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RCRA

PRELIMINARY ASSESSMENT/

SITE INVESTIGATION GUIDANCE

PERMITS AND STATE PROGRAMS DIVISION

OFFICE OF SOLID WASTE

U.S. ENVIRONMENTAL PROTECTION AGENCY

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INTRODUCTION

I. BACKGROUND

The 1984 RCRA Hazardous and Solid Waste Amendments (HSWA) established broad new authorities in the RCRA program to require corrective action for releases of hazardous wastes and constituents at RCRA-regulated facilities. These new authorities are:

- **§3004(u) - Corrective Action for Continuing Releases**

  Requires that any permit issued after November 8, 1984, require corrective action for all releases from solid waste management units at the facility, regardless of when the waste was placed in the unit. The provision also requires that owner/operators demonstrate financial assurance for any required corrective action, and allows schedules of compliance to be used in permits where the corrective action cannot be completed prior to permit issuance.

- **§3008(h) - Interim Status Corrective Action Orders**

  Provides authority to issue enforcement orders to compel corrective action or other response measures at interim status facilities, and to take civil action against the facility for appropriate relief.

- **§3004(v) - Corrective Action Beyond the Facility Boundary**

  Directs EPA to issue regulations requiring corrective action beyond the facility boundary where necessary to protect human health and the environment, unless the owner/operator can demonstrate that he is unable to obtain the necessary permission, despite his best efforts. Until such regulations are promulgated, corrective action orders can be issued to require the necessary corrective action.

The §3004(u) and §3008(h) authorities are quite similar in scope, although §3008(h) authority extends beyond facility boundaries. EPA must promulgate regulations to extend §3004(u) authority beyond facility boundaries. Both authorities can be defined in large part by the following key terms:

- "Protection of Human Health and the Environment"

  Under both authorities, corrective action will be mandated where necessary to protect human health and the environment.

- "Release"

  The definition of release under both authorities is similar to that in CERCLA, and extends to all environmental media--ground water, surface water, air, and unsaturated soils.

- "Solid Waste Management Units"

  Solid waste management units (SWMU) include: landfills; surface impoundments; waste piles; land treatment units; injection wells; incinerators; tanks; container storage units; and other physical, biological and chemical treatment units.[1]

- "Facility"

  For the purpose of implementing corrective action under either authority, the facility is defined as the entire contiguous property under the control of the owner/operator at which units subject to regulation under RCRA are located.

- "Corrective Measures"

  This term is used generally to include "corrective action" as provided in §264.100 and other activities for any media.

The following documents provide a more complete explanation of the two authorities:

- Final Codification Rule (50 FR 28702)
- Draft Policy Guidance on Corrective Action for Continuing Releases (dated January 30, 1985)
- Draft Guidance on Interim Status Corrective Action Orders (dated June 20, 1985)

1/ The §3008(h) authority applies broadly to any releases from the facility.

The new §3004 authorities allow EPA to require corrective action in permits for all releases from solid waste management units, regardless of when the waste was placed in the units. In addition, under §3008, EPA can initiate enforcement action to compel corrective action or other response measures at interim status facilities and beyond the facility boundary.

EPA is developing a phased process for implementing the corrective action provisions that consists of preliminary assessments/site investigations (PA/SI), remedial investigations and implementation of corrective measures. This document describes the approach that Agency personnel generally should use to implement the first step in the corrective action process -- conducting PA/SIs at facilities that are to receive a RCRA permit[1]. EPA is developing additional documents that provide guidance on conducting remedial investigations, making remedial decisions, and designing and implementing corrective measures.

II. OBJECTIVES OF THE PA/SI

The PA/SI, as structured in the guidance, is designed to accomplish the following objectives:

- Determine whether or not there are or are likely to be releases of hazardous wastes or hazardous constituents at the facility requiring further investigation;
- Establish the scope of remedial investigations (if necessary); and

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[1] This approach applies to all releases from solid waste management units and to unregulated releases from regulated units. Ground water releases at regulated units are addressed by current regulations.

- Establish priorities for subsequent remedial investigations.

It is not necessarily the function of the PA/SI to provide detailed physical evidence of releases, since this may require extensive investigation and analysis beyond the scope of the PA/SI. Similarly, although the objective is to identify (or assess the likelihood of) significant releases at the facility, it is not within the scope of the PA/SI to establish whether or not such releases actually pose a threat to human health and the environment. Confirming the existence of releases and characterizing the nature and extent of such releases will typically take place during the remedial investigation phase.

The findings of the PA/SI will suggest one or more of the following actions for a facility:

- No action, if releases have not, or are not likely to have, occurred.
- Limited, short-term remedial investigations, where some further information is needed to verify that a release has (or has not) occurred, and to establish the need for and nature and scope of full-scale remedial investigations.
- Full-scale remedial investigations for one or more media at one or more solid waste management units at the facility.
- Corrective measures, in cases where it is possible to establish in the PA/SI that there is an immediate need for corrective measures, and the types of corrective measures required.

When the PA/SI determines that remedial investigations (or corrective measures) are necessary at a facility, these activities will be required of the owner/operator either under a permit schedule of compliance or under an enforcement order.

III. RELATIONSHIP BETWEEN THE RCRA AND CERCLA PA/SI

Both the RCRA and CERCLA PA/SI processes establish priorities and identify immediate needs for corrective measures. There are, however, several important differences between the two PA/SI efforts. These differences stem in part from the need for the RCRA PA/SI to assess whether each unit (or groups of units located in close proximity to one another) at the facility has a release of concern. CERCLA PA/SI does not focus on individual units, but considers the facility as a whole, as well as off-site releases, to assess potential exposure routes. The primary purpose of the CERCLA PA/SI is to develop a hazard ranking score (HRS) which establishes the basis for listing the site on the National Priority List (NPL).

Although RCRA 3008(h) authority may address the entire facility, the RCRA PA/SI for facilities subject to RCRA permits is designed to determine on a unit-by-unit basis, the likelihood of releases that require further--remedial--investigations. Although facility exposure potential is a consideration in the RCRA PA/SI, the primary focus is on making this unit-by-unit determination rather than developing an overall "score" for the facility as a whole. Although CERCLA type sampling will be undertaken during each RCRA PA/SI, additional sampling may be necessary to make the unit-by-unit determinations. In general, the guidance urges minimal sampling activities beyond those necessary to complete an HRS score unless:

- Sampling is necessary in order to compel a remedial investigation; or
- Key data are missing for the determination that a facility is subject to further investigation.

A final difference between the RCRA and CERCLA PA/SIs stems from the fact that RCRA facilities have been and continue to be part of an ongoing regulatory program. More information is available on RCRA facilities and additional information is being generated all the time--particularly on land disposal facilities. As a result:

- Some facilities may be able to skip the site investigation stage because sufficient information exists on the facility to compel a remedial investigation.
- The site investigation for certain facilities may be incorporated into ongoing inspections and site visits that take place over time, instead of scheduling a separate site investigation.

IV. TECHNICAL APPROACH

The RCRA Preliminary Assessment/Site Investigation guidance is comprised of six chapters. The first two chapters describe procedures for conducting a preliminary assessment and a site investigation. The remaining four chapters describe the technical approach for examining releases to three media--surface water, ground water, and air--and for addressing subsurface gas releases. Soil is treated primarily as a transfer media. Potential threats to human health and the environment through direct contact with soil should, however, be considered when the circumstances so warrant.

The technical approach described in this document requires the investigator to apply his best professional judgment in examining a variety of factors that affect the likelihood of a release and its significance. Each technical chapter asks the investigator to look at: (1) factors that affect the releas

potential of the unit and the site, (2) actual evidence of release, and (3) factors that establish the seriousness of the actual or probable release. Exhibit 1 displays the decision-making framework for both the PA and SI stages of the process.

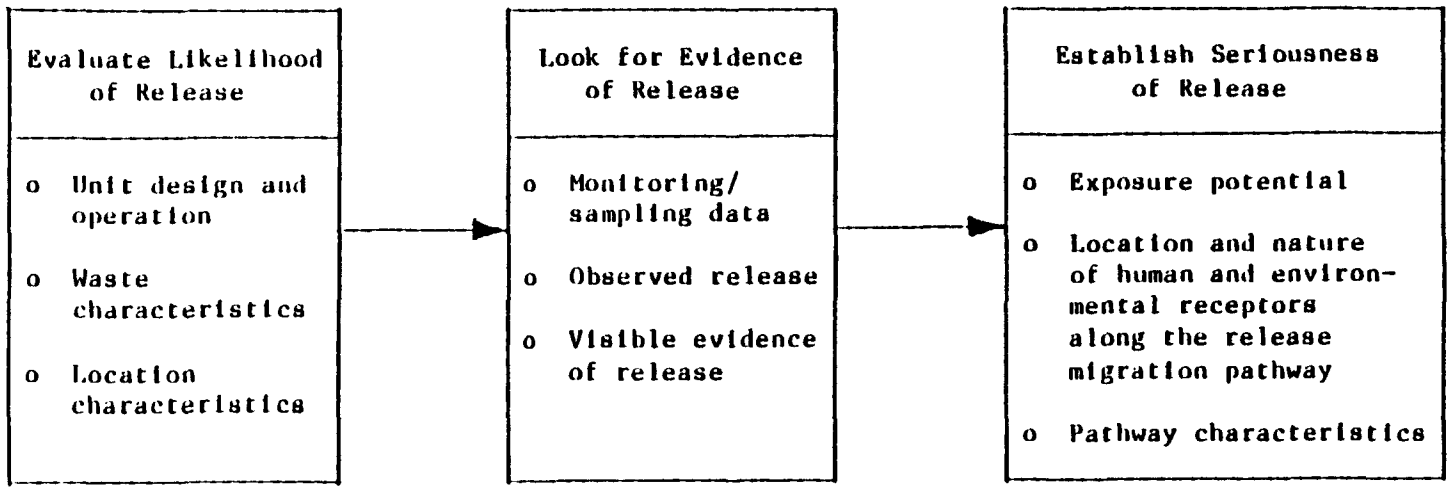
The "likelihood of release" is the broadest category of factors the investigator must consider. Examining the likelihood that a unit has a release requires evaluation of information on the facility's location and potential routes of contamination as well as information on the unit's design, age and operating characteristics, and the type of waste contained in the unit. For most cases, no one factor is sufficient to determine the likelihood that a unit has a release. All factors must be examined together and the relative importance of each factor will need to be defined on a media- and site-specific basis.

"Evidence of release" includes media-specific factors the investigator should look for during the site inspection to support an initial determination that a release has taken place. The investigator will evaluate sampling data as well as information from visual observations. It should be noted, however, that the absence of physical evidence does not necessarily mean that a release has not occurred. Factors in this category should not be used as the sole basis for eliminating a unit/facility from further consideration under the corrective action program.

The guidance provides media-specific factors related to exposure that are important in addressing the "seriousness of a release." These factors should help the investigator set priorities for initial site inspections as well as further remedial investigations.

EXHIBIT 1

APPROACH FOR IDENTIFYING RELEASES



In summary, the technical approach requires the investigator to evaluate a matrix of factors that have varying significance and to apply his best professional judgment in determining the relative weight that should be given to each factor. In many cases, information will not be available on all the factors. The weight assigned to missing information may be as important as the weight given to available information. Depending on the relative significance of the known information, the investigator may determine that the available information is sufficient to proceed with a remedial investigation. On the other hand, the investigator may determine that additional sampling is warranted before compelling the owner/operator to begin further investigations. It is left to the investigator's judgment, in consultation with appropriate permitting and enforcement authorities, to determine which factors are the most important for a particular situation.

V. FURTHER GUIDANCE

EPA is preparing additional technical guidance related to implementation of the RCRA corrective action program. This includes:

- o Guidance on RCRA remedial investigations;
- o Guidance on RCRA corrective measures;
- o Guidance on developing compliance schedules for corrective action (for permits and enforcement orders); and
- o Guidance on prioritizing RCRA facilities for corrective action.

CHAPTER ONE

COMPLETING A PRELIMINARY ASSESSMENT

I. INTRODUCTION

A. Purpose

The preliminary assessment (PA) is the first phase in the process of determining whether SWMUs are releasing and require corrective action. The purpose of the PA is to compile and evaluate available information on the facility to focus the site inspection (SI). A PA is mostly a desk top effort. By the time the PA is completed, Agency staff should be able to:

(1) Identify which units/areas/facilities do not require a site inspection

(2) Identify units/releases that require further investigation

-- Identify those situations for which a preliminary site investigation is the appropriate next step; and

-- Identify those situations where sufficient evidence of release already exists and a remedial investigation is the next step.

(3) Identify units/releases that may require immediate removal action under CERCLA authority

The preliminary assessment is also a management tool that can be used to make a variety of other decisions. Some of these include:

- Determining the site's priority for further investigation;
- Assessing the likelihood that the site will become a CERCLA site; (subject to further guidance)
- Determining whether the owner or operator has the capability and willingness to assist the site investigator by conducting sampling activities under the direction of EPA; and

- Identifying candidate facilities for a health assessment under Section 3019.

Exhibit 1-1 illustrates the PA process--collection and evaluation of available information and findings and recommendations for further action.

B. Product

Since a number of PAs may be conducted well in advance of the subsequent site investigation, a PA report is an important conclusion of the desk top analysis. This report should summarize:

(1) Site and unit conditions;

(2) Known and suspected releases;

(3) Target populations and environments and release pathways; and

(4) Recommendations addressing the purposes outlined above.

It should be noted that completion of a site investigation plan does not take place until initiation of the site inspection. This allows new information to be factored into the plan in cases where a substantial time gap exists between the time the PA is completed and the SI is started.

C. Scope

Five broad categories of information should be gathered during the PA. They are:

1. Site management description/practices;
2. Evidence of release;
3. Pollutant dispersal pathways;
4. Waste characteristics; and
5. Target population characteristics.

EXHIBIT 1-1

PRELIMINARY ASSESSMENT

Input (From Owner/Operator) → Desk Top Analysis → Output Report

Information On

I. Site Management (e.g., waste containment)
II. Evidence of Release (e.g., sampling data, visual observation)
III. Pollutant Dispersal Pathways
IV. Waste Characteristics (e.g., type, quantity, fate, toxicity)
V. Target Population (e.g., human, environment)

1. RCRA

   a. RSI #3 Submission (e.g., type, location of SWMUs)
   b. Permit Application (Part B)
   c. Inspection (e.g., site management)
   d. Exposure Assessment (e.g., pathways and targets)

2. CERCLA

   a. CERCLA PA/SI Reports (e.g., on SWMUs)
   b. HRS Documentation
   c. CERCLA RI/FS Studies
   d. CERCLA §103.(c) Notification

3. Other

   a. Aerial photography
   b. Federal, State, and Local government Parts
   c. Etc.

Report

1. Site (Unit) Conditions

2. Known and Suspected Releases

3. Target Populations Potentially Exposed and Pathways

4. Recommendations:

   a. Units/releases to be addressed further

   b. Units/releases requiring RI or immediate action

   c. Priority for further study

   d. Units requiring no further action

   e. Referrals for health assessment

Exhibit 1-2 illustrates the types of information contained in each category. Available data from all five categories are necessary to complete the PA. It should be noted, however, that complete data on any of the five categories will rarely be available, and complete data are not necessary to make the kinds of evaluations that are made during the Preliminary Assessment.

Information submitted to the RCRA program by owner/operators (e.g., information on SWMUs outlined in RSI #1, the Part B application, and exposure information reports) and inspection reports and CERCLA data files will be the major sources of information for the PA. These sources will be adequate to properly develop a PA for most facilities. In some cases, it may be necessary to obtain information from other sources to fill in if these sources do not have all the necessary data. This guidance describes some suggested sources that may be useful under some circumstances. Conducting the preliminary assessment should take an average of five work days.

This chapter describes how to use these data to make some initial decisions on further action or no further action. Subsequent chapters describe the procedures to follow in conducting a site investigation and provide guidance on how to identify actual or probable releases to each media.

II. DATA GATHERING

This section describes where and how to obtain the type of data identified in Exhibit 1-2 and how the data can be used to better understand the nature of releases at a facility.

EXHIBIT 1-2

MATRIX OF FACTORS ADDRESSED IN PA/SI DECISION

Site Management For Each Unit	Waste Characteristics For Each Unit	Pollutant Dispersal Pathways For Each Unit	Evidence of Release For Each Unit	Target Population
o Type of unit o Design and operating practices (e.g., containment) o Period of unit use o Age of unit o Location of unit	o Waste identification o Migration and dispersal characteristics o Toxicological characteristics	o Geologic o Hydrologic o Atmospheric o Climatological o Topographical	o Sampling data o Monitoring data o Other physical evidence: - Visual observation (e.g., discolored soil) - Fish kills - Worker illness - Odors	o Number of affected people o Pathway to population o Proximity to affected population o Sensitive environments

A. RCRA Sources

In some cases, RCRA file data coupled with data available through CERCLA may provide most, if not all, of the information that is needed to understand (1) the types of wastes handled by a facility, (2) the types of units, (3) the nature and characteristics of the routes by which contaminants may migrate and (4) the human and environmental populations affected or potentially affected by a release from the units.

There are four major existing sources of information in the RCRA files on SWMUs, including unregulated releases from RCRA units. These should be reviewed first. A brief discussion on the nature of these sources follows. Tables A-1 through A-4 in Appendix A provide more detailed lists of the data available through these sources.

1. Permit Application

Part A notifications and Part B applications for permits will be available for all facilities in the permit pipeline and addressed under the corrective action program.[1/] These documents contain a sizable amount of information on the facility design and physical characteristics of the surrounding area. Although owners or operators of RCRA facilities develop these applications to support permitting of regulated units, the information will sometimes apply to both unregulated releases from regulated units

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1/ The proposed Codification Rule will incorporate RSI #3 information (described above) into permit application requirements.

and releases from unregulated ("old") units. For example, all land disposal Part B applications should contain extensive hydrogeologic information related to the surficial aquifer. This information should prove invaluable at many facilities in assessing the potential for old units to contaminate ground water. If the facility is seeking only an aboveground storage facility permit, however, the permit application data may not provide much information useful in evaluating an "old" landfill.

Part B applications may not characterize the lower aquifers if they are not connected to the uppermost aquifer. If the application data are inadequate to properly assess the impacts to ground water, the information may need to be developed through other sources discussed later.

In addition to relevant data on the facility as a whole, the permit application also provides information that can be used to evaluate the potential for unregulated releases from regulated units, specifically surface water and air releases. Most of the pertinent data relate to the design and maintenance of the unit.

Part B permit applications for land disposal facilities will also provide information on whether actual releases have occurred. It is important to evaluate well placement when reviewing ground water monitoring data for regulated units. In some cases the location of existing monitoring wells may make it difficult to determine if contamination results from the regulated unit, an unregulated unit, or both. Review of the analytical data must be coupled with data on well location and ground water flow to positively identify the source of the observed release.

2. RSI #3 Submission

The Reauthorization Statutory Interpretation (RSI #3) dated February 5, 1985 from Jack W. McGraw, required the EPA regional offices to request owners or operators of RCRA facilities to submit data on each SWMU at the facility. The data submitted in response to RSI #3 should provide information on the type and location of the units and when and how much waste was received by units.

3. Compliance Inspection Reports/Information from Enforcement Orders

Inspection Reports should be available for most RCRA facilities. These reports contain useful information on site management practices, monitoring data, and unit conditions and should help in identifying problem units and releases for possible sampling. Comprehensive monitoring evaluations (CME's) evaluate ground water monitoring systems. These records may provide an indication of whether prior releases have occurred at the facility. Frequent violations of operating standards, may indicate prior releases. In addition, the reviewer may be able to obtain information on non-regulated units from results of investigations required in enforcement actions.

4. Exposure Information Report

Only facilities with or seeking permits for landfills and surface impoundments must submit exposure information. These submissions will cover all five categories of information identified in Exhibit 1-2. This information may be valuable in determining the potential for contaminants to release from regulated

and "old" units, the likelihood that these contaminants will migrate, and the likelihood that persons may be exposed to these contaminants.

5. Other RCRA Sources

ACL submissions (if any), closure plans, and post closure permits are additional sources of information for the PA.

B. CERCLA Sources

Four CERCLA data sources may be helpful in completing RCRA PAs. They are:

- CERCLA PA/SI Reports
- HRS documentation
- CERCLA RI/FS studies
- CERCLA 103(c) notifications

These sources may allow the reviewer to decide to proceed directly to a remedial investigation or immediate corrective action. The circumstances when this might be possible are discussed more fully later in this section.

1. CERCLA PA/SI Reports

Almost 15 percent of the facilities seeking RCRA Part B permits have received CERCLA inspections. The site inspection reports for these facilities can provide a considerable amount of information on facility and unit design and management, waste characterization, and pollutant dispersal pathways, particularly for SWMUs and inactive units. They may also have limited information about target populations. The exact amount of information provided in each report will depend on the amount of information available at the time the report was completed.

The CERCLA SI report is likely to provide some information for the following categories:

- o Facility design/management practices
  - -- Listing of SWMU operations, facility layout;
  - -- Discussion of conditions of identified SWMUs; and
  - -- Design specifications for SWMUs (when available).
- o Waste characteristics
  - -- Type and quantity of waste received to the extent known
- o Pollutant dispersal pathways
  - -- Analytical data on "observed releases" from the facility;
  - -- Geology, topography, hydrogeology, climate of the area (if unit could be releasing to ground water);
  - -- Climatic data (e.g. precipitation, wind data); and
  - -- Facility topography as it relates to surface drainage patterns.
- o Receptor characteristics
  - -- Size and characteristics of nearby populations and sensitive environments potentially exposed through air, surface water, and ground water routes.

In addition to reviewing the final SI report, the person conducting the RCRA preliminary assessment should also examine the CERCLA site file. These files contain supplementary information used to evaluate the site under CERCLA. These files include such items as:

- o Field log book for the SI
- o Trip reports for the SI
- o Records of communication
- o Miscellaneous historical data/reports
  - -- Site reports
  - -- Old trip reports
  - -- Old memoranda

Except for the first item, the exact contents of the file will vary depending upon the type of information available and the data collection procedures used at the time of the CERCLA SI.

2. HRS Documentation

Some subset of the sites that have undergone CERCLA SIs has been scored using the Hazard Ranking System (HRS). Information on target populations and sensitive environments should be available for each of the routes scored. The most frequently scored routes are surface water and ground water.

The Regional CERCLA program offices have copies of all CERCLA SI/HRS reports and files. Table A-5 in Appendix A provides a list of Regional CERCLA PA/SI program managers. These persons will be able to provide access to the SI reports and identify where to find the files.

3. CERCLA RI/FS Studies

Again, some subset of the sites that have been scored will be subject to a remedial investigation/feasibility study (RI/FS). If so, these reports will more thoroughly characterize air, surface water, ground water and soil contamination, as well as populations actually or potentially affected by these releases. In general, a RCRA SI will not be necessary if a CERCLA RI/FS is underway.

4. CERCLA 103(c) Notifications

Some sites may have information available on wastes disposed of at the facility from a CERCLA 103(c) notification. In the early stages of the CERCLA program, owners or operators of waste

management facilities and transporters were required to notify EPA of places where CERCLA hazardous substances had been disposed. EPA reviewed approximately 9000 notifications representing approximately 2000 sites, after accounting for redundant reporting. If the facility filed a CERCLA 103(c) notification, and no other source of information is available, this source may provide a record of past disposal operations, such as information on types, locations and volumes of waste disposed. The reviewer should contact the Regional CERCLA PA/SI coordinator to see if a CERCLA 103(c) notification exists for the facility.

5. Usefulness of CERCLA PA/SI

If a CERCLA PA/SI has been conducted for a RCRA site, it will provide valuable information that will help focus a site investigation and in some cases, allow the site investigation to be skipped in favor of a more comprehensive remedial investigation. Although the CERCLA PA/SI does not describe the release potential of individual units, there may be adequate evidence of release as a result of the CERCLA PA/SI to ask the owner/operator to initiate a comprehensive remedial investigation. A RCRA PA/SI may be required if the CERCLA PA/SI does not provide necessary information. Some scenarios are described below:

- The CERCLA SI was completed some time ago and information in the SI may be outdated;
- The results of the SI were not definitive enough to lead to an RI, or did not provide sufficient information on the units at the facility;
- The CERCLA PA/SI did not address releases of concern (e.g., air, subsurface gas);

- Unregulated releases from regulated units are a source of concern; or
- A site inspection is necessary to outline the scope of the RI.

C. Other Sources of Data

In most cases, existing EPA or State files will provide all the data necessary for a PA evaluation of a site. However, there may be situations where these sources do not contain critical information. In these cases, the reviewer may want to check other sources, such as other offices within EPA, other federal and state agencies, and private organizations. Appendix A, Tables A-6 and A-9 identify likely reliable sources of information on site management practices, waste characteristics, migration pathways, and target populations. The investigator should carefully consider the importance of the information in evaluating a site to avoid spending significant resources to obtain information that is not really critical to the analysis. For example, data sources such as former employees, local residents, and colleges and universities are likely to be consulted only rarely. Other data sources such as USGS data and historical aerial photography already in the file may be used more often.

This section discusses these sources and how the information could be used in the PA. These sources are discussed in a rough order of priority.

1. Aerial Photography

Aerial photography, especially historical aerial photography, can be a valuable tool in a prelimary assessment. Historical aerial photography can provide the following types of information:

- The location of past disposal units;
- The location of releases;
- Evidence of existing or past vegetation stress;
- Potential routes for contamination migration;
- Location and numbers of target populations; and
- Land use in the area.

A number of RCRA sites that were evaluated under CERCLA have had both historical and recent aerial survey analysis. The RCRA reviewer should contact his/her regional coordinator for aerial photography. These coordinators have access through ORD/EMSL/LV to an index of sites that have had aerial photographic analyses.

If an historical analysis and current overflight do not exist, they can be requested through the regional coordinator. EMSL has a computerized system which accesses the major sources of extensive aerial photography including libraries, archives and U.S.G.S. EMSL can use this to order copies of the photographs, analyze the photographs for relevant features and prepare a bound copy of the analysis. In most cases, historical aerial photography will suffice for the purposes of the RCRA PA/SI program.

The usefulness of current aerial photographs is more limited. They may be able to identify vestiges of old disposal practices, current vegetation damage, and surface drainage patterns. They can also accurately locate target populations. However, much of this information may be readily ascertainable from a visual inspection of the facility. Accordingly, requests for overflights should be requested only when there are no other sources of the data.

2. Other Federal/State Agencies

In some cases, permit applications may not contain sufficient geological and hydrogeological data to obtain a clear understanding of the local run-off patterns and underlying geology. This is likely to be particularly true for facilities applying for above-ground storage permits. Facilities applying for this type of permit are not required to submit detailed geological and hydrogeological information even if they have "old" landfills or impoundments on site. In addition, permit applications will not provide much information on possible target receptors, such as irrigated land or livestock. In these cases, the reviewer may need to develop data on the geology and hydrogeology and land use in the area.

Other federal agencies can provide information on land use, hydrology and geologic conditions. The U.S. Geological Survey (USGS) maps land use. These maps, coupled with information on the source and distribution of water, can provide data on the number of irrigated acres. They can also indicate where livestock may be drinking contaminated or potentially contaminated water supplies.

USGS has a series of geological atlas' that provide data on geology and soils. These maps can cover areas as small as 7-1/2° (6 by 8 miles), depending upon the particular area of concern. They can also provide data on soils and rock types underlying facilities which may be helpful if data provided by the applicant are incomplete or unavailable. This may be especially useful for evaluating larger facilities.

USGS hydrological maps provide information on ground water yield, soil transmissivity and location of USGS wells (for monitoring water levels). This type of map may assist the reviewer in understanding the relationship between land based units and depth to ground water, location of ground water recharge areas, prevailing regional flow, and ground water discontinuities (if the owner or operator has not already provided this type of information). These maps are also available for areas as small as 7-1/2°.

U.S. Department of Agriculture local Soil Conservation Service (SCS) offices map soil types and permeabilities--down to 2 acres in somes cases. These maps characterize soil type to six feet, and the backup information used to develop these maps may evaluate soils to greater depths. This backup information is also available through the local SCS. Since surface soils reflect the immediately underlying geology, these maps provide data that may be helpful in evaluating the potential for transport of contaminants through the soils and underlying rocks.

3. GEMS (Graphical Exposure Modeling System)

EPA has access, through each of the regional offices, to a computerized system with the capability to identify the number of individuals within a specific radius of a facility. This system is readily available and can provide reliable information on populations potentially at risk from air releases. When coupled with data on ground use patterns, it can also quantify target populations drinking ground water.

4. State/Local Well Permit Offices

A number of States and counties require well drillers or persons installing wells to obtain well installation permits. This source, if available, can provide the most reliable information on the number of households using well water in a particular area. These offices can often identify the aquifer from which individual wells draw and the construction of individual wells, including diameter. This information can also help in identifying the closest downgradient wells that have the appropriate well construction characteristics for sampling.

5. TSCA/OSHA/NPDES Inspections

The Toxic Substances Control Act (TSCA) regulates the disposal of PCBs and PCB equipment. In some cases the responsibility for conducting TSCA inspections is merged with the RCRA inspection program. In other cases, these inspections are conducted by a different unit within EPA. TSCA inspection files may have useful data on how much and where disposal and storage of PCBs has taken place at a particular facility.

OSHA and NPDES inspection reports may identify the types of materials handled by a facility and may also establish whether the owner or operator has a history of violations. Violation histories can indicate a facility's propensity for releases that might be subject to corrective action. For example, recurring NPDES violations may indicate a significant accumulation of hazardous materials in stream beds which could require corrective action.

6. Municipal/County/City Public Health Agencies

Municipal/county/city public health agencies or departments can provide a wealth of information on the types of units located at a particular facility and the wastes routinely received at the site. Fire marshalls can provide information on the nature of any fires or explosions that have occurred at the facility. Information on incidents and site management practices can assist in determining if any releases have occurred or are likely to occur as a result of poor facility management. These agencies maintain their records and files for a number of years and often provide the only other source of information on "old" units. Even if these files contain little information, employees who have worked with the local agency or fire department for a number of years, often know a lot about the site or where to obtain additional information.

7. Local Well Drillers

Local well drillers can provide especially useful information on the geology and hydrogeology of the area. They can identify the types of soils and rock in the area and the approximate depth in which they are found. They can indicate the location of perched water supplies, clay lenses, and other geomorphic features. They can also discuss which aquifer most residents draw their water from and the type of well construction.

8. State/County Road Commissions

Core samples of soils and rocks underlying a proposed road are often analyzed during the engineering and planning stages of road construction. Records of these analyses are usually retained

and available through most State/County road commissions. This information can provide useful data, where none or little are otherwise available, to evaluate the potential for contaminants to migrate through soils and ground water, and possibly to determine where to sample.

9. Utilities

Utilities may be able to provide extremely reliable and up-to-date population data. They can identify the number of households using public water supplies--either ground water or surface water. They can also identify the location of public water wells and intakes. This information is necessary not only to determine the affected population but may also help identify possible locations for sampling.

10. Local Airports/Weather Bureaus

These organizations maintain accurate historical records of the local climate. This information is essential in evaluating the potential and direction that contaminants could migrate through the air and the rate that contaminants could migrate through the ground water and surface water routes. Contaminants can be expected to migrate faster through the ground water in areas with higher precipitation. Wind direction(s) is essential in identifying downwind targets for air releases. Temperature is essential to evaluate the propensity for materials to volatilize. The amount of rainfall, especially during peak periods, can also indicate the likelihood that contaminants will migrate overland to surface water.

11. Naturalists/Environmental Organizations

Local environmental groups can provide information on the presence and location of wildlife and endangered species. They often have access to individuals or information which can identify the nesting grounds for animals. They can also identify any other sensitive environments.

12. Employees

Employees at the facility, both current and former, may be able to provide information on facility design and management as well as information on the types of wastes received at the facility. It may be difficult to obtain owner or operator permission to interview current employees. For former employees, it may be difficult to identify a knowledgable and reliable individual. When interviewing former and current employees, the investigator should be sure to understand the employee's motivation for providing the information and should find out why former employees no longer work at the facility.

13. Colleges/Universities

The biology departments of local colleges and universities may have information on the location of sensitive environments. In some cases, graduate student reports and publications have carefully mapped the location of nesting grounds and migratory pathways. Such studies can be valuable in identifying the impact of releases on target environments.

The geology or agriculture departments of local colleges and universities may have information characterizing the local geology

and hydrogeology. This can include maps of the area and studies evaluating the permeabilities of soils.

14. Interviews with Local Residents

As a last resort, local residents can be a source of information on a facility. Sometimes, long-term residents know a considerable amount about the kind of operations conducted at a facility and the type and amount of waste received at a facility. In general, this source of information should be avoided to prevent any undue or premature alarm.

III. EVALUATION OF PA DATA

Once the investigator has gathered all the readily available data on SWMUs at a facility, he/she should evaluate the information in order to reach some initial conclusions about the facility. Specifically, at the end of the PA, the reviewer may be able to:

- Focus the site inspection by identifying units/areas/facilities that require no further action;
- Identify situations where a facility can proceed directly to an RI;
- Identify situations where it is appropriate to require immediate corrective action (including CERCLA removal actions); and
- Identify situations when health assessments may be appropriate.

This section discusses the criteria/situations where these decisions may be possible.

A. Identify Units/Facilities That Require No Further Action

At the end of the PA, it should be possible to narrow the population of units/releases that may require further study in

the SI. Examples of situations that would not require SIs include: units that are clearly not releasing into the environment, releases that have been corrected, or releases that are controlled under other authorities. These criteria/circumstances are described in greater detail below.

1. No Waste of Concern

After conducting a PA, the reviewer may determine to his or her satisfaction that there is no hazardous waste or solid waste containing hazardous waste constituents in a particular unit. In examining whether or not the unit contains hazardous wastes or constituents, the investigator should also consider:

- o Whether the waste is hazardous due to characteristics; or
- o Whether the waste may be hazardous due to a chemical interaction that generates hazardous waste as a byproduct.

The determination that there is no waste of concern should be based on a review of a reasonable amount of data. The reviewer should be confident that the data reflect all waste handled or accepted by the unit over the entire lifetime of the unit -- not just the type of waste received in recent years. If the unit is a landfill, the investigator should be sure that the unit did not accept waste that could present a subsurface methane gas problem. For example, demolition debris is not likely to generate methane gas.

2. No Releases

In some situations, it may be appropriate to eliminate certain units from further study on the basis that they clearly

have not released hazardous wastes or hazardous constituents into the environment. Examples of units that could warrant such determination include elevated tanks and, in some cases, surface level storage tanks. In the case of aboveground tanks, for example, unit design and operation, plus the inspector's direct knowledge of the facility, could provide sound evidence that the unit is not leaking or that possible releases were contained and immediately cleaned up. It will rarely be possible to make such determinations for landfills and surface impoundments.

When evaluating any unit to see if it requires further action, the investigator should consider all potential migration routes --air, surface water, ground water and soils. In general, units that are not land-based, such as elevated storage tanks, are not routinely considered a threat to ground water. However, despite the fact that a unit is not located in the ground, poor maintenance or contingency procedures associated with the unit could result in releases to surface soils due to improper containment and chronic unremedied spills. Releases to surface soils, particularly chronic releases, can provide a sizable reservoir of contamination that could ultimately migrate to ground water and surface water. In situations where the owner or operator undertook corrective action for above ground units, such as removal of the unit and excavation of surface soils, there still could be lingering contamination if the unit had poor spill, splash, or discharge management. In these cases, the investigator may wish to proceed with an SI, regardless of whether some corrective measures were undertaken.

3. Releases Permitted Under Other Federal Authorities

It may be appropriate to eliminate from further consideration releases that are regulated under other Federal permitting authorities. However, most permitting authorities tend to be tailored to a particular route (e.g., NPDES permits for surface water releases) and do not cover all potential routes of exposure from a unit. Accordingly, a permit for surface water discharges from an impoundment would not address an impoundment's releases to ground water. In these situations, an SI should be conducted, but only for the non-permitted routes and releases.

Although the RCRA corrective action program does not address permitted routes of contamination, it can address the results of permitted contamination. For example, frequent violations of NPDES permits can result in an accumulation of hazardous materials in stream sediments. If data available on the facility suggest an environmental problem due to non-compliance, this may be the subject of further investigation.

B. Identify Candidates for an RI

In some limited situations, it may be appropriate to skip the SI and proceed directly to the RI phase of the corrective action process. This could occur in situations where (1) available data provide ample evidence that the unit/facility is probably releasing into the environment, (2) the reviewer is able to describe the nature of further study without further inspection of the facility, and (3) there are no other units at the facility that require SIs. This would most likely occur at facilities where there are only a few units of concern and the inspector has

direct knowledge of the facility through past inspections. For example, a landfill or surface impoundment situated directly in a surficial aquifer that is interconnected with a deeper regional drinking water aquifer could very well be referred for an immediate RI. It should be noted that even in cases where there is a known release, the reviewer should determine the potential seriousness of the release and determine the priority of the site for beginning RI work.

There will be some situations where the facility as a whole poses a problem and where it is difficult to distinguish between units and releases. In these cases where there is adequate evidence of releases from the facility as a whole it may be more efficient to refer the entire facility to the RI and require the owner or operator to investigate the entire facility and all routes of release instead of attempting to sort out specific units and releases at the time of the SI.

C. Require Immediate Corrective Action

Corrective action is required where there is a release from a SWMU or a facility pursuant to §3004(u) and §3008(h). If such actions are necessary to limit exposure, then interim corrective measures can and should begin before selection of an appropriate permanent corrective action.

Temporary corrective measures could be appropriate in situations where (1) there is a release of hazardous wastes into the environment that is currently affecting or will affect target populations or sensitive environments and (2) the release may be temporarily arrested by some type of interim solution.

Examples of temporary corrective measures include requiring the owner operator to provide bottled water to persons drinking water contaminated by the facility, to fence a facility to prevent direct contact with hazardous waste, to stabilize berms or dikes to prevent further releases, etc. CERCLA action may also be considered.

In some cases it may be necessary to require more permanent remedies if no other corrective measures are available or it is more effective to implement permanent corrective measures. In these cases the permanent corrective measure would address the gross contamination source while further study is undertaken to determine what additional corrective measures are needed.

Examples of more permanent measures to eliminate or minimize exposure of affected populations or environments include removal of heavily contaminated soils or wastes largely at or near the surface, installation of clay caps to prevent continued infiltration and mobilization of wastes, and closure of unit to prevent generation of additional uncontrolled wastes. In some cases, in coordination with the owner/operator of the water supply, it may be appropriate to install new wells or extend municipal water lines, if it is clear that new permanent water supplies will be needed.

D. Referrals for a Health Assessment

The PA may uncover situations that require an immediate health assessment. In these instances, the PA information is added to the Exposure Information Report submitted under §3019.

and issued to assist in determining the need for health assessment under that section. Cases where this may occur include situations where human health is now at risk from current or ongoing releases of hazardous wastes.

Examples of situations when a health assessment would be appropriate include:

- Public is now drinking water contaminated with wastes from the facility;
- Public is at risk of exposure through direct contact to wastes contained at or releasing from the facility; and
- Public is at risk from exposure from breathing hazardous wastes releasing from the RCRA facility.

The referral to ATSDR for a health assessment under §3019 is not part of the decision on further action at the facility at this stage. (Information from the completed health assessment may, of course, become part of the decision on a remedy.)

In most cases, PA information will not be sufficient to actually begin the health assessment. Sampling data acquired through a site investigation may be necessary to acquire sufficient data for a health assessment.

IV. PA DOCUMENTATION

At the end of the preliminary assessment, the reviewer should prepare a preliminary assessment report summarizing the site conditions, describing the units/releases to be addressed further and discussing the areas that might require immediate corrective action.

The purpose of this summary is to provide a record of the preliminary assessment, establish a priority for further action, and develop a plan of action for the next phases. Since it is possible that some units may proceed immediately to some type of interim corrective measures while others are evaluated further under an SI or RI, the PA report should clearly describe which routes--air, surface water, ground water subsurface gas, and/or soils should be evaluated for each unit or area.

The following is a brief itemization of the types of information contained in a PA report (by unit where practicable):

a. Unit conditions (management, waste characteristics, pollutant dispersal pathways);

b. Description of known and suspected releases: analytical, visual, and inferred from unit design/maintenance;

c. Identification of target populations or environments potentially exposed via surface water, air, ground water, soil, subsurface gas routes; and

d. Recommendations

- -- Areas/units/releases and environmental media requiring further study
- -- Priority for further study
- -- Units/releases requiring immediate interim corrective measures
- -- Units requiring no further action
- -- Referrals for a health assessment

The report should be included with other data and supporting documentation collected during the site inspection in the appropriate site file. This report plus all the other data collected will provide documentation for any subsequent actions including enforcement or CERCLA NPL listing.

CHAPTER TWO

PLANNING AND CONDUCTING THE SITE INVESTIGATION

I. INTRODUCTION

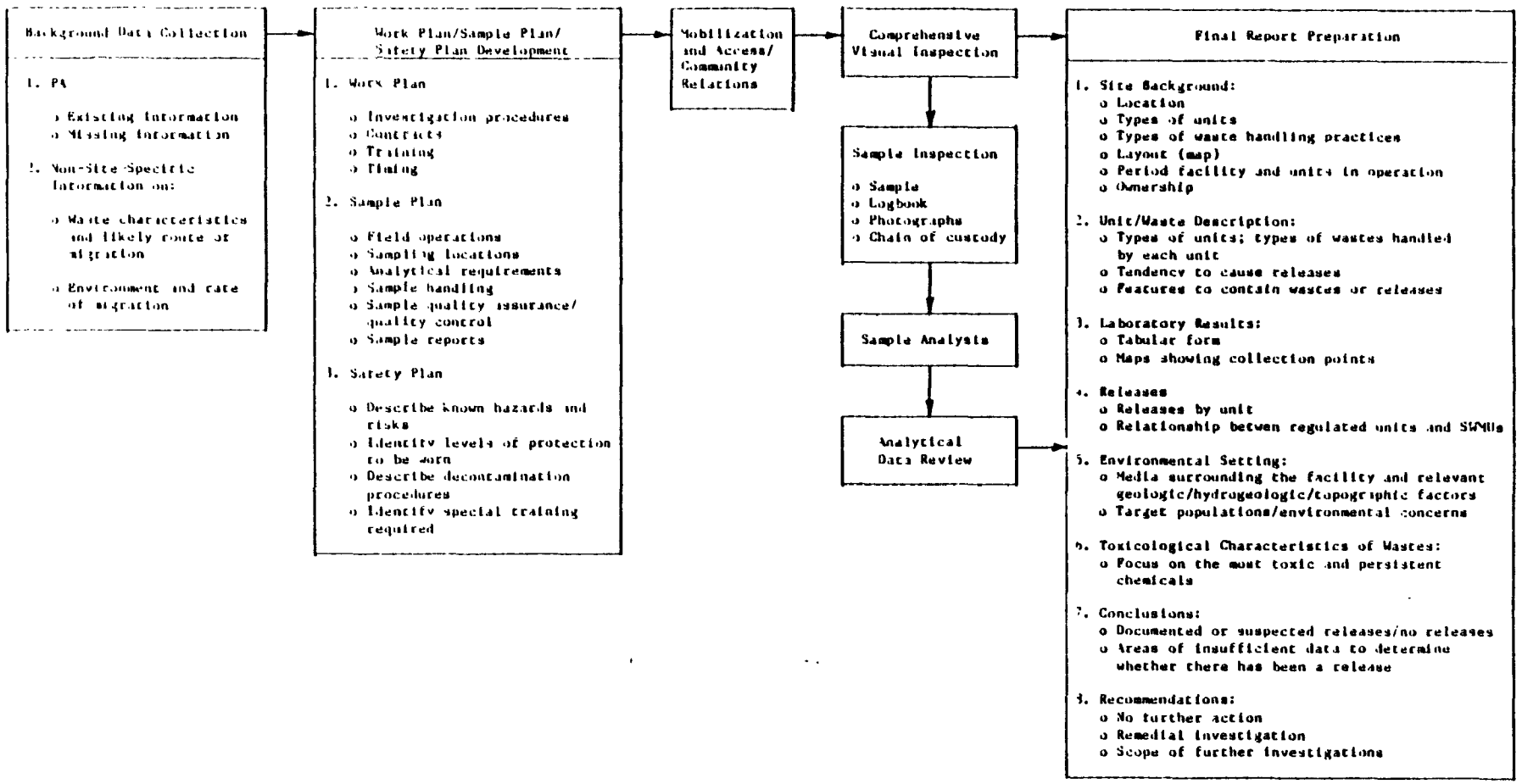
The site investigation (SI) is the second phase in evaluating SWMUs for releases to the environment. The SI builds upon the data collected during the preliminary assessment (PA) and, in general, involves collecting new information through visual observation and sampling. As a rule, the SI takes considerably more time to complete than the PA. Unlike the PA, which involves mostly desk work, the SI involves both desk and field work. This chapter of the RCRA PA/SI Guidance will address the overall process involved in conducting an SI. Exhibit 2-1 provides a step-by-step breakdown of the site investigation process. Each section of this chapter will discuss those steps in detail. Chapters three through six describe the substantive approach for evaluating releases to each media.

A. Purpose

The SI has several purposes, including (1) identify units/facilities that pose no problem, (2) gather evidence of releases sufficient to compel the owner/operator to conduct a remedial investigation, (3) prioritize facilities for further investigation, and (4) identify the scope of subsequent remedial investigations or immediate corrective action. This is accomplished by evaluating potential and actual releases and the potential for human and environmental exposure via surface water, ground water, air, soil, and subsurface gas.

EXHIBIT 2-1

SITE INVESTIGATION



B. Scope

RCRA site inspections involve both a visual inspection of the facility and sampling. The technical guidance provided in subsequent chapters describes the methodology Agency personnel should use to determine whether there is (or probably is) a release of concern for each unit at the facility.

In addition to conducting a visual inspection, Agency personnel should take a sufficient number of samples to complete the CERCLA Hazard Ranking Score. If the facility becomes a CERCLA lead site, then the agency will use the sample data collected during the SI to establish an HRS score. This guidance document also suggests unit-specific sampling that may be necessary to determine whether there is likely to be a release of concern at a specific unit. This additional sampling should only be conducted:

- If HRS sampling is not sufficient to make a determination as to whether or not a particular unit has a release of concern; or
- The sampling conducted for HRS scoring inadequately addresses the media or release of concern; or
- Additional information is necessary to either compel a remedial investigation or write a permit condition.

This additional sampling is addressed in the individual media chapters. The CERCLA office has prepared a description of sampling activities for the purposes of completing an HRS score. This is contained in Appendix B. (Note: This appendix is currently being prepared and is not included in this draft.)

C. Product

The immediate product of the site investigation is a report that summarizes the findings of the PA/SI. Although this report need not comprehensively re-state extensive material found in Agency files (e.g., Part B application information), it is a stand-alone document that should contain the salient facts and recommendations. The report should decribe:

- Site background;
- Environmental setting;
- Units at the facility (and their management and waste characteristics);
- Laboratory results;
- Toxicological characteristics of releases; and
- Recommendations.

II. BACKGROUND DATA COLLECTION

The data gathered during the Preliminary Assessment phase (on-site management characteristics, waste characteristics, pollutant pathways, target populations and evidence of release) provide the starting point for planning the site inspection.

The purpose of this initial step in the site investigation process is to gather the data necessary to prepare a work plan, safety plan and sampling plan for the facility. If key data are missing in the five categories identified in the Preliminary Assessment Guidance (Chapter One), the reviewer should determine if additional information to support the site investigation should be gathered.

If gaps in data remain or the data collected are not sufficiently detailed to be of use, then the reviewer should direct

the owner or operator to provide such information as may be reasonably available. The reviewer should develop a list of data gaps and request, by letter, the owner or operator to submit the information. The letter should be as specific as possible, identifying the type of information requested, the source (or possible sources) of the information, and the due date for the response.

After available facility-specific information is collected, the reviewer may need to gather technical/non-site-specific data that will assist the investigator in understanding the chemical and physical properties of the waste and the physical environment. This information may be helpful in assessing:

(1) What the characteristics of the waste type indicate about the waste's preferential migration route (i.e., air, surface water, soils, ground water, subsurface gas or some combination of these); and

(2) What the characteristics of the surrounding environment --soils, geology, hydrogeology, weather--indicate about the rate of contaminant migration (i.e., how will these factors contain, minimize, or facilitate the migration of contaminants).

Appendices C, D, and E contain information that can help to characterize the waste and the physical environment:

- Appendix C lists industries and their related hazardous wastes. This list may help identify which constituents to sample for in situations where there is little or no information on the types of waste present in a unit.

  To use this appendix, the investigator should determine the waste-producing activity (e.g., industrial organic chemical production, drugs, etc.) and then identify the waste streams associated with that activity. The investigator can then ascertain the related EPA waste codes, and the names of the specific hazardous constituents likely to be found in such wastes by reading across the page.

- Appendix D identifies certain site and waste characterization activities.
- Appendix E lists other standard reference manuals too large to be included in this guidance that are also useful in characterizing the waste and physical environment.

Most of this information will be used to develop the sampling and safety plans. In developing the sampling plan, the reference materials will aid in locating optimum sampling locations and determining which constituents to analyze for. To develop the safety plan, the reference materials, coupled with prior experience with the facility, will aid in identifying whether and what kind of protective clothing is needed. RCRA facilities have site-specific safety and contingency plans which should be evaluated before going on site.

III. PREPARATION OF WORK PLANS, SAFETY PLANS, AND SAMPLING PLANS

After the background information is collected, the investigator must prepare work plans, sampling plans, and safety plans. The plans document the procedures to be used, the resources needed and the rationale for the activities to be undertaken. These documents insure that all the necessary planning, preparation and review are done before field work begins. They provide a basis for later interpreting the results of the site inspection and documenting the procedures and technical approach used in order to support future enforcement action.

A. Work Plan

The work plan is the umbrella plan that pulls all three plans together. The work plan provides for the efficient scheduling of

resources such as manpower, equipment and laboratory services.

The work plan should include the following:

- Introduction. This section should briefly describe (a few paragraphs) the facility and the objectives of the SI--i.e., conduct visual inspection, collect samples? etc. This section is for the benefit of the person reviewing the plan.

- Investigation procedures. This includes the work to be done to determine whether releases have occurred or are occurring. These investigations should be sufficiently thorough to establish requirements for the owner/operator to conduct (or be compelled to conduct) further investigations. Part of this process entails identifying the specific standard operating procedures (SOPs) and field quality control (QC) procedures to be used. Appendix D contains an example checklist of SOPs and QA procedures to be used during the field work. Use of a checklist prevents weighting down the work plan with reams of boilerplate SOPs. If the owner/operator is collecting the samples, a copy of the SOPs and QA procedures should be provided. Agency personnel will be on-site at the time of sample collection to ensure proper implementation.

- Personnel requirements. This identifies all persons needed to conduct the field activities including support personnel and their specific responsibilities. Personnel requirements should also address whether or not the owner/operator will collect samples. If the owner/operator will collect samples, oversight of sample collection should be addressed.

