittent stream, drainage ditch, or tile drainage inlet that outlets to a trout stream, trout lake, or outstanding resource value water, as referenced in this subpart. In addition, this subpart states that the filter strip must otherwise be designed according to, or equivalent to, Soil Conservation Service standard 393 (USDA-SCS-MN, April 1986).

The protection required in this subpart is consistent with the intent of the rules and regulations addressing Minnesota's environment and natural resources. The requirements of this subpart are reasonable since filter strips are a relatively simple, yet very effective, means for surface water protection. Many of these surface waters already have a natural filter strip of an acceptable width at their border; therefore, the MPCA does not anticipate that many filter strips will need to be established in order to comply with the proposed rules.

Subpart 3. Run-on prevention. This subpart states that a land treatment site must have adequate controls to minimize run-on. In addition, this subpart states that, if necessary, the owner or operator shall take measures to

minimize run-on, including construction of a diversion upgradient of the land treatment site that is designed according to, or equivalent to, Soil Conservation Service standard 362 (USDA-SCS-MN, July 1989) or cropping of the land upgradient of the treatment site prior to spreading and incorporation of petroleum contaminated soil. This subpart is reasonable because run-on prevention is an important factor for minimizing run-off from land treatment sites. In addition, by minimizing run-on the potential for leaching of petroleum compounds at land treatment sites is reduced.

Subpart 4. Slope. This subpart states that no portion of a land treatment site may have a slope greater than six percent. The slope of land has a direct relationship to the potential for contaminant migration with surface run-off. As the land slope increases, the velocity of the run-off water increases. This results in an increase in the ability of the run-off water to detach particles from the soil mass and transport them from the site. The general guidance presently used by the MPCA indicates a six percent maximum slope. The MPCA staff also believes that six percent is reasonable since this allows for efficient review of sites by the MPCA since the primary reference used for land treatment site selection, county soil surveys, characterize slope within ranges that include "two to six percent".

Subpart 5. Treatment zone characteristics. This subpart establishes that the treatment zone at a proposed land treatment site must meet certain specified criteria for organic matter concentration in the upper eight inches of native soil, the soil permeability in the treatment zone, and the thickness of the treatment zone. To meet the requirements of a given permeability category, as listed in this table, 75 percent of the treatment zone must have a

permeability no greater than the listed permeability, as calculated according to the method described in part 7037.3300, subpart 5. The requirement for the thickness of the treatment zone is subject to the certain specific exceptions. This subpart also requires that the land must be capable of being tilled.

The criteria established are reasonable in that they represent the key soil characteristics that determine the suitability of land at a site for petroleum contaminated soil treatment. These factors interact to maximize biodegradation and prevent the downward migration of petroleum compounds to ground water and, therefore, it is reasonable to consider these factors together. To determine the relative effects of these factors on the fate of applied petroleum, a series of computer simulations for various land treatment settings was tested with a computer model known as the Vadose Zone Interactive Processes (VIP) Model. The VIP model was developed by the Civil and Environmental Engineering Department of the University of Utah for the purpose of evaluating the fate of a hazardous substance in the unsaturated zone of the soil of a land treatment system. This model has been demonstrated to be a useful tool for making management decisions about the application of wastes to soil and about predicting the hazard posed by a contaminated site (Grenney et al., 1989). The VIP model simulates the transport and decomposition of hazardous substances as they are affected by vadose zone processes including volatilization, biodegradation, adsorption/desorption, advection, dispersion, and oxygen transport. Complete descriptions of the VIP model are given by Grenney et al. (1987) and Stevens et al. (1989).

Among the factors the MPCA staff tested with the VIP model were native soil types with different permeabilities, organic matter concentration in the plow zone, depth of the treatment zone, amount of yearly precipitation (which is controlled largely by geographic location), soil temperature regime (also controlled largely by geographic location), and date of spreading. Refer to Exhibit 4 for a complete description of the factors tested. Tests conducted using this model were limited to determining the fate of the petroleum constituent benzene. It was necessary to choose a petroleum constituent rather than a petroleum product itself because the VIP model requires input related to substances that exhibit homogenous chemical properties. The MPCA staff believes that benzene is the most appropriate indicator constituent for these tests since it has a high solubility in water (and, therefore, can be mobile in the soil profile) and since it may pose significant human health risks if large enough quantities migrate to ground water and are subsequently consumed (EPA, 1992). In addition, with very few exceptions, ground water cleanups at petroleum release sites in Minnesota, when required, are due to exceeding drinking water standards for benzene.

The results of this testing demonstrated that the organic matter concentration in the plow zone and the depth of the treatment zone are important for maximizing biodegradation and minimizing the potential for leaching. Native soil permeabilities appeared to be an important factor also; however, the highly permeable soil tested in these simulations (a sand) showed similar results to the moderately permeable soil (a fine sandy loam) and for some conditions tested, similar results to the slowly permeable soil (a clay loam). The MPCA staff believes that it is necessary and reasonable to prohibit

the use of land treatment sites that predominately have highly permeable soils because it is not clear what effect heavy rainfall events could have on the movement of the petroleum compounds on these types of soils (the VIP model cannot accurately estimate this). Also, experience with petroleum release sites in Minnesota shows a much greater tendency for petroleum migration at sites with highly permeable soils as compared to those with lower permeabilities. In addition, the VIP simulations tested used the same organic matter levels when permeability levels were tested. While this was necessary in order to determine the relative differences of the factors tested, sandy soils generally do not have as high a concentration of organic matter as those soils with lower permeabilities, according to the Soil Conservation Service's data for the soil series of Minnesota.

The soil temperature regime and date of spreading had a negligible effect on the fate of benzene. The amount of yearly precipitation had some effect on the fate of the benzene, but this effect appeared to be limited only to conditions in which organic matter concentration in the plow zone was low and the depth of the treatment zone was small. The MPCA staff has chosen not to use yearly precipitation (i.e., geographic location) as a criteria for a land treatment site because of these results and since yearly precipitation can be highly variable.

Further discussion on the use of the VIP model and a presentation of results is given in Exhibit 4.