- Equipment requirement. All safety and sampling equipment and supplies should be identified plus any other support or non-standard equipment and supplies. Appendix F contains an example equipment list.

- Contractual services. Any contractual services needed to accomplish the field work.

- Waste disposal procedures. All waste generated as part of the site investigation activities, such as disposable suits, gloves, sampling materials, must be disposed of in an appropriate manner in accordance with RCRA regulations.

- Special training requirements. If any new equipment or procedures are to be used, then mini training should be arranged.

Special consideration must be given to aspects of the work that may vary greatly from site to site. Each one of the following areas can greatly affect the time, expense, manpower and equipment needed for the project:

- o Hazards - What physical or chemical hazards may be encountered? Are there open manholes, deep embankments, low power lines, methane gas vapors, deteriorating surface features, poison ivy, snakes? Is the facility especially large?
- o Facility Location - How far is the facility from the home office? Will samples need to be shipped by overnight courrier to the laboratory? How far away is the nearest overnight shipping office? How accessible is the facility, especially inactive areas?
- o Timing - Can the facility be visually inspected or will snow obscure facility features? Will the surface waters or ground be frozen so as to limit sampling? Will work performed in the winter be limited by short daylight hours? Will work performed in the summer wear out field personnel quickly? How will the season of the year affect water levels? Will leachate seeps be visible during the dry season?

B. Sampling Plan

1. Contents of Sampling Plan

The sampling plan is incorporated into the work plan and identifies the sampling locations, rationale and logistics. In a number of cases, it may not be possible to complete the sampling plan without a field reconnaissance visit. The reconnaissance visit should be combined with the visual inspection (section VII) to ensure efficient resource use. It may also be combined with an on-going inspection activity (CEI or CME). The following discussion briefly outlines the contents of a sampling plan.

- Field operation

  The sampling plan should discuss the sequence for conducting the field activities. The specific functions of each individual should be identified in the work plan. For example, this section should identify the individuals taking samples, maintaining the field log book, monitoring the site with instruments, and collecting samples.

- Sampling locations/rationale

  As precisely as possible, the plan should identify the location of each sample. A site map should be prepared to guide the inspectors to the appropriate location. Specific sampling mechanisms (e.g., new ground-water monitoring wells at particular depths or use of existing wells) should be identified. Each sample type should be identified--soil, sediments, surface water, VOA, air, ground water and whether the sample is collected for metal, organics, BOD analysis, etc. The plan should also state the number of samples to be collected and the volume of each sample. In addition, the plan should include justification for the selection of each sampling location.

- Analytical requirements

  The sampling plan should discuss the specific parameters and level of detection that will be used to analyze each sample.

- Sample Handling

  The preservation techniques and material for each sample should be identified. If sample filtering is needed, that should be identified in this section, including an explanation of its use. The plan should describe the containers used for each sample collection episode including the tools, supplies, and equipment needed to collect the samples. Any procedure not covered by a SOP or different from the SOP should also be delineated here.

- Quality Assurance Samples

  The plan should identify the number and type of quality assurance samples, specifically the number of blanks, duplicates, or spikes. The "rules of thumb" for QA samples are discussed later in this section.

- Equipment Decontamination

  The sampling plan should identify the reageants and any special procedures associated with equipment decontamination.

- Sampling reports/documentation

  The sampling plan should describe all sampling forms that should be filled out including chain-of-custody forms, sample receipt forms, sample traffic reports, and sample tags. If split samples are to be collected, then the plan should contain instructions as to who should receive the splits.

2. Quality Assurance/Quality Control Program for Sampling

Agency personnel should collect all samples in accordance with the appropriate quality assurance (QA) and quality control (QC) procedures. QA is the total program for assuring the reliability of monitoring and measurement data. SOPs are the cornerstone to a QA program. SOPs are the exact, detailed procedures for performing a specific task such as purging a shallow well, collecting a surface water sample, etc. The SOPs insure that the methods, techniques, and procedures for collecting technical data are correct and reproducable. They also insure that a person collecting the same type of sample somewhere else or at another time is performing the activity in the same way. This becomes particularly important in interpreting the results of the sample collection and in the defense of data in court later.

The field sampling activities should be supported by preparing and submitting several sets of quality control samples. These include blanks, spikes, duplicates, and splits. Appendix G describes each of these quality control samples.

C. Safety Plan

Agency personnel should prepare a safety plan for each field visit in accordance with appropriate EPA guidance. (See EPA's Standard Operating Safety Guides (SOSGs) for specific guidance on

selecting the appropriate level of protection and how to prepare a safety plan.) The safety plan is usually prepared last and is tailored to the SI activities. For some SIs, the safety plan will be very simple and require few protective measures. Other, more problematic sites, may require use of higher levels of protection. For example, if the SI involves sampling lagoons, then the safety requirements will be more involved than for an SI involving simple visual reconnaissance. In developing the safety plan, the owner/operator should be asked about potential hazard in advance of field work.

Appendix H contains Chapter 9 from EPA's SOSGs that explains how to develop a proper site safety plan. The SOSGs were prepared in accordance with EPA and other Federal health and safety guidelines, regulations and orders. This appendix discusses the steps involved in developing a safety plan and elaborates on the contents of each section of the plan. A brief outline of the contents of the safety plan is provided below.

- Describe Known Hazards and Risks
- List Key Personnel and Alternates
- Identify Levels of Protection to be Worn
- Identify Work Areas
- Identify Access Control Procedures
- Describe Decontamination Procedures
- Describe Site Monitoring Program
- Identify Special Training Required
- Describe Weather-Related Precautions

IV. WORK PLAN/SAMPLING PLAN/SAFETY PLAN REVIEW PROCEDURES

Once Agency personnel have the work plan, sampling plan and safety plans, they should be reviewed by:

- Other members of the team;
- Designated specialists/informal peer review; and
- Appropriate decision officials.[1]

This internal review ensures that the plans are complete, that the plans meet the goals of the site inspection, and that all the appropriate quality assurance requirements for the field work are met. Most importantly, the internal review will assist in eliminating any unnecessary sampling and ensuring the proper focus for the SI.

The plans should also be reviewed by specialists in the various disciplines associated with the field work--geologists, geohydrologists, chemists, botanists, engineers, and occupational health specialists (safety officer). These individuals should review the plan's technical approach to insure that the investigator is applying sound technical judgment and has not made any inadvertent mistakes or omissions.

Lastly, the plans should be reviewed and approved (signed) by an appropriate decision official--at least a first line supervisor. This person would be responsible for insuring that the plan meets all Agency and internal requirements in addition to meeting the goals of the investigation.

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[1] Enforcement personnel should review the plan to assure that it will produce sufficient evidence to compel the owner/operator to perform an RI when necessary.

V. ACCESS/COMMUNITY RELATIONS

A. Owner/Operator Access

Prior to conducting the field work, the investigator must contact the owner/operator to schedule a time for the SI team to enter the site and perform the necessary field activities. Although it is possible that there will be considerable contact with the owner/operator about impending field work, the appropriate regional person should contact the owner/operator to verify dates and the nature of the field activities--sample collection, picture taking, facility inspection, and instrument monitoring.

If the owner/operator is responsible for collecting and analyzing the samples, then the EPA official should contact the owner/operator to schedule a date to oversee the field activities. The agency should send the sampling plan and procedures for performing the sample collection to the owner/operator sufficiently ahead of time for him to obtain the appropriate support. If EPA is collecting and analyzing the samples, EPA must offer the owner/operator a split of all samples collected. If the owner/operator wishes to have splits, EPA should instruct him to provide analytical sample bottles for the splits.

After completing these arrangements, EPA should send a letter to the owner/operator confirming the dates and field activities. If access is denied, Appendix I provides guidance on how to obtain access to a facility.

In some cases it may be necessary to access adjacent or nearby properties in order to conduct a visual inspection or

collect samples. Owners of these properties should receive verbal as well as written notification of the dates and nature of the work.

Although the RCRA investigator is authorized to inspect a facility and collect samples and photographs, the owner/operator can require the investigator to conduct the inspection and sample collection activities to protect his legitimate rights. The admissibility of data in court may later be challenged if data are collected in violation of the owner or operator's constitutional rights. The owner/operator can observe inspection activities, unless he interferes with the safe or technically sound conduct of the site inspection.

The owner/operator has the right to request confidential treatment of certain data. The investigator must avoid agreeing to this, except when the dispute is legitimate and subject to later resolution, since it poses a problem with later using the information in public proceedings under RCRA or even under CERCLA. It also places a sizable burden on EPA to control the data. Ordinarily, environmental monitoring data are not confidential. If data deemed confidential by the owner/operator are needed to properly evaluate the facility, then a precise description of the confidential data should be identified in the field log book. The investigator should instruct the owner/operator to follow up with a letter identifying the confidential data and explaining the reason why the data are business confidential. EPA regulations governing treatment and handling of confidential data are delineated in 40 CFR Part 2, Subpart B, Sections 2.201-2.309.

B. Community Relations

If it is necessary to conduct field activities in or near residential or non-industrial business areas, then the agency should contact the appropriate local officials ahead of time. It is difficult to remain unobtrusive while conducting site inspections particularly if field workers are wearing protective clothing. Moreover, the presence of "official" people collecting samples can cause undue alarm. In some cases, it will be difficult to prevent this but prior, well handled community contact can minimize the alarm.

The Office of Solid Waste is preparing guidance on community relations that will be available later this year. This document will provide specific guidance on when and how to implement a community relations program at RCRA facilities.

VI. MOBILIZATION

During this stage of the SI, Agency personnel should collect and check all the necessary equipment and supplies to insure that equipment is functioning properly with all the appropriate pieces available. If additional supplies or unique equipment are required, these items should be procured in this stage.

This stage also includes equipment check-out and calibration. Each instrument should be checked following the SOP for that particular instrument. The instrument should also be calibrated the day of or before the instrument is to be used. At the completion of the checkout and calibration, the investigator should note the following information in the field or instrument

check out logbook: (1) The date of calibration, (2) person checking out or calibrating the instrument, (3) the calibration standards used, and (4) a notation of deviation from SOP check out or calibration procedures.

It is also necessary at this stage to confirm the availablity of analytical space in the laboratory, especially if samples will be analyzed by the EPA Contract Lab Program (CLP).

If the owner/operator is to do the sampling, he/she should identify the laboratory and its capabilities, and as appropriate, provide a checklist of the equipment to be used and evidence that it has been examined and appropriately calibrated. In addition, the owner/operator should provide a description of the laboratory arrangements that have been made and the schedules established for sampling analysis.

VII. COMPREHENSIVE VISUAL INSPECTION

The field visit will often be broken into two stages - the first stage consists of a comprehensive visual inspection to gather information about units and releases and to identify prime sampling locations. This will sometimes be done as part of a CEI or CME inspection. The second stage will involve collecting samples.[1] If the owner/operator is collecting samples, an EPA person should be present to observe the activities to ensure conformance to the work plan, record field activities in the log book, resolve any field related problems that develop, and ensure proper field quality control.

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[1] If agency visits to the facility have occurred recently, the agency may have sufficient knowledge of the facility to design the sampling to coordinate with the field inspection.

There are a host of different aspects associated with conducting a field inspection. This section will discuss the key aspects of a visual site inspection, including the sequence of field activities, photography and logbook maintenance.

A. Sequence of Field Activities

Almost all site investigations will follow the same sequence of events. Frequently, the only element that varies is the time required to perform the event. The work plan should be reviewed before field activities begin. The following is a list of tasks in sequential order.

1. Site Arrival

This step involves notifying the owner/operator of the team's arrival and establishing decontamination line/access control points.

2. Observation/Field Activity

During this stage of the field work, investigators:

- o Make visual observations consistent with the work plan;
- o Maintain a field logbook of observations;
- o Take photographs; and
- o Monitor for vapor emissions.

3. Decontamination/Demobilization

Decontamination of persons and equipment occurs not only at the completion of all field work but each time persons exit the site, including rest breaks.

In many cases, decontamination may be very simple, e.g., removing disposable coveralls and washing field boots. If sampling

is performed, then decontamination may be more involved, including decontamination of field persons, sample bottles, and sampling and field equipment.

All clothing and support materials that will not be reused must be containerized either for transport and eventual disposal or disposal on-site.

4. Site Exit

When the team leaves, the team leader should provide the owner/operator with a receipt describing the photographs taken.

B. Photography

Investigators should use regular 35mm cameras for taking photographs. They should not use unusual filters, as they tend to discolor the picture and may unfairly bias the result by making leachate seeps or lagoons look different from real life. The investigator should identify and record in the fieldbook the exact type of camera (including i.d. number), film (i.e., Fuji, asa 200), and any unusual lenses used.

Photographs should be taken to document the conditions of the facility and procedures used in inspection activities. Particular emphasis should be placed on matters identified in the work plan. Two sets of photographs should be taken in the event one camera does not function or film processing is poor.

Types of pictures that should be taken include:

- Representative overall picture(s) of facility;
- Posted signs identifying ownership of facility;
- Evidence of releases--leachate seeps, pools, discolored water, or strained soils;

- Individual units--lagoons, drums, landfills, etc.;
- Visual evidence of poor facility maintenance;
- Adjacent land use; and
- Area that unauthorized persons can easily access.

C. Logbook Maintenance

The logbook is perhaps the most important document generated during the site inspection. It will serve as a basis for preparing the final SI report, interpreting data, describing the site, and most importantly, supporting the work done and results obtained in any future legal proceedings under RCRA or CERCLA.

A unique logbook should be assigned for each site and each visit to the site. Logbooks should be bound and each page sequentially numbered. Entries into the logbook should be chronological --a time notation should introduce each entry. Mistakes in the logbook should be lined out and initialed. The logbooks should be maintained with indelible ink.

The following types of entries should be made in the logbook:

- All personnel on site during each phase of the on site work;
- All instruments used during the field work with unique identification numbers;
- Description of film used;
- Description of the weather and changes in the weather;
- Material observations related to items identified in the work plan;
- Result of field measurements--distances, instrument readings, well measurements;
- Factual description of structures and features--wells and well construction, units, containment structures, buildings, roads, topographic and geomorphic features;

- Signs of contamination--oily discharges, discolored surfaces, dead or stressed vegetation;
- Sketches of facility layout, structured features and points of contamination;
- Map of facility showing point and direction of photographs; and
- Any other relevant items.

The following information should be noted in the logbook for photographic documentation.

- The sequence of picture number;
- If more than one camera is used, identification of camera (print or slide);
- Person taking picture; and
- Description of each picture (location of photographs, image, etc.).

The person keeping the logbook should sign each page of the logbook.

VIII. SAMPLING INSPECTION

It is sometimes possible to combine the sampling effort with the comprehensive visual inspection. This would most likely occur where the investigator has recently visited the site, is thoroughly acquainted with the facility, and is able to identify in advance where samples should be taken. If it is not possible to combine the comprehensive visual inspection with sample collection, the visual inspection should be geared towards gathering data to develop the sampling plan.

The following activities are associated with a field visit to collect samples.

A. Sequence of Field Activities

In most instances, the sequence of field activities is the same regardless of whether the purpose is to collect samples or conduct comprehensive visual observations. The work plan and the sample plan should be reviewed before field activities begin.

1. Site Arrival

This step is the same as previously discussed except that the investigator should hold a briefing with the EPA field team or owner/operator team to review the day's events and ensure that each team member understands his responsibilities.

2. Preliminary Site Entry

The preliminary site entry is the first step of the field activity. The purpose of the initial site entry is to screen the facility for situations posing a threat to health, and to support logistical needs of the site investigation. Preliminary site entry will ensure that there have been no changes on site since the last visit. When a formal site entry is necessary, at least two team members should walk through the areas of the facility where work is anticipated with portable instruments to determine if there are any vapor releases or radiation emissions, if there is adequate oxygen, or if there are any explosive atmospheres.

Upon completion of this step, the team leader should evaluate the need to revise any of the plans, such as downgrading the level of protection.

If the inspector is familiar with the facility, it may not be necessary to conduct an initial site entry. The site inspector may have adequate, first-hand information on the facility to insure that the facility poses no threat to the health of the inspector.

3. Sample Activity

This stage of the field work involves the following activities:

- o Installation of sampling mechanisms;
- o Collecting samples;
- o Photographing sample collection;
- o Maintaining the logbook; and
- o Monitoring for vapor emissions.

Regardless of who is performing the sample collection, continuous monitoring for vapor emissions is needed to detect air releases from sampling activities. If the owner/operator is collecting the samples, EPA/State investigators must document precisely the sequence of sampling activities, the procedures and instruments used, and describe the samples (including location, depth, appearance, etc.).

The EPA Regional offices have developed SOPs for most SI sampling tasks under the CERCLA program. For the most part, these SOPs are applicable to RCRA field activities. If the SOPs are not applicable or appropriate for the particular field activity, then a new SOP should be developed. In some cases, only minor modifications are necessary. Where modifications to existing SOPs are made, they must be noted in the field logbook.

4. Decontamination/Demobilization

This stage is the same as for a comprehensive visual SI. In addition to decontaminating personnel and equipment, all samples must be decontaminated. Investigators must also complete sample identification forms, sample shipping forms, chain-of-custody forms, sample receipts, and sample traffic forms. Some of the information on these forms can be filled in prior to the sampling and is in fact recommended due to the number of forms and time required to complete these. All samples must be packaged for safe transport. If samples are to be shipped by express carriers, then the samples should be packaged in accordance with DOT specifications for shipping hazardous materials.

5. Site Exit

This stage is similar to the procedure discussed previously. In addition, the inspector should deliver a receipt describing the samples collected. The inspector should obtain a written acknowledgement of the receipt of sample form. If the owner/operator requested split samples, then the samples should be left with him at this time.

B. Photography

The same principles previously discussed apply to sample collection tasks. Photographs should be taken of:

- Posted signs identifying ownership of facility;
- Sampling locations; and
- Sampling activities.

C. Logbook Maintenance

The same principles discussed previously also apply here. Additional logbook entries for sampling inspections include:

- Description of sample (appearance);
- Exact depth from which sample taken;
- Description of location of sample;
- Map(s) identifying site layout and sampling points;
- Field calculations;
- Decontamination procedures used between collection of each sample;
- Any deviation from SOPs; and
- Any other relevant item.

D. Chain-of-Custody

All samples collected (including blanks and spikes) should be maintained under chain-of-custody. Chain-of-custody insures that samples collected during the SI are the samples that are analyzed and that there is little likelihood the samples were adversely affected. Chain-of-custody traces the possession of a sample from the time of collection, through all transfers of custody, to when it is received in the laboratory, where internal laboratory chain-of-custody procedures take over.

Specific chain-of-custody procedures are included in the SOP on chain-of-custody.

IX. SAMPLE SHIPMENT/ANALYSIS OF SAMPLES

At this stage of the SI, any samples that EPA or the owner/operator collected are delivered to the laboratory and the samples analyzed. SOPs covering sample shipping are available in each of

the regional offices or in EPA safety training manuals. The time involved in analyzing samples can vary from 40 days to three to four months.

X. ANALYTICAL DATA REVIEW

Upon receipt of analytical results, the data must be reviewed to insure that the results are valid. This particular step can take a considerable amount of time depending upon the backlog of data packages requiring review.

Preliminary review of analytical data involves ensuring that all deliverables required by the CLP are included in the data package, checking that all forms are completed within the requirements of the contract, flagging missing data or incomplete forms, and reporting these to the appropriate person for follow-up. The preliminary data review may also involve completing a checklist of questions which summarize key quality assurance items in the data package.

With the results provided by this preliminary data review, missing data will be requested and the EPA Regional Environmental Services Divisions (ESDs) will perform a qualitative analysis of the data. Based on laboratory internal quality assurance data provided in the data packages, the ESD determines if the data results are valid.

At the completion of the analytical data review, Agency personnel evaluate all the data collected to determine if a release or potential for release has occurred. The substance of the data evaluation stage is contained in the succeeding chapters.

XI. FINAL REPORT/FILES

After evaluating all the data, Agency personnel should prepare a brief report summarizing the results, findings, and recommendations of the SI.

The report should identify the areas or units that are releasing or suspected to be releasing and the basis for these findings. The report should also recommend areas (or units) where no further action, immediate interim corrective action, or remedial investigation is required. The basis for these recommendations should be clearly substantiated in the report. The relative priority of the facility for follow up investigation should be explained. In addition, where further action is recommended, the report should also describe the scope of further action.

The following is a recommended outline for an SI report. It may not be necessary to discuss all the items identified in the outline if the discussion is clearly irrelevant to the particular site. For example, it may not be necessary to elaborate on the geology or hydrology of an area if the only unit of concern is an inactive aboveground storage facility with no spill, discharge or overflow problems.

- <u>Site Background</u>

  This section should summarize, among other things, the location of the facility, the types of units, the types of hazardous waste handling practices (by unit), which units are regulated, the layout of the facility (include a map), how long and/or when the facility and units have been in operation, and the site ownership. This section is not intended to repeat detailed data already provided in the Preliminary Assessment Report, the Part B application or CERCLA SI report. The report should briefly summarize data found in other documents, and describe new data identified.

- Unit/Waste Description

  This section should discuss the units found at the facility and the types of wastes handled by each unit, and their tendency to cause releases into the air, ground water, surface water, soil and subsurface gas. This section should discuss the relevant design and operational features that exist or do not exist to adequately contain hazardous wastes or releases of hazardous wastes.

- Laboratory Results

  This section should discuss the results of previous and new analytical results. Much of the information in this section can be presented in tabular form and be accompanied by maps locating sample collection points.

- Releases

  Release information (by unit) should be discussed. The relationship between regulated RCRA units and SWMUs should be addressed.

- Environmental Setting

  This section should describe, in summary form, the media surrounding the facility--the relevant climatic, geological, hydrogeological, and topographical factors. Maps, sketches, and selected photographs would be included in this section to further describe the physical environment. This section should also discuss target populations and environments-including public and private water supply ground and surface water intakes, protected areas, parks, wetlands, affected irrigated crops and livestock.

- Toxicological Characteristics

  This section should discuss toxicological characteristics of the wastes releasing or suspected to be releasing into the environment. The report should focus only on the most toxic and persistent chemicals releasing.

- Conclusions and Recommendations

  This section should presents the findings and conclusions from those findings. It should address documented releases as well as findings that releases are likely to have occurred. Areas where the data are insufficient to document a release should be discussed. Units that are found not to be releasing should be identified and discussed. The report should present recommendations for further action on units not eliminated from further consideration. Where the facility or some portion of the facility is recommended for an RI or corrective action,

brief and generalized discussion of the scope of further work should be included. Recommendations for deferring further action should also be explained in this section.

- Bibliography

  This section should identify all sources of information used to evaluate and prepare the SI report. This portion is essential if the facility is referred to the CERCLA program for consideration for the National Priorities List (NPL).

- Appendices

  Any relevant memoranda, reports, pages from reports, maps, etc. that elaborate upon or further substantiate information in the SI report should be attached in this section.

A copy of the final report plus all memoranda, photographs, logbooks, trip reports, workplans, sampling plans, safety plans, sample tags, chain-of-custody forms, records of communication, plus any new reports or documents uncovered in the course of conducting the SI, should be entered into the official facility file. All this information will be used as evidentiary documentation in any future court proceedings.

GUIDANCE ON OBTAINING ACCESS TO A RCRA FACILITY FOR A SITE INVESTIGATION IF ACCESS IS DENIED

If an investigator is denied access to a facility to conduct a site investigation, the following procedural steps must be followed.

Upon Denial of Access

1. Upon denial of access, thoroughly document the event, noting time, date, and facility personnel encountered. *

2. Ask for reason of denial of access to facility.

3. If the problem is beyond the investigator's authority, suggest that the owner/operator contact an attorney to obtain legal advice regarding his/her responsibility for providing facility access under Section 3007 of RCRA.

4. If entry is still denied, exit from the premises and document any observations made pertaining to the denial, particularly any suspicions of violations being covered up.

5. Report all aspects of denial of entry to the U.S. EPA Office of Regional Counsel for appropriate action, which may include help in obtaining a search warrant. **

Search Warrant Inspections

Conducting a site investigaton under a search warrant will differ from a normal inspection. The following procedures should be complied with in these situations:

Development of a Search Warrant

1. An EPA Office of Regional Counsel attorney will assist the investigator in the preparation of the documents necessary to obtain a search warrant and will arrange for a meeting with him/her and a U.S. Attorney. The investigator should bring a copy of the appropriate draft warrant and affadavits to the meeting.

2. The U.S. EPA Office of Regional Counsel attorney will inform the appropriate Headquarters Enforcement attorney of any denials of entry and send a copy of all papers filed to EPA Headquarters.

3. The attorney will then secure the warrant and forward it to the U.S. Marshall who will issue it to the owner/operator.

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* Under no circumstances discuss potential penalties or do anything which may be construed as threatening.

** It should be stressed that it is the policy of U.S. EPA to obtain a warrant only when all other efforts to gain lawful entry have been exhausted.

Use of a Warrant to Gain Entry

1. The investigator should never attempt to make any forceful entry of the facility.

2. If there is a high probability that entry will be refused even with a warrant or where there are threats of violence, the investigator should be accompanied be a U.S. Marshall.

3. If entry is refused to an investigator holding a warrant but not accompanied by a U.S. Marshall, the investigator should leave the facility and inform the U.S. EPA Office of Regional Counsel.

Use of a Warrant to Conduct the Investigation

1. The investigation must be conducted strictly in accordance with the warrant. If the warrant restricts the investigation to certain areas of the premises or to certain records, those restrictions must be followed.

2. If sampling is authorized, all standard procedures must be carefully followed including presentation of receipts for all samples taken. The facility should also be informed of its right to retain a portion of the samples obtained by the investigator (split samples).

3. If records or property are authorized to be taken, the investigator must provide receipts to the owner/operator and maintain an inventory of all items removed from the premises.

4. In accordance with the warrant, the investigator should take photographs of all areas where violations are suspected. Photographs should also be taken at each sampling location as a quality control procedure.

For further guidance regarding denial of facility access consult the National Enforcement Investigation Center. (303) 236-5100

CHAPTER THREE

GROUND WATER

I. INTRODUCTION

The essential objective of the PA/SI in relation to ground water is to determine for each solid waste management unit at the RCRA facility whether or not the unit has released or is likely to have released hazardous wastes or constitutents to the uppermost aquifer. For units which have identified releases, or for which there is a substantial likelihood of a release, further remedial investigations will be required of the owner/operator to actually determine the extent of a release(s) and/or to characterize the release and begin developing a program of corrective measures.

Determinations regarding the need for further ground water investigations at a unit must be made on a case-by-case basis, considering the various relevant factors that are unique to each unit. For some units, it will not be difficult to assess the potential for ground water contamination, and it will be relatively easy to determine the need for further investigations. For other units, however, the likelihood of contamination will be less than obvious, and the determination will necessarily be based on the judgment of the individuals conducting and reviewing the results of the PA/SI, combined in some cases with actual sampling and analysis.

In determining the need for additional ground water investigations on the basis of the PA/SI, it must be recognized that comprehensive ground water investigations will typically require

a considerable investment of time and resources for both the owner/operator in conducting the actual investigations, and for the reviewing agency in evaluating technical plans, hydrogeologic data and analytical results. Recognizing the essential mandate of protecting human health and the environment (i.e., the need to identify ground water contamination and begin the process of cleaning up that contamination), it is the dual function of the PA/SI to identify those situations which merit additional ground water investigations, but at the same time to avoid requiring unnecessary investigations.

II. POTENTIAL FOR GROUND WATER RELEASES FROM UNITS AT THE FACILITY

Each solid waste management unit at the facility should be evaluated for its potential to be causing or to have caused ground water contamination. The exception to this is "regulated units"; i.e., landfills, surface impoundments, waste piles and land treatment units that received wastes after July 26, 1982. Releases to ground water from regulated units must be addressed in permits according to the requirements of Subpart F of Part 264 (or corresponding State regulations), rather than through the §3004(u) authority. Thus, **investigating ground water contamination from regulated units will not be the focus of the PA/SI.**

Each SWMU at the facility, which contains or has contained wastes capable of releasing hazardous constituents to ground water, must be assessed to determine the likelihood of ground water releases, and thus the need for further ground water investigations. This unit assessment will be based on the information gathered in the preliminary assessment, inspection of the unit

during the site inspection, data from existing monitoring wells that are capable of monitoring the unit, and other information generated as necessary. The unit assessment should be based on:

- An understanding of the overall potential of the unit to cause ground water releases;
- An understanding of the primary mechanisms by which releases may occur from the unit; and
- An assessment of unit-specific factors which, singly or in combination, indicate the relative likelihood of ground water releases from the unit.

Discussions of each of these elements follows.

A. Potential for and Mechanisms of Ground Water Releases

The general potential for ground water contamination from a SWMU depends, to a great extent, upon the nature and function of the unit. This is reflected in RCRA hazardous waste regulations. For example, ground water monitoring is not a requirement for container storage units, while with few exceptions, monitoring is required for landfills. Therefore, in assessing the likelihood of ground water releases from a unit, the investigator should first consider the relative potential of the unit to release. Table 3-1 presents a generalized ranking, in rough descending order, of the different types of SWMUs and their overall potential for causing ground water contamination, and a listing of the most common mechanisms by which ground water releases can occur from each unit type. Section V of this chapter also provides examples of units which would and would not merit further ground water investigations.

TABLE 3-1

RANKING OF UNIT POTENTIAL FOR GROUND WATER RELEASES AND MECHANISMS OF RELEASE

Unit Type	Release Mechanism
Class IV Injection Well	o Wastes are injected directly into the subsurface o Escape of wastes from well casing o Spillage or other releases from waste handling operations at the well head
Surface Impoundment	o Migration of wastes/constituents through liners (if present) and soils o Damage to liners o Overflow events and other spillage outside the impoundment o Seepage through dikes to surface and/or subsurface
Landfill	o Migration of leachate through liners (if present) and soils o Precipitation runoff to surrounding surface and subsurface o Spills and other releases outside the containment area from loading/unloading operations
Land Treatment Unit	o Migration of constituents through the unsaturated zone o Precipitation runoff to surrounding surface and subsurface
Underground Tank	o Tank shell failure o Leaks from piping and ancillary equipment o Spillage from coupling/uncoupling operations o Overflow
Waste Pile	o Leachate migration through liner (if present) and soils o Precipitation runoff to surface/subsurface
Class I Injection Well	o Migration of wastes from the injection zone through confining geologic strata to upper aquifers o Escape of wastes from well casings o Spillage or other releases from waste handling operations at the well head

TABLE 3-1 (Continued)

RANKING OF UNIT POTENTIAL FOR GROUND WATER RELEASES AND MECHANISMS OF RELEASE

Unit Type	Release Mechanism
In-ground Tanks	o Overflow o Tank wall failure o Leaks from ancillary equipment o Spillage from coupling/uncoupling operations
Container Storage Unit	o Spills from containers/container failure subsequent migration through liner or base (if any) and soils o Precipitation runoff from storage areas
Above Ground Tank	o Overflow o Shell failure/corrosion o Leaks from ancillary equipment o Coupling/uncoupling operations
Incinerator	o Spillage or other releases from waste handling or preparation activities o Spills due to mechanical failure

It should be understood that Table 3-1 provides only a very theoretical sense of the relative potential of units to cause ground water releases. Unit-specific factors (as described below) must be evaluated in determining whether further ground water investigations are needed for a particular unit.

B. Evaluation of Unit-Specific Factors

The following unit-specific factors should be evaluated in assessing a SWMU for ground water releases:

1. Unit design
2. Site geology/hydrogeology
3. Waste characteristics
4. Operational history
5. Physical integrity of the unit

In making a unit assessment, attention should be paid to how two or more of the above factors may combine to suggest whether or not releases are have occurred. For example, examination of an above ground tank may reveal evidence of soil contamination adjacent to the unit. However, the operational history of the unit ("4") reveals that the tank has been in operation for only six months, the tank is in good condition ("5"), and records indicate that the contamination occurred as a single, relatively small overflow event. In addition, the waste ("3") is known to be relatively non-mobile, and clay soils underlie the facility, with an uppermost aquifer that is quite deep ("2"). Consideration of all of these factors would indicate that, despite the evidence of soil contamination, likelihood of a release to ground water is very remote, and further remedial investigations would not be necessary.

The factors listed above are discussed in more detail, as follows:

1. Unit Design

Evaluation of the unit's design should focus on the following areas:

- What are the unit's capacity and dimensions?
- Does the unit have engineered features designed to prevent releases to ground water?
- Are such features adequate?

Examples of design features of concern for specific types of units are given in Section V of this chapter.

2. Site Geology/Hydrogeology

The investigator should examine the potential for releases of any wastes or constituents from the unit to contaminate ground water based on soil characteristics, geologic formations, climate, aquifer location, subsurface drainage patterns, seasonal variations and other factors.

This evaluation should rely on standard geologic and hydrogeologic principles, using whatever information is available on the subsurface characteristics of the site. If information on subsurface characteristics indicates that the potential for contamination of ground water is very low (e.g., facility overlying thick formation of low permeability clay, in an arid area with a very deep aquifer), further ground water investigations would be needed only for units for which other factors indicate a very high potential for causing contamination (e.g., a Class IV injection well). Likewise, if ground water is particularly vulnerable

(e.g., facility overlies sandy soils and ground water is shallow and fast-moving), a correspondingly low threshold would be applied in determining the need for additonal ground water investigations.

More definitive guidance on evaluating the vulnerability of ground water is contained in the Permit Writers' Guidance Manual for the Location of Hazardous Waste Land Treatment, Storage and Disposal Facilities: Phase II (draft dated June, 1985). The investigator may choose to use this guidance (and/or subsequent versions) in situations where a more complete understanding of ground water vulnerability would assist in making the necessary determinations in the PA/SI for a facility. It should be understood, however, that evaluating ground water vulnerability according to this guidance requires reasonably detailed hydrogeological information, such as that required in Part B applications in §270.14(c).

Where there is little information on a facility's subsurface characteristics, other unit-specific factors will need to be weighed more heavily in making the ground water assessment. In many cases, evaluation of unit design and waste characteristics alone may be sufficient to determine that ground water investigations are necessary, even though very little may be known about subsurface characteristics. An example of this could be a large, unlined surface impoundment.

3. Waste Characteristics

The investigator should assess the potential for wastes managed in the unit to migrate to the uppermost aquifer, based on their concentration, physical/chemical properties, and behavior

in water and soils. There is considerable variation in the relative likelihood of different hazardous constituents to actually migrate from a given unit through the unsaturated zone and into and through ground water. Many of the constituents in Appendix VIII are essentially insoluble in water (at neutral pH) and/or bind tightly to soil particles, reducing the likelihood of ground water contamination. The investigator should consider the potential mobility of the waste(s) in a unit, in combination with other unit-specific factors.

The relative mobility of waste constituents can be expressed by the sorption equilibrium constant (K_d). The K_d value for a given constituent is an estimate of its tendency to sorb to soil particles or organic matter. Actual K_d values have been calculated, however, for relatively few hazardous constituents. As a somewhat simplistic indicator of K_d, values for octanol-water partition coefficients (K_{ow}) can be used. Appendix J presents K_{ow} values for most constituents. Note that these are log values. As a general rule of thumb, chemicals with K_{ow} values of more than two can be considered relatively non-mobile; a value of less than one indicates that the waste is relatively mobile.

There are several limitations on using this measure of mobility. The actual value for a given constituent varies according to actual site soil characteristics and other factors. In addition, the presence of other wastes may substantially alter the behavior of a given constituent. Where a number of wastes are present in a unit (e.g., in a commercial landfill), the values given in Appendix J will have little application. Finally, applying the concept of waste mobility may be inappropriate in situations

where geologic features such as faults, joints, or solution channels are present.

4. Operational History

The investigator should evaluate the unit's operational history for information that indicates a release to ground water may have occurred. Operational factors that may influence the likelihood of ground water releases include:

- Service life of the unit. Units which have been managing wastes for long periods of time will usually have a greater likelihood of releases than units which have been operating for short periods of time. For example, an underground tank that has been in service for six months will have a much smaller likelihood of leakage due to corrosion than will a twenty-year old underground tank.

- Operational status. In some cases, the operational status of a storage unit (e.g., closed, inactive, decommissioned) may have an effect on the relative likelihood of a ground water release.

- Operating procedures. Proper maintenance, regular inspections, and procedures for ensuring waste compatibility with the unit may indicate that a unit is unlikely to have released (this is particularly true for storage units such as tanks and container storage areas). Evidence of good operational practices may be available from owner/operator records, and/or visual observation or historical inspection reports. Conversely, poor operating practices (e.g., underground tanks which are never leak tested or inspected internally, storage of open containers of wastes) may indicate relatively greater potential for ground water releases.

5. Physical Integrity of Unit

The investigator should examine the physical condition of the unit for indications of releases that may contaminate ground water. Section V of this chapter gives examples of how the physical condition of certain types of units may indicate potential for releases.

III. EVIDENCE OF GROUND WATER RELEASES

The investigator should look for evidence, either visual or from existing sampling data of soils and/or ground water, which indicates that a release to ground water has or is likely to have occurred. The investigator should also assess whether additional sampling data are necessary to determine the need for further ground water investigations at the unit and how such sampling/analysis should be conducted.

A. Existing Visual or Sampling Information

In some cases, visual examination of a unit or the area surrounding the unit may reveal substantial soil contamination (e.g., discolored soil, stressed vegetation), as an indication of possible ground water contamination. An organic sheen on nearby surface water may similarly indicate contamination.

At some facilities, ground water sampling data from existing monitoring wells at the facility, or from wells or springs near the facility may be available and may indicate the presence of hazardous constituents which could have migrated from a unit(s) at the facility. Such data may not be conclusive evidence of a release from any unit, due to the variabilities inherent in ground water flow, background ground water quality, errors or deficiencies in sampling and analysis, and other factors. However, if existing ground water data does exist from nearby wells or springs, and suggests contamination, even though wells may not have been placed for the purpose of monitoring the unit(s) and relatively little may be known of subsurface characteristics, such data should be considered a very strong indication of the

need for further, more intensive ground water investigations for the facility.

B. Use of Existing Ground Water Monitoring Systems

The PA/SI should include an assessment of any existing ground water monitoring systems at the facility which may be capable of detecting releases from solid waste management units (SWMUs) at the facility. Some SWMUs may have a monitoring system installed specifically for the unit. In other cases a monitoring system placed at a regulated unit(s) or other units may also be capable of monitoring the SWMU. An example of this might be a closed landfill cell surrounded by several active cells.

If the preliminary assessment indicates that an existing monitoring system may cover a SWMU, the technical adequacy of the system should be carefully examined [i.e., to what extent does it meet the general performance standard in §264.97(a)]. Information required to assess the adequacy of an existing monitoring system includes: detailed information on geology and hydrogeology at the unit, waste characteristics, background and downgradient water quality data, boring logs, well design information, and sampling and analytical procedures.

In evaluating whether a monitoring system which was installed at another unit(s) (such as a regulated unit) may be capable of also detecting releases from a SWMU, the investigator should pay particular attention to such features as proximity of the SWMU to the regulated unit, the direction of ground water flow, well locations in relation to the SWMU, and whether the constituents being monitored are appropriate for the wastes in the

SWMU. Exhibit 3-1 provides a graphic illustration of three different situations in which existing monitoring systems at regulated units may or may not be placed to adequately monitor a SWMU.

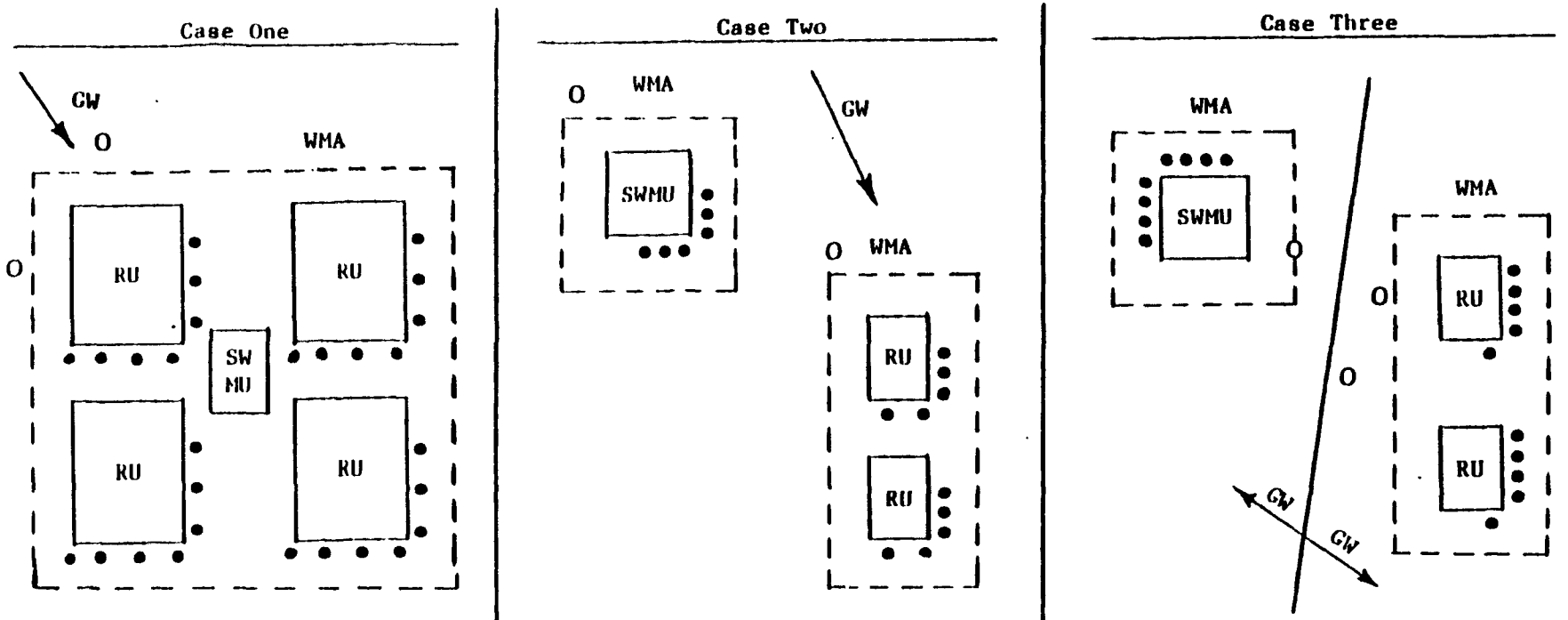
In addition to well placement, well design should also be examined to determine whether the wells are capable of yielding ground water samples representative of actual ground water quality. For example, some waste constituents with a high specific gravity will tend to be found in lower depths of an aquifer, and if the well is screened at the uppermost level of the aquifer, contamination may not be detected.

If the investigator determines that an existing ground water monitoring system and sampling and analysis program are adequate to detect releases to ground water from the solid waste management unit, and recent analytical data (e.g., within the past three months) indicate that there have been no releases, no further investigations should be required of the owner or operator. If the existing system is not adequate, and the investigator determines that there is a likelihood of ground water releases from the unit, the owner or operator should be required to conduct additional investigations as necessary, and install additional monitoring wells and/or analyze for more or different constituents, as part of the remedial investigation phase. Phase II of the technical guidance will address design of appropriate monitoring systems and analytical programs for solid waste management units.

There may be situations where existing monitoring systems are adequate to detect contamination from the unit but where there is no evidence of contamination. However, based on the type of

EXHIBIT 3-1

MONITORING WELL LOCATION



Key:
- SWMU = Solid Waste Management Unit
- RU = Regulated Unit
- WMA = Waste Management Area
- O = Background Monitoring Well
- ● = Downgradient Monitoring Well
- GW → = Ground-Water Flow Direction

Note: Drawings not to scale.

unit, its design, the wastes managed or other factors, there is a likelihood of a ground water release in the future. In such situations, the owner or operator should be required (as a permit condition, if the facility is permitted) to maintain the monitoring system and carry out an appropriate sampling/analysis program.

C. Need for Additional Sampling

The investigator may not be able to determine whether a ground water release from the unit has or is likely to have occurred on the basis of the factors described in Section III and other evidence of release. In these situations, he/she should consider whether additional sampling and analysis of soils and/or ground water would enable the determination to be made. The following are examples of situations where additional sampling might be indicated:

- Evaluation of unit-specific factors indicates that a release has probably not occurred, but there is need for an extra measure of certainty before a determination can be made that no ground water investigations are necessary.
- The evaluation indicates a likelihood of releases to ground water from the unit, but more definitive evidence is necessary to establish the need for extensive remedial investigations (or immediate corrective measures).

An illustration of a situation in which sampling would be called for is as follows: An outdoor, unsurfaced area at a facility was used as a container storage area for a number of years, but has not been used since 1980. The facility is located in an area with sandy soils. Inspection of the area reveals vegetation growing on the area, with no visible signs of contamination.

However, a review of the operating history of the facility indicates that the volume of wastes stored in this location was very large, and a number of enforcement actions for serious interim status violations were initiated against the facility, and State inspection records from the late 1970's indicate generally poor housekeeping practices. Because of these uncertainties, soil sampling of the area would be recommended.

In some cases, sampling and analysis of soils may yield sufficient evidence to enable the investigator to determine the likelihood of a release to ground water. In other situations, sampling of ground water from existing nearby wells or springs would be advisable if there is reason to believe that constituents from the unit could migrate to such wells or springs.

For any sampling of soils or ground water conducted as part of the site investigation, the constituents to be analyzed should be those which would be expected to migrate from the unit, based on what is known of the wastes managed in the unit. When little is known of the wastes managed in the unit, it is recommended that soil or ground water samples be analyzed for the priority toxic pollutants (as identified by EPA for use in wastewater discharge analysis) that are designated as hazardous constituents under RCRA (40 CFR Part 261). These constituents are listed in Appendix K.

D. Summary

Actual installation of new ground water monitoring wells as necessary will typically take place during the remedial investigation phase, and will not normally be done as part of the site

investigation. It should be possible to determine the need for additional ground water investigations at a unit without having to install new wells. However, installation of new monitoring wells and ground water sampling and analysis is not precluded as a part of a site investigation. Examples of situations in which installation of new wells might be done include:

- Evaluation of unit-specific factors reveals that a release has probably not occurred, but an extra degree of certainty is desirable, due to the presence of down gradient drinking water wells (see Section IV on exposure potential);
- A sufficient amount of information is available on site hydrogeology to enable reasonably well designed and located wells to be installed without substantial preliminary subsurface investigations; and
- It is possible to install the wells, take samples, and obtain analyses consistent with the timing of the PA/SI decision process.

IV. EXPOSURE POTENTIAL

The investigator should consider the potential for exposure of human populations and/or sensitive environments to hazardous constituents in ground water which may be occurring or could potentially occur as a result of releases from the facility in making determinations of the need for further remedial investigations. Types of exposure information of concern include:

- The proximity of the unit/facility to downgradient drinking water and irrigation wells;
- The potential for use of the aquifer as a drinking water source; and
- The potential effect of aquifer discharges to nearby surface water.

Exposure potential is an inherent characteristic of the ground-water classification system established under the EPA Ground-Water

Protection Strategy in August 1984. The highest valued or "special" ground waters (Class I) include those that are irreplaceable sources of drinking water to substantial populations. Class II, the largest category, includes the remaining current and potential sources of drinking water. Class III are not sources of drinking water due to extensive natural or man-made contamination. The strategy describes examples of clean up and protection mechanisms for each of these classes. The Agency is currently developing guidelines for classifying ground water and expects to release these for public comment by December 1985. The classification system is currently being integrated into RCRA guidance and will be formally incorporated through rule-making in coming years. Future guidances to implement corrective action authorities will address integration of ground-water classification guidance into corrective action investigations.

V. RELEASE DETERMINATIONS

This section summarizes the unit-specific and site-specific characteristics that should be evaluated to identify ground water releases. Furthermore, it summarizes factors that determine the relative exposure potential of a release. In addition, this section gives examples of site-specific situations that are likely to require further investigation and situations that probably will not require further investigation. These examples relate the individual unit and site-specific characteristics to each other to describe the process for making decisions on what releases require further investigation.

A. Summary

Exhibit 3-2 is a checklist that should help the investigator evaluate specific factors to identify ground water releases and determine the relative effect on human health and the environment. In identifying releases, the investigator should consider the series of characteristics described in the chapter and highlighted in the checklist that determine the potential for ground water releases from units of concern. These characteristics include: whether or not the unit type (e.g., land-based) or the unit's containment systems (e.g., liners) indicate a potential for release. Also, factors such as the unit's age, condition, the quality of its operating procedures, and whether or not it has had compliance problems may indicate the potential for release. Location characteristics of the unit -- soil or subsurface conditions and the depth to the uppermost aquifer -- also indicate a potential for a release to ground water. Other factors include the mobility and toxicity of waste in the unit. The investigator should examine each of these factors and how they relate to each other in determining the potential for release from units at the facility.

The investigator should also look for evidence that indicates possible ground water contamination. This includes assessing the ability of any existing ground-water monitoring systems to detect releases from the SWMU. The investigator should also consider other evidence of release, such as ground water or spring water sampling data or observations of soil contamination around the unit, in identifying releases that may require further investigation.

Exhibit 3-2

Checklist for Ground Water Releases

	Yes	No
Identifying Releases		
1. Potential for Ground Water Releases from the Unit		
o Unit type and design		
- Does the unit type (e.g., land-based) indicate the potential for release?	___	___
- Does the unit have engineered structures (e.g., liners, leachate collection systems, proper construction materials) designed to prevent releases to ground water?	___	___
o Unit operation		
- Does the unit's age (e.g., old unit) or operating status (e.g., inactive, active) indicate the potential for release?	___	___
- Does the unit have poor operating procedures that increase the potential for release?	___	___
- Does the unit have compliance problems that indicate the potential for a release to ground water?	___	___
o Physical condition		
- Does the unit's physical condition indicate the potential for release (e.g., lack of structural integrity, deteriorating liners, etc.)?	___	___
o Locational characteristics		
- Is the unit located on permeable soil so the release could migrate through the unsaturated soil zone?	___	___
- Is the unit located in an arid area where the soil is less saturated and therefore a release has less potential for downward migration?	___	___
- Does the depth from the unit to the uppermost aquifer indicate the potential for release?	___	___
- Does the rate of ground water flow greatly inhibit the migration of a release from the facility?	___	___
- Is the facility located in an area that recharges surface water?	___	___

Exhibit 3-2 (continued)

Checklist for Ground Water Releases

	Yes	No
o Waste characteristics		
- Does the waste in the unit exhibit high or moderate characteristics of mobility (e.g., tendency not to sorb to soil particles or organic matter in the unsaturated zone)?	___	___
- Does the waste exhibit high or moderate levels of toxicity?	___	___
2. Evidence of Ground Water Releases		
o Existing ground-water monitoring systems		
- Is there an existing system?	___	___
- Is the system adequate?	___	___
- Are there recent analytical data that indicate a release?	___	___
o Other evidence of ground water releases		
- Is there evidence of contamination around the unit (e.g., discolored soils, lack of or stressed vegetation) that indicates the potential for a release to ground water?	___	___
- Does local well water or spring water sampling data indicate a release from the unit?	___	___
Determining the Relative Effect of the Release on Human Health and the Environment		
1. Exposure Potential		
o Conditions that indicate potential exposure		
- Are there drinking water well(s) located near the unit?	___	___
- Does the direction of ground water flow indicate the potential for hazardous constituents to migrate to drinking water wells?	___	___

The investigator should also consider the potential for exposure from releases or potential releases. This information can be used to determine the extent of further remedial investigations. Information on the exposure potential of ground water releases can also provide a basis for prioritizing sites for remedial investigation. For example, a unit that has a release and is located near drinking water wells may be a high priority for further investigation.