As indicated, 75 percent of the treatment zone must meet a specified permeability. Part 7037.3300, subpart 5 describes how this percentage must be calculated. This effectively means that a treatment zone may contain some layers (or "horizons") of a high permeability but that low permeability layers

must predominate. It is reasonable to use the value of 75 percent since this value establishes a clear preponderance of suitable soil thickness yet does not disallow the use of soils with thin coarse-textured horizons.

The specific exceptions for the requirements for the thickness of the treatment zone are the following: 1) for sites in which a subsurface tile drainage system is present that is designed according to or equivalent to Soil Conservation Service engineering standards and criteria, the depth of the treatment zone is established as the depth of the tile drainage system; and 2) for sites in which the appearance of a seasonal high water table is caused by a zone of saturated soil that exists between zones of unsaturated soil in the upper five feet of the native soil, the depth of the treatment zone is established as the depth of bedrock or five feet, whichever is less.

The basis for the first exception is that properly installed tile lines intercept a rising water table and limit the extent of the ground water to the depth of the tile lines. It is also reasonable not to exclude the use of sites with perched ground water, as specified in item 2 since this feature is very shallow, thin and unsuitable for use as a water supply.

The requirement that the land be capable of being tilled is reasonable because a soil that is not capable of being tilled (i.e., a highly compacted surface) will not likely result in adequate treatment since the native surface soil is the primary media in which biodegradation occurs. If petroleum contaminated soil could not be adequately mixed into this surface soil, biodegradation may be limited. The primary petroleum removal mechanism in this case would likely be volatilization. The goal of land treatment is maximization of biodegradation, rather than media transfer. For these reasons it is reasonable to rely on tillable sites for land treatment.

Subpart 6. Storage areas. A storage area at a proposed land treatment site must not be located in the area prohibited for land treatment sites as provided in part 7037.0900 and native soil and site conditions for the storage area must must meet the same native soil and location requirements that land treatment sites must meet (except that areas without a tillable soil are acceptable). This subpart is reasonable since the criteria established for land treatment sites offer the same degree of environmental protection for stored petroleum contaminated soil.

Part 7037.1100 Approval Procedures for Land Treatment Sites

Subpart 1. Application for approval of a land treatment site. This subpart specifies that an applicant who seeks approval of a land treatment site must furnish the information specified in part 7037.1200 on a form prescribed by the commissioner and that the application must be signed by the owner and operator of the proposed land treatment site. Submittal of a standardized application to the commissioner is reasonable since this is a logical manner in which to review land treatment sites consistently and efficiently.

Subpart 2. Incomplete applications. This subpart states that all applications shall be reviewed for completeness by the commissioner and that if the application is incomplete, the commissioner shall promptly inform the applicant of the deficiency or deficiencies. The commissioner shall suspend further processing of the application until the applicant has provided the required information. This review process is reasonable because it assures that all of the information necessary to evaluate a land treatment site is submitted.

Subpart 3. Approval. This subpart states that the commissioner shall issue letters of approval for sites that are found to meet the criteria established in parts 7037.0900 and 7037.1000. A letter of approval constitutes a finding by the commissioner that the site can be operated in compliance with this chapter. Approval by the commissioner does not release the applicant from any duty to comply with applicable federal, state, or local government statutes, rules or ordinances, including the requirements established in this chapter. This approval process is reasonable because it allows for expedient handling and treatment of petroleum contaminated soil. This basic approval process is currently in place within the tanks and spills program of the MPCA and it operates efficiently.

Subpart 4. Denial of approval. This subpart states that the commissioner shall deny letters of approval for sites that do not meet the criteria established in parts 7037.0900 and 7037.1000. If the commissioner denies a letter of approval but finds that the site could be operated in compliance with Minn. Rules chs. 7035, 7050, and 7060 if enforceable conditions were established in a permit, the commissioner shall inform the applicant that the applicant may apply for a solid waste management permit under Minn. Rules pts. 7001.0010 to 7001.0210 and Minn. Rules ch. 7035. If the commissioner finds that no conditions could be established that would enable the site to operate in compliance with Minn. Rules chs. 7035, 7050, and 7060, the commissioner shall notify the applicant of the commissioner's intent to deny the application and afford the applicant the opportunity to request a contested case hearing as provided in Minn. Rules pt. 7000.1000. The approach indicated is reasonable because full consideration is given to a proposed land treatment site and an applicant is afforded due process if the commissioner denies the use of the site for land treatment.

Part 7037.1200 Application Requirements for Land Treatment Sites

Subpart 1. Land treatment site background information. This subpart specifies the background information that must be contained in the application. The requested information of this subpart is reasonable in that it is standard information necessary to document who is associated with and responsible for the land treatment site and where it is located.

Subpart 2. Land treatment site and native soil characterization. This subpart requires that the applicant demonstrate that the land treatment site meets the required technical criteria of the proposed rules. Likewise, the applicant must demonstrate that the storage area criteria have been met. The required information pertaining to the native soil must either be obtained from Soil Conservation Service references or be generated from actual on-site investigations. This subpart also states that when requested by the commissioner, the applicant shall perform an on-site investigation. The commissioner shall require an on-site investigation if the Soil Conservation Service soil survey lacks adequate detail, is out of date, or has historically been inaccurate.

These requirements are reasonable since they are intended to result in a written submittal that indicates whether the land treatment site meets the requirements of the proposed rules. It is reasonable to allow the use of Soil Conservation Service soil surveys since these are readily available for most counties of Minnesota and contain applicable soil-specific information. These references are considered a useful tool for many land-use applications. However, it is generally understood by many, including the Soil Conservation Service, that these references are limited in their accuracy and mapped soil series may include within them smaller unmapped soil series. It is for these

all corners and midway between all corners using conspicuous stakes or flags. This requirement is reasonable because it allows for the site to be easily identified at the time an inspection is made and it better assures that there is no confusion over what parcel of property is being proposed.

Part 7037.1300 Approval Procedures for Land Treatment of Batches of Petroleum Contaminated Soil at Approved Land Treatment Sites and Facilities

Subpart 1. In general. This subpart states that subparts 2 to 4 address the process for obtaining a letter of approval to land treat a batch of petroleum contaminated soil at approved land treatment sites and permitted land treatment facilities. An applicant who seeks approval to land treat a batch of petroleum contaminated soil at an approved land treatment site or a permitted land treatment facility shall furnish the information specified in part 7037.1400 on a form prescribed by the commissioner. Also, the application must be signed by the generator and the owner and operator of the approved land treatment site or facility where the petroleum contaminated soil is proposed to be land treated. Submittal of a standardized application to the commissioner is reasonable since this is a logical manner in which to review the required information consistently and efficiently.