B. Examples

Table 3-2 provides specific examples of the kinds of units which would and which would not merit remedial ground water investigations, based on general potential for contamination, unit specific factors, and exposure potential. This table is not intended to be a complete listing of the types of units and situations which are expected to be encountered at RCRA-regulated facilities. It is intended to give a sense of the types of unit scenarios where remedial investigations generally would and would not be needed.

Table 3-2

GROUND WATER
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Class IV Injection Wells	o All Class IV wells	o None
Surface Impoundments	o Unlined, active impoundments o Impoundments which closed with wastes in-place o Inactive or active clay-lined impoundments which held wastes for more than a very short period of time (e.g., >1 month) o Small, synthetic lined impoundments with evidence or records of liner deterioration and/or rupture o Unlined impoundments which closed by removal of wastes, but at which no ground water monitoring system, or an inadequate system, is installed	o Units which closed by removal of wastes ("clean closed") in accordance with §265.228(b) or §264.228(a)(1) (see footnote #1) o Small, clay or synthetic lined impoundments which held relatively non-mobile wastes (e.g., certain fly ashes) for a short period of time o Impoundments which were synthetically or concrete lined, whose liners have been removed, and where adequate soil sampling and physical evidence conclusively demonstrates that no leakage occurred from the unit
Landfills	o Closed/inactive commercial landfill units o Landfill units containing substantial quantities of municipal-type solid waste o Unlined monofills of wastes with relatively non-mobile constituents, in areas with high water tables o Closed, clay-lined landfill units containing relatively mobile and/or toxic containerized or non-containerized wastes o Areas of facilities with heavily contaminated soils resulting from routine, systematic and deliberate placement of wastes on the soil (e.g., wood preservative "kick-back" areas)	o Small rubbish dumps o Monofills of wastes having very low potential for migration of constituents to ground water (e.g., insoluble metal salts, certain fly ashes), and which have been adequately capped or covered by structures, in locations where the uppermost aquifer would never come in direct contact with the wastes o Small units containing wastes with relatively non-mobile constituents in arid areas with deep aquifers, which are constructed with well-designed liners and leachate collection systems and/or which are situated over relatively impermeable natural geologic formations (e.g., clay deposits)

Table 3-2 (continued)

Land Treatment Units	o Active or inactive land treatment units in non-arid areas on which substantial amounts of wastes have been placed	o Units on which wastes were placed only once, in very small amounts, in an area with a deep water table o A very small (e.g., 0.1 hectare) experimental land treatment plot which was operated for a limited period of time, in an area with a deep water table, where results of soil testing indicate complete biological degradation
Underground Tanks	o Old steel tanks (e.g., >10 years old) installed without external or internal coatings or cathodic protection, which have not recently been leak-tested or had an internal inspection by a qualified inspector o Steel tanks which have been in frequent or constant contact with ground water for a relatively long period of time o Steel or fiberglass tanks for which recent internal inspection and/or leak test indicates lack of tank integrity o Relatively new, well designed tank (e.g., cathodically protected) storing highly corrosive and/or highly mobile or toxic wastes, in an area with high water table and nearby downgradient drinking water wells	o Relatively new, well designed tank (e.g., external and internal epoxy coating and cathodic protection) storing non-corrosive and/or relatively non-mobile wastes/constituents, not likely to come in direct contact with ground water o Tank with full secondary containment (e.g., vaulted tank with leak detection system) o Tank with recent internal inspection and/or "state of the art" leak test which indicates that the tank is sound o Relatively new (e.g., <10 years) metal tank storing compatible wastes (e.g., solvents) in an arid area with clay soils
Waste Piles	o Outdoor pile containing relatively mobile wastes, not situated on a liner or base, in area with porous soils and/or shallow aquifer o Large outdoor pile containing wastes with particularly toxic constituents, with physical evidence of substantial migration of wastes outside the containment structure, in area with nearby downgradient drinking water wells	o Indoor pile with no free liquids o Covered outdoor pile situated on impermeable (e.g., well engineered synthetic or concrete) base with adequate containment system for run-on and run-off o Outdoor pile containing relatively non-mobile wastes (e.g., certain fly ashes) situated on clay soils in area of deep water table
Class I Injection Wells	o Well with poor compliance history o Well whose annulus pressure monitoring records indicate that both	o Well which received a UIC permit after 11/8/84 and the corrective action requirements of HSWA were provided for in the UIC permit

Table 3-2 (continued)

	the tubing and casing have leaked or records of injection pressure, volume, and rate indicate an unaccounted for loss of pressure or fluid	o Well which recently passed a mechanical integrity test of the casing and the tubing and the well's monitoring records of annulus pressure, injection rate, volume and injection pressure are complete and show no unaccountable losses of pressure or fluid
In-ground Tanks	o Relatively old concrete tank containing large volumes of wastes, with visible and substantial deterioration of exposed walls, or for which recent internal inspection indicates serious cracking of walls or other signs of serious deterioration of concrete o Large concrete tank with no protective internal coating or liner, holding highly toxic and/or mobile wastes in area of high water table and downgradient drinking water wells o Tank with visible evidence of extensive soil contamination from apparent (or recorded) overflow events or other operational or structural failures, in area with porous soils	o Relatively small tank with adequate liner/coating, with record of frequent inspections and maintenance schedule o Relatively new, lined/coated tank in good condition, with no evidence of releases
Container Storage Units	o Containers stored outdoors on bare soil, with visible signs of substantial soil contamination, in area of porous soils and/or shallow aquifer o Outdoor area on which very large volumes of waste containers have been stored for relatively long periods of time (e.g., >10 years) with improper storage practices (e.g., open containers) and/or inadequate containment structures, with downgradient drinking water wells and/or highly toxic/mobile wastes	o Indoor container area with adequate containment structure o Outdoor storage area with adequate containment system, with no visible evidence of contamination o Relatively small outdoor area where waste containers were placed for only a short period of time, with no evidence of serious contamination

Table 3-2 (continued)

Above Ground Tanks	o Large, outdoor metal tanks situated on soil surface with visible structural deterioration, holding highly mobile and/or toxic wastes, in area with shallow aquifer and downgradient drinking water wells o Old, outdoor tank with visible evidence of massive soil contamination due to apparent (or recorded) overflow events, in area of porous soils o Large tank situated on soil surface, for which recent internal inspection indicates severe corrosion on bottom, in area of vulnerable hydrogeology	o Small, indoor tanks with secondary containment o Outdoor tanks elevated above soil surface, with secondary containment structures o Outdoor tank in good condition situated on concrete pad, with no visible or recorded evidence of substantial release
Incinerators	o Outdoor incinerator with visible evidence of surrounding massive soil contamination resulting from apparent system/operation malfunction	o Indoor incinerator with no apparent evidence of significant releases to outside environment

Footnote:

1/ For such units, monitoring data should be carefully examined for evidence of ground water contamination; this is of particular concern for units which stored only characteristic waste.

CHAPTER FOUR

SURFACE WATER AND SURFACE DRAINAGE AREAS

I. INTRODUCTION

The site investigation for surface water and off-site surface drainage areas should determine:

1) Whether or not solid waste management units at the facility have released and/or will continue to release hazardous wastes or hazardous constituents to surface water.[1]

2) Whether or not solid waste management units at the facility have released and/or will continue to release hazardous wastes or hazardous constituents to human or environmental receptors in off-site areas.

For units with identified releases, or for which there is a substantial likelihood of a release, the owner or operator will be required to conduct further investigations to actually determine the extent of a release(s) and/or to characterize the release and begin developing a corrective measures program.

EPA is equally concerned with releases to surface water and releases that migrate overland to off-site areas and potentially expose human and environmental receptors (i.e., surface drainage releases). Releases to surface water and off-site may result from point source discharges, spills, leaks, surface run-off, or floods.

Although EPA is concerned with both surface water and surface drainage releases, this chapter presents a single approach that addresses surface drainage releases through overland drainage pathways as part of the procedure for identifying and investigating

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1/ Surface water includes any stream, river, lake, bay, wetland, estuary, and intermittent stream.

surface water releases. The approach separately addresses surface drainage releases when it is necessary to characterize factors specific to these releases.

The investigator will need to make determinations regarding the need for further investigation at a unit on a case-by-case basis, considering factors that are unique to each unit. For some units, it may be relatively easy to assess the existence or probability of surface water or surface drainage contamination and to determine the need to conduct further investigations. For other units, it may be more difficult to make these determinations and the investigator will need to use judgment in deciding whether further investigations are warranted.

Releases that result in surface water or surface drainage contamination can be difficult to identify because of their intermittent nature. For example, a surface impoundment may regularly overflow and release hazardous constituents during periods of heavy rainfall. However, unless the site investigation is conducted during a heavy rainfall, the investigator will not observe the release. Therefore, he/she should evaluate each unit at the facility for the likelihood that it is causing surface water or surface drainage releases during a storm event. If the unit is likely to have released during a storm event, he/she should examine the site for evidence that indicates such releases have occurred or occur on a regular basis. The investigator will also need to assess whether a release of concern exists before determining that further investigations are necessary.

The comprehensive investigations called for in the second phase of the corrective action process require a considerable

investment of time and resources for both the owner or operator in conducting the investigation, and for the Agency in reviewing technical plans and analytical results. Therefore, the PA/SI should serve the dual function of identifying situations which merit further investigation, and at the same time avoiding unnecessary investigations.

This chapter describes the factors the investigator should consider in assessing specific units and the site for their potential to cause surface water or surface drainage releases. It also describes the kinds of evidence the investigator should look for to identify whether or not a release has taken place and factors to consider in assessing the potential for releases to threaten human health and the environment.

II. LIKELIHOOD OF SURFACE WATER OR SURFACE DRAINAGE RELEASES

Four factors are important in assessing the potential for surface water or surface drainage contamination from a facility. They are:

- The proximity of the facility to surface water/off-site receptors;
- The potential for releases to migrate from the facility to surface water or directly to off-site receptors;
- The design and physical condition of solid waste management units at the facility; and
- The type of wastes contained in these units.

The importance of each of these factors is discussed below.

A. Proximity to Surface Water/Off-site Receptors and Release Migration Potential

The potential for surface water contamination from a facility is directly related to the facility's proximity to surface water. Facilities located along rivers or other surface water bodies are more likely to have surface water releases than facilities located in arid areas, far from significant surface water bodies. As the distance to surface water increases, it becomes more likely that hazardous constituents in surface run-off will sorb to soils or move downward in the unsaturated zone and result in ground water contamination.

The potential for surface run-off from the facility to migrate overland to nearby receptors is of particular concern when the facility is located adjacent to populated areas and no barrier (e.g., runoff control system) exists to prevent further overland migration.

Proximity is not the only factor that affects the potential for releases to migrate to surface water or drain off-site. The facility slope indicates the potential for run-off or spills to migrate from the facility. For example, releases from a facility located in a depressed area are unlikely to leave the site as surface run-off. The composition of the soil and the slope and vegetation of the terrain between the facility and the nearest surface water body will also affect the migration potential of the release. For example, a facility located close to surface water may have a low potential for surface water releases if the intervening terrain is characterized by sandy soils and heavy vegetation. In this case, run-off is more likely to migrate down

into the unsaturated and saturated zones rather than to migrate laterally overland to surface water (except during flood events or catastrophic releases). However, facilities located in areas characterized by clayey soil, and where there is less extensive vegetation between the site and nearby surface water, have a greater potential for releases to surface water.

The level of rainfall and the frequency of significant storm events also affect the potential for run-off from the facility to contaminate surface water. As mentioned earlier in this chapter, surface water releases are often intermittent and result from run-off generated during periods of heavy rainfall. A facility located in an area characterized by frequent major storm events is more likely to generate large volumes of surface run-off than a facility located in an area where major storm events are less frequent. Appendix L describes a method for estimating run-off developed by the U.S. Soil Conservation Service. The method accounts for characteristics of the intervening terrain (e.g., land use and soil types) and rainfall amounts. Run-off estimates derived from this method should help the investigator determine whether rainfall above and around the unit tends to migrate down into the unsaturated zone or tends to run off overland.

The investigator will need to consider all of these factors:

- Proximity to surface water and off-site receptors;
- Soil composition;
- Slope and vegetation characteristics of the facility and the intervening terrain;
- Rainfall; and
- The frequency of major storm events.

The investigator will also need to determine how the facility's location affects the potential for releases to surface water or the movement of surface run-off to off-site receptors.

B. Unit Design and Physical Condition

As with the other media, the likelihood that surface water or surface drainage contamination from a solid waste management unit has occurred is largely dependent on the nature and function of the unit. For example, open units that contain liquids (e.g., surface impoundments) have a greater potential for release than closed landfill cells that have been properly capped.

Table 4-1 ranks types of solid waste management units, in a loose descending order on the basis of their potential for having releases that cause surface water contamination or migrate off-site. The table is intended to provide a general sense of the relative potential for units to cause these types of releases. The investigator will also need to evaluate unit-specific factors in determining the potential for release from a particular unit.

The major unit-specific factors the investigator should evaluate include:

- Unit design. The investigator should determine whether the unit has engineered features (e.g., run-off control systems) that are designed to prevent releases from the unit. If such features are in place, the investigator should evaluate whether they are adequate (in terms of capacity, engineering, etc.) to prevent releases.

TABLE 4-1

RANKING OF UNIT POTENTIAL FOR SURFACE WATER/
SURFACE DRAINAGE RELEASES AND MECHANISMS OF RELEASE

Unit Type	Release Mechanism
Surface Impoundment	o Releases from overtopping
Landfill	o Migration of run-off outside the unit's run-off collection and containment system
	o Migration of spills and other releases outside the containment area from loading and unloading operations
	o Seepage through dikes to surrounding areas (e.g., soils, pavement, etc.)
Waste Pile	o Migration of run-off outside the unit's run-off collection and containment system
	o Migration of spills and other releases outside the containment area from loading and unloading operations
Land Treatment Unit	o Migration of run-off outside the containment area
Container Storage Area	o Migration of run-off outside the containment area
Above-ground Tank	o Releases from overflow
	o Leaks through tank shell
	o Spills from coupling/uncoupling operations
In-ground Tank	o Releases from overflow
	o Spills from coupling/uncoupling operations
Incinerator	o Spills or other releases from waste handling/preparation activities
	o Spills due to mechanical failure
Class I and IV Injection Well	o Spills from waste handling operations at the well head

* The two remaining solid waste management units; waste transfer stations, and waste recycling operations generally have mechanisms of release similar to tanks.

- Operational history. The investigator should examine the unit's operating history to obtain information that indicates that releases have taken place. Operational factors that influence the likelihood of release can include:

  -- Operating life of the unit. Units that have been operating for long periods of time are generally more likely to have releases than new units.

  -- Operating status of the unit. In some cases, the operating status of a unit (e.g., closed, inactive, etc.) may have an effect on the relative likelihood of release.

  -- Operating procedures. Maintenance and inspection records should indicate whether a unit is likely to have released. Units that are inspected regularly and properly maintained are less likely to have releases than units that have been poorly maintained.

- Physical condition of the unit. The investigator should examine the units for evidence of releases or characteristics that could cause releases (e.g., cracks or stress fractures in tanks or erosion of earthen dikes for surface impoundments).

C. Waste Characteristics

The significance of the release of toxic contaminants into surface water will depend on several factors: 1) the mass of contaminants entering the water system; 2) the transport mechanisms governing the movement and ultimate destination of each constituent in the surface water system; 3) the persistence of the constituent; and 4) the toxicity of the constituent.

The potential threat to off-site receptors from a release carried by surface run-off is linked to the mass of contaminants that reaches off-site receptors, the persistence of these contaminants in various media (e.g., soils, standing water, run-off), and toxicity of the pollutants. The significance of the first two factors can only be considered in relation to the last two factors.

In many cases, the investigator will not have complete information on the wastes and their constituents in a solid waste management unit. Incomplete waste information will make it difficult to fully evaluate the importance of each of the factors listed above in characterizing the significance of a release to surface water. The investigator will need to use judgment in making these determinations. To the extent waste information is available, the investigator may be able to take these factors into account. Each factor is discussed more fully below.

1. Mass. The mass of a contaminant relative to the volume of the receiving-water body may be an important factor governing the environmental significance of a release. It should be noted, however, that certain toxic or hazardous pollutants will accumulate in biota, and sorb to sediment, remaining in these media for sometime even if initial quantities of discharge are small. Other chemicals are highly toxic in very small amounts.

2. Transport Mechanisms. The transport mechanisms governing the movement of pollutants control their ultimate destination. The primary transport mechanisms are sedimentation, volatilization, and downstream transport in the water column. The structure and properties of each constituent will govern which mechanisms dominate their transport. While most constituents can be affected by all three transport mechanisms, it is possible in most cases to partition a constituent to one primary destination. This information can be used to predict where specific constituents will result in potential exposures. A brief description of each fate and transport mechanism follows:

- Sedimentation. Sedimentation refers to the tendency of a constituent to sorb onto suspended organic sediments carried in water bodies. Sorption can be modeled using a sorption isotherm, which predicts the relative tendency of a constituent to be partitioned to suspended particles or to remain dissolved in the water. The sorption partition coefficient, K_{sw}, describes the tendency of a constituent to be dissolved in the water phase or to be sorbed onto a particle. Once a constituent has become sorbed to a particle in the water, it will usually join the bottom sediments of the system. An approximate equivalent K_{sw} can be derived by multiplying the fraction organic carbon in sediment (OC) times K_{oc}, a similar sorption partition coefficient. K_{oc} values for chemicals are listed in Appendix J and a value of 0.02 can be used as OC.

- Volatilization. Compounds exhibiting a strong tendency to volatilize from water will pose little risk to human health or the environment through surface water exposures. Many chlorinated solvents will almost completely volatilize from a moving stream within several miles. Compounds with large Henry's Law constants will have the greatest potential for volatilization. (See Appendix J for Henry's Law values.) It will be accentuated in turbulent water systems such as fast moving streams, where the turbulence speeds up the transfer of contaminants from water to air.

- Downstream transport. Relatively immiscible organic compounds with densities less than water (e.g., oily wastes) will tend to float on water surfaces in slicks, where they may pose a significant threat to water fowl. Other immiscible compounds which are heavier than water will tend to sink into the sediments where they will remain largely undissolved in the water column. Dissolved constituents will be transported downstream in rivers and dispersed in lakes where they will be subject to natural fate processes.

3. Persistence. Many fate processes can combine to degrade a pollutant to a level below which there is no significant risk. Among the many fate processes are: hydrolysis, photolysis, oxidation/reduction, biotransformation, and bioaccumulation. Many references will report a value for a chemical's half-life in water based upon a combination of these processes (e.g., prepared by W.R. Mabey, et al., SRI International, for EPA, "Aquatic Fate

Process Data for Organic Priority Pollutants, Final Report," 1982; and EPA, "Water-Related Environmental Fate of 129 Priority Pollutants, Volumes I and II", December 1979). In this way, one can make a general assessment of a constituent's persistence in the environment. The most persistent constituents (e.g., PCBs, dioxins, etc.) will not be significantly degraded by any of the fate processes mentioned above and should generally be considered to pose a considerable risk. Bioaccumulation deserves special mention due to the unusual threat it poses to animals in the food chain. Concentrations of constituents that bioaccumulate in fish and shellfish may be higher in the fish than they were in the original release. Pollutants that bioaccumulate should be given special consideration in water bodies used for recreational or commercial fishing.

4. Toxicity. The most pertinent factor in assessing the significance of a release of hazardous constituents to surface water will often be the intrinsic toxicity of each individual contaminant. Relatively large releases of certain less toxic constituents may be diluted in streams or lakes to levels that do not significantly affect human health or the environment. However, low concentrations of highly toxic and/or persistent constituents like dioxin, PCBs, arsenic, and cyanides may pose a significant human health risk. Unfortunately, toxicity information for many of the Appendix VIII constituents is incomplete. For this reason, it will often be advisable to consider highly persistent constituents to be of the greatest concern, because

exposures can occur over a considerable length of time with unknown consequences.

While the overall fate and transport of a constituent in a surface water system will depend on the specific characteristics of the system, it is possible to generally describe the likely fate and transport for certain classes of contaminants. If the investigator knows the wastes in the unit, this information may help in determining which contaminants are of particular concern for surface water releases.

- Metals (e.g., arsenic, chromium, cyanide, and mercury) usually adsorb and accumulate in sediments in rivers and lakes. The rate at which they accumulate in the sediments will depend on the organic content of the suspended solids in the system and on the concentration of clays in the water. Most metals will exhibit a tendency to bio-accumulate in both shellfish and finfish. They will therefore pose the greatest threat to human health in waters known to be used for recreational and commerical fishing.

- Chlorinated pesticides (e.g., DDT, chlordane, lindane, heptachlor, toxaphene, etc.) may be subject to several fate and transport processes simultaneously. They have been shown to volatilize, sorb onto sediments, biodegrade, and bioaccumulate. In large quantities, chlorinated pesticides may pose a significant risk from exposure throughout the water body.

- Halogenated aliphatic hydrocarbons (e.g., trichlorethane, tetrachlorethene, chloromethane, etc.) generally exhibit a strong tendency to volatilize from water. Large quantities of these pollutants can be stripped from fast-moving, turbulent streams, reducing their risk for water-associated exposures. Although they will not tend to be transported downstream, they generally do not degrade significantly in the environment. Many of these compounds may still pose a significant risk at low concentrations due to their toxicity.

- Polycyclic aromatic hydrocarbons (e.g., napthalene, phenanthrene, benzo(a) pyrene, etc.) will tend to adsorb to bottom sediments. These pollutants are generally susceptible to biodegradation and hydrolysis in surface water systems. Because they do not tend to bioaccumulate,

releases characterized by low concentrations of these pollutants are likely to be of little concern.

Appendix J provides physical, chemical, and fate data for a list of chemicals.

D. Summary of Factors Affecting the Likelihood of Release

The investigator should consider all of the factors described above to determine the likelihood of surface water or surface drainage release from a unit. In addition, in assessing the likelihood that a release has occurred, the investigator should consider how the various factors affect each other. For example, an aboveground tank containing relatively toxic, persistent waste and located within 1000 feet of a river may not have a secondary containment or other system in place to collect liquid waste that could leak or overflow from the tank. However, the facility's records indicate that the tank is relatively new, well designed, and well constructed, and that it is inspected regularly for evidence of leaks. In this case, there is only a low potential for a release, and no further investigation would be necessary. Alternatively, the same situation for an older tank that shows signs of deterioration may require further investigation.

III. EVIDENCE OF SURFACE WATER AND SURFACE-DRAINAGE RELEASES

A. Types of Evidence

If the investigator determines that certain units at the facility are likely to have caused releases to surface water or to off-site receptors, he/she should inspect the area around the units of concern and the area between the unit and the closest surface water body and off-site area for evidence of a release.

In addition, if the facility is located adjacent to surface water, the investigator should examine the surface water for evidence of releases. The investigator should look for visible evidence of uncontrolled run-off from units at the facility. If releases have occurred or are occurring at a unit there is likely to be evidence around the unit that indicates a release is taking place. Because of the intermittent nature of releases, it is particularly important to examine the site and nearby surface water and off-site areas of concern for physical evidence of release. The investigator should look for:

- Observable contaminated run-off or leachate seeps;
- Drainage patterns that indicate possible run-off from units at the facility;
- Evidence of wash-outs or floods, such as highly eroded soil, damaged trees, etc.;
- Discolored soil, standing water, or dead vegetation along drainage patterns leading from the unit;
- Discolored surface water, sediment or dead aquatic vegetation;
- Unpermitted point source discharges;
- Units (including old fill material that is now considered hazardous waste) discharging in surface water; and
- Permitted discharges that are of concern (see Chapter 1, page 1-24).

B. Use of Sampling

Agency personnel should take enough samples during the site inspection(s) to complete a Hazard Ranking Score. Samples of run-off, on-site and off-site soils, standing water, surface water, and/or surface water sediments can be taken to identify a release or a suspected release. Appendix B describes how to

sample to obtain a Hazard Ranking Score. In addition, as explained in Chapter two of this guidance, there may be certain situations where unit-specific sampling should be conducted to confirm other evidence that a release has taken place at a unit or that there is no release from a unit. This type of sampling should only be performed to either: confirm a release to surface water or off-site areas of concern; or compel a remedial investigation or write permit conditions, or both. Appendix M lists sampling priorities (e.g., water, sediment, biota) for many compounds.

In general, simple field tests or sampling may be adequate to obtain a positive confirmation of surface water, soil, standing water, or run-off contamination. More thorough sampling may be necessary to confirm that the contamination results from a particular unit, but this more detailed sampling may be completed as part of the next phase of the corrective action process. If the investigator determines that sampling is necessary, he/she should follow the procedures that are provided in Appendix C. Procedures for analyzing samples for hazardous constituents described in 40 CFR Part 261, Subparts C and D, can be found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)."

IV. EXPOSURE POTENTIAL

If the investigator observes discharges or releases to surface water or to off-site areas of concern or if other evidence suggests that releases are taking place, he/she may choose to use exposure information (to the extent it is available for the

facility) to: 1) determine the need for further remedial investigations; and/or 2) set priorities for conducting further investigations.

The following types of information are useful in evaluating the exposure potential for surface water or off-site releases:

- Information on the use of the surface water body that receives the release. The investigator should determine the use of the surface water body (e.g., no use, commercial or industrial, irrigation, economically important resource (e.g., shellfish, commercial food preparation, recreation, or drinking). A release is more likely to significantly impact surface water that is used as a drinking water source than surface water in industrial areas that have a commercial or industrial use.

- Information on the location of any drinking or irrigation water intakes listed in public records or otherwise known within a reasonable distance of the release.

- Information on the nature and extent of the contact human and environmental receptors are likely to have with run-off from the facility. For example, if people may contact contaminated soil, run-off or standing water or if constituents may contact sensitive habitats (e.g., habitat of highly productive biological community, or community of rare or endangered plants or animals) or food chain crops.

V. RELEASE DETERMINATION

This section summarizes the unit-specific and site-specific characteristics that should be evaluated to identify surface water releases or releases that may affect off-site human or environmental receptors. Furthermore, it summarizes factors that determine the relative exposure potential of a release. In addition, this section gives examples of site-specific situations that are likely to require further investigation and situations that probably will not require further investigation. These

examples relate the individual unit and site-specific characteristics to each other to describe the process for making decisions on what releases should be further investigated.

A. Summary

Exhibit 4-1 is a checklist that should help the investigator evaluate specific factors to identify releases and determine the relative effect of the release on human health and the environment. In identifying releases, the investigator should consider the series of characteristics described in the chapter and highlighted in the checklist that determine the potential for surface water and off-site releases. These characteristics include: proximity of the facility to surface water and to off-site receptors; factors such as soil type, slope, and vegetation of the intervening terrain as well as rainfall, all of which affect the migration potential of a release; the design and physical condition of solid waste management units at the facility; and characteristics of the waste that may be releasing from the unit. The investigator should examine each of these factors and how they relate to each other in determining the potential for release from units at the facility.

Once the investigator determines that the potential for surface water and/or off-site releases exists, he/she should examine areas surrounding the units of concern and the site as a whole for evidence that releases have occurred or are occurring at a facility. Due to the intermittent nature of most of these releases, it is important to look for physical evidence such as drainage channels with contaminated soils, dead vegetation, etc., that indicates that releases have taken place.

Exhibit 4-1

Checklist for Surface Water/Surface Drainage Releases

	Yes	No
Identifying Releases		
1. Potential for Surface Water/Surface Drainage Releases from the Facility		
o Proximity to Surface Water and/or to Off-site Receptors		
- Could surface run-off from the unit reach the nearest downgradient surface water body?	___	___
- Could surface run-off from the unit reach off-site receptors (e.g., if facility is located adjacent to populated areas and no barrier exists to prevent overland surface run-off migration)?	___	___
o Release Migration Potential		
- Does the slope of the facility and intervening terrain indicate potential for release?	___	___
- Is the intervening terrain characterized by soils and vegetation that allow overland migration (e.g., clayey soils, and sparse vegetation)?	___	___
- Does data on one-year 24-hour rainfall indicate the potential for area storms to cause surface water or surface drainage contamination as a result of run-off?	___	___
o Unit Design and Physical Condition		
- Are engineered features (e.g., run-off control systems) designed to prevent releases from the unit)?	___	___
- Does the operational history of the unit indicate that a release has taken place (e.g., old, closed or inactive unit, not inspected regularly, improperly maintained)?	___	___
- Does the physical condition of the unit indicate that releases may have occurred (e.g., cracks or stress fractures in tanks or erosion of earthen dikes of surface impoundments)?	___	___

Exhibit 4-1 (cont.)

Checklist for Surface Water/Surface Drainage Releases

	Yes	No
o Waste Characteristics		
- Is the volume of discharge high relative to the size and flow rate of the surface water body?	___	___
- Do constituents in the discharge tend to sorb to sediments (e.g., metals)?	___	___
- Do constituents in the discharge tend to be transported downstream?	___	___
- Do waste constituents exhibit moderate or high characteristics of persistence (e.g., PCBs, dioxins, etc.)?	___	___
- Do waste constituents exhibit moderate or high characteristics of toxicity (e.g., metals, chlorinated pesticides, etc.)?	___	___
2. Evidence of Surface Water/Surface Drainage Releases		
o Are there unpermitted discharges from the facility to surface water that require an NPDES or a Section 404 permit?	___	___
o Is there visible evidence of uncontrolled run-off from units at the facility?	___	___
Determining the Relative Effect of the Release on Human Health and the Environment		
1. Exposure Potential		
o Are there drinking water intakes nearby?	___	___
o Could human and/or environmental receptors come into contact with surface drainage from the facility?	___	___
o Are there irrigation water intakes nearby?	___	___
o Could a sensitive environment (e.g., critical habitat, wetlands) be affected by the discharge (if it is nearby)?	___	___

The investigator should also consider the potential for exposure from these releases to determine the relative effect of the release or suspected release on human health or the environment. Information on the exposure potential of these releases provides a basis for prioritizing sites. For example, a release that could affect both surface water use and a community adjacent to the site may make the site a high priority for remedial investigation and eventual clean-up.

B. Examples

Table 4-2 provides examples of situations that are likely to require further investigation and situations that probably will not require further investigation. These examples provide some guidance on making unit-by-unit release determinations. Examples of where further investigation is required generally characterize units with inadequate containment, evidence of off-site release migration, and with some potential for exposure. The examples of where further investigation is not needed illustrate situations where a unit's containment system is properly functioning and where there is no evidence of release.

Although these unit illustrations can be helpful in making determinations, they are only examples and do not characterize the exact situation at a given site. The investigator will need to evaluate all the site-specific factors and use his/her judgment in deciding whether further investigation is warranted.

TABLE 4-2

SURFACE WATER
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Landfills	Closed units, inadequate or deteriorating cover, no run-off control system; drainage patterns indicate contaminant migration (e.g., discolored soil and/or dead vegetation); near downgradient surface water/off-site receptors	Operating units with adequate run-off control systems Closed units with adequate caps or covers; no evidence of run-off from the unit
Waste Piles	Closed units, waste inadequately covered, no run-off control system; drainage patterns indicate migration of contaminants; near surface water/off-site receptors	Operating units with run-off control systems Closed units with adequate caps or covers; no evidence of run-off from the unit
Surface Impoundments	Operating/closed units with inadequate freeboard or deteriorating dikes; drainage patterns indicate migration of contaminants; near surface water/off-site receptors	Older operating/closed units with adequate freeboard and well maintained dikes; no evidence of overtopping or release
Container Storage Areas	Inactive units with leaking containers; visible evidence of soil contamination; no run-off control system; drainage channels indicate migration of hazardous constituents; near surface water/off-site receptors	Operating units with new, well sealed containers; or adequate run-off controls Inactive units with well sealed containers; adequate run-off controls; limited potential for off-site migration of constituents
Land Treatment Units	Inactive/operating units with visible evidence of soil contamination; unit design allows run-off; near downgradient surface water/off-site receptors	Inactive/operating units with adequate run-off controls; limited potential for off-site migration of constituents

Table 4-2 (Continued)

SURFACE WATER
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Tanks	Older concrete units with no secondary containment, some visible deterioration; visible evidence suggests some overland migration of hazardous constituents; near surface water/off-site receptors	Well-designed, constructed units; inspected regularly; no evidence of leaks
	Unit with visible evidence of soil contamination from apparent (or recorded) overflow events or other operational or structural failures; visible evidence suggests some overland migration of hazardous constituents; near surface water/off-site receptors	Older units that shown signs of deterioration; no potential for off-site migration of constituents
Incinerators	Evidence of recurring spills that result from waste handling operations; drainage channels leading from the unit indicate contaminant migration; near surface water/off-site receptors	Design ensures containment of spills that could occur during waste handling operations
Class I/ IV Injection Wells	Evidence of recurring spills that result from waste handling operations; drainage channels leading from the unit indicate contaminant migration; near surface water/off-site receptors	Design ensures containment of spills that could occur during waste handling operations

CHAPTER FIVE

AIR

I. INTRODUCTION

The site investigation for air should determine whether solid waste management units at the facility have released or are likely to have released hazardous wastes or constituents to the air. Owners or operators of units with identified releases or that have a substantial likelihood of a release will be required to conduct further investigations to actually determine the extent of a release(s) and/or to characterize the release and begin developing a corrective measures program.

In general, two types of air releases can occur at solid waste management units:

- o Releases that are continuous in nature, and
- o Releases that are intermittent or catastrophic in nature.

This guidance is primarily concerned with evaluating the likelihood and significance of continuous releases. It is assumed that all units that expose hazardous waste to the ambient atmosphere have air releases; the investigator will need to use judgment in determining whether these releases are significant enough to warrant further investigation. For some units it may be relatively easy to make these determinations; for other units, these determinations may be more difficult.

Because the comprehensive investigations called for in the second phase of the corrective action process require a considerable investment of time and resources for both the owner or operator and for the agency, the PA/SI should serve the dual role of

identifying situations which merit further investigations for air releases while at the same time avoiding unnecessary investigations.

This chapter describes the factors the investigator should consider in evaluating specific units and the facility as a whole for their potential to cause air releases. It then describes the kinds of evidence the investigator should look for to determine that a release has taken place and factors to consider in assessing the potential for releases to threaten human health and the environment.

II. POTENTIAL FOR AIR RELEASES FROM THE FACILITY

Three factors are important in assessing the potential for significant air releases from a facility. They are:

- Unit characteristics, such as size (surface area and depth), type and use;
- Types of wastes/constituents in the unit; and
- Environmental and geographic conditions (temperature, wind speed, etc.) that affect exposure resulting from the release.

This section describes each of these factors in greater detail.

A. Unit Characteristics that Affect the Potential for Air Releases

When conducting the site investigation for air, Agency personnel should assess both RCRA-regulated and non-regulated units and should focus the investigation on operating units. Operating units have the greatest potential for air releases because they actively expose wastes to the air on a continuous basis. Wastes in closed, inactive units are usually covered. There may be some exposure to the air if a cover has eroded or

broken down, but air releases resulting from these situations are likely to be insignificant.

When assessing the potential for releases, the key factors to examine include:

- Unit size. The size of a unit determines the mass of potential contaminants available for release. In addition, volatilization rates are likely to be larger from open units (e.g., surface impoundments and open tanks) with large surface areas and shallow depths.

- Purpose of the unit (treatment, storage, or disposal). In general, units in which active treatment is occurring have the greatest potential for air releases. In many cases, treatment is designed to promote volatilization of constituents. In other cases, this is not the main purpose of the treatment method in use. However, the resultant mixing and movement of wastes leads to high volatilization rates.

- Design of the unit. Units in which wastes are in direct contact with the atmosphere have a higher potential for releases than closed or covered units.

- Current operational status. The nature of air releases is such that the majority of the mass available for release will be released shortly after the waste is placed in the unit. Thus, as mentioned, operating units are of greater concern than closed units. This is particularly true for unit types and wastes for which volatilization is important. Units with potential particulate releases may continue to release contaminants well after closure, especially if the unit has been poorly maintained.

- Unit specific factors. There are specific design and operational factors associated with each unit type which are useful in evaluating the possible magnitude of a potential release. These factors are summarized in Table 5-1.

In addition to considering the individual unit sizes, the investigator should be aware of the total area used for solid waste management at a facility. Although individual units may have small releases, the total release from a facility can be significant. Table 5-1 lists specific considerations for particularly important unit types.

Table 5-1

UNIT POTENTIAL FOR AIR RELEASES
AND MECHANISMS OF RELEASE

Unit Type	Characteristics and Mechanisms of Release
Operating Surface Impoundments	o Wastes directly exposed to atmosphere promotes vapor phase emissions o Large surface areas and shallow depths promote increased volatilization o Mechanical treatment methods (such as aeration) increase volatilization
Open Roofed Tanks	o Wastes directly exposed to atmosphere (promotes vapor phase emissions) o Mechanical treatment or frequent mixing will increase volatilization
Landfills	o Volatilization of vapor phase constituents through the sub-surface and daily/permanent cover o Poor or no daily cover increases volatilization o Open trench fill operations allow direct exposure of waste to atmosphere o Volatile gases transported by convection of biogenic gases released via routine landfill venting (particularly important in sanitary/hazardous mixed fills) o Particulate releases generated by machinery during filling operations o Particulate releases due to wind erosion of cover and/or exposed wastes
Land Treatment Units	o Wastes normally in direct contact with atmosphere o Application techniques which maximize waste contact with atmosphere, such as surface spreading or spray irrigation promote increased volatilization o Particulate releases due to wind erosion
Waste Piles	o Particulate emissions from uncovered waste piles o Location of waste pile in open area with no erosion protection promotes particulate generation o Waste handling activities on and around pile increase emissions o Volatile emissions are likely to be rare, but can occur based on waste composition

Table 5-1 (cont.)

UNIT POTENTIAL FOR AIR RELEASES
AND MECHANISMS OF RELEASE

Unit type	Characteristics and Mechanisms of Release
Drum Storage Areas	o Vaporization from drums frequently left open to atmosphere or from poorly sealed drums o Vapor emissions from areas containing leaking drums
Covered Tanks	o Volatile releases from pressure venting, poorly sealed access ports, or improperly operated and maintained valves and seals.
Incinerators	o Stack emissions of particulates o Stack emissions of volatile constituents High temperatures may cause volatilization of low vapor pressure organics and metals o Volatile releases via malfunctioning valves during incinerator charging
Non-RCRA Wastewater Treatment Ponds and Tanks	o Low concentration wastes may volatilize due to large surface area and active waste treatment. Releases can be significant due to generally large treatment capacities
Other Design and Operating Practices	o Inadequate spill collection systems promote intermittent air releases o Lack of vapor collection systems for use during container/tank cleaning operations o Absence of dust suppression or particulate control measures

In assessing a unit's potential for air release, the investigator should be aware of the importance of interactions between the various unit characteristics listed above and the characteristics of the wastes placed in the unit. It is important to examine how these two factors combine to result in an air release. For example, a facility may have several large operating surface impoundments, suggesting a potential for large air releases. However, if the facility is a steel manufacturer treating only spent pickle liquor in these ponds, it is unlikely any air release will occur because the hazardous constituents in the waste are non-volatile, soluble metals.

The following section discusses the waste and constituent-specific factors the investigator should consider in assessing a waste's potential to release airborne constituents.

B. Types of Waste Contained in the Unit

Only certain hazardous constituents have a significant potential for air releases. This section identifies these constituents and the factors that affect the magnitude of their release.

Volatile constituents of concern for air releases include organic vapors and volatile metals (e.g., arsenic and mercury). Table 5-2 lists a select number of hazardous chemical compounds which EPA's Office of Air Quality Planning and Standards (OAQPS) considers to be of prime concern with respect to vapor phase air releases. The table also lists the RCRA waste codes for waste streams that contain these constituents to aid in their identification. While these wastes are of primary concern, many

TABLE 5-2

HAZARDOUS CONSTITUENTS OF CONCERN AS VAPOR RELEASES

Hazardous Constituent	RCRA Waste Codes
Acetaldehyde	K001,U001
Acrolein	K012
Acrylonitrile	K011,K012,K013,U009
Allylchloride	F024,F025
Benzene	F024,F025,K001,K014,K019,K083,K085,K103,K105
Benzyl chloride	K015,K085,P028
Carbon Tetrachloride	F001,F024,F025,K016,K016,K020,K021,K073,U211
Chlorobenzene	F001,F002,F024,F025,K015,K016,K085,K105
Chloroform	F002,F024,F025,K009,K010,K016,K019,K020,K073, K021,K029,U044
Chloroprene	F024,F025
Cresols	F004,U052
Cumene (isopropylbenzene)	U055
1,4-dichlorobenzene	F002,F024,F025,K016,K085,K105,U072
1,2-dichloroethane	K018,K019,K020,K029,K030,K096,F024,F025,U077
Dichloromethane	F001,F002,F024,F025,K009,K010,K021,U080
Dioxin	F020,F021,F022,F023,F028
Epichlorohydrin	K017,K019,K020,U041
Ethylbenzene	F003
Ethylene oxide	U115
Formaldehyde	K009,K010,K038,K040,U122
Hexachlorobutadiene	F024,F025,K040,K016,K018,K030,U128
Hexachlorocyclopentadiene	F024,F025,K032,K033,K034,U130
Hydrogen cyanide	F007,F009,F010,K013,K060

TABLE 5-2 (cont.)

HAZARDOUS CONSTITUENTS OF CONCERN AS VAPOR RELEASES

Hazardous Constituent	RCRA Waste Codes
Hydrogen flouride	
Hydrogen sulfide	
Maleic anhydride	K023,K093,U147
Methyl acetate	
N-Dimethylnitrosamine	U100
Naphthalene	F024,F025,K001,K035,K060,K087,U165
Nitrobenzene	F004,K025,K083,K103,U169
Nitrosomorpholine	
Phenol	K001,K022,K087,U188
Phosgene	P095
Phthalic anhydride	K016,K023,K024,K093,K094,U190
Polychlorinated biphenyls	K085
Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260	
Propylene oxide	
1,1,2,2-tetrachloroethane	F024,F025,K016,K019,K020,K021,K030,K095,K096,U209
Tetrachloroethylene	F001,F002,F024,F025,K016,K018,K109,K020,K021,U210
Toluene	F005,F024,F025,K015,K036,K037,U220
1,1,1-trichloroethane	F001,F002,F024,F025,K019,K020,K028,K029,K073,K095, K096,U226
Trichloroethylene	F001,F002,F024,F025,K016,K018,K019,K020,U228
Vinylchloride	K019,K020,K023,K029,K028,F024,F025,U043
Vinylidenechloride	F003,F025,K019,K020,F024,K029,U078
Xylenes	F020,U239

other wastes have the potential to volatilize. Therefore, where there is a large quantity of waste, the investigator should address both total volatile organic compounds (VOC) emissions as well as emissions of the specific compounds listed in Table 5-2.

Table 5-3 lists hazardous constituents that are of special concern for particulate air releases. Particulate emissions from solid waste management units can contain organic material, heavy metals, or both. The heavy metals shown in Table 5-3 are predominantly associated with particulate releases, although both arsenic and mercury may be present as vapor phase releases due to their relatively high vapor pressures. Similarly, the organic compounds shown in Table 5-2 may also be found adsorbed or bound to soil and/or other particulate matter releases.

The investigator should examine all available information on wastes handled at the facility to determine the presence of any of the wastes or constituents referenced above.

C. Waste Characteristics that Affect the Magnitude of Release

The physical form of the waste contained in a solid waste management unit will determine to a great extent the potential for air releases from the unit. Wastes may be solid, dilute aqueous solutions, dilute organic solutions, or concentrated solutions. Air releases from solid wastes, such as those placed in landfills or waste piles, will be governed by different principles than govern releases from liquid wastes.

The concentration of specific constituents in each unit is another factor governing the potential magnitude of air releases. The higher the concentration of a particular constituent present

TABLE 5-3

HAZARDOUS CONSTITUENTS OF CONCERN AS PARTICULATE RELEASES

Hazardous Constituent	RCRA Waste Codes
Arsenic	D000,D004,K060,K021,K084,P010, P011,P012
Asbestos	U013
Beryllium	D000,D006,P015
Cadmium	D000,D006,F006,F007,F008,F009, F061,F062, F064,F065,F067,F068,F069
Chromium	D000,D007,F006,F007,F008,F009,F002, F064,F069,F086,
Lead	D000,D008,F006,F009,K003,K044,K048, K052,K061,K062,K064,K069 K086,P110
Mercury	D008,K071,K106
Nickle	F006,F007,F008,F009

in a unit, the greater is its potential for significant air release. However, the intrinsic potential for a constituent to volatilize depends on chemical and physical properties that vary greatly between different constituents. Accordingly, a highly concentrated solution of one constituent may result in a lower release potential than a dilute concentration of another constituent.

As indicated earlier, the two types of emissions of greatest concern are volatiles and particulates. Each type of emission has its own set of characteristics which can help the investigator assess the potential magnitude of a release. These characteristics are discussed below and summarized in Table 5-4, which outlines the likely unit types and appropriate parameters to consider when evaluating airborne releases from different types of waste streams.

1. Volatile Emissions

Constituent-specific physical and chemical parameters are very important indicators of the potential magnitude of a vapor-phase release. In some situations, these parameters can be used to develop constants which can provide the investigator with a useful means of quantifying relative release potential. The parameters most important when assessing the volatilization of a constituent include the following:

- Water solubility. The solubility in water indicates the maximum concentration at which a constituent can dissolve in water at a given temperature. This value can help the investigator estimate the distribution of a constituent between the dissolved aqueous phase in the unit and the undissolved solid or immiscible liquid phase. Considered in combination with the constituent's vapor pressure, it can provide a relative assessment of the potential magnitude of volatilization of a constituent from an aqueous

TABLE 5-4

PARAMETERS AND MEASURES FOR USE IN EVALUATING POTENTIAL AIR RELEASES OF HAZARDOUS WASTE CONSTITUENTS

Emission and Waste Type	Units of Concern[1]	Useful Parameters and Measures
A. Vapor Phase Emissions		
-- Dilute Aqueous Solution[2]	Surface Imp., Tanks, Containers	Solubility, Vapor Pressure, Partial Pressure,[3] Henry's Law
-- Conc. Aqueous Solution[2]	Tanks, Containers, Surface Imp.	Solubility, Vapor Pressure, Partial Pressure, Raoults Law
-- Immiscible Liquid	Containers, Tanks	Vapor Pressure, Partial Pressure
-- Solid	Landfills, Waste Piles, Land Trt.	Vapor Pressure, Partial Pressure, Octanol/Water Partition Coeff.
B. Particulate Emissions		
-- Solid	Landfills, Waste Piles, Land Trt.	Particle Size Distribution, Site Activities, Management Methods

1/ Incinerators are not specifically listed on this table because of the unique issues concerning air emissions from these units. Incinerators can burn all the forms of waste listed in this table. The potential for release from these units is primarily a function of incinerator operating conditions and emission controls, rather than waste characteristics.

2/ Although the octanol/water partition coefficient of a constituent is usually not an important characteristic in these waste streams, there are conditions where it can be critical. Specifically, in waste containing high concentrations of organic particulates, constituents with high octanol/water partition coefficients will adsorb to the particulates. They will become part of the sludge or sediment matrix, rather than volatilizing from the unit.

3/ Applicable to mixtures of volatile components.

environment (see Appendix J for the water solubility of a number of chemicals and see the discussion of Henry's Law constant below).

- Vapor pressure. Vapor pressure measures the pressure of vapor in equilibrium with a pure liquid. It is best used in a relative sense; constituents with high vapor pressures are more likely to have significant releases than those with low vapor pressures, depending on other factors such as relative solubility and concentrations (i.e. at high concentrations significant releases can occur even though a constituents vapor pressure is relatively low).

- Octanol/water partition coefficient. The octanol/water partition coefficient indicates the tendency of an organic constituent to sorb to organic constituents in the soil or waste matrices of a unit. Vapors with high octanol/water partition coefficients will adsorb readily to organic carbon, rather than volatilizing to the atmosphere. This is particularly important in landfills and land treatment units, where high organic carbon contents in soils or cover material can significantly reduce the release of vapor phase constituents.

- Partial pressure. For constituents in a mixture, particularly in a solid matrix, the partial pressure of a constituent will be more significant than the pure vapor pressure. In general, the greater the partial pressure, the greater the potential significance of the release. Partial pressures will be difficult to obtain. However, when waste characterization data is available partial pressures can be estimated using methods commonly found in engineering and environmental science handbooks.

The investigator should examine each of the above parameters in combination with each other and with the specific characteristics of the unit of interest. Several measures are available to help the investigator with this assessment, provided they are applied to the appropriate waste types and units. These measures include:

- Henry's Law constant. Henry's law constant is the ratio of the vapor pressure of a constituent and its aqueous solubility (at equilibrium). It can be used to assess the relative ease with which the compound may be removed from the aqueous phase via vaporization. It is accurate only when used concerning low concentration wastes in aqueous solution. Thus it will be most useful when the

unit being assessed is a surface impoundment or tank containing dilute wastewaters. Generally, when the value of Henry's Law constant is less than 10E-7 atm-m^3 the constituent will not volatilize from water. As the value increases the potential for significant vaporization increases, and when it is greater than 10E-3 rapid volatilization will occur. Henry's Law constants for many potentially significant constituents are listed in Appendix J.

- Raoult's Law - Raoult's Law can be used to predict releases from concentrated aqueous solutions (i.e. solutions over 10% solute). This will be most useful when the unit of concern entails container storage, tank storage, or treatment of concentrated waste streams.

For solid wastes, imiscible liquids, and wastes disposed of in landfills, land treatment, or waste piles there are no simple measures that can be used to assess the potential for volatilization of a constituent. The investigator will need to consider the appropriate chemical, physical, and unit parameters, and then use his/her best judgment in determining the potential for release. Appendix J summarizes key chemical and physical parameters the investigator should consider when assessing the different waste/unit combinations.

2. Particulate Emissions

The likelihood of particulate releases at hazardous waste management facilities is generally associated with landfills, land treatment units and/or waste piles. The severity of particulate releases is governed by different parameters than those that affect vapor-phase releases.

For particulate releases, the size distribution of the particles in the release plays an important role in both dispersion and actual exposure. Large particles will settle out of the air more rapidly than small particles, thus they will not travel as

far off-site or be diluted as much by dispersion. Very small particles (i.e., those that are less than 5 microns in diameter), are considered to be respirable and thus present a greater health hazard than larger particles. Particulate releases containing a high proportion of small particles are therefore of greatest concern. The inspector should examine the source of the particulate emissions to obtain information on particle size.

Three mechanism are particularly important in generating particulate releases at hazardous waste facilities, and the investigator should examine the site for evidence that these practices are occurring. They are:

- Wind erosion: In general, the unit's location will affect the potential for the wind to erode wastes in the unit. The unit's location and orientation with respect to the prevailing winds and large structures on site will determine the unit's vulnerability to wind erosion and the potential for particulate releases. Agency personnel should determine the location of SWMUs of concern with respect to prevailing winds and the use of wind screens (both natural and man-made) and daily covers to determine the unit's vulnerability to wind erosion.

- Reentrainment by moving vehicles on soil, paved, and unpaved roads: Vehicles moving on site can generate fugitive dust emissions. Factors affecting dust emissions generation include the amount of daily vehicular traffic at the site and the average size of the vehicles.

- Operational activities: These include the movement of soils or hazardous wastes by dozers, loading by front-end loaders, and other activities associated with landfilling or waste piles may cause fugitive dust emissions.

D. Environmental and Geographic Factors

In assessing the potential significance of air releases from a solid waste management unit or a facility with several units, the investigator needs to consider environmental factors that can affect the concentrations of airborne contaminants. These include:

- Windspeed and direction;
- Temperature; and
- Amount of rainfall.

These factors directly impact the concentration of released constituents. Under the right conditions, they can reduce the importance of a release. However, under other conditions, they may increase the effects of the release.

Atmospheric dispersion can rapidly dilute the mass of a contaminant released from a solid waste management unit. In many cases, a contaminant's concentration decreases as the distance from the source of release increases. However, specific atmospheric conditions such as wind speed, temperature and geographic factors such as the moisture content and porosity of soils, can greatly limit the amount of dispersion. When assessing air releases, the investigator needs to consider whether any of these conditions are important at the site in question. Conditions and factors that affect dispersion include:

- Narrow valleys and urban areas containing large buildings (artificial canyons);
- Areas dominated by off-shore breezes;
- Areas with atmospheric conditions known to frequently result in inversions (low average wind speeds, mountain basins, etc.
- Hot dry areas that are conducive to rapid evaporation.

The investigator may be able to obtain some of this information from local weather data bases as part of the preliminary assessment. However, collection of this information will probably require a site inspection.

III. EVIDENCE OF AIRBORNE RELEASES

Positive identification of airborne contaminants at a site is an important part of determining whether or not a significant air release has occurred. However, because air releases are difficult to observe and monitor, it will generally be difficult to make a positive identification. In addition, it is doubtful that adequate monitoring data will be readily available for a specific site. The investigator will most likely have to rely on circumstantial evidence based on available data, or, in some cases, on sampling data collected during the site investigation.

A. Available Data Collection Methods and Sources

The most useful information for determining if a release is or has occurred is on-site monitoring data. As mentioned above, it is unlikely that this type of information will be available for most sites. Sources of this information include the owner or operator, EPA regional offices, state, county or local departments of health, or OSHA. Even if this information is available, the investigator should carefully assess its usefulness, paying particular attention to proper collection of background samples and the time and weather conditions when samples were taken.

Other useful data includes citizen complaints concerning both odors coming from the facility and observed particulate emissions. It is important to note however, that the absence of odor does not imply the absence of vapor releases, since many constituents have high odor thresholds. OSHA may have, in addition to air monitoring data, collected health or personal monitoring data

from site workers. This information may also suggest the presence of a release.

B. The Role of Sampling

Agency personnel should monitor with portable instruments and/or take enough air samples during the site investigation(s) to complete a Hazard Ranking score. Appendix B describes how to sample to obtain a Hazard Ranking Score. In addition, there may be situations where the investigator may want to take samples or require the owner or operator to take samples. For example, the investigator may wish to sample the waste in the unit to obtain specific information on the types and concentrations of specific hazardous constituents in the unit to get a better indication of the potential magnitude of an air release. Other reasons to conduct additional sampling would be to: confirm a finding that a release or a potential air release from the unit warrants further investigation; compel a remedial investigation; or write a permit condition.

The investigator may choose to use monitoring equipment, such as an organic vapor analyzer or a forced air particulate filter, around the perimeter of the unit to confirm a suspected release from a unit. The investigator may also choose to take air samples with sample tubes, such as carbon tenex tubes, and analyze the samples with GCMS. However, without the proper collection of background samples as well as time series sampling, the use of such monitoring or sampling equipment during the course of a site inspection can not confirm that a release is not taking place.

The investigator can require the owner or operator to sample or monitor in certain situations. These are likely to be situations where the Agency can specify the number and location of samples, sampling or monitoring methods, and the procedures for analyzing samples.

IV. POTENTIAL FOR EXPOSURE

Exposure information, to the extent it is available for the facility, will help in assessing whether and to what extent air releases from the facility could affect human health and the environment. Again, at this stage in the corrective action process, the information and the analysis will largely be qualitative. However, this information can help in determining the need to conduct further remedial investigations, (e.g., depending on the population density around the site); and in setting priorities for the remedial investigation stage of the process.

Population density and distance from the source are the primary factors in determining the significance of a potential exposure. Distance should be measured from the unit(s) containing the waste rather than from the facility boundary, although total facility emissions from all solid waste management units must also be kept in mind. Most importantly, the investigator should consider the density of the population residing near the site, as well as transients such as workers in factories, offices, restaurants, motels, or students. Travelers that pass through the area should not be included in any count.

The most significant exposure potential will occur in situations when there is a high population density very close to the

site. However, because concentrations can be quite high, even low density populations in such close proximity to the site are of concern. Dispersion can significantly reduce concentrations as distance from a site increases. Thus, the significance of high population density at larger distances from the site is reduced.

The investigator needs to consider the relationship between distance, concentration, and population density in evaluating the significance of an exposure potential. An additional factor to consider is the population located along the line of the most predominant wind direction at a site. Because the PA/SI is primarily concerned with continuous releases, populations located along this line downwind of the site are more likely to receive significant exposures than populations located along other vectors.

If the investigator determines that a solid waste management unit is releasing large volumes of unsaturated hydrocarbons, he/she may need to consider population density over a much larger area. These constituents contribute to the formation of photochemical smog and ozone, which, in combination with other regional pollutant releases, can cause significant exposures over a wide geographic area.

V. RELEASE DETERMINATIONS

This section summarizes the unit-specific and site-specific characteristics that should be evaluated to identify airborne releases. Furthermore, it summarizes factors that determine the relative exposure potential of an air release. In addition, this section gives examples of site-specific situations that are likely

to require further investigation and situations that probably will not require further investigation. These examples relate the individual unit and site-specific characteristics to each other to describe the process for making decisions on what releases should be further investigated.

A. Summary

Exhibit 5-1 is a checklist that should help the investigator evaluate specific factors to identify releases and determine the relative effect of the release on human health and the environment. In identifying releases, the investigator should consider the series of factors highlighted in the checklist that determine the potential for air releases from the facility. These factors include:

- Unit characteristics, such as size (surface area and depth), type and use;
- Types and characteristics of wastes placed in the unit; and
- The potential of locational factors and constituent-specific factors to affect the significance of the release.

The first section of this chapter described all of these factors in some detail in order to give the investigator a better basis for determining whether a release is significant or not. While many units can be expected to have air releases, most of these releases -- either because of certain unit characteristics, concentrations of specific constituents in the waste, atmospheric dispersion characteristics, distance to receptors, etc. -- will not be significant enough to warrant further investigation. The investigator will need to consider each of the factors described

Exhibit 5-1

Checklist for Air Releases

	Yes	No
Identifying Releases		
1. Potential for Air Releases from the Facility		
o Unit Characteristics		
- Is the unit operating and does it expose wastes to the atmosphere?	___	___
- Does the size of the unit (e.g., depth and surface area) create a potential for air release?	___	___
o Does the unit contain waste that exhibits a moderate or high potential for vapor phase release?		
- Does the unit contain hazardous constituents of concern as vapor releases?	___	___
- Do waste constituents have a high potential for volatilization (e.g., physical form, concentration, and constituent-specific physical and chemical parameters that contribute to volatilization)?	___	___
o Does the unit contain waste and exhibit site conditions that suggest a moderate or high potential for particulate release?		
- Does the unit contain hazardous constituents of concern as particulate releases?	___	___
- Do constituents of concern as particulate releases (e.g., smaller, inhalable particulates) have potential for release via wind erosion, reentrainment by moving vehicles, or operational activities?	___	___
- Are particulate releases comprised of small particles that tend to travel off-site?	___	___

Exhibit 5-1 (cont.)

Checklist for Air Releases

	Yes	No
o Do certain environmental and geographic factors affect the concentrations of airborne contaminants?		
- Do atmospheric/geographic conditions limit constituent dispersion (e.g., areas with atmospheric conditions that result in inversions)?	___	___
- Is the facility located in a hot, dry area?	___	___
2. Evidence of Air Releases		
o Does on-site monitoring data show that releases have occurred or are occurring (e.g., OSHA data)?	___	___
o Have particulate emissions been observed at the site?	___	___
o Have there been citizen complaints concerning odors or observed particulate emissions from the site?	___	___

Determining the Relative Effect of the Release on Human health and the Environment

1. Exposure Potential		
o Is a populated area located near the site?	___	___

in Section I of this chapter in determining the potential for significant releases from solid water management units at the facility.

Once the investigator determines that the potential for air releases exists, he/she should examine evidence of air releases (to the extent it is available) that identifies the presence of releases. Evidence may include existing air monitoring data, observed particulate emissions, or citizen complaints about odors coming from the site.

The investigator should also consider the potential for exposure from airborne releases. Information on the exposure potential of off-site air releases provides a basis for prioritizing sites. For example, if a populated area is not located close to a site with an air problem, then further investigation may not be necessary. Alternatively, a site adjacent to a populated area (e.g., a residential development) may be a priority for a remedial investigation.

B. Examples

Table 5-5 provides examples of situations that are likely to require further investigation and situations that probably will not require further investigation for air releases. These examples provide some guidance on making unit-by-unit release determinations. Examples of where a further investigation is needed generally illustrate units, such as open roofed tanks or surface impoundments, that contain large quantities of highly volatile organic wastes and that probably have ongoing and highly concentrated releases, or characterize other types of units with a high

TABLE 5-5

AIR
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Surface Impoundments (RCRA and non-RCRA)	Surface impoundments that contain large quantities of highly volatile wastes listed in Table 6-2.	Units closed by removal of wastes. Units handling wastewaters containing only non-volatile metals.
Open Roofed Tanks	Open tanks containing large quantities of highly volatile wastes listed in Table 6-2.	Units treating or storing wastewaters containing only non-volatile metals.
Landfills	Landfills with inadequate daily cover and compaction operating procedures in areas with strong prevailing winds in close proximity to populations.	Monofills of wastes which contain only non-volatile metals and which use daily cover and compaction to control particulates. Monofills of wastes containing only organic constituents having high octanol/water partition coefficients and which use daily cover and compaction to control particulate emissions. Small landfills closed in accordance with closure provisions in §264.310. Units which have been closed for a long period of time and that are being managed using a stable cover system.
Land Treatment	Land treatment units containing large quantities of highly volatile wastes listed in Table 6-2 and located in areas with strong prevailing winds and nearby populations	Closed units which were used experimentally or for a single application of waste and for which wind erosion controls are being used.

TABLE 5-5 (Continued)

AIR
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Waste Piles	Outdoor, uncovered waste piles receiving large quantities of wastes listed in Table 6-3 and located in areas with strong prevailing winds and nearby populations.	Most indoor piles. Outdoor piles properly covered, located in areas which minimize wind erosion, and which contain only constituents with very low vapor pressures.
Drum Storage Areas	Outdoor storage areas poorly maintained with evidence of frequent open drum storage, poorly sealed drums, and/or leaking drums containing wastes listed in Table 6-2. Unit located in area with strong prevailing winds and nearby populations.	Most indoor storage areas. Well maintained outdoor storage areas in which wastes containing low vapor pressure constituents are stored.
Covered Tanks	Poorly maintained units with cracks, corrosion, or poorly sealed access ports which contain large volumes of highly volatile wastes listed in Table 6-2. Unit located in area with strong prevailing winds and nearby populations.	Most covered units.
Incinerators*	All unpermitted units.	Well maintained and permitted incinerators with inspection records detailing proper operation.

*By design all incinerators release gases and some particulate matter into the atmosphere. The investigator should thoroughly investigate all units for improper and hazardous releases.

potential for air release and that are located near populated areas. Examples of situations where a further investigation is not needed illustrate units that do not contain hazardous constituents of concern for air releases, or units that are properly maintained and have adequate waste containment systems.

Although these unit illustrations can be helpful in making determinations, they are only examples and do not characterize the exact situation at a given site. Therefore, the investigator will need to evaluate all the site-specific factors and use his/her judgment in deciding whether or not further remedial investigations are warranted.

CHAPTER SIX

SUBSURFACE GAS

I. INTRODUCTION

The site investigation for subsurface gas should determine whether releases of subsurface gas from solid waste management units at the facility are occurring. Owners or operators of units with identified releases or that have a substantial likelihood of a release will be required to conduct further investigations to actually determine the extent of a release(s) and/or to characterize the release and begin developing a corrective measures program.

In general, EPA's primary concern is to determine whether there are gas releases that could reach explosive levels in on-site or off-site buildings. Therefore, the primary constituent of concern in the subsurface gas site investigation is methane, due to its explosive properties and frequency of detection in subsurface gas. However, other potentially hazardous subsurface gases may threaten human health or the environment in some situations and the investigator may identify conditions conducive to their generation.

As with the other media, the investigations required in the second phase of the corrective action process to determine the nature and extent of subsurface gas release will be very resource intensive for both the owner or operator and for the Agency. Therefore, it is important for the PA/SI to identify units that do not require further investigation as well as those situations that clearly warrant further investigations for subsurface gas releases.

This chapter first describes the factors the investigator should consider in evaluating specific units for their potential to generate subsurface gas. Only certain wastes and certain types of units are capable of generating subsurface methane. Therefore, if the investigator determines that either the wastes in the unit are not conducive to methane generation or the type of unit does not permit subsurface gas releases, he/she does not need to look further for evidence of release.

However, if the waste/unit combination has a high potential for generating methane, the investigator should determine the potential for gas releases to move through the subsurface to on- and off-site buildings and may take samples in these buildings to obtain evidence of a release. The chapter describes these situations and provides the investigator with guidance on when sampling might be useful in making a determination that further investigations are required.

II. POTENTIAL FOR SUBSURFACE GAS RELEASES

As mentioned above, waste type and unit type and design are the primary factors affecting the potential for subsurface gas releases from a solid waste management unit. If either the type of unit or type of waste in the unit precludes methane generation, the investigator does not need to look further for evidence of release. Each of these factors is discussed in greater detail below.

A. Types of Waste Placed in the Unit

The investigator should determine whether wastes conducive to the generation of methane are present in solid waste management

units at the facility. Anaerobic decomposition of organic wastes generates large volumes of methane gas under the proper conditions. When methane is generated in SWMUs, the potential exists for it to accumulate under pressure and to migrate from the unit, thereby posing a significant risk of explosion. The methane may also be mixed with other volatile hazardous constituents present in the unit, and may increase the potential hazard associated with the accumulated gas.

Conventional solid waste refuse is the primary waste type of concern for generating methane gas. The volume of gas produced in the unit depends upon both the quantity and types of refuse present. Units may either contain primarily refuse or a mixture of refuse and hazardous wastes. Units where refuse has been codisposed with hazardous wastes may pose the most serious threat, because of the potential for other volatile hazardous wastes to be mixed with the methane.

Higher volumes of methane will be generated at units containing larger quantities of refuse. The volume of gas generated also depends upon the age of the unit and how long the waste has been in the unit. Methane generation will increase slowly after waste emplacement to a maximum generation rate which will slowly decline as the waste decomposes. The active lifetime for methane generation from units closed as landfills depends primarily upon the amount of precipitation infiltrating into the waste. Landfills in the arid Southwest will generally produce methane for 20-30 years, while landfills in the humid Southeast may only generate methane for 4-5 years after waste emplacement. Landfills

with higher moisture content provide a more suitable environment for bacterial degradation.

The temperature of waste at the time of emplacement can also affect the methane generation rate. Wastes placed in landfills in the winter at temperatures below 10°C may not generate methane for up to 5 years, even in climates with warm summers, due to the insulating properties of the waste. The waste can remain at temperatures low enough to effectively inhibit bacterial decomposition for several years. The types of refuse disposed in the unit can also affect the rate of methane generation. Descriptions of the two types of refuse that can generate methane and a brief discussion of other wastes that may mix with methane follow:

- Rapid Decomposable Refuse. Rapid decomposable wastes will produce methane at high rates under the proper conditions. These wastes include organic sludges from wastewater treatment facilities, food wastes, garden wastes, and other vegetable matter (e.g., grass clippings, tree trimmings, etc.). The high concentration of readily degradable organic compounds in these wastes provides an ideal energy source for the anaerobic organisms that produce methane.

- Slow Decomposable Refuse. Slow decomposables will not produce the immediate high volumes of methane possible with the rapid decomposables. However, they will produce methane at lower rates in the unit over a longer period of time, and thus also pose a substantial threat. Slow decomposables include paper, cardboard, wood, leather, some textiles, and several other assorted organic materials. Slow decomposables are commonly a large percentage of municipal refuse, and should be present in large quantities if the SWMUs contain municipal refuse.

- Other Wastes of Concern. Volatile organic wastes disposed in the units of concern for subsurface gas releases may volatilize into the pockets of methane gas produced by refuse decomposition and increase the hazard associated with the gas. This situation could occur where liquids such as solvents have been disposed of in landfills or waste piles in high concentrations. These compounds are not likely to migrate from the unit unless methane is present to act as a carrier. However, certain volatile

compounds would be likely to form mixtures with methane where wastes are codisposed. The volatile wastes and waste constituents of concern for subsurface gases are the same as those that have the potential for air releases. These are listed in Table 5-1.

B. Types of Units with a Potential for Subsurface Gas Releases

Only two types of solid waste management units are of concern in the subsurface gas site investigation due to their potential for generating methane or other subsurface gases of concern. These units include active and closed landfills and units that have been closed as landfills. Each is described more fully below:

- Landfills. Landfills are the most likely SWMUs to generate subsurface gases resulting in a release. The underground deposition of decomposable refuse with or without hazardous constituents provides a large source of gas and a driving force that can carry other gases venting to the atmosphere and/or migration horizontally as a subsurface gas. Closing landfills with impermeable caps without venting systems retards the release of these landfill gases as surface emissions. In these instances, a large percentage of those gases migrate laterally through soils along confining barriers such as ground water tables, clay layers, synthetic liners, and compacted covers. This migration could cause significant accumulations of potentially explosive gas in facility structures or in buildings off-site.

- Units closed as landfills. Inactive SWMUs that have been closed as landfills may generate subsurface gases. These sites include closed surface impoundments or waste piles containing decomposable or volatile wastes with in place impermeable covers. Similar to landfills, gases generated in sites closed as landfills may migrate laterally, possibly causing significant accumulations. However, closed surface impoundments and waste piles generally contain small quantities of decomposable and volatile wastes and are at shallow depths. Thus, significant gas migration and subsequent subsurface gas releases are less likely for these units than for landfills.

Other solid waste management units are unlikely to have subsurface gas releases because gases generated in the units are more likely to vent to the atmosphere than to concentrate in the unsaturated soil. Barriers (e.g., paving, compaction, or installation of covers for closure), can permit some lateral migration to occur from these units. Generally, however, this lateral migration will be limited to the extent of the barrier. Therefore, the potential for releases from shallow SWMUs is usually insignificant.

Although depth is one of several considerations for determining the potential for releases, the type of SWMU establishes potential migration pathways and the waste characteristics create the driving force for subsurface gas movement. Exhibits 6-1 and 6-2 illustrate some potential pathways from a few types of SWMUs.

III. MIGRATION OF SUBSURFACE GAS TO ON-SITE AND OFF-SITE RECEPTORS

Certain natural conditions and engineered structures can act as barriers or conduits to subsurface gas migration. For example, venting systems can prevent subsurface gas migration, while underground utility lines can promote migration.

The investigator should examine the site to determine how natural or engineered structures affect the migration of subsurface gas to on- and off-site receptors.

A. Geologic and Hydrogeolgic Factors that Affect Migration

1. Natural Barriers

Gas migration can be impeded or prevented by geologic barriers. Soil effective porosity and permeability are perhaps the

EXHIBIT 6-1

SUBSURFACE GAS GENERATION/MIGRATION IN A LANDFILL

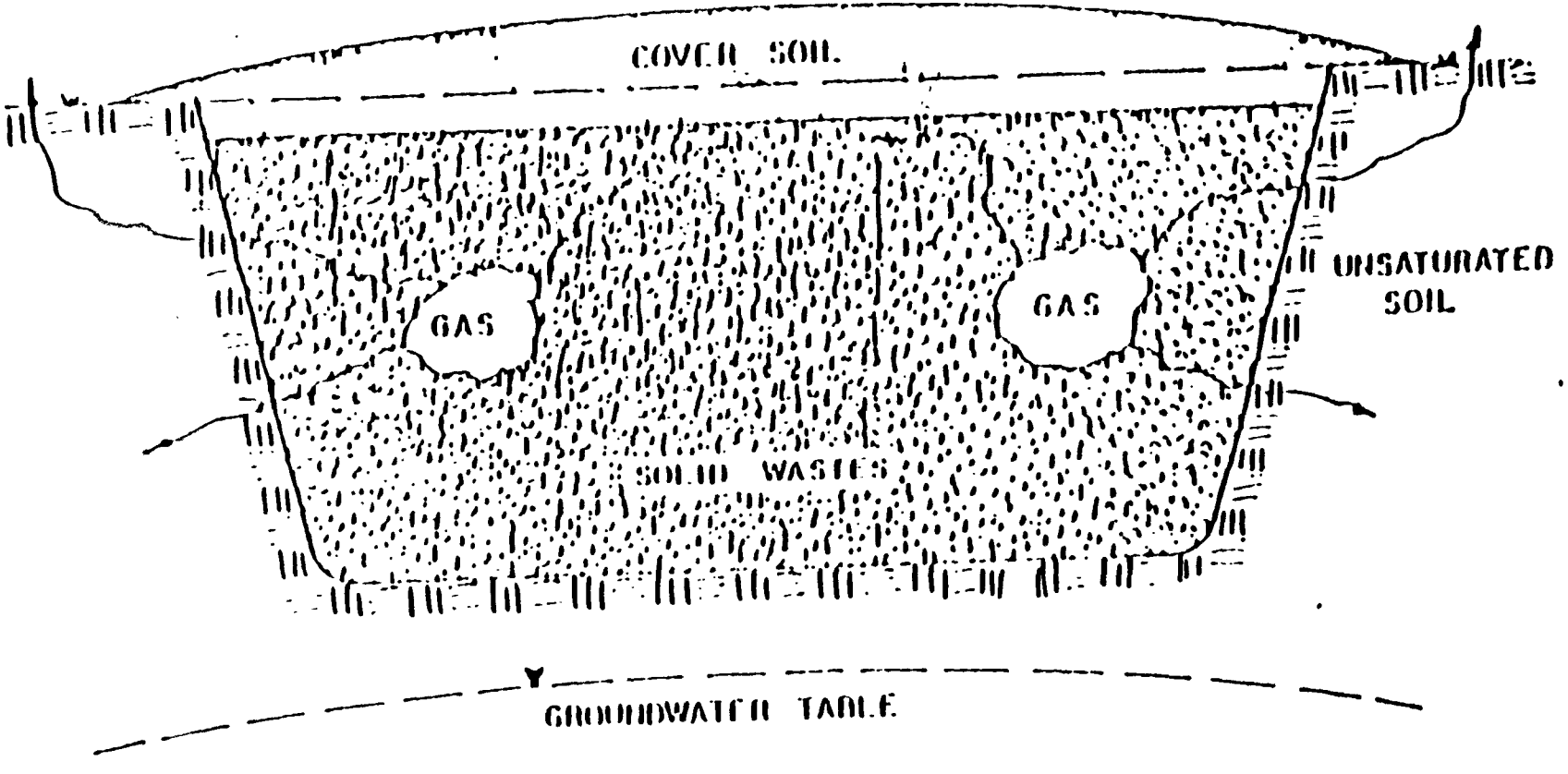
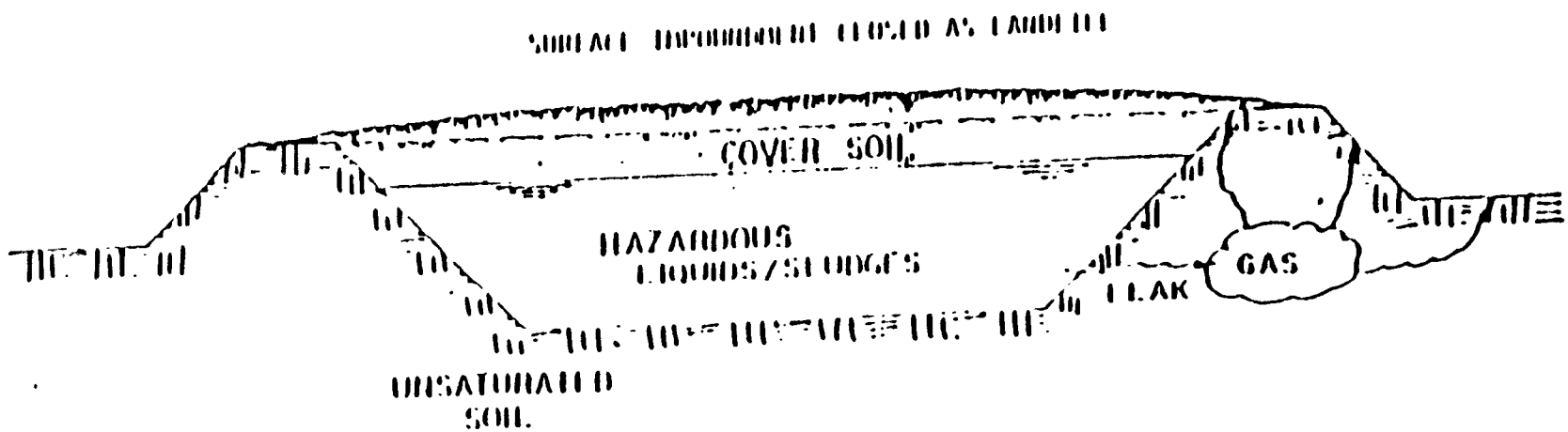


EXHIBIT 6-2

SUBSURFACE GAS GENERATION/MIGRATION FROM UNITS CLOSED AS LANDFILLS



most important natural barriers to gas migration. Porosity is a function of soil type, moisture content, and weathering. Permeability is determined by soil type. Tight, uniform soils such as clays, at least to the depth of the unit, are good barriers. Sandy soil will likely encourage venting of gas to the atmosphere with little chance of horizontal migration. However, sand and gravel lenses below a less permeable soil layer are excellent conduits for subsurface gas migration. Climatic conditions such as precipitation or freezing can also affect gas migration. Both factors tend to reduce the porosity of surface soils preventing upward gas migration.

Gas migration can also be impeded or prevented by hydrologic barriers such as surface water, ground water, and saturated soils. Subsurface gas does not penetrate ground water and surface water. Thus, if there is a lake or perennial stream between the unit and any structure, migration is unlikely. A high ground water table will restrict migration to the shallow unsaturated zone. High water tables also allow for the use of trenches as gas control devices.

Subsurface gases that come in contact with these conditions will tend to migrate towards the pathway of least resistance, usually through a porous soil. As an uncommon example, if a landfill or site closed as a landfill was surrounded (along all sidewalls and bottom) by water, gas migration beyond the confining barrier would not be expected. In most cases, however, ground water and saturated soils only partially surround a unit (usually along the bottom). Thus, lateral or vertical migration can occur.

2. Engineered Structures

Engineered barriers include:

- o Synthetic liners that effectively contain wastes;
- o Slurry walls that border landfill units; and
- o Gas control or venting systems.

The investigator should review documents on the design and operation of these systems and inspect the systems to confirm that they are functioning properly. Subsurface gas control systems are almost exclusively associated with disposal sites for municipal-type waste rather than for hazardous waste. These systems are probably only present at hazardous waste facilities where municipal waste is codisposed with hazardous waste or where a sanitary landfill is operating at the same site.

Gas migration from SWMUs may be facilitated by man-made structures located within the facility or near the property boundary. Examples of such structures include:

- o Underground power transmission lines;
- o Sewer and drainage pipes; and
- o Underground telephone cables.

Gases migrating from a SWMU may enter these structures and travel great distances to buildings or other engineered structures, resulting in a potential hazard. The investigator should inspect the facility blueprints and check with utilities (to the extent that these tasks were not completed during the PA) to ensure that no structures are present that could increase the likelihood of gas migration to on- and off-site receptors.

IV. EVIDENCE OF SUBSURFACE GAS RELEASES

If the investigator determines, based on his inspection of the unit, that there is a significant potential for the unit to generate methane and that geologic and hydrogeologic conditions at the site tend to promote gas releases, he/she should examine structures on and off-site for evidence of these releases. If such conditions do not exist, the investigator does not need to look for evidence of methane releases.

A. Role of Sampling in Making These Determinations

In some cases more extensive sampling or monitoring in on-site or off-site buildings may be needed to compel a remedial investigation or write permit conditions. Monitoring and sampling does not confirm that there are no releases from a unit, only that there were no releases at the time of sampling or monitoring. The investigator should be sure that incidental methane sources (such as gas stoves) do not interfere with the results.

Methane field monitoring can be performed with combustible gas meters, or by volumetric sampling and subsequent analysis by gas chromatography. A combustible gas meter will provide a reliable determination of combustible gas concentrations. It will not indicate whether or not the combustible gas detected is actually methane gas. However, if the waste in the unit could generate methane, then it is likely that the meter is detecting methane. Any significant gas reading (whether it is methane or not) is of concern. Reported experience indicates 0 to 100 percent of the lower explosive limit (LEL) detection to be accurate with hotwire catalytic combustion principal instruments. However, many users

prefer instruments with the capability of determining both the 0 to 100 percent LEL and the percent methane present when the concentration exceeds 100 percent LEL (i.e., 5 percent methane). Dual scale instruments are available for this application. Typically, the 0 to 100 percent gas scale uses a thermal conductivity sensor. The carbon dioxide in landfill-generated gas is reported to interfere with the thermal conductivity sensor, so the investigator should not assume that readings above 100 percent LEL are accurate. Some of the single scale 0 to 100 percent LEL instruments can also be fitted with air dilution tubes or valves to allow readings of the percent gas when the concentration is above the LEL. Instructions on the use and calibration of these instruments should be obtained from the manufacturer. Table 6-1 indicates subsurface gas sampling and testing methods and specific technical requirements for each method.

Monitoring in a facility structure (i.e., those structures within the facility's property line) should normally be done after the building has been closed overnight or for a weekend, and when the soil surface has been wet or frozen for several days. Monitoring or sampling should be done in confined areas where gas may accumulate, such as basements, crawl spaces, near floor cracks, attics, around subsurface utility connections, and in untrapped drain lines. Gas recovery and gas control equipment (if any) should be evaluated as part of a monitoring program. The results, location, date, and time for each sample should be recorded. The investigator should take safety precautions before and during monitoring in buildings.

Table 6-1

SUBSURFACE GAS SAMPLING INFORMATION

Purpose	Sampling Location/ Media	Method	Technical Requirements
To identify explosive levels of methane in structures; to identify the need for emergency action	On-site and off-site buildings and structures; sampling should be undertaken in confined areas of buildings	Combustible gas meter	Must be calibrated
To confirm adequate operation of landfill gas venting system	Vents and exhausts from landfill venting system	Combustible gas meter	Must be calibrated
To identify the presence of refuse in units with unknown waste composition	Landfills and units closed as landfills	Visual inspection of waste matrix	None
To confirm the presence of toxic constituents mixed with subsurface gas	Venting systems; on-site and off-site structures	Collect gas sample with Tenex tube; analyze with GC/MS	Requires lab and qualified technical personnel

V. RELEASE DETERMINATIONS

This section summarizes the unit-specific and site-specific characteristics that should be evaluated to identify subsurface gas releases that migrate to on-site or off-site buildings. In addition, this section gives examples of site-specific situations that are likely to require further investigation and situations that probably will not require further investigation. These examples relate the individual unit and site-specific characteristics to each other to describe the process for making decisions on which releases to further investigate.

A. Summary

Exhibit 6-3 is a checklist that should help the investigator evaluate specific factors to identify subsurface gas releases or to identify sites that have a high potential for gas release and gas migration to on-site or off-site buildings. In identifying releases, the investigator should consider the series of factors described in the chapter and highlighted in the checklist to determine the potential for subsurface gas releases from the unit. The primary factors include: whether or not the unit contains waste that generates methane or generates volatile constituents that may migrate along with methane; and the unit's potential to generate subsurface gas releases. The investigator should examine these unit-specific characteristics and how they relate to each other in determining the potential for subsurface gas releases from units at the facility.

Exhibit 6-3

Checklist for Subsurface Gas Releases

	Yes	No
Identifying a Release		
1. Potential for Subsurface Gas Releases		
o Does the unit contain waste that generates methane or generates volatile constituents that may be carried by methane (e.g., decomposable refuse/volatile organic wastes)?	___	___
o Is the unit an active or closed landfill or a unit closed as a landfill (e.g., surface impoundments and waste piles)?	___	___
2. Migration of Subsurface Gas to On-site or Off-site Buildings		
o Are on-site or off-site buildings close to the unit?	___	___
o Do natural or engineered barriers prevent gas migration from the unit to on-site or off-site buildings (e.g., low soil permeability and porosity hydrogeologic barriers/liners, slurry walls, gas control systems)?	___	___
o Do natural site characteristics or man-made structures (e.g., underground power transmission lines, sewer pipes/sand and gravel lenses) facilitate gas migration from the unit to buildings?	___	___
Determining the Relative Effect of the Release on Human Health and the Environment		
1. Exposure Potential		
o Does building usage (e.g., residential, commercial) exhibit high potential for exposure?	___	___

Once the investigator determines that the wastes in the unit and the type of unit are conducive to subsurface gas releases, he/she should decide whether methane gas could migrate to on-site or off-site structures. Gas migration can be impeded or prevented by natural barriers or engineered structures. Natural barriers, such as ground water and surface water prevent lateral gas migration. Engineered structures, such as liners and slurry walls may also prevent gas migration. The investigator should also determine whether gas migration could be facilitated by man-made structures. For example, gas may travel through an underground power transmission line to an on-site or off-site building. If the investigator determines that there is a significant potential for methane migration to buildings, he/she may choose to sample to confirm that there is a release from the unit. However, sampling should not be necessary during most site investigations.

B. Examples

Table 6-2 provides examples of situations that are likely to require further investigation and situations that probably will not require further investigation for subsurface gas releases. These examples provide some guidance on making unit-by-unit release determinations. Examples of where a further investigation is warranted include units that have a high potential for methane generation and methane migration to on-site or off-site structures, or where sampling in these structures indicates a gas problem. Examples that illustrate situations where a further investigation probably is not required include units where either the waste in

Table 6-2
SUBSURFACE GAS
UNIT ILLUSTRATIONS

Unit Type	Further Investigation Needed	Further Investigation Not Needed
Closed Landfills or Other Units Closed as Landfills	o Units which contain hazardous constituents co-disposed with refuse where gas venting systems or barriers to gas migration will not prevent migration to on-site or off-site structures o Units where sampling in either on-site or off-site structures indicates dangerous levels of methane gas has migrated from the unit o Units where conduits may facilitate gas migration to on-site or off-site structures from units known to be generating methane gas	o Units that never contained slow or rapid decomposable refuse o Units where inspection confirms a properly functioning gas venting system o Units where natural or engineered barriers will prevent migration of methane to structures o Units in humid climates that have been closed for over 5 years o Units in arid climates that have been closed for over 30 years
Active Landfills	o Units which contain hazardous wastes co-disposed with biodegradable refuse where gas venting systems or barriers to gas migration do not function properly. Potential for gas to migrate to nearby structures o Units where sampling indicates that dangerous levels of methane have migrated from the unit to structures	o Units with a properly functioning gas venting system o Units that have never contained biodegradable refuse or only insignificant quantities

the unit or barriers are not conducive to methane generation or migration.

Although these unit illustrations can be helpful in making determinations, they are only examples and are unlikely to characterize the exact situation at a given site. For example, at many sites with a potential methane problem, natural or engineered barriers may only impede, not prevent, gas migration. In these cases it will be difficult to determine if gas could migrate to on-site or off-site structures. Therefore, especially in these marginal situations, the investigator will need to evaluate all the site specific factors and how they relate to each other to determine whether a remedial investigation is required.

A P P E N D I C E S

A P P E N D I X A

P R E L I M I N A R Y A S S E S S M E N T D A T A

TABLE A-1

RCRA SOURCES OF INFORMATION ON
SITE DESCRIPTION/MANAGEMENT PRACTICES

RSI #3

- o Type of unit
- o Location of each unit at facility on a topographical map
- o Whether the unit is operating
- o When the unit closed

Part B

- o Interim status ground water monitoring data
- o Description of existing contamination
- o Records on prior releases

Compliance Inspections

- o Results of owner/operator monitoring data
- o Significant violations of operating standards

Exposure Assessment

- o Summary of work-related injuries and illnesses

TABLE A-2

RCRA SOURCES OF INFORMATION ON WASTE CHARACTERISTICS

RSI #3

- o General information on waste quantities
- o Description of waste

Part B

- o List of wastes for each unit
- o Description of unit sizes and volume of waste received

Exposure Assessment

- o Estimate of annual amount of waste received and pretreatment processes used
- o Presence of municipal-type waste/quantities/locations/dates received (relates to sub-surface gas problems)
- o Summary of waste analyses not already submitted

TABLE A-3

RCRA SOURCES OF INFORMATION ON
POLLUTANT DISPERSAL PATHWAYS

Part B

The following information is submitted on all units, regardless of whether the units are landbased or not. This information will be used to evaluate both "old" and regulated units.

- o Facility description (location of units, drains, ditches, surface waters, etc.)
- o Topographical map
- o Procedures to prevent release
- o Contingency plans in the event of a release
- o Access control to active units (relates to possible direct contact)

The following information must be submitted if the facility is seeking a permit for a land-based unit. This information will assist in evaluating both "old" landfills and impoundments as well as regulated units.

- o Characterization of uppermost aquifer (flow rate and direction)
- o Ground water table contour maps
- o Flood plain data
- o Prevailing wind direction/speed
- o Procedures to prevent accidental ignition or reaction
- o Plans to control wind dispersal of particulate matter
- o Description of corrective action taken at units
- o Systems to control run-on and run-off
- o Procedures to prevent overtopping
- o Structural integrity of dikes

Exposure Assessment Submission

- o Existing aerial photography
- o On site accidents involving waste transport or subsurface gas
- o Regional map showing areas of ground water recharge/ discharge
- o Map showing location of all surface water bodies on site and within 3 miles (including ditches and water diversion structures)
- o Nearby stream and river velocities
- o Description of system used to monitor surface water quality/ summary of surface water quality data
- o Description of NPDES permits for the facility/ description of violations

TABLE A-3 (continued)

RCRA SOURCES OF INFORMATION ON
POLLUTANT DISPERSAL PATHWAYS

Exposure Assessment Submission (continued)

- Description of known releases to ground water/surface water/air/soil/subsurface gas; extent of contamination
- Map of location of any structures or underground conduits within 1000 feet of property boundary
- Description of any monitoring or control mechanisms for subsurface gas release
- General description of the unsaturated zone surrounding the unit (soil type, thickness)
- Areas on the site that are paved, capped, or otherwise made less permeable to gas
- Results and procedures used for any soil sampling
- Description on type of release causing soil contamination
- Description of spill/clean-up procedures for routine spills/releases
- Procedures used to minimize number/serverity of transportation accidents

TABLE A-4

RCRA SOURCES OF INFORMATION ON
TARGET POPULATION CHARACTERISTICS

Exposure Assessment Submission

- Summary of risk assessment for liability insurance
- Land use and zoning maps for 4 mile radius
- Previous contamination of public/private supplies for 3 mile radius
- Known food chain contamination from land-based unit seeking permit
- Major uses of surface waters
- Location of intakes and population served
- Known food chain contamination from land-based unit seeking permit
- Population within a four mile radius
- Known food chain contamination from contaminated soils
- Maps showing nearby access and on-site transportation routes (relates to possible direct contact to hazardous materials)

TABLE A-5

REGIONAL CERCLA CONTACTS

Region	Name	Telephone Number
I	Ruth Leabman	223-1725 (FTS) 617-223-1725 (DDD)
II	Perry Katz	264-8678 (FTS) 212-264-8678 (DDD)
III	Ed Skernolis	597-4779 (FTS) 215-597-4779 (DDD)
IV	Joel Veader	257-2234 (FTS) 404-881-2234 (DDD)
V	Don Josif	886-0393 (FTS) 312-886-0393 (DD)
VI	Jo Johnson-Ballard	729-9742 (FTS) 214-767-9742 (DDD)
VII	Gail Wright	758-6864 (FTS) 913-236-6864 (DDD)
VIII	Dave Schaller	564-1532 (FTS) 303-293-1532 (DDD)
IX	Jeff Rosenblum	454-7513 (FTS) 415-974-7513 (DDD)
X	Debbie Flood	399-2722 (FTS) 206-442-2722 (DDD)

TABLE A-6

GENERAL SOURCES OF INFORMATION

Site Management Practices

1. TSCA, OSHA, NPDES Compliance Reports
2. Municipal/County/City--Public Health Safety Inspections
3. Fire Marshall
4. Aerial Photography

Waste Quantities and Characteristics

1. CERCLA 103(c) Notification
2. RCRA Enforcement Compliance Reports
3. Existing Owner/Operator Sampling/Monitoring Data
4. NPDES Permits Application/Compliance Reports
5. Industrial Process References
6. Professional Organizations
7. Interviews with Current and Former Employees, Residents

Identification of Pollutant Dispersal Pathways

1. RCRA Enforcement Compliance Reports
2. USGS Geological Atlas
3. State Geological Survey Offices
4. Local USDA Soil Conservation Service Maps, Surveys, and Publications
5. Local Universities/Colleges
6. USGS Hydrological Atlas
7. Local Well Drillers
8. National Weather Service
9. National Climatic Center, Ashville, NC
10. HUD, Flood Insurance Rate Maps
11. Local Property Insurance Agencies
12. Local Fire Marshalls

Target Population Characteristics

1. Maps and Aerial Photographs
   a. EPA Aerial Photographic Analysis
   b. USGS Land Use Maps
   c. Local Planning Commissions/Agencies
2. Local/Municipal Water Departments
3. State/Local Well Installation Registration Offices (if required by the State law)
4. County Agricultural Extension Offices
5. State Fish and Wildlife Agenceis
6. Local Naturalists or Environmental Groups
7. Local Well Drillers
8. GEMS Population and Housing Data Retrieval System (available through USEPA only)

APPENDIX B

CERCLA HAZARD RANKING SYSTEM SAMPLING PROCEDURES

[TO BE INCLUDED]

APPENDIX C

LIST OF INDUSTRIES AND THEIR RELATED HAZARDOUS WASTES

[PREPARED BY SCS ENGINEERS FOR THE LAND DISPOSAL BRANCH OF THE OFFICE OF SOLID WASTE]

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
01	CASH GRAINS	SPENT DEGREASER. SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT IN MANUFACTURE OF VARIOUS INSECTICIDES AND PHOTOGRAPHIC FILMS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U209	1,1,2,2-TETRACHLOROETHANE (ACETYLENE TETRACHLORIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS PESTICIDES AND INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U084	1-3 DICHLOROPROPENE
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, PHARMACEUTICALS, DISINFECTANTS, SOLVENTS, RUBBER, AND GASOLINES. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U101	2,4 DIMETHYL PHENOL (XYLENOL)
		SPENT DEFOLIANT AND WEED KILLER. CHEMICAL FAMILY IS CARBOXYLIC.	U240	2-4 DICHLOROPHENOXYACETIC
		BY-PRODUCTS FROM THE MANUFACTURE OF OR SPENT INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P004	ALDRIN (HHDN))
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS INSECTICIDES OR FUMIGANTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUNDS.	P006	ALUMINUM PHOSPHIDE (ALP)
		BY-PRODUCTS FROM THE MANUFACTURE OF ARSENATES, INSECTICIDES, AND DYES. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P011	ARSENIC PENTOXIDE (ARSENIC (V) OXIDE)
		USED IN THE MANUFACTURE OF PIGMENTS, CERAMIC ENAMELS, INSECTICIDES, RODENTICIDE, AND HERBICIDE. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P012	ARSENIC TRIOXIDE (ARSENIC (III) OXIDE)
		USED AS A FUMIGANT AND DISINFESTANT OF VARIOUS DOMESTIC CROPS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U029	BROMOMETHANE (METHYL BROMIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES SUCH AS DDT. CHEMICAL FAMILY IS ALDEHYDE.	U034	CHLORAL (TRICHLOROACETALDEHYDE)
		PRIMARY USE IS IN THE MANUFACTURE OF INSECTICIDES, TANNING AGENTS, AND RUBBER. CHEMICAL FAMILY IS ALDEHYDE.	U053	CROTONALDEHYDE (2-BUTENAL)
		PRIMARY USES INCLUDE PESTICIDE FOR CONTROLLING LEAF ROLLERS AND OTHER INSECTS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U060	DDD (DICHLORODIPHENYLDICHLORO-)
		PRIMARILY USED AS AN INSECTICIDE FOR COTTON AND TOBACCO CROPS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U061	DDT (DICHLORODIPHENYLTRICHLORO-)
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		PRIMARILY USED IN THE PRODUCTION OF INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P037	DIELDRIN (DEOD)

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
01	CASH GRAINS	PRIMARILY FOUND IN INSECTICIDES AND ACARICIDE (FOR MITES AND TICKS). CHEMICAL FAMILY IS ESTER.	P039	DISULFOTON (O,O-DIETHYL S-[2-(ETHYL-THIO)
		PRIMARILY USED AS AN INSECTICIDE. CHEMICAL FAMILY SUBSTITUTED HYDROCARBON.	P050	ENDOSULFAN
		PRIMARILY USED AS AN INSECTICIDE. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	P051	ENDRIN
		PRIMARILY FOUND IN INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P059	HEPTACHOR
		PRIMARILY USED IN THE MANUFACTURE OF INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U129	HEXACHLOROCYCLOHEXANE (GCCH)
		PRIMARILY FOUND IN CONTACT INSECTICIDES. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	P062	HEXAETHYL TETRA PHOSPHATE (HETP)
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROCKET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMINE.	U133	HYDRAZINE (DIAMINE)
		PRIMARILY USED AS AN INSECTICIDE (ESPECIALLY COTTON). CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	P071	METHYL PARATHION
		PRIMARILY USED AS A SYSTEMATIC INSECTICIDE. CHEMICAL FAMILY IS AMIDE.	P085	OCTAMETHYLPYROPHOSPHORAMIDE (SCHRADAN)
		PRIMARILY USED IN MANUFACTURE OF INSECTICIDES AND ACARICIDE. CHEMICAL FAMILY IS ESTER.	P089	PENTACHLORONITROBENZENE (PCNB)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, FUNGICIDES, DISINFECTANTS, BACTERIOSTAT, AND RUBBER. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U244	THIURAM (TETRAMETHYLTHIURAM DISULFIDE)
		USED IN THE MANUFACTURE OF MEDICINE, PLATED METAL, AND INSECTICIDES. SPENT CHEMICAL REAGENT. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P121	ZINC CYANIDE
		PRIMARY USAGE IS AS A SOIL FUMIGANTS FOR NEMATODES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U066	1,2-DIBROMO-3-CHLOROPROPANE
		SPENT ORGANIC SOLVENT, BY-PRODUCT FROM THE MANUFACTURE OF VARIOUS DYES, INSECTICIDES, AND METAL POLISHES. CHEMICAL FAMILIY IS HALOGENATED AROMATIC HYDROCARBONS.	U070	1,2-DICHLOROBENZENE (O-DICHLOROBENZENE)
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	U071	1,3-DICHLOROBENZENE (M-DICHLOROBENZENE)
0131	COTTON	PRIMARILY USED AS AN INSECTICIDE FOR COTTON AND TOBACCO CROPS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U061	DDT (DICHLORODIPHENYLTRICHLORO-

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
0131	COTTON	USED AS AN INSECTICIDE (COTTON AND VEGETABLES IN EARLY STAGES O F GROWTH). CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P123	TOXAPHENE (OCTACHLORO CAMPHENE)
0132	TOBACCO	PRIMARILY USED AS AN INSECTICIDE FOR COTTON AND TOBACCO CROPS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U061	DDT (DICHLORODIPHENYLTRICHLORO-)
		PRIMARILY USED AS A HERBACIDE WITH APPLICATION TO TOBACCO AND S UGAR BEETS. CHEMICAL FAMILY IS KETONE.	U148	MALEIC HYDRAZIDE (1,2-DIHYDRO-3,6-PYRI-DAZINEDI)
07	AGRICULTURAL SERVCS.	SPENT DEGREASER. SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT I N MANUFACTURE OF VARIOUS INSECTICIDES AND PHOTOGRAPHIC FILMS. C HEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U209	1,1,2,2-TETRACHLOROETHANE (ACETYLENE TETRACHLORIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS PESTICIDES AND INSE CTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U084	1-3 DICHLOROPROPENE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULT URAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U167	1-NAPHTHYLAMINE
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, PHARMACEUTICA LS, DISINFECTANTS, SOLVENTS, RUBBER, AND GASOLINES. CHEMICAL FA MILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U101	2,4 DIMETHYL PHENOL (XYLENOL)
		PRIMARILY USED AS A PLANT HORMONE, HERBICIDE, DEFOLIANT. CHEMI CAL FAMILY IS CARBOXYLIC ACID.	U232	2,4,5-TRICHLOROPHENOXYACETIC
		USED AS A FUNGICIDE, HERBICIDE, AND DEFOLIANT. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U231	2,4,6 TRICHLOROPHENOL
		SPENT DEFOLIANT AND WEED KILLER. CHEMICAL FAMILY IS CARBOXYLIC.	U240	2-4 DICHLOROPHENOXYACETIC
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULT URAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U168	2-NAPHTYLAMINE
		PRIMARILY USED AS SOIL FUMIGANT, CHEMICAL INTERMEDIATE, LABORAT ORY REAGENT AND SOLVENT. CHEMICAL FAMILY IS ALCOHOL.	P102	2-PROPYN-1-OL (PROPARGYL ALCOHOL)
		BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS PHARMACEUTICALS, HERBICIDES, AND POLYMERS, EXPECIALLY POLYURETHANE AND POLYESTER RESINS. CHEMICAL FAMILY IS ALDEHYDE.	P003	ACROLEIN (ACRYLIC ALDEHYDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF OR SPENT INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P004	ALDRIN (EHHDN)
		BY-PRODUCTS FROM THE MANUFACTURE AND TREATMENT OF PHARMA- CEUTICALS, HERBICIDES, PLASTICIZERS, AND GLYCEROL. CHEMICAL FAMILY IS ESTER.	P005	ALLYL ALCOHOLS (2-PROPEN-1-OL)