Subpart 2. Incomplete applications. This subpart states that all applications shall be reviewed for completeness by the commissioner and that if the application is incomplete, the commissioner shall promptly inform the applicant of the deficiency or deficiencies. The commissioner shall suspend further processing of the application until the applicant has provided the

required information. This review process is reasonable because it assures that all of the information necessary to evaluate a land treatment site is submitted.

Subpart 3. Approval. This subpart states that the commissioner shall issue letters of approval for treatment of batches of petroleum contaminated soil. A letter of approval for land treatment of a batch of petroleum contaminated soil constitutes a finding by the commissioner that the batch can be treated in compliance with this chapter at the proposed site. A letter of approval for land treatment of a batch of petroleum contaminated soil at a land treatment facility constitutes a finding by the commissioner that the batch can be treated in compliance with the solid waste management facility permit for the facility. Approval by the commissioner does not release the applicant from any duty to comply with applicable federal, state, or local government statutes, rules or ordinances, including the requirements established in this chapter or a solid waste management permit issued under Minn. Rules ch. 7035. This basic approval process is currently in place within the tanks and spills program of the MPCA and it operates efficiently.

Subpart 4. Denial of approval. This subpart states that the commissioner shall deny approval of an application for a letter of approval if acceptance of the batch of petroleum contaminated soil would cause a land treatment site to operate in violation of the limitations established in part 7037.1000 or other operating requirement established in part 7037.1500 to 7037.2700, or cause a land treatment facility to violate a condition established in its solid waste management facility permit. The commissioner shall notify the applicant of the commissioner's intent to deny the application and afford the applicant the opportunity to request a contested case hearing as

provided in Minn. Rules pt. 7000.1000. The approach indicated is reasonable because full consideration is given to a proposed batch of petroleum contaminated soil and an applicant is afforded due process if the commissioner denies approval for land treatment of the batch.

Part 7037.1400 Application Requirements to Land Treat a Batch of Petroleum Contaminated Soil

Subpart 1. Land treatment site information. This subpart specifies the background information that must be contained in an application to land treat a batch of petroleum contaminated soil at a land treatment site or facility. The general purpose of this subpart is to document who is associated with and responsible for the land treatment site or facility and where it is located. Also, the specified information allows determination of whether the site would operate within the limitations allowed under these rules (e.g., soil volume limits) or whether the facility will operate within its permit.

Subpart 2. Petroleum contaminated soil information. This subpart specifies the information pertaining to the batch of petroleum contaminated soil that the application must contain. It is reasonable to request this information since it identifies where the petroleum contaminated soil originated and to determine whether the proposed land treatment for the specific batch of petroleum contaminated soil will comply with the rules (or permit, as it applies to a facility).

Subpart 3. Soil nutrient information. This subpart requires that an applicant furnish a description containing the information required under part 7037.3600, regarding the nutrient status of the land treatment plot. It

is reasonable to require this as part of the submitted application so that this element of the management of the petroleum contaminated soil can be reviewed so that it is conducted properly.

Subpart 4. Local government notification. An applicant shall furnish a copy of the information required in subparts 2 to 4 of this part to the appropriate county, city, and township officials listed under part 7037.1200, subpart 3, at the same time or prior to submittal of the information to the commissioner. This requirement is reasonable since it entails minimal extra effort while providing the county and local governments with important information relating to the land treatment site or facility.

Subpart 5. Border marking. At the time an application to land treat a batch of petroleum contaminated soil is submitted to the commissioner, the borders of the proposed plot must be marked on all corners and midway between all corners using conspicuous stakes or flags. This requirement is reasonable because it allows for the plot to be easily identified should an inspection be made and it better assures that there is no confusion over what portion of the land treatment site is being proposed.

Part 7037.1500 Operational Requirements for Approved Land Treatment Sites: Scope

This part states that following issuance of the approval required under part 7037.1300 the owner and operator of a land treatment site shall comply with the operational requirements established in parts 7037.1600 to 7037.2700. The reasonableness of the operational requirements is described in the specified parts.

Part 7037.1600 Storage of Petroleum Contaminated Soil at Land Treatment Sites

Subpart 1. Storage on a plot. This subpart states that an owner or operator may store petroleum contaminated soil for up to 10 days without run-off controls within an approved land treatment plot and that after 10 days an owner or operator shall spread the batch of petroleum contaminated soil in accordance with part 7037.2300 or take measures to control run-off. Acceptable measures to control run-off from stockpiled petroleum contaminated soil are A) covering with a tarpaulin, unreinforced plastic that is at least 10 mils thick, or reinforced plastic that is at least six mils thick; or B) placing silt dams on the perimeter of the stockpile that are made of a geotextile material and are secured with stakes.

The procedures and approach described in this subpart are reasonable because the location of the stored soil and the length of storage time are considered in determining whether run-off controls are necessary. This subpart recognizes that, in the short term, the potential for migration of petroleum constituents is not significantly greater for stored soil than it is for spread and incorporated soil. It is reasonable to require the listed run-off control measures after 10 days since some run-off may occur if repeated heavy rains occur. While the same could occur for spread and incorporated soil within a land treatment site, the risk is less since incorporation of the soil acts to reduce surface exposure and enhance biodegradation. The listed run-off control measures are reasonable since such measures are routinely used in situations involving exposed soil stockpiles.

As indicated previously, some comments were received by the MPCA stating that plastic should not be required since it tends to break down in the wind and become a nuisance. This comment was made primarily by those who own,

established in order to avoid spreading petroleum contaminated soil under conditions in which the potential for run-off is high. Both frozen and water-saturated conditions minimize infiltration and, therefore, increase the chances for run-off should rainfall occur. The starting and ending dates indicated were selected to further ensure that run-off is minimized since soil freezing is likely outside this time range in many parts of Minnesota. It is reasonable to limit soil spreading as indicated in this part because run-off moves some petroleum contamination away from the designated land treatment plot and may adversely impact surface water quality.