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07	AGRICULTURAL SERVCS.	BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS INSECTICIDES OR FUMIGANTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUNDS.	P006	ALUMINUM PHOSPHIDE (ALP
		USED IN THE MANUFACTURE OF VARIOUS ARSENATES, AND GLASS. USED AS A WOOD PRESERVATIVE AND VEGETATION DEFOLIANT. CHEMICAL FAMILY IS MINERAL ACID.	P010	ARSENIC ACID (ORTHOARSENIC ACID
		BY-PRODUCTS FROM THE MANUFACTURE OF ARSENATES, INSECTICIDES, AND DYES. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P011	ARSENIC PENTOXIDE (ARSENIC (V) OXIDE
		USED IN THE MANUFACTURE OF PIGMENTS, CERAMIC ENAMELS, INSECTICIDES, RODENTICIDE, AND HERBICIDE. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P012	ARSENIC TRIOXIDE (ARSENIC (III) OXIDE
		USED AS A FUMIGANT AND DISINFESTANT OF VARIOUS DOMESTIC CROPS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U029	BROMOMETHANE (METHYL BROMIDE
		USED IN THE MANUFACTURE OF VARIOUS RODENTICIDE, FUMIGANTS, AND AS A LEACHING AGENT FOR GOLD AND SILVER ORE. CHEMICAL FAMILY IS INORGANIC SALT.	P021	CALCIUM CYANIDE
		MANUFACTURING BY-PRODUCTS AND/OR SLUDGE FROM THE TREATMENT OF VISCONE RAYON, CELLOPHANE, AND VETERINARY MEDICINES. CHEMICAL FAMILY IS SULFIDE.	P022	CARBON DISULFIDE (CARBON DISULFIDE
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES SUCH AS DDT. CHEMICAL FAMILY IS ALDEHYDE.	U034	CHLORAL (TRICHLOROACETALDEHYDE
		BY-PRODUCTS OF THE MANUFACTURE OF VARIOUS INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U036	CHLORDANE
		POSSIBLE DISTILLATION BY-PRODUCTS OF PHENOL, CHLORONITRO BENZENE, AND ANILINE. SPENT PESTICIDE INTERMEDIATES. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	U037	CHLOROBENZENE (PHENYL CHLORIDE
		VARIOUS SPENT REFRIGERANTS AND PROPELLANTS. BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES AND FLUOROCARBON PLASTICS. SPENT ANALYTICAL LABORATORY REAGENTS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U044	CHLOROFORM (TRICHLOROMETHANE
		BY-PRODUCTS FROM THE MANUFACTURE OF DISINFECTANTS, SURFACTANTS, SALICYLALDHYDES, COUMARIN, AND VARIOUS HERBICIDES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U052	CRESOLS (METHYL PHENOL
		PRIMARY USE IS IN THE MANUFACTURE OF INSECTICIDES, TANNING AGENTS, AND RUBBER. CHEMICAL FAMILY IS ALDEHYDE.	U053	CROTONALDEHYDE (2-BUTENAL
		PRIMARY USES INCLUDE PESTICIDE FOR CONTROLLING LEAF ROLLERS AND OTHER INSECTS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U060	DDD (DICHLORODIPHENYL)ECHLORO-

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07	AGRICULTURAL SERVCS.	PRIMARILY USED AS AN INSECTICIDE FOR COTTON AND TOBACCO CROPS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U061	DDT (DICHLORODIPHENYLTRICHLORO-)
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		SPENT HERBICIDE. CHEMICAL FAMILY IS CARBONATE.	U062	DIALLATE (2,3-DICHLOROALLYL DIISOPRO-)
		PRIMARILY USED IN THE PRODUCTION OF INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	P037	DIELDRIN (HEOD)
		PRIMARILY FOUND IN INSECTICIDES AND ACARICIDE (FOR MITES AND TICKS). CHEMICAL FAMILY IS ESTER.	P039	DISULFTON (O,O-DIETHYL S-[2-(ETHYL-THIO)
		PRIMARILY USED AS AN INSECTICIDE. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	P050	ENDOSULFAN
		PRIMARILY USED AS AN INSECTICIDE. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	P051	ENDRIN
		USED IN THE PRODUCTION OF PHARMACEUTICALS (INCLUDING VETERINARY), PESTICIDES, AND FUNGICIDES. CHEMICAL FAMILY OIS NITRILE.	U238	ETHYL CARBAMATE (URETHANE)
		SPENT LABORATORY REAGENTS. BY-PRODUCT FROM MANUFACTURE OF FERTILIZERS, DYES, EMBALMING FLUIDS, DISINFECTANTS, AND BLEACHES. CHEMICAL FAMILY IS ALDEHYDE.	U122	FORMALDEHYDE (METHYLENE OXIDE)
		PRIMARILY USED IN THE MANUFACTURE OF INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U129	HEXACHLOROCYCLOHEXANE (HCCH)
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROCKET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMINE.	U133	HYDRAZINE (DIAMINE)
		PRIMARILY USED AS A HERBACIDE WITH APPLICATION TO TOBACCO AND SUGAR BEETS. CHEMICAL FAMILY IS KETONE.	U148	MALEIC HYDRAZIDE (1,2-DIHYDRO-3,6-PYRI-DAZINEDI)
		PRIMARILY USED AS AN INSECTICIDE (ESPECIALLY COTTON). CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	P071	METHYL PARATHION
		PRIMARILY USED AS A SYSTEMATIC INSECTICIDE. CHEMICAL FAMILY IS AMIDE.	P085	OCTAMETHYLPYROPHOSPHORAMIDE (SCHRADAN)
		PRIMARILY USED IN MANUFACTURE OF INSECTICIDES AND ACARICIDE. CHEMICAL FAMILY IS ESTER.	P089	PENTACHLORONITROBENZENE (PCNB)
		PRIMARILY USED IN THE MEDICINE AND VETERINARY MEDICINE. CHEMICAL FAMILY IS AMIDE.	U187	PHENACETIN (N-(4-ETHOXYPHENYL)-ACETAMIDE)

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12	BITUMINOUS COAL & LIGNITE MINING	FOUND IN COAL TAR AND IS A BY-PRODUCT OF INCOMPLETE COMBUSTION. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U022	BENZO(A) PYRENE (3-4-BENZOPYRENE
22	TEXTILE MILL PRODUCTS	USED AAS A YELLOW DYE IN PAPER, VARIOUS TEXTILES, AND LEATHERS. IT IS ALSO A FUNGICIDE. CHEMICAL FAMILY IS AMINE.	U014	AZARAMINE (BENZENAMINE
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROCKET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMINE.	U133	HYDRAZINE (DIAMINE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES, TEXTILES, PIGMENTS, VARISHES. SPENT ANALYTICAL LABORATORY REAGENT. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	U144	LEAD ACETATE (ACETIC ACID (LEAD) SALT)
		BY-PRODUCTS FROM THE MANUFACTURE OF POLYESTER AND ALKYL RESINS, PESTICIDES, AND PAPER. CHEMICAL FAMILY IS FURAN.	U147	MALEIC ANHYDRIDE (2,5-FURANEDIONE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF SULFRIC ACID, GLASS, PHOTOGRAPHIC DEVELOPER, AND DYED TEXTILES. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P120	VANADIUM PENTOXIDE (VANADIUM (V) OXIDE
		PRIMARILY USED AS A PRESERVATIVE IN GUMS, GLUES, INKS, PAINTS, TEXTILES, AND LEATHER GOODS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U039	P-CHLORO-M-CRESAL (4-CHLORO-3-METHYL PHENOL
24	LUMBER & WOOD PRODUCTS	USED IN THE MANUFACTURE OF VARIOUS ARSENATES, AND GLASS. USED AS A WOOD PRESERVATIVE AND VEGETATION DEFOLIANT. CHEMICAL FAMILY IS MINERAL ACID.	P010	ARSENIC ACID (ORTHOARSENIC ACID
		PRIMARY USES INCLUDE WOOD PRESERVATIVES AND DISINFECTANTS. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U051	CREOSOTE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF FUNGICIDE, BACTERICIDE, ALGICIDE, HERBICIDE, AND WOOD PRESERVATIVES. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U242	PENTACHLOROPHENOL
26	PAPER AND ALLIED PRODUCTS	USED AAS A YELLOW DYE IN PAPER, VARIOUS TEXTILES, AND LEATHERS. IT IS ALSO A FUNGICIDE. CHEMICAL FAMILY IS AMINE.	U014	AZARAMINE (BENZENAMINE
		BY-PRODUCTS FROM THE MANUFACTURE OF POLYESTER AND ALKYL RESINS, PESTICIDES, AND PAPER. CHEMICAL FAMILY IS FURAN.	U147	MALEIC ANHYDRIDE (2,5-FURANEDIONE
		PRIMARILY USED IN THE MANUFACTURE OF PYROTECHNICS, CERAMICS, GLASS AND PAPER. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P187	STRONTIUM SULFIDE
281	INDUSTRIAL INORGANIC CHEMICALS	BY-PRODUCTS FROM THE MANUFACTURE OF ARSENATES, INSECTICIDES, AND DYES. CHEMICAL FAMILY IS NON-METALLIC OXIDE.	P011	ARSENIC PENTOXIDE (ARSENIC (V) OXIDE
		USED IN THE MANUFACTURE OF PIGMENTS, CERAMIC ENAMELS, INSECTICIDES, RODENTICIDE, AND HERBICIDE. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P012	ARSENIC TRIOXIDE (ARSENIC (III) OXIDE

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281	INDUSTRIAL INORGANIC CHEMICALS	USED IN VARIOUS ELECTROPLATING SOLUTIONS. CHEMICAL FAMILY IS NON-METALLIC CYANIDE.	P013	BARIUM CYANIDE
		BY-PRODUCTS FROM THE MANUFACTURE OF PIGMENTS, CORROSION INHIBITORS, AND COATING FOR LIGHT WEIGHT METALS. CHEMICAL FAMILY IS INORGANIC SALT.	U032	CALCIUM CHROMATE
		USED IN THE MANUFACTURE OF VARIOUS RODENTICIDE, FUMIGANTS, AND AS A LEACHING AGENT FOR GOLD AND SILVER ORE. CHEMICAL FAMILY IS INORGANIC SALT.	P021	CALCIUM CYANIDE
		MANUFACTURING BY-PRODUCTS AND/OR SLUDGE FROM THE TREATMENT OF VISCONE RAYON, CELLOPHANE, AND VETERINARY MEDICINES. CHEMICAL FAMILY IS SULFIDE.	P022	CARBON DISULFIDE (CARBON BISULFIDE)
		BY-PRODUCTS FROM ELECTROPLATING COPPER AND INORGANIC SYNTHESIS INVOLVING THE CYANIDE ION. CHEMICAL FAMILY IS INORGANIC SALT.	P029	COPPER CYANIDE (CUPRIC CYANIDE)
		PRIMARY USES INCLUDE FUMIGANTS, PARASITICIDES, RAT EXTERMINANTS. CHEMICAL FAMILY IS INORGANIC SALT.	U246	CYANOGEN BROMIDE (BROMINE CYANIDE)
		PRIMARILY USED IN DETONATION CAPS. CHEMICAL FAMILY IS ORGANO METALLIC COMPOUND.	P065	MERCURY FULMINATE (MERCURIC CYANATE)
		SPENT CHEMICAL INTERMEDIATE. CHEMICAL FAMILY IS OXIDE.	P076	NITRIC OXIDE (NITROGEN MONOXIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF NITRIC ACID. CHEMICAL FAMILY IS OXIDE.	P078	NITROGEN DIOXIDE
		USED IN INSECTICIDES, FUMIGANTS, GOLD AND SILVER ORE PROCESSING . SPENT ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P098	POTASSIUM CYANIDE
		CHEMICAL FAMILY IS INORGANIC COMPOUND.	P099	POTASSIUM SILVER CYANIDE
		PRIMARILY USED AS A CHEMICAL REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U204	SELENIOUS ACID (SELENIUM DIOXIDE)
		PRIMARILY USED IN MEDICINES (TREATMENT OF SEBORRHEA). CHEMICAL FAMILY IS INORGANIC COMPOUND.	U205	SELENIUM SULFIDE (SULFUR SELENIDE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF GOLD AND SILVER PROCESSING, ELECTROPLATING, HYDROCYANIC ACID, INSECTICIDES, DYES, PIGMENTS, AND CHELATING AGENTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P106	SODIUM CYANIDE
		PRIMARILY USED IN THE MANUFACTURE OF PYROTECHNICS, CERAMICS, GLASS AND PAPER. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P107	STRONTIUM SULFIDE

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281	INDUSTRIAL INORGANIC CHEMICALS	CHEMICAL FAMILY IS INORGANIC COMPOUND.	P113	THALLIC OXIDE (THALLIUM III OXIDE)
		USED IN THE PRODUCTION OF MEDICINES AND AS A INDUSTRIAL CATALYST. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U216	THALLIUM CHLORIDE (THALLOUS CHLORIDE)
		PRIMARILY USED AS AN ANALYTICAL REAGENT AND IN THE PRODUCTION OF PYROTECHNIC CHEMICALS. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U217	THALLIUM NITRATE (THALLOUS NITRATE)
		CHEMICAL FAMILY IS INORGANIC COMPOUND.	P114	THALLIUM SELENITE
		USED IN THE MANUFACTURE OF MEDICINE, RODENTICIDE, PESTICIDE, AND AS AN ANALYTICAL REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P115	THALLIUM SULFATE (THALLOUS SULFATE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF SULFRIC ACID, GLASS, PHOTOGRAPHIC DEVELOPER, AND DYED TEXTILES. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P120	VANADIUM PENTOXIDE (VANADIUM (V) OXIDE)
		USED IN MEDICINES AND AS A RAT POISON. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P122	ZINC PHOSPHIDE
		PRIMARILY USED IN DYE PRODUCTION, GASOLINE, MEDICINES, AND CARROSION INHIBITORS. CHEMICAL FAMILY IS AMINE.	P077	P-NITRO BENZINE (4-NITRO-BENZAMINE)
282	PLASTICS,SYNTHETICS, FIBERS(EXCEPT GLASS	POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, RUBBER, POLYESTER RESINS, AND FUNGICIDE. CHEMICAL FAMILY IS KETONE.	U166	1,4-NAPHTHOQUINONE (1,4-NAPHTHALENEDIONE)
		BY-PRODUCTS FROM THE MANUFACTURE OF FIBERGLASS, ACRYLIC RESINS, AND REINFORCED PLASTICS. CHEMICAL FAMILY IS PEROXIDE.	U160	2-BUTANONE PEROXIDE (METHYL ETHYL KETON PEROXIDE)
		USED IN INSECTICIDES, FUMIGANTS, GOLD AND SILVER ORE PROCESSING. SPENT ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U191	2-PICOLINE (2-METHYL-PYRIDINE)
		PRIMARILY USED AS A CURING AGENT FOR POLYURETHANES AND EPOXY RESINS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U158	4-4-METHYLENE BIS (2-CHLORO-AN
		BY-PRODUCTS FROM THE MANUFACTURE OF RUBBER AND CERTAIN DYES SUCH AS MICROSCOPY STAINS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U021	BENZIDINE ((1,1-BIPHENYL)-4,4 DIAMINE)
		BY-PRODUCTS FROM THE MANUFACTURE OF POLY SULFIDE RUBBER. SPENT SOLVENT. CHEMICAL FAMILY IS ETHER.	U024	BIS(2-CHLORO ETHOXY) METHANE (DICHLOROETHYL FORMAL)
		SPENT ION-EXCHANGE RESINS AND LABORATORY REAGENTS. CHEMICAL FAMILY IS ETHER.	P016	BIS(CHLOROMETHYL) ETHER (DICHLOROMETHYL ETHER)

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282	PLASTICS,SYNTHETICS, FIBERS(EXCEPT GLASS	MANUFACTURING BY-PRODUCTS AND/OR SLUDGE FROM THE TREATMENT OF VISCONE RAYON, CELLOPHANE, AND VETERINARY MEDICINES. CHEMICAL FAMILY IS SULFIDE.	P022	CARBON DISULFIDE (CARBON DISULFIDE)
		VARIOUS SPENT REFRIGERANTS AND PROPELLANTS. BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES AND FLUOROCARBON PLASTICS. SPENT ANALYTICAL LABORATORY REAGENTS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U044	CHLOROFORM (TRICHLOROMETHANE)
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		PRIMARILY USED AS A MONOMERIC PLASTICIZER FOR VINYL AND CELLULO SIC RESINS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON .	U107	DI-N-OCTYL PHTHALATE
		BY-PRODUCTS OF THE MANUFACTURE OF VARIOUS EOPXY AND PHENOXY RES INS. CHEMICAL FAMILY IS EPOXIDE.	U041	EPICHLOROHYDRIN ((-CHLORO-2,3-EPOXY PROPANE)
		BY-PRODUCTS OF THE MANUFACTURING IN THE FOLLOWING INDUSTRIES: P HARMACEUTICALS, ION EXCHANGE AND PROTECTIVE COATINGS, ADHESIVES , AND SURFACTANTS. CHEMICAL FAMILY IS IMINES.	P054	ETHYLENE IMINE (AZIRIDENE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF SYNTHETIC RESINS, PHARMACEUTICALS, INSECTICIDES, AND FUNGICIDES. CHEMICAL FAMILY IS AMIDE.	U116	ETHYLENE THIOUREA (2-IMIDAZOLIDINETHIONE)
		USED IN THE LEATHER TANNING, AND IN MANUFACTURING ADHESIVES AND POLYESTER. CHEMICAL FAMILY IS ALDEHYDE.	U126	GLYCIDYLALDEHYDE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, R ESINS, DYES, AND PESTICIDES. CHEMICAL FAMILY IS HALOGENATED HYD ROCARBON.	U130	HEXACHLOROCYCLOPENTADIENE
		BY-PRODUCTS FROM THE MANUFACTURE OF POLYESTER AND ALKYL RESINS, PESTICIDES, AND PAPER. CHEMICAL FAMILY IS FURAN.	U147	MALEIC ANHYDRIDE (2,5-FURANEDIONE)
		USED IN THE PRODUCTION OF VARIOUS ELASTOMERS, COATING AND PLAST ICS, SUCH AS STYRENE AND BUTADIENE. CHEMICAL FAMILY IS NITRILE.	U152	METHACRYLONITRILE (MAN)
		PRIMARILY USED AS A MONOMER FOR POLYMETHACRYLATE RESINS. CHEMIC AL FAMILY IS ESTER.	U162	METHYL METHACRYLATE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES(SEDATIVE), OILS, WAXES, RUBBER, SOLVENTS, LEATHER. CHEMICAL FAMILY IS A LDEHYDE.	U182	PARALDEHYDE (2,4,6 TRIMETHYL-1,3,5-TRIOXA
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS RESINS, DY ES, PHARMACEUTICALS, ADHESIVES, MEDICINES, AND RUBBER. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U201	RESORCINOL (RESORCIN)

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282	PLASTICS,SYNTHETICS, FIBERS(EXCEPT GLASS	POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DRUGS, DYES, RESINS, PHOTOGRAPHIC CHEMICALS, AND AS AN ANALYTICAL REAGENT. CHEMICAL FAMILY IS AMIDE.	U219	THIOUREA (THIOCARBAMIDE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, FUNGICIDES, DISINFECTANTS, BACTERIOSTAT, AND RUBBER. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U244	THIURAM (TETRAMETHYLTHIURAM DISULFIDE)
		PRIMARILY USED IN THE PRODUCTION OF POLYURETHANE FOAMS, ELASTOMERS, AND COATING. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U223	TOLYLENE DIISOCYANATE (1,3-DIISOCYANATOMETHYL
		BY-PRODUCT FROM THE MANUFACTURE OF POLYVINYL CHLORIDE AND RELATED POLYMERS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBONS.	U043	VINYL CHLORIDE (CHLOROETHYLENE
		BY-PRODUCTS FROM THE MANUFACTURE OF CELLULOSE ACETATE, RESINS, PERFUMES, PLASTICS, RUBBERS, AND SOLID ROCKET PROPELLANTS. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U102	METHYL PHTHALATE
		SPENT SOLVENT. FUEL ADDITIVE. BY-PRODUCTS FROM MANUFACTURE OF RESINS, COATINGS, DYES, AND EXPLOSIVES. CHEMICAL FAMILY IS AROMATIC.	U220	TOLUENE (METHYL BENZENE
	DRUGS	POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, RUBBER, POLYESTER RESINS, AND FUNGICIDE. CHEMICAL FAMILY IS KETONE.	U166	1,4-NAPHTHOQUINONE (1,4-NAPHTHALENEDIONE
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, PHARMACEUTICALS, DISINFECTANTS, SOLVENTS, RUBBER, AND GASOLINES. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U101	2,4 DIMETHYL PHENOL (XYLENOL
		USED IN INSECTICIDES, FUMIGANTS, GOLD AND SILVER ORE PROCESSING. SPENT ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U191	2-PICOLINE (2-METHYL-PYRIDINE
		POSSIBLE BY-PRODUCT FROM THE MANUFACTURE OF VARIOUS DYES AND PHARMACEUTICALS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	P047	4-6 DINITRO-O-CRESOL (DNCP
		BY-PRODUCTS FROM THE MANUFACTURE OF DYES AND PHARMACEUTICALS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U006	ACETYL CHLORIDE (ETHANOYL CHLORIDE
		BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS PHARMACEUTICALS, HERBICIDES, AND POLYMERS, EXPECIALLY POLYURETHANE AND POLYESTER RESINS. CHEMICAL FAMILY IS ALDEHYDE.	P003	ACROLEIN (ACRYLIC ALDEHYDE
		BY-PRODUCTS FROM THE MANUFACTURE AND TREATMENT OF PHARMACEUTICALS, HERBICIDES, PLASTICIZERS, AND GLYCEROL. CHEMICAL FAMILY IS ESTER.	P005	ALLYL ALCOHOLS (2-PROPEN-1-OL

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283	DRUGS	BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF PHOTOGRAPHIC CHEMICALS, QUARTERNARY (AMMONIUM) AGENTS, PERFUMES, AND PHARMACEUTICALS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	P028	BENZYL CHLORIDE (A-CHLOROTOLUENE)
		USED IN THE MANUFACTURE OF VARIOUS PHARMACEUTICAL PRODUCTS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	P014	BENZENETHIOL (THIOPHENOL)
		BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES AND LUBRICANT ADDITIVES. CHEMICAL FAMILY IS ALPHATIC HYDROCARBONE.	P018	BRUCINE (DIMETHOXYSTRYCHNINE)
		USED IN THE MANUFACTURE OF VARIOUS MEDICINE. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U035	CHLORAMBACIL (BUTANOIC ACID)
		USED IN THE PRODUCTION OF PHARMACEUTICALS (INCLUDING VETERINARY), PESTICIDES, AND FUNGICIDES. CHEMICAL FAMILY OIS NITRILE.	U238	ETHYL CARBAMATE (URETHANE)
		BY-PRODUCTS OF THE MANUFACTURING IN THE FOLLOWING INDUSTRIES: P HARMACEUTICALS, ION EXCHANGE AND PROTECTIVE COATINGS, ADHESIVES , AND SURFACTANTS. CHEMICAL FAMILY IS IMINES.	P054	ETHYLENE IMINE (AZIRIDENE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF SYNTHETIC RESINS, PHARMACEUTICALS, INSECTICIDES, AND FUNGICIDES. CHEMICAL FAMILY IS AMIDE.	U116	ETHYLENE THIOUREA (2-IMIDAZOLIDINETHIONE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, R ESINS, DYES, AND PESTICIDES. CHEMICAL FAMILY IS HALOGENATED HYD ROCARBON.	U130	HEXACHLOROCYCLOPENTADIENE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES, TEXTILE S, PIGMENTS, VARISHES. SPENT ANALYTICAL LABORATORY REAGENT. CHE MICAL FAMILY IS ORGANOMETALLIC COMPOUND.	U144	LEAD ACETATE (ACETIC ACID (LEAD) SALT)
		PRIMARILY USED IN THE PRODUCTION OF VARIOUS MEDICINES AND INSEC T CHEMOSTERILANT. CHEMICAL FAMILY IS CARBOXYLIC ACID.	U150	MELPHALAN (SURCOLYSIN)
		POSSIBLE BY-PRODUCT FROM THE MANUFACTURE OF MEDICINES, INSECTIC IDES, AND LEATHER TANNING. CHEMICAL FAMILY IS SUBSTITUTED HYDRO CARBON (COMPLEX).	P075	NICOTINE AND SALTS
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES(SEDATIVE), OILS, WAXES, RUBBER, SOLVENTS, LEATHER. CHEMICAL FAMILY IS A LDEHYDE.	U182	PARALDEHYDE (2,4,6 TRIMETHYL-1,3,5-TRIOXA
		SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT FROM THE MANUFACTU RE OF VARIOUS DYES, PHARMACEUTICALS, AND PHENOL-BASED COMPOUNDS . SPENT SOLVENT. CHEMICAL FAMILY IS PHENOL.	U188	PHENOL (CARBOLIC ACID)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, MEDICINES, P ERFUMES, AND VARIOUS ORGANIC LABORATORY REAGENTS. CHEMICAL FAMI LY IS ESTERS.	U190	PHTHALIC ACID ESTERS

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283	DRUGS	SPENT SOLVENT. BY-PRODUCT FROM MANUFACTURE OF VARIOUS VITAMINS, DRUGS, DYES, FUNGICIDES. CHEMICAL FAMILY IS AMINE.	U196	PYRIDINE
		PRIMARILY USED AS A MEDICINE (ANTI-HYPERTENSION) AND IN ANIMAL FEED. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON (ALKLOID).	U200	RESERPINE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS RESINS, DYES, PHARMACEUTICALS, ADHESIVES, MEDICINES, AND RUBBER. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U201	RESORCINOL (RESORCIN)
		PRIMARILY USED AS A NON-NUTRITIVE SWEETNER FOUND IN SYRUPS, MEDICINES, SOFT DRINKS, AND DIETIC FOODS. CHEMICAL FAMILY IS IMIDE.	U202	SACCHARIN (O-BENZOSULFIMIDE)
		PRIMARILY USED IN THE MANUFACTURE OF PERFUMES, SOAPS, MEDICINES, INSECTICIDES, AND HELIOTROPIN. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U203	SAFROLE (4-ALLYL-1,2-METHYLENE DIOXYB)
		PRIMARILY USED IN MEDICINES (TREATMENT OF SEBORRHEA). CHEMICAL FAMILY IS INORGANIC COMPOUND.	U205	SELENIUM SULFIDE (SULFUR SELENIDE)
		USED IN THE MANUFACTURE OF MEDICINE AND PROCESSING OF VARIOUS ORES. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	U214	THALLIUM ACETATE (THALLOUS ACETATE)
		USED IN THE PRODUCTION OF MEDICINES AND AS A INDUSTRIAL CATALYST. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U216	THALLIUM CHLORIDE (THALLOUS CHLORIDE)
		USED IN THE MANUFACTURE OF MEDICINE, RODENTICIDE, PESTICIDE, AND AS AN ANALYTICAL REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P115	THALLIUM SULFATE (THALLOUS SULFATE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DRUGS, DYES, RESINS, PHOTOGRAPHIC CHEMICALS, AND AS AN ANALYTICAL REAGENT. CHEMICAL FAMILY IS AMIDE.	U219	THIOUREA (THIOCARBAMIDE)
		USED IN THE MANUFACTURE OF MEDICINE, PLATED METAL, AND INSECTICIDES. SPENT CHEMICAL REAGENT. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P121	ZINC CYANIDE
		USED IN MEDICINES AND AS A RAT POISON. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P122	ZINC PHOSPHIDE
		USED IN THE MANUFACTURE OF VARIOUS MEDICINES. CHEMICAL FAMILY IS AMINE.	P046	ALPHA-ALPHA-DIMETHYL PHENETHYL
		BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	P024	P-CHLOROANILINE (BENZENAMINE)
284	SOAP, DETERGENTS AND OTHER CLEANING PREP.	BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS PERFUMES AND FLAVORINGS. SPENT INTERMEDIATE FOR VARIOUS PHARMACEUTICALS. CHEMICAL FAMILY IS KETONE.	U004	ACETOPHENONE (1-PHENYL ETHANONE)

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284	SOAP, DETERGENTS AND OTHER CLEANING PREP.	BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF PHOTOGRAPHIC CHEMICALS, QUARTERNARY (AMMONIUM) AGENTS, PERFUMES, AND PHARMACEUTICALS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	P028	BENZYL CHLORIDE (1-CHLOROTOLUENE
		BY-PRODUCTS FROM THE MANUFACTURE OF DISINFECTANTS, SURFACTANTS, SALICYLALDEHYDES, COUMARIN, AND VARIOUS HERBICIDES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U052	CRESOLS (METHYL PHENOL
		BY-PRODUCTS OF THE MANUFACTURING IN THE FOLLOWING INDUSTRIES: PHARMACEUTICALS, ION EXCHANGE AND PROTECTIVE COATINGS, ADHESIVES, AND SURFACTANTS. CHEMICAL FAMILY IS IMINES.	P054	ETHYLENE IMINE (AZIRIDENE
		BY-PRODUCTS FROM THE MANUFACTURE OF SEVERAL GLYCOLS, SURFACTANTS AND ROCKET PROPELLANT. CHEMICAL FAMILY IS OXIRANE.	U115	ETHYLENE OXIDE (1,2-EPOXY ETHANE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, MEDICINES, PERFUMES, AND VARIOUS ORGANIC LABORATORY REAGENTS. CHEMICAL FAMILY IS ESTERS.	U190	PHTHALIC ACID ESTERS
		PRIMARILY USED IN THE MANUFACTURE OF PERFUMES, SOAPS, MEDICINES, INSECTICIDES, AND HELIOTROPIN. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U203	SAFROLE (5-ALLYL-1,2-METHYLENE DIOXYB
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF GOLD AND SILVER PROCESSING, ELECTROPLATING, HYDROCYANIC ACID, INSECTICIDES, DYES, PIGMENTS, AND CHELATING AGENTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P106	SODIUM CYANIDE
		SPENT ORGANIC SOLVENT. BY-PRODUCT FROM MANUFACTURE OF VINYL CHLORIDE, SOAPS, CHELATING AGENTS, DEGREASERS, AND ANTI-KNOCK GASOLINE. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U077	1,2-DICHLOROETHANE (ETHYLENE DICHLORIDE
		SPENT ORGANIC SOLVENT. BY-PRODUCT FROM THE MANUFACTURE OF PERFUMES, LACQUERS, AND THERMOPLASTICS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBONS.	U079	1,2-DICHLOROETHYLENE (ACETYLENE CHLORIDE
		SPENT ORGANIC SOLVENTS. BY-PRODUCT FROM THE MANUFACTURE OF PERFUMES, LACQUERS, AND THERMOPLASTICS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U078	1,1-DICHLOROETHYLENE (VINYLIDENE CHLORIDE
		BY-PRODUCTS FROM THE MANUFACTURE OF CELLULOSE ACETATE, RESINS, PERFUMES, PLASTICS, RUBBERS, AND SOLID ROCKET PROPELLANTS. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U102	METHYL PHTHALATE
285	PAINTS, VARNISHES, LAQUERS & ENAMELS	SPENT NON-HALOGENATED SOLVENTS: SPENT CLEANING OR SPINNING SOLVENTS SPENT PAINT, LAQUER, OR VARNISH REMOVERS CHEMICAL FAMILY IS KETONE.	U002	ACETONE (2-PROPANONE

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285	PAINTS, VARNISHES, LAQUERS & ENAMELS	USED IN THE MANUFACTURE OF PIGMENTS, CERAMIC ENAMELS, INSECTICIDES, RODENTICIDE, AND HERBICIDE. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P012	ARSENIC TRIOXIDE (ARSENIC (III) OXIDE)
		USED IN THE MANUFACTURE OF PAINTS, VARNISHES, LACQUERS. CHEMICAL FAMILY IS ETHER.	U025	BIS(2-CHLOROETHYL) ETHER (DICHLOROETHYL ETHER)
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		SPENT ORGANIC LABORATORY REAGENT. SPENT PAINT SOLVENT. CHEMICAL FAMILY IS ALCOHOL.	U140	ISOBUTYL ALCOHOL (ISOBUTANOL)
		SPENT SOLVENT. SPENT DEGREASER. SPENT PAINT REMOVER. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U080	METHYLENE CHLORIDE (DICHLOROMETHANE)
		SPENT ORGANIC SOLVENTS. BY-PRODUCT FROM THE MANUFACTURE OF PERFUMES, LACQUERS, AND THERMOPLASTICS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U078	1,1-DICHLOROETHYLENE (VINYLIDENE CHLORIDE)
		PRIMARILY USED AS A PRESERVATIVE IN GUMS, GLUES, INKS, PAINTS, TEXTILES, AND LEATHER GOODS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U039	P-CHLORO-M-CRESAL (4-CHLORO-3-METHYL PHENOL)
2865	CYCLIC CRUDES,DYES & ORGANIC PIGMENTS	POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U167	1-NAPHTHYLAMINE
		BY-PRODUCTS OF THE MANUFACTURE OF VARIOUS DYES AND EXPLOSIVES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U105	2,4-DINITROTOLUENE
		USED IN THE MANUFACTURE OF DYES, EXPLOSIVES, AND TOLUIDINES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U106	2,6 DINITROTOLUENE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U168	2-NAPHTYLAMINE
		USED IN INSECTICIDES, FUMIGANTS, GOLD AND SILVER ORE PROCESSING. SPENT ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	U191	2-PICOLINE (2-METHYL-PYRIDINE)
		USED IN THE MANUFACTURE OF VARIOUS DYES, PIGMENTS, AND URETHANE PLASTICS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U073	3,3-DICHLOROBENZIDINE
		USED IN THE MANUFACTURE OF VARIOUS DYES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U091	3-3' DIMETHOXYBENZIDINE (DIANISIDINE)
		BY-PRODUCTS FROM THE MANUFACTURE OF DYES AND PHARMACEUTICALS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U006	ACETYL CHLORIDE (ETHANOYL CHLORIDE)

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2865	CYCLIC CRUDES,DYES & ORGANIC PIGMENTS	USED IN THE MANUFACTURE OF PIGMENTS, CERAMIC ENAMELS, INSECTICIDES, RODENTICIDE, AND HERBICIDE. CHEMICAL FAMILY IS NON-METALIC OXIDE.	P012	ARSENIC TRIOXIDE (ARSENIC (III) OXIDE)
		BY-PRODUCTS IN THE MANUFACTURE OF DYES. SPENT ANALYTICAL REAGENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U157	BENZYL CHLORIDE (3,4-BENZACRIDINE)
		BY-PRODUCTS FROM THE MANUFACTURE OF RUBBER AND CERTAIN DYES SUCH AS MICROSCOPY STAINS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U021	BENZIDINE ((1,1-BIPHENYL)-4,4 DIAMINE)
		USED IN THE MANUFACTURE OF SYNTHETIC DYE. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U023	BENZOTRICHLORIDE (TOLUENE TRICHLORIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF PIGMENTS, CORROSION INHIBITORS, AND COATING FOR LIGHT WEIGHT METALS. CHEMICAL FAMILY IS INORGANIC SALT.	U032	CALCIUM CHROMATE
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		SPENT LABORATORY REAGENTS. BY-PRODUCT FROM MANUFACTURE OF FERTILIZERS, DYES, EMBALMING FLUIDS, DISINFECTANTS, AND GERMICIDES. CHEMICAL FAMILY IS ALDEHYDE.	U122	FORMALDEHYDE (METHYLENE OXIDE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, RESINS, DYES, AND PESTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U130	HEXACHLOROCYCLOPENTADIENE
		SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT FROM THE MANUFACTURE OF VARIOUS DYES, PHARMACEUTICALS, AND PHENOL-BASED COMPOUNDS. SPENT SOLVENT. CHEMICAL FAMILY IS PHENOL.	U188	PHENOL (CARBOLIC ACID)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, MEDICINES, PERFUMES, AND VARIOUS ORGANIC LABORATORY REAGENTS. CHEMICAL FAMILY IS ESTERS.	U190	PHTHALIC ACID ESTERS
		SPENT SOLVENT. BY-PRODUCT FROM MANUFACTURE OF VARIOUS VITAMINS, DRUGS, DYES, FUNGICIDES. CHEMICAL FAMILY IS AMINE.	U196	PYRIDINE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF GOLD AND SILVER PROCESSING, ELECTROPLATING, HYDROCYANIC ACID, INSECTICIDES, DYES, PIGMENTS, AND CHELATING AGENTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P106	SODIUM CYANIDE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DRUGS, DYES, RESINS PHOTOGRAPHIC CHEMICALS, AND AS AN ANALYTICAL REAGENT. CHEMICAL FAMILY IS AMIDE.	U219	THIOUREA (THIOCARBAMIDE)

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2865	CYCLIC CRUDES,DYES & ORGANIC PIGMENTS	USED IN THE MANUFACTURE OF DYE INTERMEDIATE AND TOLUENE-2,4 DIISOCYANATE. CHEMICAL FAMILY IS AMINE.	U221	TOLUENEDIAMINE (3)AMINOTOLUENE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF SULFRIC ACID, GLASS, PHOTOGRAPHIC DEVELOPER, AND DYED TEXTILES. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P120	VANADIUM PENTOXIDE (VANADIUM (V) OXIDE
		SPENT ORGANIC SOLVENT, BY-PRODUCT FROM THE MANUFACTURE OF VARIOUS DYES, INSECTICIDES, AND METAL POLISHES. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	U070	1,2-DICHLOROBENZENE (O)-DICHLOROBENZENE
		SPENT SOLVENT, FUEL ADDITIVE, BY-PRODUCTS FROM MANUFACTURE OF RESINS, COATINGS, DYES, AND EXPLOSIVES. CHEMICAL FAMILY IS AROMATIC.	U220	TOLUENE (METHYL BENZENE
		BY-PRODUCTS FROM THE MANUFACTURE OF DYES AND FUNGICIDES. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U197	P-BENZOQUINONE (1,4-CYCLOHEXADIENE DIONE
		BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	P024	P-CHLOROANILINE (BENZENAMINE
		PRIMARILY USED AS A PRESERVATIVE IN GUMS, GLUES, INKS, PAINTS, TEXTILES, AND LEATHER GOODS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U039	P-CHLORO-M-CRESAL (4-CHLORO-3-METHYL PHENOL
		PRIMARILY USED IN DYE PRODUCTION, GASOLINE, MEDICINES, AND CORROSION INHIBITORS. CHEMICAL FAMILY IS AMINE.	P077	P-NITRO BENZINE (4-NITRO-BENZAMINE
2869	OTHER INDUSTRIAL ORGANIC CHEMICALS	BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS JET AND ROCKET FUELS, AND PHOTOGRAPHIC CHAMICALS. CHEMICAL FAMILY IS AMINE. ALDEHYDE.	U098	1,1-DIMETHYL HYDRAZINE
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS JET AND ROCKET FUELS. CHEMICAL FAMILY IS AMINE.	U098	1,1-DIMETHYL HYDRAZINE
		DISTILLATION BOTTOMS AND BY PRODUCTS FROM PRODUCTION OF ACETALDHYDE FROM ETHYLENE; CHEMICAL FAMILY IS ALDEHYDE.	U001	ACETALDHYDE (ACETIC ALDEHYDE
		SPENT NON-HALOGENATED SOLVENTS; SPENT CLEANING OR SPINNING SOLVENTS; SPENT PAINT, LAQUOR, OR VARNISH REMOVERS; CHEMICAL FAMILY IS KETONE.	U002	ACETONE (2-PROPANONE
		BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS PHARMACEUTICALS, HERBICIDES, AND POLYMERS, EXPECIALLY POLYURETHANE AND POLYESTER RESINS. CHEMICAL FAMILY IS ALDEHYDE.	P003	ACROLEIN (ACRYLIC ALDEHYDE
		BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF ACRYLIC POLYMERS AND VARIOUS SEMICONDUCTIVE POLYMERS. CHEMICAL FAMILIY IS NITRILE.	U009	ACRYLONITRILE (PROPENONITRILE

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2869	OTHER INDUSTRIAL ORGANIC CHEMICALS	MANUFACTURING BY-PRODUCTS AND/OR SLUDGE FROM THE TREATMENT OF V ISCONE RAYON, CELLOPHANE, AND VETERINARY MEDICINES. CHEMICAL FA MILY IS SULFIDE.	P022	CARBON DISULFIDE (CARBON DISULFIDE)
		SPENT REFRIGERANT AND METAL DEGREASING SOLVENTS. BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS SEMI-CONDUCTORS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U211	CARBON TETRACHLORIDE (TETRACHLOROMETHANE)
		BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES SUCH AS DDT. CHEMICAL FAMILY IS ALDEHYDE.	U034	CHLORAL (TRICHLOROACETALDEHYDE)
		PRIMARILY USED AS AN INSECTICIDE FOR COTTON AND TOBACCO CROPS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	U061	DDT (DICHLORODIPHENYLTRICHLORO-)
		SPENT REFRIGERANT. CHEMICAL FAMILY IS HALOGENTAED HYDROCARBON.	U075	DICHLORODIFLUOROMETHANE (FREON 12)
		BY-PRODUCTS FROM THE MANUFACTURE OF SEVERAL GLYCOLS, SURFACTANT S AND ROCKET PROPELLANT. CHEMICAL FAMILY IS OXIRANE.	U115	ETHYLENE OXIDE (1,2-EPOXY ETHANE)
		SPENT LABORATORY REAGENTS. BY-PRODUCT FROM MANUFACTURE OF FERT ILIZERS, DYES, EMBALMING FLUIDS, DISINFECTANTS, AND GERMICIDES. CHEMICAL FAMILY IS ALDEHYDE.	U122	FORMALDEHYDE (METHYLENE OXIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROC KET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMI NE.	U133	HYDRAZINE (DIAMINE)
		SPENT SOLVENT. SPENT ORGANIC LABORATORY REAGENT. SPENT PAINT AN D WAX REMOVER. CHEMICAL FAMILY IS KETONE.	U159	METHYL ETHYL KETONE (2-BUTANONE)
		SPENT ORGANIC SOLVENT. BY-PRODUCT FROM THE MANUFACTURE OF VARIO US ISOCYANATES, CARBONATES, CHLOROFORMATES, PESTICIDES, AND HER BICIDES. CHEMICAL FAMILY IS KETONES.	P095	PHOSGENE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, MEDICINES, P ERFUMES, AND VARIOUS ORGANIC LABORATORY REAGENTS. CHEMICAL FAMI LY IS ESTERS.	U190	PHTHALIC ACID ESTERS
		PRIMARILY USED AS A NON-NUTRITIVE SWEETNER FOUND IN SYRUPS, MED ICINES, SOFT DRINKS, AND DIETIC FOODS. CHEMICAL FAMILY IS IMIDE .	U202	SACCHARIN (O-BENZOSULFIMIDE)
		SPENT DRY CLEANING SOLVENT. SPENT DEGREASER. BY-PRODUCT OF MANU FACTURE OF FLOUROCARBONS. CHEMICAL FAMILY IS HALOGENATED HYDROC ARBONS.	U210	TETRACHLOROETHYLENE (PERCHLOROETHYLENE)
		USED AS A FUEL ADDITIVE. CHEMICAL FAMILY IS METAL SUBSTITUTED H YDROCARBON.	P110	TETRAETHYL LEAD

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287	AGRICULTURAL CHEMICALS	POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U167	1-NAPHTHYLAMINE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	U168	2-NAPHTYLAMINE
		USED AS A FUMIGANT AND DISINFESTANT OF VARIOUS DOMESTIC CROPS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U029	BROMOMETHANE (METHYL BROMIDE)
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROCKET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMINE.	U133	HYDRAZINE (DIAMINE)
		BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, AND AGRICULTURAL CHEMICALS. CHEMICAL FAMILY IS AMINE.	P024	P-CHLOROANILINE (BENZENAMINE)
289	MISCELLANEOUS CHEMICALS	BY-PRODUCTS OF THE MANUFACTURE OF VARIOUS DYES AND EXPLOSIVES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U105	2,4-DINITROTOLUENE
		USED IN THE MANUFACTURE OF EXPLOSIVES, PHOTOGRAPHIC DEVELOPER AND DYES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	P048	2-4 DINITROPHENOL
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		USED IN THE PRODUCTION OF EXPLOSIVES, MEDICINES, AND ROCKET PROPELLANTS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON (POLYOLS).	P081	NITROGLYCERINE (TRINITRATE 1,2,3-PROPANETRIA)
		SPENT SOLVENT. FUEL ADDITIVE. BY-PRODUCTS FROM MANUFACTURE OF RESINS, COATINGS, DYES, AND EXPLOSIVES. CHEMICAL FAMILY IS AROMATIC.	U220	OLUENE (METHYL BENZENE)
		PRIMARILY USED AS A PRESERVATIVE IN GUMS, GLUES, INKS, PAINTS, TEXTILES, AND LEATHER GOODS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U039	P-CHLORO-M-CRESAL (4-CHLORO-3-METHYL PHENOL)
29	PETROLEUM REFINING & RELATED INDUSTRIES	BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS JET AND ROCKET FUELS. CHEMICAL FAMILY IS AMINE.	U098	1,1-DIMETHYL HYDRAZINE
		BY-PRODUCTS FROM THE MANUFACTURE OF JET AND ROCKET FUEL, AND PHOTOGRAPHIC CHEMICALS. CHEMICAL FAMILY IS HYDRAZINE.	U099	1,2 DIMETHYL HYDRAZINE
		SPENT ORGANIC SOLVENT. GASOLINE COMPONENT. BY-PRODUCTS FROM THE MANUFACTURE OF CARBON TETRACHLORIDE, AND VARIOUS GUMS, WAXES, AND RESINS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBONS.	U083	1,2-DICHLOROPROPANE (PROPYLENE DICHLORIDE)
		DISTILLATION BOTTOMS AND BY PRODUCTS FROM PRODUCTION OF ACETALDHYDE FROM ETHYLENE; CHEMICAL FAMILY IS ALDEHYDE.	U001	ACETALDHYDE (ACETIC ALDEHYDE)

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
29	PETROLEUM REFINING & RELATED INDUSTRIES	SPENT NON-HALOGENATED SOLVENTS: SPENT CLEANING OR SPINNING SOLVENTS SPENT PAINT, LAQUOR, OR VARNISH REMOVERS CHEMICAL FAMILY IS KETONE.	U002	ACETONE (2-PROPANONE)
		SPENT REFRIGERANT AND METAL DEGREASING SOLVENTS. BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS SEMI-CONDUCTORS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U211	CARBON TETRACHLORIDE (TETRACHLOROMETHANE)
		POSSIBLE DISTILLATION BY-PRODUCTS OF PHENOL, CHLORONITRO BENZENE, AND ANILINE. SPENT PESTICIDE INTERMEDIATES. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBONS.	U037	CHLOROBENZENE (PHENYL CHLORIDE)
		VARIOUS SPENT REFRIGERANTS AND PROPELLANTS. BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES AND FLUOROCARBON PLASTICS. SPENT ANALYTICAL LABORATORY REAGENTS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U044	CHLOROFORM (TRICHLOROMETHANE)
		USED IN THE MANUFACTURE OF NITRO CELLULOSE LACQUERS AND ELASTOMERS, INSECTICIDES, INKS, ADHESIVES, AND SOLID ROCKET PROPELLENT. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U069	DI-N-BUTYL PHTHALATE (DBP)
		BY-PRODUCTS FROM THE MANUFACTURE OF SEVERAL GLYCOLS, SURFACTANTS AND ROCKET PROPELLANT. CHEMICAL FAMILY IS OXIRANE.	U115	ETHYLENE OXIDE (1,2-EPOXY ETHANE)
		BY-PRODUCT FROM THE MANUFACTURE OF ROCKET FUELS AND VARIOUS FLOUROCARBONS. CHEMICAL FAMILY IS HALOGEN.	P056	FLOURINE
		BY-PRODUCTS FROM THE MANUFACTURE OF AGRICULTURAL CHEMICALS, ROCKET FUELS, AND METAL PLATING SOLUTIONS. CHEMICAL FAMILY IS AMINE.	U133	HYDRAZINE (DIAMINE)
		USED IN THE PRODUCTION OF EXPLOSIVES, MEDICINES, AND ROCKET PROPELLANTS. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON (POLYOLS).	P081	NITROGLYCERINE (TRINITRATE 1,2,3-PROPANETRIOL)
		PRIMARILY USED AS A ROCKET FUEL AND ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	P112	TETRANITROMETHANE
		SPENT ORGANIC SOLVENT. BY-PRODUCT FROM MANUFACTURE OF VINYL CHLORIDE, SOAPS, CHELATING AGENTS, DEGREASERS, AND ANTI-KNOCK GASOLINE. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U077	1,2-DICHLOROETHANE (ETHYLENE DICHLORIDE)
		SPENT ORGANIC SOLVENT. BY-PRODUCT FROM THE MANUFACTURE OF PERFUMES, LACQUERS, AND THERMOPLASTICS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBONS.	U079	1,2-DICHLOROETHYLENE (ACETYLENE CHLORIDE)
		SPENT ORGANIC SOLVENTS. BY-PRODUCT FROM THE MANUFACTURE OF PERFUMES, LACQUERS, AND THERMOPLASTICS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U078	1,1-DICHLOROETHYLENE (VINYLIDENE CHLORIDE)

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
29	PETROLEUM REFINING & RELATED INDUSTRIES	BY-PRODUCTS FROM THE MANUFACTURE OF CELLULOSE ACETATE, RESINS, PERFUMES, PLASTICS, RUBBERS, AND SOLID ROCKET PROPELLANTS. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U102	METHYL PHTHALATE
30	RUBBER & MISC.	BY-PRODUCTS FROM THE MANUFACTURE OF INSECTICIDES, PHARMACEUTICALS, DISINFECTANTS, SOLVENTS, RUBBER, AND GASOLINES. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U101	,4 DIMETHYL PHENO. (XYLENOL)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF PHARMACEUTICALS, DYES, RUBBER, POLYESTER RESINS, AND FUNGICIDE. CHEMICAL FAMILY IS KETONE.	U166	1,4-NAPHTHOQUINONE (1,4-NAPHTHALENEDIONE)
		BY-PRODUCTS FROM THE MANUFACTURE OF RUBBER AND CERTAIN DYES SUCH AS MICROSCOPY STAINS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U021	BENZIDINE ((1,1-BIPHENYL)-4,4 DIAMINE)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES(SEDATIVE), OILS, WAXES, RUBBER, SOLVENTS, LEATHER. CHEMICAL FAMILY IS ALDEHYDE.	U182	PARALDEHYDE (2,4,6 TRIMETHYL-1,3,5-TRIOXA)
		-PRODUCTS FROM THE MANUFACTURE OF CELLULOSE ACETATE, RESINS, PERFUMES, PLASTICS, RUBBERS, AND SOLID ROCKET PROPELLANTS. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	U102	METHYL PHTHALATE
31	LEATHER & LEATHER PRODUCTS	USED IN THE PRODUCTION OF PARATHION, FUNGICIDE (LEATHER), AND VARIOUS ORGANIC SYNTHESIS REACTIONS. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U170	4-NITROPHENOL
		PRIMARY USE IS IN THE MANUFACTURE OF INSECTICIDES, TANNING AGENTS, AND RUBBER. CHEMICAL FAMILY IS ALDEHYDE.	U053	CROTONALDEHYDE (2-BUTENAL)
		USED IN THE LEATHER TANNING, AND IN MANUFACTURING ADHESIVES AND POLYESTER. CHEMICAL FAMILY IS ALDEHYDE.	U126	GLYCIDYLALDEHYDE
		POSSIBLE BY-PRODUCT FROM THE MANUFACTURE OF MEDICINES, INSECTICIDES, AND LEATHER TANNING. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON (COMPLEX).	P075	NICOTINE AND SALTS
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF MEDICINES(SEDATIVE), OILS, WAXES, RUBBER, SOLVENTS, LEATHER. CHEMICAL FAMILY IS ALDEHYDE.	U182	PARALDEHYDE (2,4,6 TRIMETHYL-1,3,5-TRIOXA)
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS RESINS, DYES, PHARMACEUTICALS, ADHESIVES, MEDICINES, AND RUBBER. CHEMICAL FAMILY IS SUBSTITUTED AROMATIC HYDROCARBON.	U201	RESORCINOL (RESORCIN)
		PRIMARILY USED AS A PRESERVATIVE IN GUMS, GLUES, INKS, PAINTS, TEXTILES, AND LEATHER GOODS. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U039	P-CHLORO-M-CRESAL (4-CHLORO-3-METHY. PHENOL)