Part 7037.1800 Petroleum Loading Limitations

Subpart 1. In general. This subpart establishes that the loading of petroleum contaminated soil on a native soil may not exceed a spreading thickness of four inches, or 540 cubic yards per acre. Subparts 2 to 5 provide the loading of petroleum contaminated soil based on the following factors: type of petroleum released; the contaminant level of the petroleum contaminated soil; and the treatment zone characteristics under part 7037.1000, subpart 5, items A to C. In addition, this subpart establishes that if a batch of petroleum contaminated soil contains gasoline and a petroleum type other than gasoline then the more stringent requirements of subparts 2 or 3 must be followed.

A maximum spreading thicknesses of four inches is reasonable because it is important to mix the petroleum contaminated soil with the native soil in order to maximize biodegradation. MPCA staff experience has shown that most standard tillage implements cannot effectively incorporate the added soil if the spreading thickness exceeds approximately four inches. Also, a spreading

thickness no thicker than four inches better assures thorough mixing with a large portion of the fertile surface soil. Consideration of the type and level of petroleum contamination is reasonable because these are important factors concerning the environmental risk posed by spreading petroleum contaminated soil. Additional discussion of the reasonableness of these factors is provided under subparts 2 and 3. The requirements for petroleum contaminated soil with mixtures of petroleum is reasonable because the most conservative of the applicable standards are required.

Subpart 2. Gasoline contaminated soil. A table is provided in this subpart that lists the maximum allowable levels of gasoline contamination in petroleum contaminated soil that may be spread at a land treatment site at a spreading thickness of four inches. The limits selected are reasonable because they are conservative standards that are based on how the treatment zone characteristics affect the fate of applied petroleum. The effects of the various treatment zone factors was described previously under part 7037.1000, subpart 5.

As described in Exhibit 4, various simulations were tested with the VIP model over different ranges of conditions. For most of the tests a single concentration of the indicator petroleum constituent (benzene) was used. This concentration was based on an estimated level of benzene contained in gasoline contaminated soil with a TPH concentration of 10,000 ppm. Such an estimate is possible since many petroleum constituents generally exist at known ranges of concentrations in the different petroleum products. In this subpart the specified maximum allowable petroleum loading levels are based on TPH concentrations, rather than benzene or other volatile constituents, since this parameter is much less prone to error due to volatile loss during soil sampling

and handling. Although the focus of the simulations conducted in Exhibit 4 was not on different levels of applied petroleum, it is reasonable to establish limits based on petroleum levels provided that the various treatment zone factors are also considered. This subpart is structured so that higher levels of gasoline contamination may be spread as each of the treatment zone factors becomes more favorable (i.e., less conducive to migration of contaminants to ground water).

As indicated, the MPCA staff believe that the selected criteria and corresponding petroleum loading levels are conservative. The results from the computer simulations indicated that the potential for leaching of benzene is very limited. Under the allowable conditions provided under this subpart very little leaching was estimated with the simulations using the VIP model in Exhibit 4. Generally, the results for these conditions showed that with a petroleum loading level of 10,000 ppm TPH, less than 0.05 percent of the total benzene leached. The MPCA staff believes that even the small amounts of leaching that were estimated with the VIP model are unlikely under actual conditions for the following reasons: 1) The assumed level of benzene in the soil was based on a benzene concentration of two percent in gasoline. This estimate is somewhat high for most batches of gasoline contaminated soil, according to data contained in the MPCA petroleum release site files; 2) the VIP model appears to underestimate volatile loss of petroleum constituents. The range of the percent of the applied benzene lost to the air ranged from approximately 0.5 to 2 percent. According to published data from actual field measurements in a 10 day experiment for applied petroleum compounds, approximately 17 percent of the applied benzene was lost to the air (American Petroleum Institute, 1989); 3) a relatively low level of organic matter (0.5

percent) was assumed for the lower treatment zone. According to the Soil Conservation Service's data for the soil series of Minnesota, the organic matter content of most medium- to fine-textured soil is typically greater than this level; and 4) other conservative estimates were made for the various input variables for the model. In addition, as discussed previously the results from the soil sampling study results in Exhibit 3 indicate that petroleum is quickly broken down and does not tend to migrate appreciably below the plow zone.

Subpart 3. Fuel oil and crude oil contaminated soil. This subpart is similar to subpart 2, except that this subpart provides the maximum allowable levels of contamination in petroleum contaminated soil in which the TPH level is characterized as fuel oil or crude oil and that may be spread at a land treatment site.

As indicated previously, the focus of the use of the VIP model was on gasoline and its constituents. The middle distillate fuels, residual fuel oils and crude oil have very low BETX concentrations (EPA, 1989). Data contained in MPCA petroleum release site files, including stockpile analyses presented in Exhibit 3, shows that the BETX constituents are quite variable, but are very low--typically several times lower than the levels that occur in gasoline. The maximum allowable petroleum loading rates for the middle distillate fuels, residual fuel oils and crude oil in this subpart are set at two times the allowable TPH levels for gasoline in subpart 2. While soil contaminated with these heavier petroleum products was not tested directly with the VIP model, these petroleum loading rates are conservative given the documentation of low concentrations of mobile petroleum constituents.

Subpart 4. Spreading thickness adjustments. This subpart states that petroleum contaminated soil with contaminant levels that exceed the listed

levels in subparts 2 and 3 may be spread if done at thinner spreading thicknesses that result in an equivalent or a lower petroleum loading level than those listed in the table. To determine the acceptable spreading thicknesses for petroleum contaminated soil that exceeds the listed levels in subparts 2 and 3, part 7037.3500 must be used. This subpart is reasonable because these adjustments result in obtaining the intended objectives of this part with regard to petroleum loading.

Subpart 5. Petroleum contaminated soil containing lead. This subpart requires that petroleum contaminated soil with a total lead level greater than 300 ppm be spread at a thickness that assures lead levels in the mixture of petroleum contaminated soil and native soil after incorporation to be below 300 ppm. To determine final projected lead levels in the mixture of soil, prior to soil spreading the owner or operator is required to collect a composite soil sample of the upper eight inches of the native soil as described in part 7037.3200, subpart 1, and analyze the sample for total lead as described in part 7037.3100, subpart 1. This subpart is included to prevent surface soil lead concentrations from exceeding the standards of Minn. Rules pt. 4760.0020 for bare soil on residential property or on playgrounds. It is reasonable to refer to this standard for agency consistency and also to protect against the possibility that future use of the land treatment area may include residential properties or playgrounds. It should also be noted that this standard is lower than the standards established that exist for food-chain protection in the rules governing sewage sludge management (Minn. Rules ch. 7040). According to the Statement of Need and Reasonableness for Minn. Rules ch. 7040, the application limits for lead for that chapter are recommended by the EPA and were developed by joint efforts of researchers in

various agricultural experiment stations, the United States Department of Agriculture, and the EPA, and are also used in guidelines and rules from other states.

Part 7037.1900 Prohibition of Mixing or Repeated Use

This part establishes that 1) petroleum contaminated soil originating from separate releases must not be combined or spread on the same plot of land; 2) plots that were previously used for land treatment of petroleum contaminated soil may not receive repeat applications of petroleum contaminated soil; and 3) individual plots within an approved land treatment site must be separated by a minimum of two feet to prevent mixing of different batches of spread petroleum contaminated soil.

It is reasonable to manage batches of petroleum contaminated soil as separate entities because this assures accurate monitoring and documentation of treatment. Also, different management approaches for the different batches may be necessary. The requirement prohibiting repeat applications is based on the MPCA staff's concern with land use intensity for land treatment at land treatment sites. While a native soil may be able to provide the needed degradation for repeated applications of soil, such a practice would, in general, present a greater environmental risk if management of the site was not carefully controlled. Both the level of regulatory oversight provided in the proposed rules and the MPCA resources available for the land treatment component of the tanks and spills program preclude any more than a one-time application per plot of soil.

Part 7037.2000 Maintenance of Border Marking

This part states that the border markings established at the land treatment site under parts 7037.1200, subpart 4 and 7037.1400, subpart 5 must remain in place during spreading of the contaminated soil and until all follow-up monitoring requirements are fulfilled under 7037.2700. It is reasonable to require this so that the plots can be easily identified for proper management and monitoring.

Part 7037.2100 Removal of Large Rocks and Debris

This part states that rocks larger than four inches in diameter and debris must be removed from petroleum contaminated soil prior to incorporation into the native soil. Debris includes pieces of plastic, bricks, metal, and wood. This is reasonable because such materials may interfere with or damage tillage or planting equipment.

Part 7037.2200 Fertilizer Application

Subpart 1. Conditions. This part states that a native soil must be evaluated to determine if nutrient addition is required if the petroleum loading level exceeds the loading level resulting form the application of petroleum contaminated soil with an average total petroleum hydrocarbon concentration of 2000 ppm to be spread at a thickness of four inches, or an equivalent petroleum loading level at a thinner spreading thickness. Evaluation of the need to apply fertilizer and determination of appropriate fertilizer application rates is given in 7037.3600. This subpart also states that the commissioner shall grant an exemption to the maximum fertilizer rates under part 7037.3600 if the owner or operator submits documentation that

indicates that lack of nutrients may be limiting petroleum biodegradation. This documentation must include the results of a nutrient evaluation as given in subpart 2 and soil monitoring results as given in part 7037.2700.

This subpart is reasonable because in order to efficiently decompose hydrocarbons, microbes must have available to them sufficient amounts of nutrients such as nitrogen and phosphorus. It is standard practice for land treatment and other types of bioremediation to evaluate nutrient needs and supply them if necessary. Also, fertilizers represent a small portion of the cost associated with land treatment and are easy to apply. Selection of 2000 ppm TPH in this subpart is based on the calculations of part 7037.3600 whereby certain conservative assumptions were made. Specifically, an organic matter content of two percent and a phosphorus concentration of 10 ppm were used in the formulas of subpart 2 and MPCA staff determined that in order to have no need for added fertilizer, the petroleum loading rate must be no higher than approximately 2000 ppm TPH (spread four inches thick). It is reasonable to allow an exception to these maximum rates provided the requested evidence shows that nutrients are limiting biodegradation. Under these conditions a substantial amount of nutrient immobilization is taking place and, therefore, the potential for leaching would be low.

Subpart 2. Application methods and timing. This subpart states that if fertilizer is to be applied to the land treatment site for the purpose of biodegradation of added petroleum contaminated soil, it must be broadcast to assure as uniform an application as possible. Also, fertilizers may be applied in a single application or in smaller, multiple applications during the required dates and conditions given for soil spreading under subpart 3. In addition, fertilizers must be incorporated into the native soil within 10 days

of application. These requirements provide a reasonable scheme for proper fertilizer management. Uniform application allows for the most efficient petroleum degradation. The timing for incorporation is reasonable in that sufficient time is allowed to complete the work. If planned properly the plot can be fertilized prior to soil spreading and the fertilizer and petroleum contaminated soil can be incorporated in the same operation.

Part 7037.2300 Spreading and Incorporation of Petroleum Contaminated Soil

This part requires that petroleum contaminated soil be spread uniformly over the entire designated plot and that petroleum contaminated soil be incorporated into the upper four to six inches of native soil as soon as feasible but no longer than 48 hours after spreading. This part also states that, in order to minimize soil moisture loss and volatile loss of the petroleum contaminants, the initial incorporation must involve only one or two passes with a tillage implement during a single tillage cycle such that most soil clods are broken up and petroleum contaminated soil and native soil mixing occurs. Spreading and incorporation are very important for maximizing petroleum degradation and it is reasonable to provide these requirements because these practices are not difficult to do and can typically be accomplished with standard farm machinery.

Part 7037.2400 Tillage

This part states that unless the plot has been seeded to a crop, tillage of the soil following the initial incorporation must be done in monthly cycles, excluding the period from November 1 to April 1, until all soil monitoring samples taken under part 7037.2700 are less than 10 parts per million total

petroleum hydrocarbons or until a minimum of four tillage cycles have been done, whichever is first. This part also states that tillage of the soil must be delayed until the soil moisture is increased if the soil lacks moisture such that tillage would cause wind erosion or decreased microbial activity.

Tillage can be a very critical management factor for biodegradation of petroleum. The approach provided in this part recognizes this, yet provides a reasonable set of limits that must be followed. Specifically, it is reasonable to limit tillage only to the warmer parts of the year when biodegradation can occur. Also, it makes sense to not require tillage beyond the time that the monitoring goal of part 7037.2700 is reached. Also, this part recognizes that too much tillage is not appropriate and that it may cause unfavorable effects. It would not be practical or reasonable to specify soil moisture conditions more than is indicated in this subpart since optimal moisture conditions vary considerably for different surface soils.