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
32	STONE, CLAY, GLASS & CONCRETE PRODUCTS	USED IN THE MANUFACTURE OF VARIOUS ARSENATES, AND GLASS. USED AS A WOOD PRESERVATIVE AND VEGETATION DEFOLIANT. CHEMICAL FAMILY IS MINERAL ACID.	P010	ARSENIC ACID (ORTHOARSENIC ACID)
		PRIMARILY USED IN THE MANUFACTURE OF PYROTECHNICS, CERAMICS, GLASS AND PAPER. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P107	STRONTIUM SULFIDE
33	PRIMARY METAL INDUSTRIES	USED IN VARIOUS ELECTROPLATING SOLUTIONS. CHEMICAL FAMILY IS NON-METALLIC CYANIDE.	P013	BARIUM CYANIDE
		SPENT REFRIGERANT AND METAL DEGREASING SOLVENTS. BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF VARIOUS SEMI-CONDUCTORS. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U211	CARBON TETRACHLORIDE (TETRACHLOROMETHANE)
		BY-PRODUCTS FROM ELECTROPLATING COPPER AND INORGANIC SYNTHESIS INVOLVING THE CYANIDE ION. CHEMICAL FAMILY IS INORGANIC SALT.	P029	COPPER CYANIDE (CUPRIC CYANIDE)
		PRIMARILY USED IN ORGANIC SYNTHESIS REACTIONS AND AS A LEACHING AGENT FOR GOLD. CHEMICAL FAMILY IS NITRILE.	U149	MALONONITRILE (PROPANEDINITRILE)
		PRIMARILY USED IN METALURGY AND ELECTROPLATING INDUSTRIES. CHEMICAL FAMILY IS ORGANO METALLIC COMPOUNDS.	P074	NICKEL CYANIDE
		PRIMARILY USED AS A SYSTEMATIC INSECTICIDE. CHEMICAL FAMILY IS AMIDE.	P085	OCTAMETHYLPYROPHOSPHORAMIDE (SCHRADAN)
		USED IN INSECTICIDES, FUMIGANTS, GOLD AND SILVER ORE PROCESSING. SPENT ANALYTICAL CHEMISTRY REAGENT. CHEMICAL FAMILY IS INORGANIC COMPOUND.	P098	POTASSIUM CYANIDE
		PRIMARILY USES ARE IN MEDICINE AND SILVER PLATING. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P104	SILVER CYANIDE
		POSSIBLE BY-PRODUCTS FROM THE MANUFACTURE OF GOLD AND SILVER PROCESSING, ELECTROPLATING, HYDROCYANIC ACID, INSECTICIDES, DYES, PIGMENTS, AND CHELATING AGENTS. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P106	SODIUM CYANIDE
		USED IN THE MANUFACTURE OF MEDICINE AND PROCESSING OF VARIOUS ORES. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	U214	THALLIUM ACETATE (THALLOUS ACETATE)
		USED IN THE MANUFACTURE OF MEDICINE, PLATED METAL, AND INSECTICIDES. SPENT CHEMICAL REAGENT. CHEMICAL FAMILY IS ORGANOMETALLIC COMPOUND.	P121	ZINC CYANIDE
		SPENT ORGANIC SOLVENT, BY-PRODUCT FROM THE MANUFACTURE OF VARIOUS DYES, INSECTICIDES, AND METAL POLISHES. CHEMICAL FAMILIY IS HALOGENATED AROMATIC HYDROCARBONS.	U070	1,2-DICHLOROBENZENE (O-DICHLOROBENZENE)

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
36	ELECTRICAL & ELEC. MACH. EQUIP & SUPLYS	SPENT SOLVENT AND DIELECTRIC FLUIDS. CHEMICAL FAMILY IS NITRILE .	P101	ETHYL CYANIDE (PROPANENITRILE
		SPENT ORGANIC INTERMEDIATE. SPENT DOPING AGENT FOR SOLID STATE ELECTRONIC COMPONENTS. CHEMICAL FAMILY IS PHOSPHIDE.	P096	PHOSPHINE (HYDROGEN PHOSPHIDE
		SPENT SOLVENTS. FOUND IN DIELECTRIC FLUIDS AND ELECTRICAL INSUL ATION. CHEMICAL FAMILY IS HALOGENATED AROMATIC HYDROCARBON.	U207	TETRACHLOROBENZENE
38	MEASURING, ANALYZING & CONTROLING INSTMTS	SPENT DEGREASER. SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT I N MANUFACTURE OF VARIOUS INSECTICIDES AND PHOTOGRAPHIC FILMS. C HEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U208	1,1,1,2-TETRACHLOROETHANE
		SPENT DEGREASER. SPENT ORGANIC LABORATORY REAGENT. BY-PRODUCT I N MANUFACTURE OF VARIOUS INSECTICIDES AND PHOTOGRAPHIC FILMS. C HEMICAL FAMILY IS HALOGENATED HYDROCARBON.	U209	1,1,2,2-TETRACHLOROETHANE (ACETYLENE TETRACHLORIDE
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS JET AND ROCKET FUEL S. CHEMICAL FAMILY IS AMINE.	U098	1,1-DIMETHYL HYDRAZINE
		BY-PRODUCTS FROM THE MANUFACTURE OF JET AND ROCKET FUEL, AND PH OTOGRAPHIC CHEMICALS. CHEMICAL FAMILY IS HYDRAZINE.	U099	1,2 DIMETHYL HYDRAZINE
		USED IN THE MANUFACTURE OF EXPLOSIVES, PHOTOGRAPHIC DEVELOPER A ND DYES. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	P048	2-4 DINITROPHENOL
		BY-PRODUCTS FROM THE MANUFACTURE AND WASTE TREATMENT OF PHOTOGRAPHIC CHEMICALS, QUARTERNAY (AMMONIUM) AGENTS, PERFUMES, AND PHARMACEUTICALS. CHEMICAL FAMILIY IS HALOGENATED AROMATIC HYDROCARBONS.	P028	BENZYL CHLORIDE (α-CHLOROTOLUENE
		USED IN ORGANIC SYNTHESIS REACTIONS AND PRODUCTION OF PHOTOGRAP HIC CHEMICALS. SPENT MICRO LABORATORY REAGENT. CHEMICAL FAMILY IS METAL OXIDE.	P087	OSMIUM TETROXIDE
		PRIMARILY USED IN MANUFACTURE OF PHOTOGRAPHIC CHEMICALS, RODENT ICIDE, AND VARIOUS KETONES. CHEMICAL FAMILY IS AMIDE.	P116	THIOSEMICARBAZIDE (AMINOTHIOUREA
XXXX	- UNKNOWN -	SPENT SOLVENT. SPENT DEGREASER. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	**	1,2,3 TRICHLOROPROPAN (ALLYL TRICHLORIDE
XXXX		BY-PRODUCTS FROM THE MANUFACTURE AND TREATMENT OF EPICHLOROHYDR IN; CERTAIN SYNTHETIC PHARMACEUTICALS, AND ADHESIVES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	**	ALLYL CHLORIDE (3-CHLOROPROPENE
		ACTS AS AN IMPORTANT ELEMENT IN PLATING OR ALLOYING METALS FOR CORROSION RESISTANCE. CHEMICAL FAMILY IS METALLIC ELEMENT.	**	CHROMIUM AND COMPOUNDS
		SOURCE IS THE DEGRADATION OF DDT (INSECTICIDE). SPENT OR RESIDU AL INSECTICIDES. CHEMICAL FAMILY IS SUBSTITUTED HYDROCARBON.	**	DDT (DICHLORODIPHENYLTRICHLOROETHA

SIC	INDUSTRY NAME	WASTE DESCRIPTIONS	WASTE CODE	COMPOUND / SYNONYM NAMES
XXXX		SPENT SOLVENT. CHEMICAL FAMILY IS HALOGENATED ALCOHOL.	**	DICHLOROPROPANOL (ALPHA-DICHLORHYDRIN)
		BY-PRODUCTS FROM THE MANUFACTURE OF VARIOUS MEDICINES. CHEMICAL FAMILY IS PHOSPHATE.	**	DIISOPROPYLFLUOROPHOSPHATE (DFP)
		PRIMARILY USED IN THE THE PRODUCTION OF DYES AND AS A CAMPHOR SUBSTITUTE IN CELLULOID. CHEMICAL FAMILY IS AROMATIC HYDROCARBON.	**	DINITROBENZENE
		NATURAL GAS. CHEMICAL FAMILY IS HYDROCARBON.	**	METHANE
		USED IN THE MANUFACTURE OF DYES, PHOTOGRAPHIC CHEMICALS, AND VARIOUS ORGANIC SYNTHESIS REACTIONS. SPENT LABORATORY REAGENTS. CHEMICAL FAMILY IS AMINE.	**	PHENYLENEDIAMINE (BENZENEDIAMINE)
		CHEMICAL FAMILY IS ESTER.	**	PHOSPHOROTIC ACID
		SPENT SOLVENT. BY-PRODUCTS FROMMANUFACTURE OF DYES, DIELECTRIC FLUIDS, LUBRICANTS, AND INSECTICIDES. CHEMICAL FAMILY IS HALOGENATED HYDROCARBON.	**	TRICHLOROBENZENE

Constituents Currently Without Descriptions

1. Amino-1,1a,2,8,8a,8b,(hexalydro-8-hdroxy methyl) -8a-methoxy-5-methyl-carbamate
2. Dibeny[a,h]acoridine
3. Dibenz[a,j]aciridine
4. Dibenz[a,h]anthracene
5. 7H-Dibenzo[c,g]carbazcle
6. O-O dimethyl O,2 pyrazinyl phosphorothioate
7. Diethyl stilbesterol
8. Dihydrosafrd
9. 3,4 Dihydroxy-alpha-(methyl amino) methyl benzl alcohol
10. Halomethane
11. Heptachlor epoxide
12. Methyl methacrylate
13. 2-methyl-2-(methylthio) propionaldehyde-o-oxime
14. Nitrogen mustard
15. Nitrogen mustard n oxide
16. Nitroquinoline-1-oxide
17. Nitrosamine
18. Nitrosomethylethylamine
19. Nitrosomethylurea
20. Nitrosomethyl urethane
21. Nitrosomorpholine
22. Nitrosonornicatine
23. Nitrososarcosine
24. Selenium and compound
25. Silver and compounds
26. Thallium and compounds
27. 2,4,5 trichlorophenoxypropionic acid
28. Trichloropropane (isomers)
29. 1,2,3 trichloropropane
30. Trinitro benzene
31. Tris (1-azridenyl) phosphene sulfide
32. Tris (2,3-dibromopropyl) phosphate
33. Vanadic acid, ammonium salt
34. 2-acetylaminofluorene
35. Aflatoxins
36. 4-aminobiphenyl
37. Antimony
38. Aramite
39. Aramite
40. Arsenic and compounds

Generic Compounds Currently Without Descriptions

41. Azaserine
42. Benzenecirsonic acid
43. Benzo[b] fluoranthene
44. Benzo[j] fluoranthene
45. Beryllium and compounds
46. N,N-Bis (2-chloroethyl)-2-naphthylamine
47. Bis (2-chloroisopropyl) ether
48. Bis (2-ethyl hexyl) phthalate
49. 2-sec-butyl-4,6-dinitrophenol
50. Cadmium and compounds
51. 1-chloro-2,3-epoxypropane
52. Chloromethyl methyl ether
53. Citrus Red #2
54. 2-cyclohexyl-4,6-dinitrophenol
55. Cyclophosphamide
56. Daunomycin
57. Dibenz [a,h] acridine
58. Dichlorophenylarsine
59. Diethyl arsine
60. O-O-diethyl S-methyl dithiophosphate
61. Dimethylcarbomoyl chloride
62. Diphenylamine
63. 2,4-dithiobiuret
64. Iron dextran
65. Kepone
66. Methyl methanesulfonate
67. Mustard gas
68. Propyl thiouracil

APPENDIX D

REFERENCED STANDARD OPERATING GUIDELINES FOR PROJECT ACTIVITIES

[THE MATERIAL IN THIS APPENDIX WAS DEVELOPED BY THE OFFICE OF EMERGENCY AND REMEDIAL RESPONSE (OERR)]

REFERENCED STANDARD OPERATING GUIDELINES FOR PROJECT ACTIVITIES

Please check off the following tasks that will be performed during the course of the project. Then, at the bottom of the page and on subsequent pages, describe fully, for each task, the appropriate procedures and actions that will be taken to provide both quality assurance and quality control. If a given task has standard operating guidance (SOG) that is documented, please refer to that guidance. The primary reference would be State Agency Standard Operating Procedures. List others as appropriate.

Document/Section	Description
_____	Ambient Air Sampling (OVA, HNU, etc.)
_____	Ground-Water Sampling
_____	Surface-Water Sampling
_____	Soil/Sediment Sampling
_____	Tap Water Sampling
_____	Land Surveying
_____	Electrical Resistivity Survey
_____	Electromagnetic Survey
_____	Magnetometer Survey
_____	Metal Detection Survey
_____	Ground Penetrating Radar Survey
_____	Seismic Survey
_____	Water Level Measurements
_____	Perimeter Survey
_____	Soil Borings/Well Installation
_____	Bedrock Fracture Analysis
_____	Pump/Permeability Tests
_____	Preparation of Water Table Maps
_____	Preparation of Bedrock Contour Maps

REFERENCED STANDARD OPERATING GUIDELINES FOR PROJECT ACTIVITIES

_____	Determination of Ground-Water Flow
_____	Decontamination Procedures
Others (list below):	
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

REFERENCES

The following portions of the NUS Superfund Division Quality Assurance Manual describe the quality assurance procedures for the tasks listed on the previous page:

( )	Number	Subject
_____	QAP 2.5	Work Plans
_____	QAP 4.1	Field Data Collection
_____	QAP 4.2	Data Reduction, Validation, and Reporting
_____	QAP 5.2	Contractor Quality Assurance Requirements
_____	QAP 6.1	Preparation of Instructions and Procedures
_____	QAP 7.1	Identification of Controlled Evidentiary Documents
_____	QAP 7.2	Issuance and Distribution of Controlled Documents
_____	QAP 7.5	Interim Document Review Procedure
_____	QAP 8.1	Control of Procurement Activities
_____	QAP 8.2	Evaluation and Selection of Contractors
_____	QAP 9.1.F2	Chain of Custody
_____	QAP 9.2.F2	Sample Control
_____	QAP 10.1	Analysis Techniques
_____	QAP 11.1	Offsite Reconnaissance
_____	QAP 11.2	Onsite Inspections
_____	QAP 12.1	Implementation of Measuring and Test Equipment Controls Materials
_____	QAP 13.1	Packaging, Marking, Labeling, and Shipping of Samples from Hazardous-Waste Sites
_____	QAP 16.1	Storage and Retrieval of Quality Assurance Records
_____	QAP 17.4	Preparation for Audit
_____	QAP 17.6	Quality Notices

APPENDIX E

OTHER STANDARD REFERENCE MATERIALS ON WASTE AND ENVIRONMENTAL CHARACTERIZATION

OTHER STANDARD REFERENCE MATERIALS OF WASTE AND ENVIRONMENTAL CHARACTERIZATION

Perry's Chemical Engineer's Handbook

Chemical Process Handbook

Encyclopedia of Chemical Process

CRS Handbook of Chemistry and Physics

SAX, Dangeous Property of Indsutrial Materials

A P P E N D I X F

E X A M P L E E Q U I P M E N T L I S T

[THE MATERIAL IN THIS APPENDIX WAS DEVELOPED BY OERR]

EXPENDABLE EQUIPMENT

Item	Quantity Packaged	Amount Required
CHEMICALS		
Acetone	5 gal.	1
Acetone	1 gal.	
Trichloroethane	5 gal.	
Trichloroethane	1 gal.	
Methylene-chloride	5 gal.	
Methylene-chloride	1 gal.	
Hexane	1 gal.	1
Gasoline	1 gal.	1
Gasoline	5 gal.	
Nitric Acid	1 gal.	
Nitric Acid	5 ml.	2 Boxes
Sodium Hydroxide	1 liter	
Motor Oil	1 qt.	1
2-Cycle Oil	1/2 pt.	
Alconox	1 gal.	1
Baking Soda	2 lb. box	
SAMPLE CONTAINERS		
40 ml. VOA Bottles	1 each	10
½ gal. Amber Bottle	1 each	10
1 liter Amber Bottle	1 each	
8 oz. Glass Jars	1 each	10
1 liter Plastic Bottles	1 each	5
Plastic Bags 3" x 12"	100 box	
Plastic Bags 10" x 12"	100 box	
Plastic Bags 12" x 20"	100 box	
Paint Cans w/lid & snaps	1 gal.	
Paint Cans w/lid & snaps	½ gal.	
Paint Cans w/lid & snaps	1 qt.	
Vermiculite	4 cu. ft.	
BOOTS		
Butyl Rubber Boots		2
Hip Boots Size _____		
Latex Boot Covers		5
Tyvek Boot Covers		

EXPENDABLE EQUIPMENT (Cont'd)

Item	Quantity Packaged	Amount Required
GLOVES		
Neoprene		
Viton		5
Butyl Rubber		5
Cotton Work		
Latex		
Leather Work		
P.V.C. Surgical		1 Box
CHEMICAL RESISTANT COVERALLS		
Tyvek SM		
Tyvek MED		
Tyvek LG		
Tyvek XLG		10
Tyvek XXLG		
Saranex SM		
Saranex MED		
Saranex LG		
Saranex XLG		10
Saranex XXL		
SAMPLE TUBES		
Glass Tube .5 mm x 300 mm	1 each	
Glass Tube 1 mml x 300 mm	1 each	
P.V.C. Tube 2" x 10'	1 each	
P.V.C. Tube 4" x 10'	1 each	

EXPENDABLE EQUIPMENT (Cont'd)

Item	Quantity Packaged	Amount Required
FILM		
C-135-36-100-Prints	1 roll	
C-135-36-200-Prints	1 roll	
C-135-36-400-Prints	1 roll	2
C-135-24-100-Prints	1 roll	
C-135-24-200-Prints	1 roll	
C-135-24-400-Prints	1 roll	
C-135-12-100-Prints	1 roll	
C-135-12-200-Prints	1 roll	
C-135-12-400-Prints	1 roll	
C-135-36-200-Slide	1 roll	
C-135-36-25-Slide	1 roll	2
B&W-135-20-400-Prints	1 roll	
SX-70 Polaroid	1 sgl. pack	
Kodamatic	1 sgl. pack	
STATIONERY SUPPLIES		
Graph Paper		
Manilla Tags		
Paper Towels		2 Rolls
Felt Tip Markers		4
Ball Point Pens		2
Indelible Ink Pens		2
ROPE		
Nylon 3/16"	600' roll	1 Roll
Nylon 1/4"	1000' roll	
Manila 1/4	100' roll	
Manila 1/2	50' roll	
TAPE		
Clear Plastic	1 each	2
Duct	1 roll	2
Elec. Vinyl	1 roll	
Filament	1 roll	4
Flagging	100' roll	
Masking	1 roll	1
Transparent	1 each	

EXPENDABLE EQUIPMENT (Cont'd)

Item	Quantity Packaged	Amount Required
MISCELLANEOUS		
Aluminum Foil	500' roll	
17# Drums 55 gal.	1 each	1
17# Drums 55 gal.	1 each	
Kimwipes	box	1
pH Paper	2 rolls	1
Plastic Roll 10' x 25'	1 roll	
Trash Bags 45 gal.	20 box	1
Vermiculite	1 bag	4

Item	Quantity Packaged	Amount Required
WRITE IN:		

*Preservatives, calibrating solutions, sample packing materials, and special items of equipment are the responsibility of the Project Manager.

DEPARTURE DATE: 3-9-85

GROUP MANAGER L. C. Redwood

NON-EXPENDABLE EQUIPMENT

Equipment	Amount Required
CAMERAS	
Cannon AE1	2
Polariod One Step	
Polaroid SX70	
Camera bag	
Binoculars	
AIR MONITORING	
HNU Photoionization Detector	1
Draeger Tubes Type NH_3 + H_2S	2 Boxes
Organic Vapor Analyzer	1
OVA Chart Recorder	
Explosimeter	1
Combination Explosimeter and O_2 Indicator	
Oxygen Indicator	1
Draeger Tube Hand Pump	1
H_2S Gas Indicator	1
Mercury Sniffer	
Photovac	
METERS	
Radiation Mini-Alert	1
Conductivity Meter	
pH Meter	1
Resistivity Meter (Bison)	
Resistivity Meter (Soil Test)	
Metal Detector	
SURVEYING EQUIPMENT	
Optical Rangefinder	
Level, Hand 2X	
Brunton Transit w/case	
Compass	
200' Fiberglass Measuring Tape	1
300' Fiberglass Measuring Tape	

NON-EXPENDABLE EQUIPMENT (cont'd)

Equipment	Amount Required
PUMPS AND LIQUID SAMPLING EQUIPMENT	
Double Diaphragm Pump 1"	
Submersible Pump 1"	1
Submersible Pump 2"	
Pitcher Pump 2"	
Bacon Bomb Sampler	1
Kemmerer Sampler	1
LG Well Kit Sampler	1
SM Well Kit Sampler	
SS Bailer	
Teflon Bailer	
Bottom Filling Bailer	1
SOIL SAMPLING EQUIPMENT	
Spoons Lg	
Spoons Sm	
Spatula Lg	
Spatula Sm	
Scoops	
Trowel	4
Large Stainless Steel Bucket	4
Medium Stainless Steel Bucket	
Small Stainless Steel Bucket	3
Split Spoon Sampler	
3" Bucket Auger	1
3.5" Hand Auger	1
Dredge	1
DECON EQUIPMENT	
Indian Tank	1
Heavy Duty Sprayer	1
John Deer Power Spray w/gas can	
50' Sec. Garden Hose	
Mop	
Lg Hdl Dairy Brushes	3
SM Hdl Dairy Brushes	
Scrub Brushes	
Bottle Brushes	
Whisk Brushes	
Wire Brushes	

NON-EXPENDABLE EQUIPMENT (cont'd)

Equipment	Amount Required
POWER EQUIPMENT	
Digger Mobile	
3 HP Water Pump w/gas can	
Generator w/gas can	1
Power Auger w/gas can	
Extension Cord-Heavy Duty 100"	1
Extension Cord-Light Duty 25"	
Remote Drum Opener	
PERSONAL PROTECTION	
Hard Hat	5
Safety Goggles	5
Safety Glasses	
Splash Shield	2
Full Face Respirator	
Respiratory Cartridges	
Butyl Rubber Apron	2
Encapsulated Suits	
Life Vests	
Rain Jacket	
Rain Pants	
SELF CONTAINED BREATHING APPARATUS	
401 SCBA	
Dual Purpose SCBA	5
CASCADE System	
45 cu. ft. Composite Tanks	10
Umbilical Breathing Air Lines (50' Sec)	
Umbilical Breathing Air System	
330 cu. ft. Class "D" Breathing Air Cylinder	
STANDBY SAFETY EQUIPMENT	
20# Fire Extinguishers	1
O_2 Resuscitator	1
Stretcher	1
Eye Wash	1
Trauma Kit	1

NON-EXPENDABLE EQUIPMENT (cont'd)

Equipment	Amount Required
HAND TOOLS	
Hacksaw	
Post Hole Digger	
Bung Wrench	
Rake	
Saw	
Ax	
Shovel	1
MISCELLANEOUS	
Beeper	
Ventilation Smoke Tube Assy.	
Isotemp Oven	
Wind Speed and Direction Finder	
Garbage Can	
Clipboard	
33 qt. Ice Chest	2
40 qt. Ice Chest	
Write In:	

Departure Date 3-8-85

Group Manager L. C. REDWOOD
(Signature)

Approved: [illegible]

APPENDIX G

SAMPLE QUALITY CONTROL

[THE MATERIAL IN THIS APPENDIX WAS DEVELOPED BY OERR]

Sample Quality Control

This appendix describes four types of quality control samples--blanks, spikes, duplicates, and splits.

Blanks

There are two kinds of blanks of concern for this type of work: trip blanks and field blanks. Trip blanks are used to determine if inadvertent contamination is introduced from the sample containers or from an activity other than sample collection such as sample shipment, storage. Blanks are prepared by the sampler using distilled deionized water of known high purity. These bottles are then sent with the othe sample bottles to the field but are not opened. One set of trip blanks for each analytical parameter group (e.g., organics, metals, volatiles) should be prepared and submitted for each day of sampling at a particular site.

Field blanks are used to determine if contamination is introduced by the sample collection activities or sampling environment. They are prepared by bringing a quantity of distilled deionized water to the field and "preparing" a sample by pouring the water into the bottles. They can also be prepared by pouring the sample through sample collection devices such as bailers. A field blank should be generated for each day of sampling at a particular site.

Blanks should be submitted in the same manner as the other field samples, with no distinguishing labeling or markings.

Spikes

Spikes are used to measure the analytical accuracy of a laboratory. A sample is split at the laboratory with a known quality of a compound added to one portion of the sample. The samples are analyzed and the percent recovery of the known quality is determined. One spiked sample is recommended for every ten field samples. Spiked samples are prepared by the laboratory performing the analyses after the samples are received at the laboratory. Although spikes are generally not handled by field personnel, they are part of the QA process and should be specified in the sampling plan.

Duplicates

Duplicate samples are another method of checking on the precision of a laboratory's analytical methods. One duplicate sample should be taken for every ten samples collected at a facility. Duplicates are prepared by collecting one portion of sample, homogenizing it and dividing the sample into equal portions.

Splits

Splits are identical portions of samples split between EPA and the ownr/operator. Splits are required only if the owner/operator is responsible for collecting and analyzing the samples. Split samples are used to evaluate the accuracy of analyses performed by a laboratory. Splits are prepared in the field exactly like a duplicate, but unlike duplicates, splits are always analyzed by different laboratories. The owner/operator

should be instructed to prepare a split of all samples. The EPA inspector will then select two samples for EPA to analyze from among all the samples.

APPENDIX H

DEVELOPING A SITE SAFETY PLAN

[SOURCE DOCUMENT FOR THIS APPENDIX IS EPA'S OCCUPATIONAL HEALTH AND SAFETY MANUAL, CHAPTER 9, HAZARDOUS SUBSTANCES RESPONSES, MAY 5, 1984]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 19 1984

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Standard Operating Safety Guides, November 1984

FROM: William N. Hedeman, Jr., Director
Office of Emergency and Remedial Response

TO: Regional Office Addressees

The enclosed Standard Operating Safety Guides, November 1984 replaces the Interim Standard Operating Guides, Revised September 1982. The Guides have been updated and revised to reflect additional experience EPA personnel have gained in responding to environmental incidents involving hazardous substances.

The Standard Operating Safety Guides are in accordance and consistent with the procedures for employee health and safety contained in EPA's Occupational Health and Safety Manual, Chapter 9, Hazardous Substances Responses, (1440 TN12), May 5, 1984.

The guides are not meant to be a comprehensive safety manual for incident response. Rather, they provide information on health and safety to complement professional judgement and experience, and to supplement existing Regional office safety procedures.

If you have any questions or comments concerning the guides, please contact Mr. Stephen Lingle, Director, Hazardous Response Support Division or Mr. J. Stephen Dorrler, Chief, Environmental Response Team.

Enclosure

Addressees

Director, Ofc. of Emergence & Remedial Resp., Region II
Director, Hazardous Waste Mgmt. Div., Region III
Director, Air & Waste Management Division,
Regions IV, VI, VII. VIII
Director, Waste Mgmt. Div., Regions I & V
Director, Toxics & Waste Mgmt. Div., Region IX
Director, Air & Waste Division X

cc: Gene Lucero, OWPE
John Skinner, OSW

PART 9

SITE SAFETY PLAN

I. INTRODUCTION

The purpose of the site safety plan is to establish requirements for protecting the health and safety of responders during all activities conducted at an incident. It contains safety information, instructions, and procedures.

A site safety plan must be prepared and reviewed by qualified personnel for each hazardous substance response. Before operations at an incident commence, safety requirements must be written, conspicuously posted or distributed to all response personnel, and discussed with them. The safety plan must be periodically reviewed to keep it current and technically correct.

In non-emergency situations, for example, long-term remedial action at abandoned hazardous waste sites, safety plans are developed simultaneously with the general work plan. Workers can become familiar with the plan before site activities begin. Emergency response generally requires verbal safety instructions and reliance on existing standard operating procedures until, when time permits, a plan can be written.

The plan must contain safety requirements for routine (but hazardous) response activities and also for unexpected site emergencies. The major distinction between routine and emergency site safety planning is the ability to predict, monitor, and evaluate routine activities. A site emergency is unpredictable and may occur anytime.

II. GENERAL REQUIREMENTS

The site safety plan must:

- Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted.
- List key personnel and alternates responsible for site safety, response operations, and for protection of public.
- Describe Levels of Protection to be worn by personnel.
- Delineate work areas.
- Establish procedures to control site access.
- Describe decontamination procedures for personnel and equipment.
- Establish site emergency procedures.

- Address emergency medical care for injuries and toxicological problems.

- Describe requirements for an environmental surveillance program.

- Specify any routine and special training required for responders.

- Establish procedures for protecting workers from weather-related problems.

III. SITE SAFETY PLAN SCOPE AND DETAIL

The plan's scope, detail, and length is based on:

- Information available about the incident.

- Time available to prepare a site-specific plan.

- Reason for responding.

Three general categories of response exist - emergencies, characterizations and remedial actions. Although considerations for personnel safety are generic and independent of the response category, in scope, detail, and length safety requirements and plans vary considerably. These variations are generally due to the reason for responding (or category of response) , information available, and the severity of the incident with its concomitant dangers to the responder.

A. Emergencies

1. Situation:

Emergencies generally require prompt action to prevent or reduce undesirable affects. Immediate hazards of fire, explosion, and release of toxic vapors or gases are of prime concern. Emergencies vary greatly in respect to types and quantities of material, numbers of responders, type of work required, population affected, and other factors. Emergencies last from a few hours to a few days.

- Information available: Varies from none to much. Usually information about the chemicals involved and their associated hazards is quickly obtained in transportation-related incidents, or incidents involving fixed facilities. Determining the substances involved in some incidents, such as mysterious spills, requires considerable time and effort.

- Time available: Little time, generally requires prompt action to bring the incident under control.

- Reason for response: To implement prompt and immediate

actions to control dangerous or potentially dangerous situations.

2. Effects on Plan

In emergencies, time is not available to write lengthy and detailed safety plans. Decisions for responder safety are based on a continual evaluation of changing conditions. Responding organizations must rely on their existing written standard operating safety procedures or a generic plan, and verbal safety instructions adapted to meet site-specific conditions. Since heavy reliance is placed on verbal safety instructions an effective system to keep all responders informed must be established. Whenever possible, these incident-specific instructions should be written.

B. Incident Characterization

1. Situation:

In non-emergency responses,for example, preliminary inspections at abandoned wastes sites or more comprehensive waste site investigations the objective is to determine and characterize the chemicals and hazards involved, the extent of contamination, and risks to people and the environment. In general, initial inspections, detailed investigations, and extent of contamination surveys are limited in the activities that are required and number of people involved. Initial or preliminary inspections generally require 1-2 days. Complete investigations may last over a longer time period.

- Information available: Much background information. Generally limited on-site data for initial inspection. On-site information more fully developed through additional site visits and investigations.

- Time available: In most cases adequate time is available to develop written site-specific safety plan.

- Reason for response: To gather data to verify or refute existing information, to gather information to determine scope of subsequent investigations, or to collect data for planning remedial action.

2. Effects on Plan:

Sufficient time is available to write safety plans. In scope and detail, plans tend to be brief containing safety requirements for specific on-site work relevant to collecting data. As information is developed through additional investigations, the safety plan is modified and, if necessary, more detailed and specific requirements added.

- ...up after controlled, restoration of ...s activities are re... and support base, ext... work activities. Remedial a...
- Information available: Much known a...ars to completely accomplish.
- Time available: Ample time for work pla...
- Reason for response: Systematic and co... cleanup, and restoration.

2. Effects on Plan:

Since ample time is available before work commen... safety plan tends to be comprehensive and detaile... prior investigations much detail may be known about ...terials or hazards at the site and extent of contamin...

IV. SITE SAFETY PLAN DEVELOPMENT

To develop the plan as much background information as possible should be obtained, time permitting, about the incident. This would include, but not be limited to:

- Incident location and name.
- Site description.
- Chemicals and quantities involved.
- Hazards associated with each chemical.
- Behavior and dispersion of material involved.
- Types of containers, storage, or transportation methods.
- Physical hazards.
- Prevailing weather condition and forecast.
- Surrounding populations and land use.
- Ecologically sensitive areas.

- Facility records.

- Preliminary assessment reports.

- Off-site surveys.

- Topographic and hydrologic information.

The information initially available or obtained through subsequent characterization provides a basis for developing a site-specific safety plan. Information is needed about the chemicals and hazards involved, movement of material on and off the site, and potential contact with responders or the public. This type of information is then used along with the reason for responding (and work plan) to develop the safety plan. The plan is tailored to the conditions imposed by the incident and to its environmental setting. As additional information becomes available the safety plan is modified to protect against the hazards discerned and to provide for site emergencies that may occur.

V. ROUTINE OPERATIONS

Routine operations are those activities required in responding to an emergency or a remedial action at a hazardous waste site. These activities may involve a high degree of risk, but are standard operations that all incident responses may require.

Safety practices for routine operations closely parallel accepted industrial hygiene and industrial safety procedures. Whenever a hazardous incident progresses to the point where operations become more routine, the associated site safety plan becomes a more refined document. As a minimum, the following must be included as part of the site safety plan for routine operations.

- Describe the Known Hazards and Risks

  This must include all known or suspected physical, biological, radiological, or chemical hazards. It is important that all health related data be kept up-to-date. As air, water, soil, or hazardous substance monitoring and sampling data becomes available, it must be evaluated, significant risk or exposure to workers noted, potential impact on public assessed, and changes made in the plan. These evaluations need to be repeated frequently since much of the plan is based on this information.

- List Key Personnel and Alternates

  The plan must identify key personnel (and alternates) responsible for site safety. It should also identify key personnel assigned to various site operations. Telephone numbers, addresses, and organizations of these people must be listed in the plan and posted in a conspicuous place.

- Designate Levels of Protection to be Worn

  The Levels of Protection to be worn at locations on-site or by work functions must be designated. This includes the specific types of respirators and clothing to be worn for each level. No one shall be permitted in areas requiring personnel protective equipment unless they have been trained in its use and are wearing it.

- Delineate Work Areas

  Work areas (exclusion zone, contamination reduction zone, and support zone) need to be designated on the site map and the map posted. The size of zones, zone boundaries, and access control points into each zone must be marked and made known to all site workers.

- List Control Procedures

  Control procedures must be implemented to prevent unauthorized access. Site security procedures - fences, signs, security patrols and check-in procedures - must be established. Procedures must also be established to control authorized personnel into work zones where personnel protection is required.

- Establish Decontamination Procedures

  Decontamination procedures for personnel and equipment must be established. Arrangements must also be made for the proper disposal of contaminated material, solutions, and equipment.

- Address Requirements for an Environmental Surveillance Program

  A program to monitor site hazards must be implemented. This would include air monitoring and sampling, and other kinds of media sampling at or around the site that would indicate chemicals present, their hazards, possible migration, and associated safety requirements.

- Specify Any Routine and Special Training Required

  Personnel must be trained not only in general safety procedures and use of safety equipment, but in any specialized work they may be expected to do.

- Establish Procedures for Weather-Related Problems

  Weather conditions can affect site work. Temperature extremes, high winds, storms, etc. impact on personnel safety. Work practices must be established to protect workers from the effects of weather and shelters provided, when necessary. Temperature extremes especially heat and its effect on people wearing protective clothing, must be considered and procedures established to monitor for and minimize heat stress

VI. ON-SITE EMERGENCIES

The plan must address site emergencies - occurrences that require immediate actions to prevent additional problems or harm to responders, the public, property, or the environment. In general, all responses present a degree of risk to the workers. During routine operations risk is minimized by establishing good work practices and using personnel protective equipment. Unpredictable events such as fire, chemical exposure, or physical injury may occur and must be anticipated. The plan must contain contingencies for managing them.

- Establish Site Emergency Procedures

  -- List the names and emergency function of on-site personnel responsible for emergency actions along with the special training they have.

  -- Post the location of nearest telephone (if none at site).

  -- Provide alternative means for emergency communications.

  -- Provide a list of emergency services organizations that may be needed. Names, telephone numbers, and locations must be posted. Arrangements for using emergency organizations should be made beforehand. Organizations that might be needed are:

    - Fire
    - Police
    - Health
    - Explosive experts
    - Local hazardous material response units
    - Civil defense
    - Rescue

  -- Address and define procedures for the rapid evacuation of workers. Clear, audible warnings signals should be established, well-marked emergency exits located throughout the site, and internal and external communications plans developed. An example of codes that could be used for emergency operations based on direct-reading instruments is contained in Annex 7.

  -- A complete list of emergency equipment should be attached to the safety plan. This list should include emergency equipment available on-site, as well as all available medical, rescue, transport, fire-fighting, and mitigative equipment.

- Address emergency medical care.

  -- Determine location of nearest medical or emergency care facility. Determine their capability to handle chemical exposure cases.

  -- Arrange for treating, admitting, and transporting of injured or exposed workers.

  -- Post the medical or emergency care facilities location, travel time, directions, and telephone number.

  -- Determine local physician's office location, travel directions, availability, and post telephone number if other medical care is not available.

  -- Determine nearest ambulance service and post telephone number.

  -- List responding organization's physicians, safety officers, or toxicologists name and telephone number. Also include nearest poison control center, if applicable.

  -- Maintain accurate records on any exposure or potential exposure of site workers during an emergency (or routine operations). The minimum amount of information needed (along with any medical test results) for personnel exposure records is contained in Annex 8.

- Advise workers of their duties during an emergency. In particular, it is imperative that the site safety officers, standby rescue personnel, decontamination workers, and emergency medical technicians practice emergency procedures.

- Incorporate into the plan, procedures for the decontamination of injured workers and for their transport to medical care facilities. Contamination of transport vehicles, medical care facilities, or of medical personnel may occur and should be addressed in the plan. Whenever feasible these procedures should be discussed with appropriate medical personnel in advance of operations.

- Establish procedures in cooperation with local and state officials for evacuating residents who live near the site.

VII. IMPLEMENTATION OF THE SITE SAFETY PLAN

The site safety plan, (standard operating safety procedure or a generic safety plan for emergency response) must be written to avoid misinterpretation, ambiguity, and mistakes that verbal orders cause. The plan must be reviewed and approved by qualified personnel. Once the safety plan is implemented, its needs to be periodically examined and modified, if necessary, to reflect any changes in site work and conditions.

All agencies and organizations which have an active role at the incident must be familiar with the plan. If possible the plan should be written in coordination with the organizations involved. Lead personnel from these organizations should sign the plan to signify they agree with it and will follow its provisions.

All personnel involved at the site must be familiar with the safety plan, or the parts that pertain to their specific activities. Frequent safety meeting should be held to keep all informed about site hazards, changes in operating plans, modifications of safety requirements and for exchanges of information. It is the responsibility of personnel involved at the site as workers or visitors to comply with the requirements in the plan.

Frequent audits by the incident manager or the safety designee should be made to determine compliance with the plan's requirements. Any deviations should be brought to the attention of the incident manager. Modifications in the plan should be reviewed and approved by appropriate personnel.

VIII. SAMPLE SAFETY PLANS

Annex 9 and 10 are two examples of Site Safety Plans. Since no one sample plan or plan format can adequately address all safety requirements for the variety of incidents that occur, they should be used as a guide to help develop an incident-specific plan. They can also be used, with necessary adaptation, as generic plans for emergency response.

In some incidents, the sample plans contained in Annex 9 and 10 might be satisfactory to use by themself. Filling in the blanks provides an effective safety plan. In many incidents they should only be considered as a check list. Since they do not exhaustively cover every condition which may need addressed, users of these sample plans and any other type examples must realize their application to any one incident may not be acceptable. Therefore they must be used with discretion and tempered by professional judgement and experience. They are not meant to be all inclusive but examples of considerations, requirements, and format which should be adapted for incident-specific conditions.

APPENDIX I

GUIDANCE ON OBTAINING ACCESS TO A RCRA FACILITY IF ACCESS FOR A SITE INVESTIGATION IS DENIED

[SOURCE MATERIAL FROM: U.S.E.P.A. HAZARDOUS WASTE GROUND WATER TASK FORCE, "REVISED DRAFT PROTOCOL FOR GROUND-WATER INSPECTIONS AT HAZARDOUS WASTE TREATMENT, STORAGE AND DISPOSAL FACILITIES", JUNE 1985]

APPENDIX J

PHYSICAL, CHEMICAL, AND FATE DATA

[THE ATTACHED WAS PREPARED BY ICF, INC., FOR THE OFFICE OF EMERGENCY AND REMEDIAL RESPONSE, EPA, AND FOUND IN "DRAFT SUPERFUND HEALTH ASSESSMENT MANUAL", MAY 1985]

PHYSICAL, CHEMICAL, AND FATE DATA

Chemical Name	CAS #	Mole Weight g/mole	Water Solubility mg/l	S*	Vapor Pressure mm Hg	S*	Henrys Law Constant atm-m3/mol	Koc ml/g	S*	Log Kow	S*	Fish BCF l/kg	S*
Acenapthene	83-32-9	154	3.42E+00	C	1.55E-03	C	9.20E-05	4600		4.00	C	242	H
Acenapthylene	208-96-8	152	3.93E+00	C	2.90E-02	C	1.48E-03	2500		3.70	C		
Acetone	67-64-1	58	?		2.70E+02	J	NA			-0.24	J		
Acetonitrile	75-05-8	41	?		7.40E+01	F	NA			-0.34	F		
2-Acetylaminofluorene	53-96-3	223	6.50E+00	B			NA			3.28	B		
Acrylonitrile	107-13-1	53	7.90E+04	C	1.00E+02	C	8.84E-05	0.85	C	0.25	C	48	G
Aflatoxin B1	1162-65-8	312					NA						
Aldrin	309-00-2	365	1.80E-01	C	6.00E-06	C	1.60E-05	96000	C	5.30	C	28	H
Allyl Alcohol	107-18-6	58	5.10E+05	B	2.46E+01	B	3.69E-06			0.22	B		
4-Aminobiphenyl	92-67-1	169	8.47E+02	B	6.00E-05	B	1.59E-08			2.78	B		
Amitrole	61-82-5	84	2.80E+05	B			NA			-2.08	B		
Ammonia	7664-41-7	17	5.30E+05	F	7.60E+03	F	3.21E-04			0.00	F	0	I
Anthracene	120-12-7	178	4.50E-02	A	1.95E-04	A	1.02E-03	14000	C	4.45	A		
Antimony and Compounds	7440-36-0	122					NA					1	H
Arsenic and Compounds	7440-38-2	75	1.50E+06	E	0.00E+00	E	NA					44	H
Asbestos	1332-21-4	NA	NA		NA		NA					0	D
Auramine	2465-27-2	267	2.10E+00	B			NA			4.16	B		
Azaserine	115-02-6	173	1.36E+05	B			NA			-1.08	B		
Aziridine	151-56-4	43	2.66E+06	B	2.55E+02	B	5.43E-06			-1.01			
Barium and Compounds	7440-39-3	137					NA						
Benzene	71-43-2	78	1.75E+03	A	9.52E+01	A	5.59E-03	83	B	2.12	A	5.2	H
Benzidine	92-87-5	184	4.00E+02	C	5.00E-04	C	3.03E-07	10.5	C	1.30	C	87.5	H
Benz(a)anthracene	56-55-3	228	5.70E-03	C	2.20E-08	C	1.16E-06	1380000	B	5.60	C		
Benz(c)acridine	225-51-4	229	1.40E+01	B			NA			4.56	B		
Benzo(a)pyrene	50-32-8	252	1.20E-03	A	5.60E-09	A	1.55E-06	5500000	C	6.06	C		
Benzo(b)fluoranthene	205-99-2	252	1.40E-02	C	5.00E-07	C	1.19E-05	550000	C	6.06	A		
Benzo(ghi)perylene	191-24-2	276	7.00E-04	A	1.03E-10	A	5.34E-08	1600000	C	6.51	A		
Benzo(k)fluoranthene	207-08-9	252	4.30E-03	C	5.10E-07	C	3.94E-05	550000	C	6.06	C		
Benzyl Chloride	100-44-7	127	3.30E+03	F	1.00E+00	E	5.06E-05			2.63	F		
Beryllium and Compounds	7440-41-7	9	2.00E-01	E	0.00E+00	E	NA					19	H
Bis(2-chloroethyl)ether	111-44-4	143	1.02E+04	C	7.10E-01	C	1.31E-05	13.9	C	1.50	C	6.9	H
Bis(2-chloroisopropyl)ether	108-60-1	171	1.70E+03	C	8.50E-01	C	1.13E-04	61	C	2.10	C	0	D
Bis(chloromethyl)ether	542-88-1	115	2.20E+04	C	3.00E+01	C	2.06E-04	1.2	C	0.38	C	0.67	H
1,3-Butadiene	106-99-0	54	7.35E+02	F	1.84E+03	F	1.78E-01			1.99	F		
Cacodylic acid	75-60-5	138	8.30E+05	F			NA			0.00	F		
Cadmium and Compounds	7440-43-9	112	2.60E+00	E	0.00E+00	E	NA					81	H
Captan	133-06-2	301	5.00E-01	E	6.00E-05	E	4.75E-05			2.35	F		
Carbon Disulfide	75-15-0	76	2.94E+03	E	3.60E+02	E	1.23E-02			2.00	F	0	I
Carbon Tetrachloride	56-23-5	154	7.57E+02	A	9.00E+01	A	2.41E-02			2.64	A	19	H
Chlorambucil	305-03-3	304					NA						
Chlordane	57-74-9	410	5.60E-01	A	1.00E-05	A	9.63E-06	140000	C	3.32	A	14000	H
Chlornaphazin	494-03-1	268					NA						
Chlorobenzene	108-90-7	113	4.66E+02	A	1.17E+01	A	3.77E-03	330	C	2.84	A	10	H
Chlorobenzilate	510-15-6	325	2.19E+01	B	1.20E-06	B	2.34E-08			4.51	B		
Chlorodibromomethane	124-48-1	208			1.50E+01	D	NA			2.09	D		
Chloroform	67-66-3	119	8.20E+03	A	1.51E+02	A	2.87E-03			1.97	A	3.75	H
Chloromethyl Methyl Ether	107-30-2	81	?				NA			0.00	I		
4-Chloro o-toluidine hydrochloride	3165-93-3	142					NA						