Part 7037.2500 Cropping

This part provides for the option of seeding the plot to a crop (other than root crops or crops for direct human consumption) after the initial incorporation of petroleum contaminated soil into the native soil instead of tilling the soil, as described part 7037.2400. This part also states that if seeding is delayed, the tillage schedule given in part 7037.2400 must be followed until seeding can be done. This provision is included in the proposed rules since a growing crop reduces the potential for run-off and wind erosion, reduces surface moisture loss by shading the soil, and reduces the potential for leaching by removing soil water. While tillage does enhance aeration of the soil, degradation can still take place without tillage and, depending on

climatic conditions, the degradation rates under a cropped condition may be greater than those of an uncropped condition due to better surface moisture. It is reasonable to exclude from the crop options root crops and crops grown for direct human consumption since this leaves many choices of crops for farmers to grow, yet provides an extra margin of safety since petroleum may adhere to the edible portions of these crops.

Part 7037.2600 Notification of Soil Spreading

Subpart 1. In general. This subpart states that an owner or operator shall furnish the information specified in subpart 2 to the commissioner on a form prescribed by the commissioner within 10 days after spreading a batch of petroleum contaminated soil. A 10-day notification is reasonable since the requested information is brief and uncomplicated. Also, much of the contents of this form can be prepared prior to the date of spreading. It is reasonable to require the use of a specific prescribed form for this information so that all applicable portions of the rules are addressed and so that the review process is consistent and efficient.

Subpart 2. Notification information. This subpart specifies the background and technical information that must be contained in the submittal. This subpart is reasonable in that it requires similar information that has been previously requested, except that actual rather than estimated data is requested for some items. The purpose of this subpart is to provide the commissioner with background information related to the land treatment site and persons associated with it and to determine whether the spreading of the specific batch of petroleum contaminated soil complied with the applicable provisions of the rules.

Subpart 3. Local government notification. This subpart requires similar notification requirements as part 7037.1400, subpart 3, and is reasonable for the reasons described within the discussion of that subpart.

Part 7037.2700 Monitoring and Reporting Requirements

Subpart 1. In general. This subpart states that an owner or operator shall sample the soil following the spreading and incorporation of a batch of petroleum contaminated soil in accordance with the practices of subparts 2 to 4. It is reasonable to require a specific means by which to determine the degree of treatment occurring. Such information indicates whether additional management may be appropriate and also eventually documents completion of treatment.

Subpart 2. Sampling procedures. This subpart specifies that soil samples must be composite samples collected within a plot from the surface to a depth of eight inches using the procedures described in part 7037.3400. The minimum number of composite samples collected from the upper eight inches is based on the volume of the batch of petroleum contaminated soil actually spread and must follow the table in part 7037.2900, subpart 1, item A. It is reasonable to sample the upper eight inches of soil since studies reviewed for this rulemaking show that the upper portion of the soil is where the bulk of the petroleum would be over time. It is reasonable to use composite sampling rather than a grab sampling technique since composite sampling provides more representative results. While it is acknowledged that composite sampling may result in poor quantification of highly volatile petroleum constituents (e.g. benzene), such constituents are typically at a relatively low concentrations and are quickly subjected to biodegradation and volatilization. In addition,

the monitoring approach in the proposed rules is to quantify the amount of petroleum remaining, which can be effectively done using the indicator parameter TPH. It is reasonable to collect an adequate number of composite samples since soil treatment across the plot can be variable due to many interacting factors.

Subpart 3. Frequency of sampling. This subpart states that monitoring of a plot in the year of spreading must be done according to a specified schedule, until all soil analytical results in a single sampling round are 10 ppm TPH or lower. The 10 ppm TPH target value is a petroleum level that has been used in the tanks and spills land treatment program for three years. MPCA staff believes that this level indicates that substantial to near-complete treatment has occurred. This is a reasonable approach since information is generated that documents treatment and, as data from the MPCA's petroleum release site files shows, does so without an excessive number of sampling rounds.

Subpart 4. Analysis. This subpart specifies that soil samples must be analyzed for TPH, according to the methods under part 7037.3100, subpart 2, item C or D and that the commissioner shall require analysis for additional compounds if the commissioner determines that additional analysis is necessary to protect the public health and environment. It is reasonable to quantify petroleum as TPH since this provides a reliable indicator of petroleum The requirement for additional analysis is reasonable since there is the possibility of land treatment of petroleum contaminated soil with a relatively high concentration of a particular constituent of environmental concern. Such instances have not been common in the experience of the tanks and spills program; however, this provision provides a reasonable environmental safeguard.

Subpart 5. Submittal of monitoring information. This subpart specifies that within 30 days of receipt of laboratory results for the soil samples, the owner or operator shall submit the information specified in this subpart on a form prescribed by the commissioner. This subpart is reasonable in that it requires similar background information that has been previously requested. Also, the specific soil management information requested allows determination of compliance with the applicable provisions of the rules and the analytical results allows for comparison with the standards provided in these rules.

Subpart 6. County and local government notification. This subpart requires similar notification requirements as part 7037.1400, subpart 3, and is reasonable for the reasons described within the discussion of that subpart.

Part 7037.2800 Methodology and References: Scope

Parts 7037.2900 to 7037.3600 establish the methodologies that must be used when making the determinations required under this chapter, including methods of sampling and analysis. Part 7037.3700 incorporates by reference the documents referenced in this chapter. The reasonableness of the referenced parts is described under the individual parts. It is reasonable to establish a scope section for these parts to the alert the reader as to their function in this chapter.

Part 7037.2900 Collection of Grab Samples of Petroleum Contaminated Soil

Subpart 1. Soil samples collected from stockpiles. This subpart specifies the quantity of grab soil samples to collect from stockpiled petroleum contaminated soil and specifies the procedures for taking these samples.

Subpart 2. Soil samples collected from borings. This subpart specifies the quantity of grab soil samples to collect from soil borings conducted in an area of petroleum contaminated soil and specifies the procedures for taking these samples.

The contents of both subparts within this part are reasonable because accurate, representative sampling is critical for characterizing petroleum contaminated soil. These procedures follow established standard methodologies for grab sampling.

Part 7037.3000 Collection of Composite Samples of Petroleum Contaminated Soil

Subpart 1. Soil samples collected from stockpiles. This subpart specifies the quantity of composite soil samples to collect from stockpiled petroleum contaminated soil and specifies the procedures for taking these samples.

Subpart 2. Soil samples collected from borings. This subpart specifies the quantity of composite soil samples to collect from soil borings conducted in an area of petroleum contaminated soil and specifies the procedures for taking these samples.

As with part 7037.2900, the contents of both subparts within this part are reasonable because accurate, representative sampling is critical for characterizing petroleum contaminated soil. These procedures follow established standard methodologies for composite sampling.

Part 7037.3100 Analysis of Petroleum Contaminated Soil Samples

Subpart 1. General requirements. This subpart specifies that all petroleum contaminated soil samples must be analyzed using an EPA approved

laboratory method or equivalent, unless an alternative method is specified in subpart 2. It is reasonable to require established and appropriate laboratory methods so that accurate soil characterization is done.

Subpart 2. Specific analysis requirements. This subpart lists specific laboratory analysis requirements for selected parameters. This list includes specific types of procedures and references methods used by the Minnesota Department of Health and the Wisconsin Department of Natural Resources. The methods selected are reasonable because they are established in the field of petroleum analysis and are appropriate to the parameters for which they are used. Also, use of specified methods will limit variability due to differences among laboratory methods.

Part 7037.3200 Collection of Native Soil Samples

Subpart 1. Native soil fertility samples. This subpart specifies the sample type, sample quantity, and sampling procedures for samples collected for determining the concentration of organic matter and extractable phosphorus in the native soil.

Subpart 2. Samples for determining native soil permeability. This subpart specifies the sample location, sample quantity, and sampling procedures for soil permeability.

The contents of both subparts within this part are reasonable because accurate, representative sampling is critical for characterizing the native soil where land treatment will be done.

Conservation Service soil surveys. As in subpart 3, allowing the use of Soil Conservation Service soil surveys is reasonable since these typically provide adequate characterization of soils in Minnesota and they are readily available.

Subpart 5. Calculation of percent permeability in a treatment zone. This subpart provides the steps for calculating the percentage of a treatment zone having an acceptable permeability. Inclusion of this subpart is reasonable because this provides clear instructions for the regulated community and should minimize simple errors due to incorrect calculations.

Subpart 6. Seasonal high water table. This subpart states that the depth to the seasonal high water table must be obtained from Soil Conservation Service soil surveys or determined through field observation of the depth and color characteristics of the native soil and soil mottles that may exist in the native soil. These procedures are reasonable because they established procedures that are adapted from United States Department of Agriculture criteria (USDA, 1983). As in subparts 3 and 4, allowing the use of Soil Conservation Service soil surveys is reasonable since these typically provide adequate characterization of soils in Minnesota and they are readily available.

Part 7037.3400 Collection of Soil Monitoring Samples from a Land Treatment Site

This part specifies the sample type, sample quantity, and sampling and handling procedures for samples collected for determining the concentration of petroleum remaining in the surface soil of a land treatment plot. These requirements provide the data for land treatment monitoring. This part is reasonable because accurate, representative sampling is critical for determining the degree of treatment completed.

Part 7037.3500 Spreading Thickness and Land Area Calculations

Subpart 1. Spreading thicknesses. In this subpart the formula for determining the acceptable spreading thicknesses for petroleum contaminated soil that exceeds the contaminant levels in part 7037.1800, subps. 2 and 3, is provided.

Subpart 2. Land area. In this subpart the formula for determining the amount of acreage required for land treatment of a known volume of petroleum contaminated soil is provided.

Inclusion of the formulas in the above subparts is reasonable this provides clear instructions for the regulated community and should minimize simple errors due to incorrect calculations.

Part 7037.3600 Determination of Nutrient Addition for Petroleum Hydrocarbon Biodegradation

Subpart 1. Nutrient evaluation and addition. This subpart specifies the procedure for calculating nitrogen and phosphorus requirements for land treatment. Minimum nitrogen addition is based on the petroleum loading level, the percent organic matter in the native soil, the crop grown within the previous year and whether nitrogen fertilizer was added within the previous year. Minimum phosphorus addition is based on the petroleum loading rate, the available phosphorus content of the native soil, and the amount of phosphorus applied within the previous three years. The procedure provided in this subpart is reasonable since some of the components of this procedure are comparable to considerations used for crop fertilization. For example, the University of Minnesota Agricultural Extension Service recommends similar nitrogen credits for nonlegume crops grown in a season following a legume

(e.g. corn following alfalfa). It makes sense that these similarities exist since both hydrocarbon breakdown and crop nutrition depend on soil nutrient availability. The derivations of calculations for nitrogen and phosphorus requirements are given in Exhibit 5.

Subpart 2. Maximum nutrient application rates. This subpart specifies the maximum rates of nitrogen and phosphorus to be applied in a one year period. These rates are dependent on whether the plot was cropped after the petroleum contaminated soil was spread. The maximum rates were largely adapted from the maximum rates recommended by the Agricultural Extension Service of the University of Minnesota for field crops (Rehm et al., 1985). While field crop conditions are not completely analogous to petroleum breakdown, the MPCA staff believes that the approach in this subpart is conservative in that it offers at least as much protection from adverse environmental impacts from the addition of fertilizer to land treatment sites, such as nitrate leaching, as the field crop recommendations do. Moreover, decomposing hydrocarbons immobilize the added nutrients. The MPCA staff does not believe that the maximum rates are overly conservative because they will allow significant petroleum breakdown to occur.

Subpart 3. Other fertilizer management considerations. This subpart states that if fertilizer is applied in separate multiple applications and the monitoring requirements have been met then the total amount of required fertilizer need not be applied. Also, this subpart lists the acceptable nutrient sources. The contents of this subpart are reasonable since there is no need to apply nutrients after treatment is substantially complete and since the suitable nutrient sources are common crop nutrient sources and they are readily available.