PHYSICAL, CHEMICAL, AND FATE DATA

Chemical Name	CAS #	Mole Weight g/mole	Water Solubility mg/l	S*	Vapor Pressure mm Hg	S*	Henrys Law Constant atm m3/mol	Koc ml/g	S*	Log Kow	S*	Fish BCF l/kg	S*
Chromium III and Compounds	7440-47-3	52			0.00E+00	E	NA					16	H
Chromium VI and Compounds	7440-47-3	52	6.20E+05	E	0.00E+00	E	NA					16	H
Chrysene	218-01-9	228	1.80E-03	A	6.30E-09	A	1.05E-06	200000	C	5.61	A		
Copper and Compounds	7440-50-8	64	?		0.00E+00	G	NA					200	D
Creosote	8001-58-9	NA					NA						
Cresol	1319-77-3	108	3.10E+04	E	2.40E-01	J	1.10E-06	500	G	1.97	F	0	F
Cyanides	NA	NA	?		?		NA						
Cyclophosphamide	50-18-0	261	1.31E+09	B			NA			-3.22	B		
Daunomycin	20830-81-3	528	2.70E+05	B			NA			-1.99	B		
DDD	72-54-8	320	1.00E-01	C	1.89E-06	C	7.96E-06	770000	C	6.20	C		
DDE	72-55-9	318	4.00E-02	C	6.50E-06	C	6.80E-05	4400000	C	7.00	C	51000	G
DDT	50-29-3	355	5.00E-03	A	5.50E-06	A	5.13E-04	247000	G	6.19	J	54000	H
Diallate	2303-16-4	274	1.40E+01	B	6.40E-03	B	1.65E-04			0.73	B		
2,4-Diaminotoluene	95-80-7	122	4.77E+04	B	3.80E-05	B	1.28E-10			0.35	B		
1,2,7,8-Dibenzopyrene	189-55-9	305	1.10E-01	B			NA			6.62	B		
Dibenz(a,h)anthracene	53-70-3	278	5.00E-04	C	1.00E-10	C	7.33E-08	3300000	C	6.80	C		
1,2-Dibromo-3-chloropropane	96-12-8	236	1.00E+03	B	1.00E+00	B	3.11E-04			2.29	B		
Dibutylnitrosamine	924-16-3						NA						
Dibutyl Phthalate	84-74-2	278	1.30E+01	C	1.00E-05	C	2.82E-07	170000	C	5.60	C		
1,2-Dichlorobenzene	95-50-1	147	1.00E+02	C	1.00E+00	C	1.93E-03	1700	C	3.60	C	56	H
1,3-Dichlorobenzene	541-73-1	147	1.23E+02	C	2.28E+00	C	3.59E-03	1700	C	3.60	C	56	H
1,4-Dichlorobenzene	106-46-7	147	7.90E+01	C	1.18E+00	C	2.89E-03	1700	C	3.60	C	56	H
3,3'-Dichlorobenzidine	91-94-1	253	4.00E+00	C	1.00E-05	C	8.32E-07	1553	C	3.50	C	312	H
1,1-Dichloroethane	75-34-3	99	5.50E+03	A	1.82E+02	A	4.31E-03	30	C	1.79	A		
1,2-Dichloroethane (EDC)	107-06-2	99	8.57E+03	A	6.40E+01	A	9.78E-04	14	C	1.48	A	1.2	H
1,1-Dichloroethylene	75-35-4	97	2.25E+03	A	6.00E+02	A	3.40E-02	65	C	1.84	A	5.6	H
1,2-Dichloroethylene (trans)	540-59-0	97	6.30E+03	A	3.24E+02	A	6.56E-03	59	C	0.48	A	1.6	H
1,2-Dichloroethylene (cis)	540-59-0	97	3.50E+03	A	2.08E+02	A	7.58E-03		C	0.70	A	1.6	H
Dichloromethane	75-09-2	85	2.00E+04	C	3.62E+02	C	2.03E-03	8.8	C	1.30	C	5	H
2,4-Dichlorophenol	120-83-2	163	4.60E+03	C	5.90E-02	C	2.75E-06	300	C	2.90	C	41	H
2,4-Dichlorophenoxyacetic Acid	94-75-7	221	6.20E+02	F	4.00E-01	F	1.88E-04	20	G	2.81	F		
Dichlorophenylarsine	696-28-6	223					NA						
1,2-Dichloropropane	78-87-5	113	2.70E+03	C	4.20E+01	C	2.31E-03	51	C	2.00	C		
1,3-Dichloropropene	542-75-6	111	2.80E+03	C	2.50E+01	C	1.30E-03	48	C	2.00	C	1.9	H
Dieldrin	60-57-1	381	1.95E-01	C	1.78E-07	C	4.58E-07	1700	C	3.50	C	4760	H
Diepoxybutane	1464-53-5	86					NA						
Diethanolnitrosamine	1116-54-7						NA						
Diethyl Arsine	692-42-2	134	4.17E+02	B	3.50E+01	B	1.48E-02			2.97	B		
1,2-Diethylhydrazine	1615-80-1	88	2.88E+07	B			NA			-1.68	B		
Diethylnitrosamine	55-18-5	102			5.00E+00	F	NA			0.48	F		
Diethyl Phthalate	84-66-2	222	8.96E+02	C	7.50E-03	C	1.14E-06	142	C	2.50	C	117	G
Diethylstilbestrol (DES)	56-53-1	268	9.60E-03	B			NA			5.46	B		
Dihydrosafrole	94-58-6	164	1.50E+03	B			NA			2.56	B		
3,3'-Dimethoxybenzidine	119-90-4	244					NA						
Dimethylamine	124-40-3	45	1.00E+06	F	1.52E+03	F	9.02E-05			-0.38	F	0	F
Dimethyl sulfate	77-78-1	126	3.24E+05	B	6.80E-01	B	3.48E-07			-1.24	B		
Dimethyl[illegible]inoazobenzene	60-11-7	225	1.36E+01	B	[illegible].30E-07	B	7.19E-09			3.72	B		
7,12-D[illegible]dibenz(a)anthracene	57-97-6	256	4.40E-03	B			NA	476000	G	6.94	B		

PHYSICAL, CHEMICAL, AND FATE DATA

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Dimethylcarbamoyl Chloride	79-44-7	108	1.44E+07	B	1.95E+00	B	1.92E-08			-1.32	B		
1,1-Dimethylhydrazine	57-14-4	60	1.24E+08	B	1.57E+02	B	1.00E-07			-2.42	B		
1,2-Dimethylhydrazine	540-73-8	60					NA						
Dimethylnitrosamine	62-75-9	74	?	C	8.10E+00	C	NA	0.1	C	-0.68	C	0	D
1,3-Dinitrobenzene	99-65-0	168	3.00E+03	F			NA			1.62	F		
4,6-Dinitro-o-cresol	534-52-1	198	2.90E+02	C	5.00E-02	C	4.49E-05	240	C	2.70	C	0	F
2,4-Dinitrophenol	51-28-5	184	5.60E+03	C	1.49E-05	C	6.45E-10	16.6	C	1.50	C	0	D
2,3-Dinitrotoluene	602-01-7	182	3.10E+03	B			NA			2.29	B	3.8	H
2,4-Dinitrotoluene	121-14-2	182	3.10E+03	B	5.10E-03	C	3.94E-07	45	C	2.00	C	3.8	H
2,5-Dinitrotoluene	619-15-8	182	1.32E+03	B			NA			2.28	B	3.8	H
2,6-Dinitrotoluene	606-20-2	182	1.32E+03	B	1.80E-02	C	3.27E-06	92	C	2.00	C	3.8	H
3,4-Dinitrotoluene	610-39-9	182	1.08E+03	B			NA			2.29	B	3.8	H
1,4-Dioxane	123-91-1	88	4.31E+05	B	3.99E+01	B	1.07E-05			0.01	B		
N,N-Diphenylamine	122-39-4	169	5.76E+01	B	3.80E-05	B	1.47E-07			3.60	B	30	B
1,2-Diphenylhydrazine	122-66-7	184	1.84E+03	C	2.60E-05	C	3.42E-09	418	C	2.90	C	25	H
Dipropylnitrosamine	621-64-7	130	9.90E+03	C	4.00E-01	C	6.92E-06	15	C	1.50	C		
Epichlorohydrin	106-89-8	93	3.19E+05	B	1.57E+01	B	5.99E-06			0.15	B		
Ethanol	64-17-5	44	?		7.40E+02	G	NA			-0.32	J		
Ethyl Methanesulfonate	62-50-0	124	3.69E+05	B	2.06E-01	B	9.12E-08			0.21	B		
Ethylbenzene	100-41-4	106	1.52E+02	A	7.00E+00	A	6.43E-03	1100	C	3.15	A	37.5	H
Ethylene Dibromide (EDB)	106-93-4	188	1.18E+04	B	1.17E+01	B	2.45E-04	44	G	1.76	B		
Ethylene Oxide	75-21-8	44	1.00E+06	B	1.31E+03	B	7.56E-05			-0.22	B		
Ethylenethiourea	96-45-7	102	2.00E+03	F			NA			-0.66	J	0	F
1-Ethyl-nitrosourea	759-73-9	117	3.31E+08	B			NA						
Ferric Dextran	9004-66-4	7500					NA						
Fluoranthene	206-44-0	202	2.06E-01	A	5.00E-06	A	6.46E-06	38000	C	4.90	A	1150	H
Fluorene	86-73-7	116	1.69E+00	C	7.10E-04	C	6.42E-05	7300	C	4.20	C	1300	G
Fluorides	NA	NA					NA						
Formaldehyde	50-00-0	30	?		1.00E+01	E	NA			0.00	F	0	F
Glycidaldehyde	765-34-4	72	1.70E+08	B	1.97E+01	B	1.10E-08			-1.55	B		
Glycol Ethers	NA	NA					NA						
Heptachlor	76-44-8	374	1.80E-01	C	3.00E-04	C	8.19E-04	12000	C	4.40	C	15700	H
Heptachlor Epoxide	1024-57-3	389	3.50E-01	C	3.00E-04	C	4.39E-04	220	C	2.70	C	14400	G
Hexachlorobenzene	118-74-1	285	6.00E-03	A	1.09E-05	A	6.81E-04	3900	G	5.23	A	8690	H
Hexachlorobutadiene	87-68-3	261	1.50E-01	A	2.00E+00	A	4.57E+00	29000	C	4.78	A	2.8	H
Hexachlorocyclopentadiene	77-47-4	273	2.10E+00	A	8.00E-02	A	1.37E-02	4800	C	5.04	A	4.3	H
alpha Hexachlorocyclohexane (HCCH)	319-84-6	291	1.67E+00	C	2.50E-05	C	5.87E-06	3800	C	3.90	C	130	H
beta-HCCH	319-85-7	291	2.40E-01	C	2.80E-07	C	4.47E-07	2800	C	3.90	C	130	H
gamma HCCH (Lindane)	58-89-9	291	7.00E+00	C	1.60E-04	C	7.85E-06	1080	G	3.90	C	130	H
delta-HCCH	319-86-8	291	3.14E+01	C	1.70E-05	C	2.07E-07	6600	C	4.10	C	130	H
Hexachloroethane	67-72-1	237	5.00E+01	C	4.00E-01	C	2.49E-03	20000	C	4.60	C	87	H
Hexachlorophene	70-30-4	407	4.00E-03	F			NA			7.54	F		
Hydrazine	302-01-1	32	3.41E+08	B	1.40E+01	B	1.73E-09			-3.08	B		
Indeno(1,2,3-cd)pyrene	193-39-5	276	5.30E-04	C	1.00E-10	C	6.86E-08	1600000	C	6.50	C		
Iodomethane	77-88-4	142	1.40E+04	J	4.00E+02	J	5.34E-03			1.69	J		
Iron and Compounds	15438-31-0												
Isoprene	78-79-5	68	?		4.00E+02	E	NA						
Isosafrole	120-58-1	160	1.00E+03	B	1.60E-08	B	3.25E-12			2.66	B		

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Kepone	143-50-0	491	9.90E-03	B			NA			2.00	B	8400	G
Lasiocarpine	303-34-4	412	1.60E+03	B			NA			0.99	B		
Lead and Compounds (Inorganic)	7439-92-1	207	1.70E+01	E	0.00E+00	E	NA					49	H
Manganese and Compounds	7439-96-5	55					NA						
Mercury and Compounds (Inorganic)	7439-97-6	201	?		2.00E-03	E	NA					5500	H
Methyl Ethyl Ketone	78-93-3	72	2.68E+05	A	7.75E+01	A	2.74E-05			0.26	A	0	I
Methyl Chloride	74-87-3	50	2.50E+04	B	4.31E+03	B	1.15E-02			0.95	B		
Methyl Mercury		216					NA					7250	H
Methyl Methacrylate	80-62-6	100	2.00E+01	F	3.70E+01	E	2.43E-01			0.79	F		
Methyl Parathion	298-00-0	263	6.00E+01	E	9.70E-06	E	5.59E-08			1.91	E	45	I
3-Methylcholanthrene	56-49-3	268					NA						
4,4'-Methylene-bis-2-chloroaniline	101-14-4	267					NA						
Methylnitrosourea	684-93-5	103	6.89E+08	B			NA			-1.81	B		
Methylthiouracil	56-04-2	142					NA						
Methylvinylnitrosamine	4549-40-0	86	7.60E+05	B	1.27E+01	B	1.83E-06			-0.23	B		
N-Methyl-N'-nitro-N-nitrosoguanadin	70-25-7						NA						
Mitomycin C	50-07-7	334					NA						
Mustard gas	505-60-2	159	8.00E+02	B	1.70E-01	B	4.45E-05			1.37	B		
1-Napthylamine	134-32-7	143	2.35E+03	B	6.50E-05	B	5.21E-09			2.07	B		
2-Napthylamine	91-59-8	143	5.86E+02	B	2.56E-04	B	8.23E-08			2.07	B		
Nickel and Compounds	7440-02-0	59			0.00E+00	D	NA					47	H
Nitrosomethylurethane	615-53-2						NA						
N-Nitrosopiperidine	100-75-4	114	1.90E+06	B	1.40E-01	B	1.11E-08			-0.42	B		
N-Nitrosopyrrolidine	930-55-2	100	7.00E+06	B	1.10E-01	B	2.07E-09			-1.06	B		
5-Nitro-o-toluidine	99-55-8						NA						
Pentachlorobenzene	608-93-5	250	1.35E-01	F			NA			5.19	F	2125	H
Pentachloronitrobenzene	82-68-8	295	7.11E-02	B	1.13E-04	B	6.18E-04			5.45	B		
Pentachlorophenol	87-86-5	266	1.40E+01	C	1.10E-04	C	2.75E-06	57000	C	5	C	770	G
Phenacetin	62-44-2	179					NA						
Phenanthrene	85-01-8	178	1.00E+00	A	6.80E-04	A	1.59E-04	14000	C	4.46	A	2630	G
Phenobarbital	50-06-6	232	1.00E+03	B			NA			-0.19	B		
Phenol	108-95-2	94	9.30E+04	A	3.41E-01	A	4.54E-07	14.2	C	1.46	A	1.4	H
Phenylalanine Mustard	148-82-3	305					NA						
Polychlorinated Biphenyls	1336-36-3	?	?		6.70E-03	D	NA			?		100000	G
Propane Sultone	1120-71-4						NA						
Propyleneimine	75-55-8	57	9.44E+05	B	1.41E+02	B	1.12E-05			0.40	B		
Pyrene	129-00-0	202	1.32E-01	A	2.50E-06	A	5.04E-06	38000	C	4.88	A		
Saccharin	81-07-2	183					NA						
Safrole	94-59-7	162	1.50E+03	B	9.10E-04	B	1.29E-07			2.53	B		
Selenium and Compounds	7782-49-2	79	3.80E+05	E	0.00E+00	E	NA					16	H
Silver and Compounds	7440-22-4	108	1.30E+01	E	0.00E+00	D	NA					7000	D
Streptozocin	18883-66-4	457					NA						
1,2,4,5-Tetrachlorobenzene	95-94-3	216	6.00E+00	F	?		NA			4.67	F	1125	H
2,3,7,8-TCDD (Dioxin)	1746-01-6	322	2.00E-04	A	1.70E-06	A	3.60E-07	3300000	I	6.72	A	5000	H
1,1,1,2-Tetrachloroethane	630-20-6	168	2.90E+03	J	5.00E+00	J	3.81E-04						
1,1,2,2-Tetrachloroethane	79-34-5	168	2.90E+03	A	5.00E+00	A	3.81E-04	110	C	2.39	A	4.2	H
Tetrachloroethylene	127-18-4	166	1.50E+02	A	1.78E+01	A	2.59E-02	364	I	2.6	A	31	H
2,3,4,6-Tetrachlorophenol	58-90-2	142	1.00E+03				NA			4.1	I	340	[illegible]

PHYSICAL, CHEMICAL, AND FATE DATA

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Tetraethyl Lead	78-00-2	323	8.00E-01	J	1.50E 01	J	7.97E-02						
Thioacetamide	62-55-5	75					NA			0.46	J		
Thiourea	62-56-6	76	1.72E+06	B			NA			-2.05	B		
o-Tolidine	119 93-7	212	7.35E+01	B			NA			2.88	B		
Toluene	108-88-3	92	5.35E+02	A	2.81E+01	A	6.37E-03	300	C	2.73	A	10.7	H
o-Toluidine	636-21-5	107	1.50E+04	J	1.00E-01	J	9.39E-07			1.29	J		
Toxaphene	8001-35-2	414	5.00E 01	C	4.00E 01	C	4.36E 01	964	C	3.3	C	17100	H
Tribromomethane (Bromoform)	75-25-2	253	3.01E+03	C	5.00E+00	C	5.52E-04	116	C	2.4	C		
1,2,4-Trichlorobenzene	120-82-1	181	3.00E+01	C	2.90E 01	C	2.31E-03	9200	C	4.3	C	2800	G
1,1,1-Trichloroethane	71-55-6	133	1.50E+03	A	1.23E+02	A	1.44E-02	152	C	2.5	C	5.6	H
1,1,2-Trichloroethane	79-00-5	133	4.50E+03	A	3.00E+01	A	1.17E 03	56	C	2.47	A	5	H
Trichloroethylene	79-01-6	131	1.10E+03	A	5.79E+01	A	9.10E-03	126	C	2.38	A	10.6	H
Trichlorfon	52-68-6	257	1.54E+05	E	7.00E 06	E	1.71E 11			2.27	A		
2,4,5-Trichlorophenol	95-95-4	197	1.19E+03	A	1.00E+00	A	2.18E-04			3.72	A	119	H
2,4,6 Trichlorophenol	88-06-2	198	8.00E+02	A	1.20E 02	A	3.90E-06	2000	C	3.87	A	150	H
Tris(2,3-dibromopropyl)phosphate	126-72-7	698	1.20E+02	B			NA			4.12	B	2.7	G
Trypan Blue	72-57-1	961					NA						
Uracil Mustard	66-75-1	252	6.41E+02	B			NA			-1.09	B		
Uranium and Compounds	7440-61-1	238					NA						
Urethane	51-79-6	89					NA						
Vanadium and Compounds	7440-62-2	51					NA						
Vinyl Chloride	75-01-4	63	2.67E+03	A	2.66E+03	A	8.19E-02			1.38	A	1.17	H
Xylene	1330-20-7	106	1.98E+02	F	1.00E+01	F	7.04E-03			3.26	F		
Zinc and Compounds	7440-66-6	65	1.60E+00	E	0.00E+00	D	NA					47	H

* Letters denote the source of the data.

APPENDIX K

LIST OF PRIORITY POLLUTANTS

PRIORITY POLLUTANTS

	Compound Name	Chemical Abstract Service Number
Metals and Cyanide	Antimony, Total	7440-36-0
	Arsenic, Total	7440-38-2
	Beryllium, Total	7440-41-7
	Cadmium, Total	7440-43-9
	Chromium, Total	7440-47-3
	Copper, Total	7440-50-8
	Lead, Total	7439-92-1
	Mercury, Total	7439-97-6
	Nickel, Total	7440-02-0
	Selenium, Total	7782-49-2
	Silver, Total	7440-22-4
	Thallium, Total	7440-28-0
	Zinc, Total	7440-66-6
	Cyanide, Total	57-12-5
Dioxin	2,3,7,8-Tetrachloro-dibenzo-p-dioxin (TCDD)	1764-01-6
Volatile Compounds	Acrolein	107-02-8
	Acrylonitrile	107-13-1
	Benzene	71-43-2
	Bromoform	75-25-2
	Carbon Tetrachloride	56-23-5
	Chlorobenzene	108-90-7

APPENDIX K. (CONTINUED)

	Compound Name	Chemical Abstract Service Number
Volatile Compounds (cont.)	Chloroethane	75-00-3
	2-Chloroethylvinyl Ether	110-75-8
	Chloroform	67-66-3
	1,1-Dichloroethane	75-34-3
	1,2-Dichloroethane	107-06-2
	1,1-Dichloroethylene	75-35-4
	1,2-Dichloropropane	78-87-5
	1,3-Dichloropropylene	542-75-6
	Ethylbenzene	100-41-4
	Methyl Bromide	74-83-9
	Methyl Chloride	74-87-3
	Methylene Chloride	75-09-2
	1,1,2,2-Tetrachloroethane	79-34-5
	Tetrachloroethylene	127-18-4
	Toluene	108-88-3
	1,2-Trans-dichloroethylene	156-60-5
	1,1,1-Trichloroethane	71-55-6
	1,1,2 Trichloroethane	79-00-5
	Trichloroethylene	79-01-6
	Vinyl Chloride	75-01-4

APPENDIX K. (CONTINUED)

	Compound Name	Chemical Abstract Service Number
Acid Compounds	2-Chlorophenol	95-57-8
	2,4-Dichlorophenol	120-83-2
	2,4-Dimethylphenol	105-67-9
	4,6-Dinitro-o-cresol	534-52-1
	2,4-Dinitrophenol	51-28-5
	2-Nitrophenol	88-75-5
	4-Nitrophenol	100-02-7
	p-Chloro-m-cresol	59-50-7
	Pentachlorophenol	87-86-5
	Phenol	108-95-2
	2,4,6-Trichlorophenol	88-06-2
Base/Neutral Compounds	Acenaphthene	83-32-9
	Acenaphthylene	208-96-8
	Anthracene	120-12-7
	Benzidine	92-87-5
	Benzo[a]anthracene	56-55-3
	Benzo[a]pyrene	50-32-8
	Benzo[b]fluoranthene	205-99-2
	Benzo[ghi]perylene	191-24-2
	Benzo[k]fluoranthene	207-08-9
	Bis(2-chloroethoxy) Methane	111-91-1
	Bis(2-chloroethyl) Ether	111-44-4

APPENDIX K. (CONTINUED)

	Compound Name	Chemical Abstract Service Number
Base/Neutral Compounds (cont.)	Bis(2-chloroisopropyl) Ether	102-60-1
	Bis(2-ethylhexyl) Phthalate	117-81-7
	4-Bromophenyl Phenyl Ether	101-55-3
	Butyl Benzyl Phthalate	85-68-7
	2-Chloronaphthalene	91-58-7
	4-Chlorophenyl Phenyl Ether	7005-72-3
	Chrysene	218-01-9
	Dibenzo[a,h]anthracene	53-70-3
	1,2-Dichlorobenzene	95-50-1
	1,3-Dichlorobenzene	541-73-1
	1,4-Dichlorobenzene	106-46-71
	3,3'-Dichlorobenzidine	91-94-1
	Diethyl Phthalate	84-66-2
	Dimethyl Phthalate	131-11-3
	Di-n-Butyl Phthalate	84-74-2
	2,4-Dinitrotoluene	121-14-2
	2,6-Dinitrotoluene	606-20-2
	Di-n-Octyl Phthalate	117-84-0
	1,2-Diphenylhydrazine (as Azobenzene)	122-66-7
	Fluoranthene	206-44-0
	Flourene	86-73-7
	Hexachlorobenzene	118-74-1

APPENDIX K. (CONTINUED)

	Compound Name	Chemical Abstract Service Number
Base/Neutral Compounds (cont.)	Hexachlorobutadiene	87-68-3
	Hexachlorocyclopentadiene	77-47-4
	Hexachloroethane	67-72-1
	Indeno[1,2,3-cd]pyrene	193-39-5
	Isophorone	78-59-1
	Naphthalene	91-20-3
	Nitrobenzene	98-95-3
	N-Nitrosodimethylamine	62-75-9
	N-Nitrosodi-N-propylamine	621-64-7
	N-Nitrosodiphenylamine	86-30-6
	Phenanthrene	85-01-8
	Pyrene	129-00-0
	1,2,4-Trichlorobenzene	120-82-1
Pesticides	Aldrin	309-00-2
	alpha-BHC	319-84-6
	beta-BHC	319-85-7
	gamma-BHC	58-89-9
	delta-BHC (Lindane)	319-86-8
	Chlordane	57-74-9
	4,4'-DDT	50-29-3
	4,4'-DDE	72-55-9
	4,4'-DDD	72-54-8
	Dieldrin	60-57-1

APPENDIX K. (CONTINUED)

	Compound Name	Chemical Abstract Service Number
Pesticides (cont.)	alpha-Endosulfan	115-29-7
	beta-Endosulfan	115-29-7
	Endosulfan Sulfate	1031-07-8
	Endrin	72-20-8
	Endrin Aldehyde	7421-93-4
	Heptachlor	76-44-8
	Heptachlor Epoxide	1024-57-3
	PCB-1242	53469-21-9
	PCB-1254	11097-69-1
	PCB-1221	11104-28-2
	PCB-1232	11141-16-5
	PCB-1248	12672-29-6
	PCB-1260	11096-82-5
	PCB-1016	12674-11-2
	Toxaphene	8001-35-2

APPENDIX L

CALCULATING SURFACE RUN-OFF

[THE METHODOLOGY IN THIS APPENDIX WAS ADAPTED FROM AN APPROACH FOUND IN-U.S.S.C.S., URBAN HYDROLOGY FOR SMALL WATERSHEDS, TECHNICAL RELEASE NUMBER 55, JANUARY 1985.]

CALCULATING SURFACE RUN-OFF

This appendix presents a method for estimating surface run-off for different amounts of rainfall. This method is based on the use of a matrix developed by the U.S Soil Conservation Service (U.S.S.C.S). The matrix (in Table L-3) gives estimates of surface run-off for selected run-off curve numbers and rainfall amounts.

The run-off curve numbers in the matrix represent the effect of soil type, land use and vegetative cover on run-off amount. The investigator must assign hydrologic soil classifications for soils between the unit and surface water and/or off-site receptors and identify land uses in order to derive the weighted run-off curve number. This can be done by:

1) Determine the hydrologic soil classification(s) for all soil types in the area between the unit and surface water and/or off-site receptors. This information can be obtained by:

   a) Contacting the nearest SCS office and requesting a <u>soil survey</u> of the county where the facility is located. The soil survey contains maps that indicate soil names for all areas of the county.

   b) Using Table L-1 to locate the soil name(s) and corresponding hydrologic soil classification (e.g., A, B, C, or D).

2) Determine the land use(s) of the area between the unit and surface water and/or off-site receptors. (see Table L-2 for land use descriptions).

3) Using Table L-2, identify the run-off curve number for each land use description/hydrologic soil group combination.

4) Calculate the weighted run-off curve number (see the example given below).

Once the weighted run-off curve number is derived, the investigator must identify the 1-year 24-hour rainfall amount and use it and the weighted run-off curve number in the matrix in Table L-3 to determine run-off.

Below is an example of how to use the matrix to determine run-off.

Example

Compute the run-off from 5 inches of rainfall for a 1,000 acre watershed between a landfill and the nearest downgradient stream. All the soils are in hydrologic soil group C. The land use between the unit and the surface water is 50 percent meadow (good condition); 25 percent pasture land (poor condition); and 25 percent wood land (good cover).

1. Compute the weighted run-off curve number.

Land use	Percent of total land use		Table L-2 Curve number		Product
Meadow (good condition)	50	x	71	=	3550
Pasture land (poor condition)	25	x	86	=	2150
Wood land (good cover)	25	x	70	=	1750
	100%				7450

Thus

$$\text{Weighted CN} = \frac{7450}{100} = 74.5 \text{ (use 75)}$$

2. From Table L-3 using CN = 75 and Rainfall = 5 interpolate to read run-off = 2.45 inches

TABLE L-1

SOIL NAMES AND HYDROLOGIC CLASSIFICATIONS

Table L-1 on the following pages provides soil names and their hydrologic classifications. The hydrologic classifications, A, B, C, or D, are indicators of the minimum rate of infiltration obtained for a bare soil after prolonged wetting. These hydrologic classifications and information on the associated land use, can be used to compute run-off curve numbers shown in the appendix.

The hydrologic soil groups, as defined by SCS soil scientists, are:

A. (Low run-off potential). Soils that have a high infiltration rate even when thoroughly wetted and consist chiefly of deep, well drained sands or gravels.

B. Soils that have a moderate infiltration rate when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse texture.

C. Soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soils, with moderately fine to fine texture.

D. (High run-off potential). Soils having a very slow infiltration rate when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

TABLE L-1

Soil Names and Hydrologic Classifications

		ARAKA	A	ARAUOR	D	ARBCK	B	ATLEE	C
AASTAD	B	ARASKA	B	ARAGCN	D	ARBUCKLE	B	ATMORE	B/D
ABAJO	C	ARELA	C	ARALU	D	ARCATA	B	ATOKA	C
ABBOTT	D	ALADDEN	B	ARANA	B	ARCH	B	ATSION	C
ABBOTTSTOWN	C	ALAE	A	ARARGOSA	D	ARCHABAL	B	ATTERBERRY	B
ABEGG	B	ALAELOA	B	ARARILLC	B	ARCHER	C	ATTEWAN	A
ABELA	B	ALAGA	A	ARASA	B	ARCHIN	C	ATTICA	B
ABELL	B	ALAKAI	C	ARBENSCN		ARCO	B	ATTLEBORO	
ABERDEEN	D	ALAPA	C	ARBCY	C	ARCULA	C	ATWATER	B
ABES	D	ALAMANCE	B	ARBRAW	C	ARD	C	ATWELL	C
ABILENE	C	ALAMC	C	ARECEE	A	ARDEN	B	ATWOOD	B
ABINGTON	B	ALAMOSA	C	ARELIA	B	ARDENVEIR	B	AUBBEENAUBBEE	B
ABIQUA	C	ALAPAHA	D	ARENIA	B	ARDILLA	C	AUBERRY	B
ABU	B	ALAPAI	A	ARERICUS	A	ARDOALE	B	AUBURN	C
ABWA	C	ALRAN	B	APES	C	ARENA	C	AUBURNDALE	D
ABRAHAM	B	ALRANO	C	APHERST	C	ARENALES	A	AUDIAN	B
ABSAROKEE	C	ALBANY	C	ARITY	C	ARENOTSVILLE	B	AU GRES	C
ABSCUTA	B	ALRATON	C	ARMON	B	ARENOSA	A	AUGSBURG	B
ABSHER	D	ALHEE	C	AMULE	C	ARENZVILLE	B	AUGUSTA	C
ACASIO	C	ALBEMARLE	B	APCR	B	ARGONAUT	D	AULO	D
ACADEMY	C	ALHERTVILLE	C	AMOS	C	ARGUELLO	B	AURA	B
ACADIA	D	ALRIA	C	APSTERDAM	B	ARGYLE	B	AURORA	C
ACANA	D	ALBION	B	ARTCFT	D	ARIZO	A	AUSTIN	C
ACEITUNAS	A	ALBRIGHTS	C	ARY	D	ARKABUTLA	C	AUSVASSE	D
ACEL	D	ALCALDE	C	ANACAPA	B	ARKPORT	B	AUZQUI	B
ACKER	B	ALCESTER	B	ANAMUAC	D	ARLAND	B	AVA	C
ACKMEN	B	ALCOA	B	ANAPITE	D	ARLING	C	AVALANCHE	B
ACME	C	ALCONA	B	ANAPRA	B	ARLINGTON	A	AVALON	B
ACO	B	ALCOVA	H	AAATONE	D	ARLOVAL	C	AVERY	B
ACOLITA	B	ALDA	C	AAAVERDE	B	ARMAGH	D	AVON	C
ACOVE	C	ALDAX	D	AACHG	C	ARMINGTON	D	AVONBURG	D
ACTON	B	ALDEN	C	ANCHORAGE	A	ARMU	B	AVONDALE	B
ACUFF	B	ALDER	E	ANCHOR BAY	D	ARPLUR	B	AWBREY	D
ACWORTH	B	ALDERDALE	L	ANCHUR POINT	B	ARPSTEP	C	AXTELL	D
ADA	B	ALDERWOOD	C	ANCLUTE	C	ARPSTRONG	D	AYAR	C
ADAIR	D	ALDINO	C	ANCO	C	ARPUCHEE	D	AYCOCK	B
ADAMS	A	ALEKNAGIK	B	ANCORS	C	ARNEGARD	B	AYR	B
ADAMSON	A	ALEX	E	ANCERSCN	B	ARNHART	C	AYRES	D
ADAMSTOWN		ALEXANDRIA	C	ANCES	C	ARNHEIM	C	AYRSHIRE	C
ADAMSVILLE	C	ALEXIS	B	ANCCAINIA	C	ARNU	D	AYSEES	B
ADATHIN	D	ALFORD	A	ANDOVER	D	ARNOLD	B	AZTALAN	B
ADAVEN	D	ALGANSEE	B	ANDRES	B	ARNOT	C/D	AZTEC	B
ADDISON	D	ALGIERS	C/D	ANDREWS	C	ARNESTOCK		AZULE	C
ADDY	C	ALGOMA	B/D	ANEC	D	AROSA	D	AZWELL	B
ADE	A	ALICE	A	ANETH	A	ARP	D		
ADEL	A	ALICEL	A	ANGELICA	D	ARRINGTON	B	BABB	A
ADELAIDE	D	ALICIA	C	ANGELINA	B/D	ARROLIPE	C	BABBINGTON	B
ADELANTO	B	ALIDA	B	ANGIE	C	ARRON	C	BABCOCK	B
ADELPHIA	C	ALIKCHI	D	ANGLE	A	ARRCN	B	BABYLON	A
ADENA	C	ALKO	D	ANGLEN	B	ARRUNSMITH	B	BACA	C
ADILLIS	A	ALLAGASH	B	ANGOLA	C	ARTA	C	BACH	D
ADINGTON BACK		ALLARD	B	ANGESTURA	B	ARTCIS	C	BACHUS	B
ADKINS	A	ALLEGHENY	B	ANIAK	D	ARVACA	D	BACKBONE	A
ADLER	C	ALLEMANDS	D	ANITA	D	ARVANA	C	BADENAUGH	B
ADOLPH	D	ALLEN	B	ANKENY	A	ARVESON	C	BADGER	C
ADRIAN	A/D	ALLENDALE	C	ANLAUF	C	ARVILLA	B	BADGERTON	B
AENEAS	B	ALLENSVILLE	C	ANNANELLA	A	ARZELL	C	BADO	D
AETNA	A	ALLEATINE	D	ANNANDALE	C	ASA	B	BADUS	C
AFTON	D	ALLENWOOD	B	ANNISTON	B	ASBURY		BAGCAO	B
AGAR	B	ALLEY	C	ANCKA	A	ASCALON	B	BAGGOTT	D
AGASSIZ	D	ALLIANCE	D	ANCRES	C	ASCHOFF	B	BAGLEY	B
AGATE	D	ALLIGATOR	C	ANSELMC	A	ASCHROFT	B	BAHER	B
AGAWAM	B	ALLIS	D	ANSON	B	ASHBY	C	BAILE	D
AGENCY	C	ALLISON	C	ANTELOPE SPRINGS	C	ASHCALE	B	BAINVILLE	C
AGER	D	ALLOUEZ	C	ANTERO	C	ASHE	B	BAIRD HOLLOW	C
AGNER	B	ALLOWAY		ANT FLAT	C	ASHEUR	C	BAJURA	D
AGNEW	B/C	ALMAC	B	ANTHONY	B	ASHLEY	A	BAKEOVEN	D
AGNOS	B	ALMENA	C	ANTIGO	B	ASH SPRINGS	C	BAKER	C
AGUA	A	ALMONT	D	ANTILOA	B	ASHTON	B	BAKER PASS	B
AGUADILLA	A	ALPY	B	ANTICCH	D	ASHUE	B	BALAAM	A
AGUA DULCE	C	ALCHA	C	ANTLER	C	ASHUELOT	C	BALCH	D
AGUA FRIA	C	ALCNSO	B	ANTCINE	C	ASHWOOD	C	BALCOM	B
AGUEDA	A	ALLVAR	C	ANTY	B	ASKEW	C	BALD	C
AGUILITA	B	ALMENA	B	ANWAY	B	ASC	D	BALDER	C
AGUINALDO	D	ALPON	B	ANZA	B	ASCTIN	C	BALDOCK	B/C
AGUSTIN	A	ALPCWA	A	APACHE	D	ASPEN	B	BALDWIN	D
AHATONI	D	ALPS		APAKUIE	A	ASPERMONT	B	BALDY	B
AHL	C	ALSEA	A	APISHAPA	C	ASSINAIBOINE	B	BALE	C
AHLSTROM	C	ALSTAD	B	APISON	B	ASSUMPTION	B	BALLARD	B
AHMEEK	B	ALSTOWN	D	APRIAN	D	ASTATULA	A	BALLINGER	C
AHOLT	D	ALTAMONT	C	APPLEGATE	C	ASTOR	A/D	BALP	B/C
AHTANUM	C	ALTAMESTA	C	APPLETON	C	ASTORIA	B	BALPAN	B/C
AHWAHNEE	C	ALTCORP	D	APPLING	B	ATASCADERO	C	BALCN	B
AIELLO	C	ALTMAR	A	APRON	B	ATCO	B	BALTIC	D
AIKEN	B	ALTO	C	APT	C	ATEFIC	C	BALTIMORE	B
AIKMAN	D	ALTOONA	C	APTARISIC	B	ATHOLWELL	B	BAMBER	B
AILEY	B	ALTON		ARARY		ATHENA	B	BAMBOATH	A
AINAKEA	B	ALTUS	D	ARACA	B	ATHESS	B	BANCAS	B
AINWOOD	C	ALTVAN		ARAPIEN	C	ATHERTON	B/C	BANCROFT	B
AIR ISA	B	ALVIN		ARAVA	D	ATHOL	B	BANCERA	B
AIRPORT	D	ALVIRA	C	ARAVETON	B	ATKINSON	B	BANGG	C
AITS	A	ALVISO	D	ARBELA	C	ATLAS	D	BANGOR	B

NOTES A BLANK HYDROLOGIC SOIL GROUP INDICATES THE SOIL GROUP HAS NOT BEEN DETERMINED
TWO SOIL GROUPS SHOWN AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION

January 1971

TABLE L-1 (continued)

BANGSTON	A	BEATTY		BERTELSEN	A	BLAKENEY	C	BORGA	D
BANKARD	A	BEAUCOUP	B	BERTHOUD	B	BLAKEPORT	B	BORDEAUX	B
BANKS	A	BEAUFORD	D	BERTIE	C	BLAMER	C	BORDEN	B
BANNER	C	BEAUMONT	D	BERTOLOTTI	B	BLANCA	B	BORDER	B
BANNERVILLE	C/D	BEAUREGARD	C	BERTRAND	B	BLANCHARD	A	BORNSTEDT	B
BANNOCK	B	BEAUSITE	B	BERVILLE	D	BLANCHESTER	B/D	BORREGO	C
BANQUETE	D	BEAVERTON	B	BERYL	B	BLAND	C	BORUP	B
BARABOO	B	BECK	C	BESSEMER	B	BLANDFORD	C	BORYANT	D
BARAGA	C	BECKER	B	BETHANY	C	BLANDING	B	BORZA	C
BARBARY	D	BECKET	C	BETHEL	D	BLANEY	B	BOSAMIC	D
BARBUR	B	BECKLEY	B	BETTERAVIA	C	BLANKET	C	BOSCO	A
BARBOURVILLE	B	BECKTON	D	BETTS	B	BLANTON	A	BOSKET	B
BARCLAY	C	BECKWITH	C	BEULAH	B	BLANYON	C	BOSLER	B
BARCO	B	BECKWOURTH	B	BEVENT	B	BLASINGAME	C	BOSQUE	B
BARCUS	B	BECREEK	B	BEVERLY	B	BLENCOE	C	BOSS	D
BARD	D	BEDFORD	C	BEW	D	BLENC	D	BOSTON	C
BARDEN	C	BEDINGTON	B	BEWLEYVILLE	B	BLENCON	B	BOSTWICK	B
BARDLEY	C	BEDNER	C	BEWLIN	D	BLETHEN	B	BOSWELL	D
BARELA	C	BEFBE	A	BEXAR	C	BLEVINS	B	BOSWORTH	D
BARFIELD	D	BEECHER	C	BEZZANT	B	BLICHTON	D	BOTELLA	B
BARFUSS	B	BEFCHY		BIBB	B/D	BLISS	D	BOTHWELL	C
BARKER	C	BEEHIVE	B	BIBON	A	BLOCKTON	C	BOTTINEAU	C
BARKERVILLE	C	BEEZAR	B	BICKELTON	B	BLODGETT	A	BOTTLE	A
BARKLEY	B	BEHAMIN	B	BICKMORE	C	BLOMFORD	B	BOULDER	B
BARLANE	D	BEHEMOTOSH	B	BICCNOOA	C	BLOOM	C	BOULDER LAKE	D
BARLOW	B	BEJUCOS	B	BIDDEFORD	D	BLOOMFIELD	A	BOULDER POINT	B
BARNARD	D	BELDEN	D	BIDDLEMAN	C	BLOOMING	B	BOULFLAT	D
BARNES	B	BELDING	B	BIDWELL	B	BLOGR	D	BOURNE	C
BARNESTON	B	BELFAST	B	BIEBER	D	BLOSSOM	C	BOW	C
BARNEY	A	BELFIELD	A	BIENVILLE	A	BLOUNT	C	BOWBELLS	B
BARNHARDT	B	BELFORE	B	BIG BLUE	D	BLUCHER	C	BOWCCIN	D
BARNSTEAD		BELGRADE	A	BIGEL	A	BLUEBELL	C	BOWCRE	C
BARNUM	B	BELINDA	D	BIGETTY	C	BLUE EARTH	D	BOWERS	C
BARNADA	D	BELKNAP	C	BIGGS	A	BLUEJCINT	B	BOWIE	B
BARRINGTON	B	BELLAMY	B	BIGGSVILLE	B	BLUE LAKE	A	BOWMAN	B
BARRON	B	BELLAVISTA	D	BIG HORN	C	BLUEPOINT	B	BOWMANSVILLE	C
BARRONETT	C	BELLE	B	BIG TIMBER	D	BLUE STAR	B	BOX ELDER	C
BARRONS	D	BELLEFONTAINE		BIGWIN	A	BLUEWING	B	BOXWELL	C
BARRY	D	BELLICUM	B	BIJOU	A	BLUFFDALE	C	BOY	A
BARSTOW	B	BELLINGHAM	C	BILLETT	A	BLUFFTON	D	BOYCE	B/D
BARTH	C	BELLPINE	C	BILLINGS	C	BLUFORD	D	BOYD	D
BARTLE	D	BELMONT	B	BINFORD	B	BLY	B	BOYER	B
BARTON	B	BELMORE	B	BINGHAM	B	BLYTHE	D	BOYNTON	
BARTONPLAT	B	BELT	D	BINNSVILLE	D	BOARCTREE	C	BOYSAG	D
BARVON	C	BELTED	D	BINS	B	BOBS	D	BOYSEN	B
BASCOM	B	BELTRAMI	B	BIPPUS	B	BOBTAIL	B	BOZARTH	C
BASEMAN	D	BELTSVILLE	C	BIRCH	A	BOCK	B	BOZE	B
BASHAW	D	BELUGA	C	BIRCHWOOD	C	BODENBURG	B	BOZEMAN	A
BASHFR	B	BELVCIR	C	BIRDS	C	BODINE	B	BRACEVILLE	C
BASILE	D	BENCLARE	C	BIRDSALL	D	BOEL	A	BRACKEN	D
BASIN	C	BENEVOLA	C	BIRDSBORO	B	BOELUS	A	BRACKETT	C
BASINGER	C	BENEWAH	C	BIRDSLEY	D	BOETTCHER	C	BRAD	D
BASKET	C	BENFIELD	C	BIRKBECK	B	BOGAN	C	BRADDOCK	C
BASS	A	BENGE	B	BISBEE	A	BOGANT	B	BRADENTON	B/D
BASSEL	B	BEN HUR	B	BISCAY	C	BOGUE	D	BRADER	C
BASSETT	B	BENIN	D	BISMLP	B/C	BOHANNON	C	BRADFORD	B
BASSLER	D	BENITO	D	BISPING	B	BOHEMIAN	B	BRADSHAW	A
BASTIAN	D	BENJAMIN	D	BISSELL	B	BOISTFORT	C	BRADWAY	C
BASTROP	B	BEN LOMOND	B	BIT	D	BOLAR	C	BRACY	B
BATAVIA	B	BENMAN	A	BITTEROOT	A	BOLD	B	BRACYVILLE	C
BATES	B	BENNDALE	B	BITTERROOT	C	BOLES	C	BRAHAM	B
BATH	C	BENNETT	C	BITTER SPRING	C	BOLIVAR	B	BRAINERD	B
BATTLE CREEK	C	BENNINGTON	D	BITTERSPRING	C	BOLIVIA	B	BRALLIER	D
BATZA	C	BENOIT	C	BIXBY	B	BOLTON	B	BRAP	B
BAUDETTE	B	BENSON	C/D	BJORK	C	BOMBAY	B	BRAPARD	B
BAUER	C	BENTONVILLE		BLACKLY	C	BON	B	BRAPBLE	C
BAUGH	B/C	BENZ	D	BLACK BUTTE	C	BONACCORD	C	BRAPWELL	D
BAXTER	B	BERTHA	B	BLACK CANYON	D	BONAPARTE	A	BRAND	D
BAXTERVILLE	B	BECHWAE	C	BLACKCAP	A	BOND	C	BRANDENBURG	A
BAYAMON	B	BERCAIL	C	BLACKETT	B	BONDURANCH	C	BRANDON	B
BAYARD	A	BERDA	B	BLACKFOOT	B	BONDURANT	B	BRANDYWINE	C
BAYDOWN	D	BEREA	C	BLACKHALL	D	BONE	D	BRANFORD	B
BAYSHORE	B/C	BERENICETON	B	BLACKHAWK	D	BONG	B	BRANTFORD	B
BAYSIDE	C	BERENT	A	BLACKLEAF	B	BONHAM	C	BRASHEAR	C
BAYWOOD	A	BERGLAND	D	BLACKLOCK	D	BONILLA	B	BRASSFIELD	B
BAZETTE	C	BERGSTROM	B	BLACKMAN	C	BONITA	D	BRATTON	B
BEAD	C	BERINO	B	BLACK MOUNTAIN	B	BONN	D	BRAXTON	C
BEADLE	C	BERKELEY		BLACKOAK	C	BONNER	B	BRAYHILL	B/D
BEALES	A	BERKS	C	BLACKPIPE	C	BONNET	B	BRAYS	D
BEAR BASIN	B	BERKSHIRE	B	BLACK RIDGE	C	BONNEVILLE	B	BRAYTON	C
BEAR CREEK	C	BERLIN	C	BLACKROCK	B	BONNICK	A	BRAZITO	A
BEARDALL	C	BERMUDIAN	B	BLACKSTON	B	BONNIE	C	BRAZOS	A
BEARDEN	C	BERNAL	C	BLACKTAIL	B	BONO	D	BRECKENRIDGE	D
BEARDSTOWN	C	BERNALCO	B	BLACKWATER	D	BONSALL	D	BRECKNOCK	B
BEAR LAKE	D	BERNARD	D	BLACKWELL	B/D	BONTA	C	BREECE	B
BEARMOUTH	A	BERNARDINO	C	BLADEN	,	BONTI	C	BREGAR	D
BEARPAW	B	BERNARDSTON	C	BLAIC	D	BOOKER	C	BREPEN	B
BEAR PRAIRIE	B	BERNHILL	B	BLAINE	B	BOOMER	B	BREPER	B
BEARSKIN	D	BERNICE	A	BLAIR	C	BOONE	A	BREMO	C
BEASLEY	C	BERNING	C	BLAIRTON	C	BOONESBURG	B	BRENS	A
BEASON	L	BERRENDOS	D	BLAKE	C	BOOTH	C	BRENDA	C
BEATON	C	BERRYLAND	D	BLAKELAND	A	BORAH	A	BRENNAN	B

NOTES A BLANK HYDROLOGIC SOIL GROUP INDICATES THE SOIL GROUP WAS NOT YET DETERMINED
TWO SOIL GROUPS SUCH AS B/D INDICATES THE DRAINED/UNDRAINED SITUATION

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TABLE L-1 (continued)

BREMNER	C/D	BUCKLEY	B/C	CAIG	B	CAPUTA	C	CATLIN	B
BRENT	C	BUCKLON	D	CAIRO	D	CARACO	C	CATNIP	D
BRENTON	B	BUCKNER	A	CAJALCO	C	CARALAMPI	B	CATOCTIN	C
BRENTWOOD	B	BUCKNEY	A	CAJON	A	CARBO	C	CATLOSA	B
BRESSER	B	BUCKS	B	CALABAR	D	CARBOL	D	CATSKILL	A
BREVARD	B	BUCKSKIN	C	CALABASAS	C	CARBONDALE	D	CATTAHAUGUS	C
BREVORT	B	BUCODA	C	CALAIS	C	CARBURY	B	CAUGLE	B
BREWER	C	BUDD	B	CALAPINE	D	CARDIFF	B	CAVE	D
BREWSTER	D	BUDE.	C	CALAPOOYA	C	CARDINGTON	C	CAVE ROCK	A
BREWTON	C	BUDE	C	CALAWAN	B	CARDON	D	CAVE	D
BRICKEL	C	BUELL	A	CALCO	C	CAREY	B	CAVUDE	C
BRICKTON	C	BUENA VISTA	B	CALDER	D	CAREY LAKE	B	CAVCUR	D
BRIDGE	C	BUFFINGTON	B	CALDWELL	B	CAREYTOWN	D	CAWKER	B
BRIDGEHAMPTON	B	BUFF PEAK	C	CALEAST	C	CARGILL	C	CAYAGUA	C
BRIDGEPORT	B	BUICK	C	CALEB	B	CARIBE	B	CAYLOR	B
BRIDGER	A	BUKREEK	B	CALERA	C	CARIBEL	B	CAYUGA	C
BRIDGESON	B/C	BULLION	D	CALHI	A	CARIBOU	B	CAZADERO	C
BRIDGEVILLE	B	BULLREY	B	CALHOUN	D	CARLIN	D	CAZADOR	B
BRIDGPORT	B	BULL RUN	B	CALICO	D	CARLINTON	B	CAZENOVIA	A
BRIEDWELL	B	BULL TRAIL	B	CALIFON	C	CARLISLE	A/D	CEBOLLA	C
BRIEF	B	BULLY	B	CALIPUS	B	CARLOTTA	B	CECIL	B
BRIENSBURG		BUMGARD	B	CALITA	B	CARLUM	D	CEDARAN	D
BRIGGS	A	BUNCOMBE	A	CALIZA	A	CARLSBAD	C	CEDAR BUTTE	C
BRIGGSDALE	C	BUNDO	B	CALKINS	C	CARLSBORG	A	CEDAREDGE	B
BRIGGSVILLE	C	BUNEJUG	C	CALLAHAN	C	CARLSON	C	CEDAR MT.	D
BRIGHTON	A/D	BUNKER	D	CALLEGUAS	D	CARLTON	B	CEDARVILLE	B
BRIGHTWOOD	C	BUNSELMEIER	C	CALLINGS	C	CARPI	B	CEDONIA	B
BRILL	B	BUNTINGVILLE	B/C	CALLOWAY	C	CARNEGIE	C	CEDRON	C/D
BRIM	C	BURYAN	B	CALPAR	B	CARNERO	C	CELAYA	B
BRIMFIELD	C/D	BURBANK	A	CALRAVA	C	CARNEY	D	CELETON	D
BRINKLEY	B	BURCH	B	CALCUSE	B	CAROLINE	C	CELINA	C
BRINEGAR	B	BURCHARD	B	CALPINE	B	CARR	B	CELIO	A
BRINKERTON	D	BURCHELL	B/C	CALVERT	D	CARRISALITOS	D	CELLAR	C
BRISCOT	B	BURDETT	C	CALVERTON	C	CARRIZO	A	CENCOVE	B
BRITE	C	BUREN	C	CALVIN	C	CARSO	D	CENTER	C
BRITTON	C	BURGESS	B	CALVISTA	D	CARSON	D	CENTER CREEK	B
BRIZAR	A	BURGI	B	CAM	B	CARSTAIRS	B	CENTERFIELD	B
BROAD	C	BURGIN	D	CAMAGUEY	D	CARSTUMP	C	CENTERVILLE	D
BROADALBIN	C	BURKE	C	CAMARGO	B	CARTAGENA	D	CENTRALIA	B
BROADAX	B	BURKHARDT	B	CAMARILLO	B/C	CARTECAY	C	CENTRAL POINT	B
BROADBROOK	C	BURLEIGH	D	CAMAS	A	CARUSO	C	CERESCO	A
BROAD CANYON	B	BURLESON	D	CAMASCREEK	B/D	CARUTHERSVILLE	B	CERRILLOS	C
BROADHEAD	C	BURLINGTON	A	CAMBERN	C	CARVER	A	CERRO	C
BROADHURST	D	BURMA		CAMBRIDGE	C	CARWILE	C	CHACRA	C
BROCK	D	BURMESTER	D	CAMCEN	B	CARYVILLE	B	CHAFFEE	C
BROCKLISS	C	BURNAC	C	CAMERON	D	CASA GRANDE	C	CHAGRIN	B
BROCKMAN	C	BURNETTE	B	CAMILLUS	B	CASCADE	C	CHAIX	B
BROCKPORT	D	BURNHAM	D	CAMP	B	CASCADO	B	CHALFONT	C
BROCKTON	D	BURNSIDE	B	CAMPBELL	B/C	CASCILLA	B	CHALMERS	C
BROCKWAY	B	BURNSVILLE	B	CAMPHORA	B	CASCO	B	CHAMA	B
BRODY	C	BURNT LAKE	B	CAMPIA	B	CASE	B	CHAMBER	C
BROGAN	B	BURRIS	D	CAMPO	C	CASEDIER	D	CHAMBERING	C
BROGDEN	B	BURT	D	CAMPONE	B/C	CASEY	C	CHAMISE	B
BROLLIAR	C	BURTON	B	CAMPSPASS	C	CASMEL	C	CHAMORANE	B
BROMO	B	BUSE	B	CAMPUS	B	CASMION	D	CHAMPION	B
BROMBAUGH	B	BUSHNELL	C	CAMRODEN	C	CASMPENE	B	CHANCE	B/D
BRONCHO	B	BUSHVALLEY	D	CANA	C	CASMPLAT	B	CHANDLER	B
BRONSON	B	BUSTER	C	CANAAN	C/D	CASING	A	CHANEY	C
BRONTE	C	BUTANO	C	CANADIAN	B	CASITO	C	CHANNAHON	B
BROOKE	C	BUTLER	D	CANACICE	D	CASPAR	A	CHANNING	B
BROOKFIELD	B	BUTLERTOWN	C	CANANDAIGUA	D	CASPIANA	B	CHANTA	B
BROOKINGS	B	BUTTE	C	CANASERAGA	C	CASS	A	CHANTIER	D
BROOKLYN	D	BUTTERFIELD	C	CANAVERAL	C	CASSALAGA		CHAPIN	C
BROOKSIDE	C	BUXIN	D	CANDELERO	C	CASSIA	C	CHAPMAN	
BROOKSTON	B/D	BUXTON	C	CANE	C	CASSCLANY	B	CHAPPELL	B
BROOKSVILLE	D	BYARS	D	CANEADEA	D	CASSVILLE		CHARO	B
BROSELEY	B	BYRON	A	CANEER	B	CASTAIC	C	CHARITON	C
BRUSS	B			CANEL	B	CASTALIA	C	CHARITY	D
BROUGHTON	D	CABALLO	C	CANELCX	C	CASTANA	B	CHARLESTON	C
BRUNARD	C	CABARTON	C	CANEY	C	CASTELL	C	CHARLEVOIX	B
BRUNDELL	B	CABBA	C	CANEYVILLE	C	CASTILE	B	CHARLOS	A
BRUNFIELD	A	CABBART	C	CANFIELD	C	CASTINE	C	CHARLOTTE	A/D
BRUNKLEE	B	CABEZON	D	CANISTEO	C	CASTLE	D	CHARLTON	B
BRUYLES	C	CABIN	C	CANALINGER	B	CASTLE VALLEY	D	CHASE	C
BRUCE	D	CABINET	C	CANCE	B	CASTNER	C	CHASEBURG	B
BRUIN	C	CABLE	D	CANCHCITO	C	CASTO	C	CHASEVILLE	A
BRUNEEL	B	CABO ROJO	C	CANCVA	B/D	CASTROVILLE	B	CHASKA	C
BRUNO	A	CABOT	C	CANTON	B	CASUSL	C	CHASTAIN	D
BRUNT	C	CACAPON	B	CANTHIL	B	CASWELL	B	CHATGUAN	B
BRUSETT	B	CACHE	D	CANTUA	B	CATALINA	B	CHATFIELD	
BRUSH		CACIQUE	B	CANUTIO	B	CATALPA	C	CHATHAM	B
BRUSSETT	A	CADOC	D	CANYON	D	CATANO	A	CHATSWORTH	D
BRYAN	A	CADEVILLE	D	CAPAL	B	CATARINA	D	CHAUNCEY	C
BRYCAN	B	CADPUS	B	CAPAY	D	CATAULA	C	CHAVIES	B
BRYCE	D	CADONA	C	CAPE	D	CATAWBA	B	CHAWANAKEE	C
BUCAN	D	CADOR	C	CAPE SEAR	D	CATH	D	CHEADLE	C
BUCHANAN	C	CAGEY	C	CAPERS	D	CATHCART	B	CHECKETT	D
BUCHENAU	C	CAGUABO	D	CAPILLO	D	CATHEDRAL	C	CHECAMAP	B
BUCHER	C	CAHABA	B	CAPLES	C	CATHERINE	D/D	CHEESMAN	B
BUCKINGHAM		CAHELL	D	CAPPS	B	CATHRO	D	CHEHALER	C
BUCKLAND	C	CAHUNE	C	CAPSHAW	C	CATLETT	C/D	CHEHALIS	B
BUCKLESAS	B	CAHTC	C	CAPULIN	C				