Part 7037.3700 Incorporation by Reference

Subpart 1. In general. This subpart states that for purposes of this chapter, the documents in subpart 2 are incorporated by reference and that they are not subject to frequent change. This subpart also states that these documents can be found at the Minnesota State Law Library. It is reasonable to incorporate these documents by reference in order to avoid duplicating published standards and methodologies that are provided elsewhere.

Subpart 2. Referenced standards. This subpart lists the documents incorporated by reference in this chapter and provides additional addresses for where these documents can be obtained.

VI. SMALL BUSINESS CONSIDERATIONS IN RULEMAKING

Minn. Stat. § 14.115, subd. 2 (1990) requires the MPCA, when proposing rules that may affect small businesses, to consider the following methods for reducing the impact on small businesses:

1) the establishment of less stringent compliance or reporting requirements for small businesses;

2) the establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses;

3) the consolidation or simplification of compliance or reporting requirements for small businesses;

4) the establishment of performance standards for small businesses to replace design or operational standards required in the rule; and

5) the exemption of small businesses from any or all requirements of the rule.

The MPCA staff anticipates that the proposed rules will have little, if any, negative effect on small businesses as defined in Minn. Stat. § 14.115 (1990) for the following reasons:

1) In the absence of specific rules relating to petroleum contaminated soil, general guidance would need to be used. While a greater degree of specificity is contained in the proposed rules than in the general guidance presently used, the overall approaches are similar.

2) If no regulatory framework for land treatment existed (i.e. neither rules nor general guidance), then the MPCA tanks and spills program would not consider land treatment as a treatment option since serious environmental damage might occur if land treatment was not done properly. This scenario would mean that most removed petroleum contaminated soil would have to be transported to thermal treatment facilities, which typically charge about $10-20 more per cubic yard of soil than land treatment sites do.

3) The MPCA believes that the proposed rules are very clear in their technical content and are straightforward from an administrative standpoint. The administrative process used under the general guidance has been simplified and streamlined over the past three years through the use of fill-in-the-blank forms for land treatment applications, notifications, and monitoring results. These aspects have been incorporated into the proposed rules. It is not uncommon for land owners or service station owners to complete the required applications for land treatment approval without the assistance of an environmental consultant.

4) Responsible persons that generate petroleum contaminated soil from a petroleum storage tank release are eligible for receiving reimbursement of up

to 90 per cent of their land treatment expenses (as well as other eligible cleanup expenses) from the Petroleum Tank Release Compensation Account (Petrofund).

VII. CONSIDERATION OF IMPACT TO AGRICULTURAL LAND

Minn. Stat. § 14.11, subd. 2 (1990) requires the MPCA to comply with Minn. Stat. §§ 17.80 to 17.84 if it determines that the rule may have a direct and substantial adverse impact on agricultural land in the state.

The MPCA staff does not believe that the proposed rules will have a substantial adverse impact on agricultural land. Although the research cited in part III indicated some petroleum hydrocarbon impacts on plant growth, these studies focused on petroleum loading rates typically associated with oil spills and were limited to the period of time that oil remained in the soil (i.e. prior to when significant biodegradation took place). It is expected that if any adverse impact on crop productivity were to occur due to the applied petroleum hydrocarbons this effect would be limited to the season in which the contaminated soil was spread (and possibly the following season if the soil was either applied late the previous season or if high petroleum levels existed in the contaminated soil) since biodegradation and other processes remove these compounds.

Among the nondegradable constituents of petroleum, the heavy metal lead is a compound that could warrant special consideration since it is a constituent of leaded gasoline and since agricultural lands containing high lead could limit their use for production of food-chain crops. However, potential impacts on agricultural land by lead from gasoline contaminated soil are not likely since a conservative standard for lead limits has been

established in the proposed rules as explained under the discussion of the reasonableness of part 7037.1800, subpart 5.

Substantial adverse impacts on agricultural land due to the application of the soil, independent of the contaminants within it, are also not expected. While the added soil is low in plant nutrients and organic matter, the addition of fertilizers can supply needed plant nutrients. In some cases, slightly less desirable physical properties of the surface of the native soil may result due to the addition of the contaminated soil. However, since the proposed rules limit a particular parcel of land to a single application of petroleum contaminated soil (that can be, at most, a four inch thick layer), a significant adverse change in the physical properties of the native soil is not expected.

VIII. CONSIDERATION OF ECONOMIC FACTORS

In exercising its powers, the MPCA is required by Minn. Stat. § 116.07, subd. 6 (1990) to give consideration to economic factors. The statute provides:

> In exercising all its powers the pollution control agency shall give due consideration to the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic, and other economic factors and other material matters affecting the feasibility and practicability of any proposed action, including, but not limited to, the burden on a municipality of any tax which may result therefrom, and shall take or provide for such action as may be reasonable, feasible, and practical under the circumstances.

The proposed rules are not specifically designed to promote new business, but business opportunities will be present with adoption of the proposed rules. Specifically, many landowners have created land treatment businesses and such businesses have been considerably more profitable than the alternative use of

the land (typically, pasture or farming). Such business opportunities would be expected to remain under the proposed rules.

The MPCA staff is concerned with keeping all petroleum cleanup costs associated with spills and tank releases to a minimum while ensuring appropriate environmental protection. This concern is shared by many people, including petroleum retailers and consumers, since the money available through the Petrofund is generated through a one penny per gallon fee on gasoline sold at the wholesale level. This fee is passed on to the consumer in increased costs at the gas pump. The MPCA staff believes that the proposed rules will not increase the portion of these funds used for soil treatment expenses since it is unlikely that the proposed rules will impede interested landowners from using suitable portions of their land for land treatment of petroleum contaminated soil.

IX. CONCLUSION

The MPCA has, in this document and its exhibits, made its presentation of facts establishing the need for and reasonableness of the proposed rules. This document constitutes the MPCA's Statement of Need and Reasonableness for proposing Minnesota Rules Chapter 7037.

X. EXHIBITS AND REFERENCES

The MPCA is relying on the following documents to support the proposed rules:

Agency

Ex. No.	Title
1	Notice of Intent to Solicit Outside Opinion
2	Advisory group meetings: comments and suggestions
3	MPCA study: soil sampling at selected land treatment sites
4	Land treatment simulations using the Vadose Zone Interactive Processes Model
5	Nutrient addition calculations

References

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Charles W. Williams
Commissioner

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