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TWO SOIL GROUPS SUCH AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION

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TABLE L-1 (continued)

CHEHULPUM	C	CHUTE	A	CCACHELLA	B	CONALB	B	COTITO	C
CHELAN	B	CIALES	D	CCAO	B	CCNANT	C	COTC	C
CHELSEA	A	CIALITUS	B	CCAL CREEK	C	CCNASAUGA	C	COTCPART	A
CHEMAWA	A	CIBEQUE	A	CCALMONT	C	CCNATA	D	COTT	B
CHEMUNG		CIBU	U	CCAMC	C	CCNBCY	D	COTTER	B
CHEN	D	CIBOLA	B	CCARSEGCLD	B	CCNCHAS	C	COTTERAL	B
CHENA	A	CICERO	D	CCATTCOOK	C	CCNCHO	C	COTTIER	B
CHENANGO	A	CIDEACONE	B	CCATSBURG	D	CCNCCHULLY	B	COTTONWOOD	C
CHENEY	B	CINBAL	C	CCBB	B	CONCORD	D	COTTRELL	C
CHENANGO	C	CIENEGA	B	CCBEN	D	CCNCHEER	B	COUCH	C
CHENOWETH	B	CIMA	C	CCBEY	B	CCNCLA	C	COUGAR	C
CHEQUEST	C	CIMARRON	C	CCBURG	C	CCNDIT	C	COULSTONE	B
CHERERTE	A	CINCINNATI	C	CCCHETUPA	C	CONDON	C	COUNTS	C
CHERIKEE	D	CINCO	A	CCCCA	A	CONE	A	COUPEVILLE	B
CHERAY	C	CINEBAR	A	CCCOLALLA	C	CCNEJO	C	COURT	B
CHERRYHILL	C	CIRCLE	C	CCDCHUS	C	CCNESTUGA	B	COURTHOUSE	D
CHERRY SPRINGS	D	CIRCLEVILLE	C	CODY	A	CCNESUS	B	COURTLAND	B
CHESAW	B	CISNE	D	CCE	A	CCNGAMEE	B	COURTNEY	D
CHESHIRE	B	CISPUS	A	CCEBURN	C	CONI	D	COURTROOM	B
CHESHMINA	D	CITICO	B	CCFF	D	CONLEN	B	COUSE	C
CHESNIMNUS	B	CLACKAMAS	C	CCGGCK	B	CONLEY	C	COUSHATTA	B
CHESTER	B	CLAIBORNE	B	CCGSWELL	C	CONNEAUT	C	COVE	D
CHESTERTON	C	CLAIRE	A	CCHASSET	B	CONNECTICUT		COVEILC	B
CHETCO	D	CLAIREMONT	B	CONCCTAM	D	CCNNER	B	COVELAND	C
CHETER	B	CLALLAM	B	CONCE	B	CONCTTON	B	COVENTRY	B
CHEVELON	C	CLAM GULCH	C	CCIT	C	CONCVER	B	COVEYTOWN	C
CHEWACLA	C	CLAMC	C	CCKEDALE	C	CUNUWINGU	C	COVINGTON	D
CHEWELAH	B	CLANTON	C	CCKEL	C	CONRAD	B	COWAN	A
CHEYENNE	B	CLAPPER	B	CCKER	D	CCNRLE	B	COWARTS	C
CHEAHA	D	CLAREMORE	C	CCKESBURY	D	CCNSEN	C/D	COWDEN	D
CHICKASHA	B	CLARENCE	C	CCKEVILLE	B	CCNSTABLE	A	COWCRY	C
CHICOPEE	B	CLARESON	C	CCLEATH	C/D	CCNSUMO	B	COWEEMAN	C
CHICOTE	D	CLARKEVILLE	C	CCLBERT	D	CONTINENTAL	C	COWERS	B
CHIGLEY	C	CLARINDA	D	CCLBURN	B	CONTRA COSTA	C	COWICHE	A
CHILCOTT	D	CLARION	B	CCLBY	B	CONVERT	C	COWCOD	C
CHILDS	B	CLARITA	D	CCLCHESTER	B	COOA	D	COX	D
CHILGREN	C	CLARK	B	CCLDEN		CCCKPCRT	C	COXVILLE	D
CHILHOWEE	C	CLARK FORK	A	COLD SPRINGS	C	CCULCHITH	B	COYATA	C
CHILI	B	CLARKSBURG	C	CCLE	B/C	COULVILLE	C	COZAD	B
CHILLICOTHE	C	CLARKSDALE	C	CLLEBRCCK	B	COOPUS	B	CRABTON	B
CHILLISQUAQUE		CLARKSON	B	COLEMAN	C	CCLNEY	B	CRADDOCK	B
CHILLUP	B	CLARKSVILLE	B	CCLEMANTOWN	D	CCOPER	C	CRAGLESAUGH	D
CHILMARK	B	CLARNC	B	CLLETU	A	CCCTER	C	CRAFTON	C
CHILO	B/D	CLARY	B	CCLFAR	C	CCPARE	B	CRAGC	B
CHILNQUEN	B	CLATO	B	CCLIMAS	B	COPALIS	B	CRAIG	C
CHILSON	D	CLATSOP	D	CCLLAMER	C	COPELAND	B/D	CRAIGMONT	C
CHILTON	B	CLAVERACK	C	CCLLARD	B	COPITA	B	CRAPEN	D
CHIMAY	C	CLAWSON	C	CCLLBRAN	C	CCPLAY		CRANE	B
CHIMNEY	B	CLAYBURN	B	CCLLEEN	C	CCPPER RIVER	D	CRANSTON	B
CHINA CREEK	B	CLAYSPRINGS	D	CCLLEGIATE	C	COPPERTON	B	CRARY	C
CHINCHALLO	B/D	CLAYTON	B	CCLLETT	C	CCPPOCK	B	CRATER LAKE	B
CHINIAK	A	CLEARFIELD	C	CCLLIER	A	COPSEY	D	CRAVEN	C
CHINO	B/C	CLEAR LAKE	D	CCLLINGTON	B	CCUCILLE	C/D	CRAWFORD	C
CHINOOK	B	CLEER	C	CCLLINS	C	CLRA	D	CREAL	D
CHIPETA	D	CLE ELUM	B	CCLLINSTON	C	CCRAL	C	CREBBIN	C
CHIPLEY	C	CLEGG	B	CCLLINSVILLE	C	CCRCLETT	C	CREECMAN	D
CHIPMAN	C	CLEMAN	B	CCLPA	B	CCRMIN	B	CREEPMUCK	C
CHIPPENY	D	CLEMVILLE	A	CCLMCR	C	CORCLEGA	C	CREIGHTON	B
CHIPPEWA	B/D	CLENDA	B	CCLC	B	CCRL	C	CRELOCK	B
CHIQUITU	C	CLENÉ	B	CCLCCRUP	B	CORCES	B	CRESBARD	C
CHIRICAHUA	D	CLERMONT	C	COLLPA	A	CCRDOVA	C	CRESCENT	B
CHITINA	B	CLEVERLY	A	CCLCMBC	B	CCRINTH	C	CRESCC	C
CHITTENDEN	C	CLIFFDOWN	C	CCLCNA	C	CORKINDALE	B	CREST	C
CHITWOOD	C	CLIFFHOUSE	C	CCLCNIE	A	CORLENA	A	CRESTLINE	B
CHIVATI	C	CLIFFORD	B	CCLCRALG	B	CORLETT	B	CRESTMORE	
CHIWAWA	B	CLIFFWOOD	C	CCLLRCCK	C	CORLEY	C	CRESTON	A
CHO	C	CLIFTERSON	B	CCLCSC	D	CORMANT	C	CRESWELL	C
CHOREE	D	CLIFTON	C	CCLCSSE	A	CCHAMILL	B	CRETE	D
CHOLA	B/D	CLIFTY	B	CCLP	D	CORNIAU	D	CREVA	D
CHOCOLOCCO	B	CLIMAKA	D	CLLRAIN	B	CORNUTT	C	CREVASSE	A
CHOPAKA	C	CLIMAX	C	CCLTCN	A	CLANVILLE	B	CREWS	C
CHOPTANK	A	CLIME	C	CLLTS NECK	B	CORUZAL	C	CRICEK	B
CHOPTIK	D	CLINTON	B	CLLUMBIA	B	CCPPENING	D	CRIP	B
CHORALPONT	B	CLOVINE	C	CCLLPBINE	A	CORRALITOS	A	CRISFIELD	B
CHOTEAU	C	CLONTARF	B	CCLUSA	C	CCRRECO	C	CRITCHELL	B
CHRISTIAN	C	CLOUCALLUM	C	CCLVILLE	B	CORRENA	D	CRIVITZ	A
CHRISTIANA	B	CLOGLATO	D	CCLVIN	C	CLOSON	C	CROCKER	A
CHRISTIANBURG	D	CLOGLET	B	CELWCCD	B/D	CORTEZ	D	CROCKETT	C
CHRISTY	B	CLOUD	D	CLLYER	C/D	CONTINA	A	CROFTON	B
CHROMI	C	CLOUDCROFT	C	CCPENIC	B	CLRUNNA	C	CROGHAN	B
CHUALAR	B	CLOUD PEAK	B	CCPETA	C	CORVALLIS	B	CROKER	C
CHUBBS	C	CLOUD RIM	B	CCPFREY	C	CORWIN	B	CROOKED CREEK	D
CHUCKABALLA	B	CLOUGH	D	CCPITAS	A	CCRY	C	CROLASTON	B
CHULITNA	B	CLOVERDALE	D	CCPLY	C	CORYDON	C	CROOM	B
CHUMMY	C	CLOVER SPRINGS	B	CCPPERCE	C	COSAC	C	CROPLEY	C
CHUMSTICK	C	CLOVIS	B	CLPO	A	COSH	C	CROSBY	C
CHUPADERA	A	CLUFF	C	CCPOCONE	B	CCSHCCTON		CROSS	D
CHUNCH	D	CLUNIE	D	CCPCRO	B	COSAI	B	CROSSVILLE	B
CHURCHILL	D	CLURO	C	CCPRICHE	B	CCSSAYUNA	C	CROSWELL	A
CHURCHVILLE	D	CLUAC	C	CCPRTCN	C	COSTELLA	A	CROT	D
CHURN	B	CLYDE	D	CLPSTCCK	C	CCTACU	C	CROTON	C
CHURNUASHEN	B	CLYMER	B	CCPUS	B	CCTATI	C	CROLLM	B

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TABLE L-1 (continued)

CROW	C	DANZ	B	DEL REY	C	DIXPONT	C	DRY CREEK	C
CROW CREEK	B	DANGOL	D	DEL RIO	C	DIXMONE	B	DRYDEN	B
CRUMBOOT	C	DANTEN	C	DELTA	C	DIXONVILLE	C	DRY LAKE	C
CRUMMEART	A	DARLING	A	DELTON	B	DIXVILLE	A	DUANE	B
CRUM HILL	C	DARNELL	C	DELWIN	A	DOAK	C	DUBAKELLA	C
CRONLEY	D	DARNEN	B	DELYNDIA	B	DOBBS	B	DUBAY	D
CROWN	B	DARR	A	DEMAST	B	DOBY	D	DUBBS	B
CRUMSMAN	B	DARRET	C	DEMASTERS	B	DOCAS	A	DUBCIS	C
CRUZITO	C	DARROCH	C	DE MAYA	C	DOCKERY	C	DUBUQUE	B
CRUCKTON	B	DART	A	DEMERS	D	DOCT	B	DUCEY	B
CRUECKSHANK	C	DARVADA	D	DEMEY	D	DODGE	B	DUCHESNE	A
CRUMP	B	DARWIN	D	DEMONA	C	DODGEVILLE	B	DUCKETT	C
CRUMP	D	DASSEL	D	DEMOPOLIS	C	DODSON	C	DUCOR	D
CRUTCH	B	DATCMAN	C	DEMPSTER	B	DOGER	A	DUDA	A
CRUTCHER	D	DATINO	C	DENAY	B	DOGUE	C	DUDLEY	D
CRUZL	C	DATMYLER	C	DENISON	C	DOLANO	B	DUEL	B
CRYSTAL LAKE	A	DAULTON	D	DENMARK	D	DOLF	C	DUELR	C
CRYSTAL SPRINGS	D	DAUPHIN		DENNIS	C	DOLLAR	B	DUFFAU	B
CRYSTLA	B	DAVEY	A	DENNY	D	DOLLARD	C	DUFFER	D
CUBA	A	DAVIDSON	A	DENROCK	D	DOLORES	B	DUFFIELD	B
CUBERANT	B	DAVIS	B	DENTON	D	DOLPH	C	DUFFSON	B
CUCHILLAS	D	DAVISON	A	DENVER	C	DOMINGO	C	DUFFY	B
CUDAHY	D	DAWES	C	DEPEW	C	DOMINGUEZ	C	DUFUR	B
CUDIYI	B	DAWMCO	B/D	DEPOE	D	DOMINIC	A	DUGGINS	D
CUEMI	B	DAWSON	D	DERINCA	C	DOMINO	C	DUGCUT	D
CUEVA	D	DAY	D	DESAN	A	DONA ANA	B	DUGDAY	C
CUEVITAS	D	DAYBELL	A	DESANT	C	DONALD	E	DUKES	A
CULLEN	C	DAYTON	D	DESCALABRADO	D	DONEGAL		DULAC	C
CULLEURA	B	DAYVILLE	B/C	DESCHUTES	C	DONERAIL	C	DUMAS	B
CULLO	C	DAZE	D	DESERET	C	DONILA	A	DUMECO	C
CULPEPER	C	DEACON	B	DESHA	D	DONALDSTON	C	DUMONT	C
CULVERS	C	DEADFALL	B	DESPLER	C	DONNA	D	DUMBAR	D
CUMBERLAND	B	DEAMA	C	DESCLATELN	C	DONNAN	C	DUMBARTON	C
CUMLEY	C	DEAN	A	DESPAIN	B	DONNYBROOK	D	DUMBRIDGE	B
CUMMINGS	B/D	DEAN LAKE	C	DETEN	C	DONOVAN	B	DUMCAN	D
CUNEL	C	DEARDURFF	B	DETLLA	C	DOOLEY	A	DUMCANNON	B
CUPPER	A	DEARY	C	DETOUR	C	DOONE	E	DUMCOR	D
CUMPLI	C	DEARYTON	A	DETROIT	C	DOOR	B	DUNCAS	C
CUMECANTI	A	DEATMAN	C	DEV	B	DORA	D	DUNCAY	A
CUMLEW	C	DEAVER	C	DEVILS DIVE	D	DORAN	C	DUNCEE	C
CUMMAN	C	DEBENGER	C	DEVCL	B	DORCHESTER	B	DUNELLEN	B
CURANT	D	DECAN	D	DEVCN	B	DORDSHEN	C	DUNE SAND	A
CURTIS CREEK	D	DECATHON	C	DEVORE	A	DORLINEA	C	DUNGENESS	A
CURTIS SIDING	A	DECATUR	D	DEWANT		DORCVAN	D	DUN GLEN	C
CUSHING	A	DECCA	A	DEWEY	B	DORS	B	DUNKINSVILLE	B
CUSHMAN	C	DECKER	C	DEWVILLE	B	DORSET	A	DUNKIRK	B
CUSTER	C	DECKERVILLE	C	DEXTER	B	DOS CABEZAS	C	DUNLAP	B
CUTTER	D	DECLC	B	DIA	C	DOSSMAN	B	DUNMORE	B
CUTZ	D	DECORRA	B	DIABLO	D	DOTHAN	B	DUNNING	C
CUYAMA	A	DECRESS	D	DIAMOND	C	DOTTA	B	DUNPHY	C
CYCLINDER	A	DEE	C	DIAMOND SPRINGS	C	DOTY	B	DUNVILLE	B
CYNTHIANA	C/D	DEERWATER	C	DIAZ	C	DOUBLETOP	B	DU PAGE	B
CYPRESSNET	C	DEER CREEK	C	DIBBLE	C	DOUGS	B	DUPEE	C
CYRIL	B	DEERFIELD	B	DICK	A	DOUGHERTY	A	DUPLIN	C
		DEERFORD	D	DICKEY	A	DOUGHTY	A	DUPC	C
DABLO	B	DEERING	C	DICKINSON	A	DOUGLAS	B	DUPONT	C
DACINA	C	DEERLODGE	D	DICKSON	C	DOURL	A	DUPREE	D
DADE	A	DEER PARK	A	DIGBY	C	DOVER	B	DURALDE	C
DAFTON	B	DEERTON	B	DIGGER	C	DOVRAY	D	DURAMO	B
DAGGETT	A	DEERTRAIL	C	DIGHTON	B	DOW	B	DURANT	D
DAGLUM	D	DEFIANCE	D	DILL	B	DOWAGIAC	B	DURELLE	B
DAGUA	B	DEFUNO	D	DILLARD	C	DOWDEN	C	DURHAM	B
DAGUSH	C	DEGAMMI	B/C	DILLCOWA		DOWELLTON	C	DURREE	C
DAGUEY	C	DEGNER	C	DILLINGER	B	DOWNER	B	DURCC	B
DAHLQUIST	A	DE GREY	D	DILLON	D	DOWNEY	B	DURSTEIN	D
DAIGLE	C	DEJARNET	A	DILLWYN	A	DRANS	A	DUTCHESS	B
DAILEY	A	DEKALB	C	DILPAN	C	DRIE	C	DUTSON	C
DAKOTA	A	DELCVEN	D	DILTS	D	DRYCE	C	DUTTON	D
DALLO	B	DELARE	A	DILWORTH	C	DRYLE	A	DUVAL	B
DALBY	D	DELANCO	C	DIMAL	C	DRYLE	A	DUZEL	B
DALE	A	DELANEY	A	DIMYAN	C	DRYLESTOWN	D	DWIGHT	D
DALHART	B	DELANO	A	DINCLE	B	DRYN	C	DWYER	A
DALIAN	A	DELECO	C	DINGLISHNA	C	DRA	C	DYE	C
DALLAS	B	DELENA	C	DINKELMAN	B	DRAGUT	C	DYER	
DALTON	C	DELFINA	D	DINKEY	A	DRIDE	B	DYKE	B
DALUPE	D	DELMI	A	DINNER	A	DRAGOON	B	DYNENG	D
DAMASCUS	D	DELICIAS	D	DINSDALE	B	DRAGSTON	C		
DAMI	D	DELAS	D/D	DINUBA	B/C	DRAIN	C	EAO	C
DANA	B	DELL	C	DINZEN	B	DRAKE	B	EAGAR	B
DANBURY	C	DELLEKEN	C	DIRTICE	C	DRANTON	B	EAGLECONE	B
DANDY		DELLO	A/C	DISQUE	B	DRAPER	C	EARIN	B
DANGERA	C	DELLROSE	B	DISAMEL	D	DRESSLER	B	EARES	B
DANCRIDGE	D	DELTA	D	DISAUTEL	B	DRESSLER	C	EARLE	C
DANE CO	D	DELMAR	D	DISCO	B	DREWS	B	EARLMONT	B/C
DANIELS	B	DELMITA	C	DISHMEN	D	DRIFTON	C	EARP	B
DANNO	D	DELMONT	A	DISTERHOFF	D	DRIGGS	A	EASLEY	C
DANSLEY	C	DELNORTE	C	DITCHCAMP	C	DRUM	C	EAST FORK	C
DANNEMORA	D	DELPHI	D	DIVERS	B	DRUMMER	A	EAST LAKE	A
DANSKIN	B	DELPHILL	C	DIVILE	B	DRUMMOND	C	EASTLAND	C
DANT	D	DELPIEDRA	C	DIX	A	DRURY	B	EASTON	C
DANVERS	C	DELPINE	D	DIX	A	DRYAC	C	EASTONVILLE	A
DANVILLE	C	DELRAY	B/D	DIXIE	C	DRYBURG	B	EAST PARK	D

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TABLE L-1 (continued)

EASTMONT	A	ELLISON	B	ESPERO	A	FARNUP	B	FLEISCHMANN	D
EATONTOWN		ELLNAM	C	ESPANTO	B	FARRAGUT	C	FLEPING	C
EAUGALLIE	B/D	ELLSBERRY		ESPIL	D	FARRAH	B	FLETCHER	B
EBA	C	ELLSWORTH	C	ESPINAL	A	FARRELL	B	FLORE	D
EBAFAT	D	ELPA	B	ESSLATZEL	B	FARRENBURG	B	FLOP	C
EBAS	B	ELPDALE	B	ESS	B	FARROT	C	FLOPATICH	A
EBENEZER	C	ELPIRA	A	ESSEN	C	FARSCA	B	FLORENCE	C
ECLLES	A	ELPO	C	ESSEX	C	FARWELL	C	FLORIDANA	B/D
ECMAND	C	ELPCAT	P	ESSERVILLE	D	FATIMA	B	FLURISSANT	C
ECMLEN	B	ELPORE	B	ESTACADO	B	FATTIG	C	FLOWELL	C
ECRLEY	A	ELRWOOD	C	ESTELLINE	B	FAUNCE	A	FLOWEREE	B
ECKMAN	A	ELNURA	A	ESTEP	D	FAUGUIER	C	FLOYD	B
ECRANT	D	ELUIRA	B	ESTERBROOK	B	FAWCETT	C	FLUSHING	
ECTOR	C	ELPAN	D	ESTHERVILLE	B	FAWN	B	FLUVANNA	C
EDALGO	C	EL PECO	C	ESTU	C	FAXON	D	FLYGARE	B
EDDS	B	EL RANCHO	B	ESTRELLA	B	FAYAL	C	FLYNN	D
EDDY	C	ELRED	B/D	ETHAN	B	FAYETTE	B	FOARD	D
EDEN	C	ELREO	B/D	ETHETE	B	FAYETTEVILLE	B	FOGELSVILLE	B
EDENTON	C	ELS	A	ETHRIDGE	C	FAYWOOD	C	FOLA	B
EDENVALE	D	ELSAN	B	ETIL	A	FE	D	FOLEY	D
EDGAR	B	ELSINBORO	B	ETNA		FEDORA	B	FONDA	D
EDGECOMBE	B	ELSMERE	A	ETCHAN	B	FELDA	B/D	FONCIS	C
EDGELEY	C	ELSO	D	ETCHM	B	FELIDA	B	FONTAL	C
EDGEMONT	B	EL SOLYO	C	ETTA	C	FELLOWSHIP	D	FONTREEN	B
EDGEWATER	C	ELSTON	B	ETTER	B	FELT	B	FOPIANO	D
EDGEWICK	B	ELTOPIA	P	ETTERSBURG	B	FELTA	C	FORBES	B
EDGEWOOD	A	ELTREE	A	ETTRICK	D	FELTPAR	A	FORC	D
EDINGTON	C	ELTSAC	D	EUGAMES	B	FELTON	B	FORDNEY	A
EDINA	D	ELUMA	B	EUDORA	B	FELTONIA	B	FOROVILLE	B
EDINBURG	C	ELWOOD	C	EUFAULA	A	FENCE	B	FORE	D
EDISON	B	ELY	B	EUREKA	C	FENDALL	C	FORELAND	C
EDISTO	C	ELYSIAN	B	EUSTIS	A	FENWOOD	B	FORELLE	B
EDITH	A	ELZINGA	B	EUTAW	D	FERDELFORD	C	FORESMAN	B
EDLOE	B	EMBDEN	B	EVANGELINE	C	FERDIG	C	FORESTDALE	D
EDMONDS	C	EMBERT	C	EVANS	B	FERGUS	B	FORESTER	C
EDMUND	D	EMER	C	EVANSTON	B	FERGUSON	B	FORGAY	A
EDMUND	C	EMERALD	B	EVANG	A	FERNANDO	C	FORMAN	B
EDNA	D	EMERSON	B	EVART	D	FERNDALE	B	FORNEY	D
EDNEYVILLE	B	EMIDA	D	EVENDALE		FERNLEY	C	FORREST	C
EDOM	C	EMIGRANT	B	EVERETT	B	FERNOW	B	FORSEY	C
EDSON	C	EMIGRATION	D	EVERGLADES	A/D	FERNPOINT	C	FORSGREN	C
EDWARDS	B/D	EMILY	B	EVERLY	B	FERRELO	B	FORT COLLINS	B
EFL	C	EMLIN	B	EVERPAN	C	FERRIS	D	FORT DAUM	C
EFFINGTON	D	EMMA	C	EVERSON	C	FERRON	B	FORT LYON	B
EFNOR	A	EMMERT	A	EVESBORO	A	FERTALINE	D	FORT MEADE	A
EGAN	C	EMMET	B	EWA	B	FESTINA	B	FORT MOTT	A
EGAN	B	EMMONS	C	EWAIL	A	FETTIC	D	FORT PIERCE	C
EGBERT	B/C	EMORY	A	EWINGSVILLE	B	FIANDER	C	FORT ROCK	C
EGELAND	A	EMPEY	B	EXCHEQUER	D	FIBEA	D	FORTUNA	D
EGGLESTON	B	EMPEYVILLE	C	EXETER	C	FIDALGO	C	FORTWINGATE	C
EGLAN	C	EMPIRE	C	FALINE	C	FIDDLETOWN	C	FORWARD	C
EILAS	C	EMRICK	B	EZRAY	D	FIDOYMENT	C	FOSHORE	B
EIFORT		ENCE	B	EZUM	C	FIELDING	B	FOSSUM	B
EKAM	C	ENCIFRRO	D	EVERBCH	D	FIELDON	B	FOSTER	B/C
EKALAKA	B	ENLINA	B	EYNE	B	FIELDSUN	A	FOSTORIA	B
ELAM	A	ENDERS	C			FIFE	B	FOUNTAIN	D
ELAFAT	D	ENDICOTT	B	FABIUS	B	FIFER	D	FOURLOG	D
ELBURN	B	ENFT	A	FAGEVILLE	B	FILLMORE	D	FOURPILE	B
ELCO	B	ENFIELD	B	FAHEY	B	FINCASTLE	C	FOUR STAR	B/C
ELD	B	ENGLE	A	FAIR	C	FINGAL	C	FOUTS	B
ELDER	B	ENGLESIDE	B	FAINES	A	FINLEY	B	FOX	B
ELDER HOLLOW	D	ENGLEWOOD	C	FAIRBANKS	B	FIRESTEEL	B	FOXCREEK	C
ELDERON	B	ENGLUND	D	FAIRDALE	B	FINGRELL	B	FOXPOINT	C
ELDON	B	ENNIS	B	FAIRFAX	B	FINNAGE	B	FOXCL	D
ELDORADO	C	ENOCHVILLE	B/D	FAIRFIELD	B	FIAL	C	FOXPARK	B
ELDRIDGE	C	ENOLA	B	FAIRHAVEN	B	FIRTH	B	FOXTON	C
ELEPHANT	D	ENON	C	FAIRPOINT	D	FISH CREEK	B	FRAILEY	C
ELFRIDA	B	ENOS	B	FAIRPORT	C	FISHERS	B	FRAP	B
ELFRIDA	A	ENOSBURG	D	FAJARDO	C	FISHPOND	D	FRANCIS	A
ELIJAH	C	ENSIGN	D	FALAYA	C	FISHRILL		FRANK	D
ELIOAA	C	ENSLEY	C	FALCON	C	FITCH	A	FRANKFORT	D
ELK	A	ENSTROM	B	FALFURRIAS	A	FITCHVILLE	C	FRANKING	C
ELKADER	B	ENTERPRISE	B	FALK	B	FITZGERALD	B	FRANKLIN	B
ELKAPER	C	ENTIAT	D	FALKNER	C	FITZHUGH	B	FRANKSTOWN	B
ELK HOLLOW	B	ENUMCLAW	E	FALL	B	FIVE OUT	B	FRANKTOWN	D
ELKHORN	A	EPHRAIM	C	FALLBROOK	B	FIVEPILE	B	FRANKVILLE	B
ELKINS	D	EPHRATA	B	FALLON	C	FIVES	B	FRATERNIDAD	D
ELKINSVILLE	A	EPOPETTE	D	FALLSBURG		FLAGG	B	FRAZER	C
ELKMOUND	C	EPPING	D	FALLSINGTON	D	FLAGSTAFF	C	FREO	C
ELK MOUNTAIN	B	EPSIE	C	FALMER	C	FLAK	B	FREDENSBORG	C
ELKTON	D	ERA	B	FANG	C	FLAMING	B	FREDERICK	B
ELLABELLE	A/D	ERAP	C	FANNIN	B	FLAMINGO	D	FREDON	C
ELLEDGE	C	ERBEN	C	FANAL	C	FLANAGAN	B	FREDONIA	C
ELLERY	C	ERIC	B	FANL	C	FLANCREAU	B	FREDRICKSON	C
ELLETT	D	ERIE	C	FANACAY	C	FLASHER	A	FREEBURG	C
ELLIOTT	A	ERIN	F	FANALLENE	B	FLATHEAD	A	FREECE	D
ELLICOTT	A	ERNEST	C	FANANAY	D	FLAT MIRAN	B	FREEHOLD	B
ELLINGTON	B	ERNAPOUSPE	D	FANCO	D	FLATTOP	D	FREEL	B
ELLING	B	ESCAL	B	FANISTA	B	FLAXTON	A	FREEMAN	C
ELLIOTT	C	ESCALANTE	B	FANLANG	B	FLEAK	A	FREEMANVILLE	B
ELLIS	D	ESCAMBIA	C	FANNINGTON	C/D	FLECHAUD	C	FREEON	B
ELLISFORDE	C	ESCUADIDO	C	FARRUP	B	FLEETWOOD		FREER	C

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TABLE L-1 (continued)

FREESTONE	C	GASCONADE	D	GLENFIELD	D	GRANGER	C	GUNN	B
FREEZENER	B	GAS CREEK	C	GLENFORD	C	GRANGEVILLE	B/C	GUNTER	A
FREMONT	C	GASKELL	C	GLENHALL	B	GRANILE	B	GURABO	D
FRENCH	C	GASS	D	GLENHAP	B	GRANC	D	GURNEY	C
FRENCHTOWN	D	GASSET	D	GLENHORA	C	GRANT	B	GUSTAVUS	B
FRENEAU		GATESBURG	A	GLENHALLEN	C	GRANTSBURG	C	GUSTIN	C
FRESNO	C	GATEVIEW	B	GLENORA	B	GRANTSDALE	A	GUTHRIE	D
FRIANA	D	GATEWAY	C	GLENRCSE	B	GRANVILLE	B	GUYTON	D
FRIANT	D	GATEWOOD	D	GLENSTED	D	GRAPEVINE	C	GWIN	D
FRIDLO	C	GAULDY	B	GLENTON	B	GRASPEPE	B	GWINNETT	B
FRIEDMAN	B	GAVINS	C	GLENVIEW	B	GRASSNA	B	GYMER	C
FRIES	D	GAVIOTA	D	GLENVILLE	C	GRASSY BUTTE	A		
FRIO	B	GAY	D	GLIDE	B	GRATZ	C	HACCKE	C
FRIZZELL	C	GAYLORD	B	GLIKON	B	GRAVCEN	C	HACIENDA	C
FROBERG	D	GAYNOR	C	GLORIA	C	GRAVE	B	HACK	B
FROHMAN	C	GAYVILLE	B	GLOUCESTER	A	GRAVITY	C	HACKERS	B
FRONHOFER	C	GAZELLE	D	GLOVER	C/D	GRAYCALM	A	HACKETTSTOWN	B
FRONTON	D	GAZOS	B	GLYNDON	B	GRAYFORD	B	HADLEY	B
FROST	D	GEARHART	A	GLYNN	C	GRAYLING	A	HADO	B
FRUITA	B	GEARY	B	GOBLE	C	GRAYLOCK	B	HAGEN	B
FRUITLAND	B	GEE	B	GOCCARO	B	GRAYPOINT	B	HAGENBARTH	B
FRYE	D	GEEBURG	C	GODDE	D	GRAYS	B	HAGENER	A
FUEGO	C	GEER	C	GOEDECKE	D	GREAT BEND	B	HAGER	C
FUERA	C	GEFO	A	GODFREY	C	GREELEY	B	HAGERMAN	B
FULDA	C	GELKIE	B	GODWIN	D	GREEN BLUFF	B	HAGERSTOWN	C
FULLERTON	B	GEM	C	GOEGLEIN	C	GREEN CANYON	B	HAGGA	B
FULMER	B/D	GENTO	C	GOESSEL	D	GREENCREEK	B	HAIG	C
FULSHEAR	C	GENSON	C	GOFF	C	GREENDALE	B	HAIKU	B
FULTON	D	GENESEE	B	GOGEBIC	B	GREENFIELD	B	HAILMAN	B
FUQUAY	A	GENEVA	C	GOLBIN	C	GREENHORN	D	HAINES	B/C
FURNIS	B/D	GENOA	D	GOLCONDA	D	GREENLEAF	B	HAIRE	C
FURY	B/D	GENOLA	B	GOLDENDALE	B	GREENOUGH	C	HALAWA	B
		GEORGEVILLE	B	GOLDFIELD	B	GREENPORT		HALCER	C
GABASTRA-	C	GEORGIA	B	GOLDHILL	B	GREEN RIVER	B	HALE	B
GABALDON	C	GERALD	D	GOLDMAN	C	GREENSBORO		HALEIWA	B
GABICA	D	GERBER	D	GOLDRIDGE	B	GREENSON	C	HALEY	B
GACEY	D	GERIG	B	GOLGRUN	A	GREENTON	C	HALF MOON	B
GADDES	C	GERING	B	GOLUSBORO	C	GREENVILLE	B	HALFORD	A
GADES	G	GERLAND	C	GOLDSTON	C	GREENWATER	A	HALFWAY	D
GADSDEN	D	GERMANIA		GOLDSTREAM	D	GREENWICH	B	HALII	B
GAGE		GERMANY	B	GOLEVALE	C	GREENWOOD	D	HALIIMAILE	B
GAGEBY	B	GESTRIN	B	GOLUVEIN	C	GREER	C	HALIS	B
GAGETOWN	C	GETTA	C	GOLIAD	C	GREGORY	A	HALL	B
GAHEE	B	GETTYS	C	GOLLAMER	A	GRELL	C	HALLECK	B
GAINES	C	GEYSER	D	GOMEZ	B	GRENADA	C	HALL RANCH	C
GAINESVILLE	A	GHENT	C	GONVICK	B	GRENVILLE	B	HALLVILLE	B
GALATA	D	GIABLER	C	GOOCH	D	GRESHAM	C	HALSEY	D
GALE	B	GIBBON	B	GOODALE	C	GREWINGK	C	HAMAKUAPOKO	B
GALEN	B	GIBBS	D	GOODING	C	GREYBACK	B	HAMAN	B
GALENA	C	GIBBSTOWN	A	GOODINGTON	C	GREYBULL	C	HAMAR	B
GALEPPI	C	GIFFIN	C	GOODLOW	B	GREYCLIFF	C	HAMBLEN	C
GALESTOWN	A	GIFFORD	C	GOODMAN	B	GRIFFY	B	HAMBRIGHT	D
GALEY	B	GILA	C	GOODRICH	B	GRIGSTON	B	HAMBURG	B
GALISTEO	D	GILBY	B	GOODSPRINGS	D	GRIPSTAD	B	HAMEL	C
GALLAGHER	B	GILCHRIST	B	GOOSE CREEK	B	GRISWOLD	B	HAMERLY	C
GALLATIN	A	GILCREST	B	GOOSE LAKE	C	GRIVER	C	HAMILTON	A
GALL. GOS	B	GILEAU	C	GOOSMUS	B	GRIZZLY	C	HAMLET	B
GALLINA	C	GILES	B	GORCO	C	GROGAN	B	HAMLIN	B
GALLION	B	GILFORD	B/D	GORE	D	GROSECLOSE	C	HAMPDEN	
GALVA	B	GILMCULY	B	GORGONIO	A	GROSS	C	HAMPSHIRE	C
GALVESTON	A	GILLSPIE	C	GORMAN	B	GRULTON	A	HAMPTON	C
GALVIN	C	GILLIAM	C	GORIN	C	GROVE	A	HAMTAN	C
GAMBLER	A	GILLIGAN	B	GORING	C	GROVELAND	B	HANA	A
GANNETT	D	GILLS	C	GORMAN	B	GROVER	B	HANALEI	C
GANSNER	D	GILMORE	D	GORLS	A	GROVETON	B	HANAPEPULU	A
GAPO	D	GILPIN	C	GORZELL	B	GRUBBS	D	HANCEVILLE	B
GARDNAYER	B	GILRCY	C	GOSHEN	B	GRULLA	D	HANO	B
GARA	B	GILSON	B	GOSHUTE	D	GRUMMIT	C	HANOFORD	B
GARBER	A	GILT EDGE	C	GOSPERT	C	GRUNCY	C	HANEY	B
GARBUTT	B	GIMAT	D	GOTHAM	A	GRUVER	C	HANGAARO	C
GARCENO	C	GINGER	C	GOTHARD	D	GRYGLA	C	HANGER	B
GARDENA	B	GINI	B	GOTHIC	C	GUACALUPE	B	HANIPOE	B
GARDINER	A	GINSER	C	GOTHO	C	GUAJE	A	HANKINS	C
GARDNERS FORK	B	GIRD	A	GOULDING	D	GUALALA	D	HANKS	B
GARDNERVILLE	D	GIVEN	C	GOVAN	C	GUAMANI	B	HANLY	A
GARDONE	A	GLADDEN	A	GOVE	B	GUANAJIBO	C	HANNA	B
GARDY	C	GLADSTONE	B	GOWEN	B	GUANICA	D	HANOVER	C
GARFIELD	C	GLADWIN	A	GRACE	B	GUAYABO	B	HANS	C
GARITA	C	GLAMIS	C	GRAGLE	B	GUAYABOTA	D	HANSEL	C
GARLAND	A	GLANN	B/C	GRALEPONT	B	GUAYAMA	D	HANSKA	C
GARLET	A	GLASGOW	C	GRACEVILLE	B	GUBEN	B	HANSON	A
GARLOCK	C	GLEAN	A	GRACY	D	GUCKEEN	C	HANTHO	B
GARMON	C	GLEASON	C	GRAFTON	B	GUELPH	B	HANTZ	D
GARMORE	A	GLEN	B	GRAHAM	D	GUENCO	C	HAP	B
GARNER	D	GLENBERG	B	GRAIL	C	GUERNSEY	C	HARGOOD	B
GARO	D	GLENBRUCK	D	GRAPH	B	GUERRERO	C	HARNEY	C
GARR	D	GLENCOE	C	GRANATH	B	GUEST	D	HARBORD	B
GARRARD	B	GLENDALE	A	GRANBY	A/D	GUIN	A	HARBOURTON	
GARRETSON	A	GLENDALE	B	GRANDE RONDE	D	GULEN	B	HARCO	B
GARNETT	B	GLENDIVE	B	GRANDFIELD	B	GULKANA	A	HARCEMAN	B
GARNISON	B	GLENDORA	C	GRANDVIEW	C	GUMBOOT	C	HARDESTY	B
GARWIN	C	GLENELG	B	GRANER	C	GUNBARREL	A	HARDING	

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TABLE L-1 (continued)

HAPOSCRABBLE	B	HEPER	B	HILGRETH	D	HONEYGROVE	C	HUMBARGER	B
HARDY	D	HEBERT	C	HILGA	D	HONEYVILLE	C	HUMBIRD	C
HARGREAVE	A	HEBGEN	A	HILES	B	HONN	B	HUMBOLDT	C
HARKENS	C	HERO	D	HILGER	B	HONCKAA	A	HUMOUR	B
HARKEY	B	HERMON	C	HILGRAVE	B	HONCLUA	B	HUPE	C
HARLAN	B	HECHT	B	HILLERMAN	C	HONCRANU	B	HUMESTON	C
HARLER	C	HECKI	C	HILLET	D	HONGULIULI	D	HUMPINGTON	C
HARLESTON	C	HECLA	B	HILLFIELD	B	HONUAULU	A	HUMPHREYS	B
HARLINGEN	D	HECTOR	D	HILLGATE	C	HOUD	B	HUMPTULIPS	B
HARMEHL	C	HEDOGN	C	HILLIARD	B	HOODLE	B	HUNSAKER	B
HARMONY	C	HEDRICK	B	HILLCN	B	HOODSPORT	B	HUNTERS	B
HARNEY	C	HEDVILLE	D	HILLSBORO	B	HOODVILLE	B	HUNTING	C
HARPETH	A	HEGNE	D	HILLSDALE	B	HOORTON	C	HUNTINGTON	B
HARPS	A	HEIDEN	D	HILPAR	C/D	HOOLEHUA	B	HUNTSVILLE	B
HARPSTER	C	HEIDTMAN	C	HILC	A	HOCPAL	C	HUPP	B
HARPT	B	HEIL	D	HILT	B	HOCPER	D	HURLEY	D
HARQUA	B	HEIMDAL	B	HILTON	B	HOPESTON	B	HURON	C
HARQUA	B	HEISETON	B	HINCKLEY	A	HOSSIC	A	HURST	D
HARRIET	D	HEISLER	B	HINDES	C	HOOT	D	HURWAL	B
HARRIMAN	B	HEIST	B	HINESBURG	C	HOLTEN	D	HUSE	C
HARRIS	D	HEITT	C	HINGLE	D	HOOVER	B	HUSSA	B/D
HARRISBURG	D	HEITZ	D	HINMAN	C	HOPETON	C	HUSSMAN	D
HARRISON	C	HEIZER	D	HINSDALE		HOPEWELL		HUTCHINSON	C
HARRISVILLE	C	HELOT	C	HINTZE	D	HOPGOOD	C	HUTSON	B
HARSTENE	B	HELEMANO	C	HISLE	D	HOPKINS	B	HUXLEY	D
HART	D	HELENA	C	HITT	B	HOPLEY	B	HYAP	D
HART CAMP	C	HELMER	C	HI VISTA	C	HOPPER	B	HYAT	A
HARTFORD	A	HELVETIA	C	HIWASSEE	B	HOQUIAM	B	HYATTVILLE	B
HARTIG	B	HELY	B	HINCOD	A	HORATIO	D	HYDABURG	D
HARTLAND	B	HEMBRE	B	HIXTON	B	HORD	B	HYDE	D
HARTLETON	B	HEMPI	C	HOBACKER	B	HOREB	B	HYDRO	C
HARTLINE	B	HEMPFIELD		HOBAN	C	HORNELL	D	HYMAS	D
HARTSBURG	B	HEPPSTEAD	C	HOBBS	B	HORNING	A	HYRUM	B
HARTSELLS	B	HERCRATT	B	HOBSON	C	HORNITOS	D	HYSPAN	D
HARTSHORN	B	HENDERSON	B	HOCHHEIM	B	HORRORS	B		
HARVARD	B	HENDRICKS	B	HOCKING	B	HORSESHOE	B	IAO	C
HARVEL	B	HENEFER	C	HOCKINSON	C	HORTON	B	IBERIA	C
HARVEY	C	HENGIN	B	HOCKLEY	C	HORTONVILLE	B	IGENE	C
HASKILL	A	HENLEY	C	HODGE	B	HOSKIN	C	IDA	B
HASKINS	C	HENLINE	C	HODGINS	C	HOSLEY	D	IDABEL	B
HASSELL	D	HENNERE	C	HODGSON	C	HOSMER	C	IDANA	C
HASTINGS	B	HENNEPIN	B	HOEBE	B	HOTAN	C	IDECN	D
HAT	B	HENNINGSEN	C	HOELZLE	C	HOT LAKE	C	IDMON	B
HATBORO	D	HENRY	D	HOFFMAN	C	HOUDEK	B	IGNACIO	B
HATCH	C	HENSEL	B	HOFFMANVILLE	C	HOUGHTON	A/D	IGO	D
HATCHERY	C	HENSHAW	C	HOGANSBURG	B	HOUK	C	IGUALOAO	D
HATFIELD	C	HENSLEY	D	HOGELAND	B	HOULKA	C	IHLEN	D
HATHAWAY	B	HEPLER	D	HOGG	D	HOULTON	C/D	IJAP	C
HATTIE	C	HERBERT	B	HOGRIS	B	HOUNOBY	D	ILDEFONSO	B
HATTON	C	HEREFORD	B	HOH	B	HOURGLASS	B	ILKA	B
HAUBSTADT	C	HERKIMER	B	HOHMANN	C	HOUSATONIC	D	ILLION	B/D
HAVANA	B	HERLONG	D	HOKE	C	HOUSE MOUNTAIN	D	IMA	B
HAVEN	B	HERMISTON	B	HOLBROOK	B	HOUSEVILLE	C	IMBLER	B
HAVERLY	B	HERMON	A	HOLCOMB	D	HOUSTON	D	IMLAY	C
HAVERSON	B	HERNDON	B	HOLDAWAY	D	HOUSTON BLACK	C	IMMOKALEE	B/D
HAVILLAH	B	HERO	B	HOLDEN	A	HOVDE	A/C	IMPERIAL	C
HAVINGDON	C	HERRERA	A	HOLDERNESS	C	HOVEN	D	INAVALE	A
HAVRE	B	HERRICK	C	HOLDREGE	B	HOVENDEEP	C	INDIANOLA	C
HAWARDEN	B	HERRON	B	HOLLAND	B	HOVENT	D	INDIAN	
HAW	B	HERSH	A	HOLLINGER	B	HOVEY	C	INDIAN CREEK	D
HAWES	A	HERSHAL	B/D	HOLLIS	C/D	HOWARD	B	INDIANOLA	C
HAWI	B	HESCH	A	HOLLISTER	D	HOWELL	C	INDIANOLA	A
HAWKEYE	A	HESPER	C	HOLLOMAN	C	HOWLAND	C	INDIO	B
HAWKINSVILLE	A	HESPERIA	B	HOLLOWAY	A	HOYT	B	INGA	B
HAWKSPRINGS	B	HESPERUS	B	HOLLY	D	HOYLETON	C	INGALLS	B
HAYTON	A	HESSE	C	HOLLY SPRINGS	D	HOYTUS	A	INGARO	B
HAYBOURNE	B	HESSEL	C	HOLLYWOOD	D	HOYTVILLE	D	INGENIO	C
HAYANO	C	HESSELBERG	C	HOLMDEL	C	HUBBARD	A	INGRAM	D
HAYDEN	B	HESSELTINE	B	HOLMES	B	HUBER	D	INKLER	B
HAYESTON	B	HESSON	C	HOLOPUA	B	HUBERT	B	INKS	C
HAYESVILLE	B	HETTINGER	D	HOLOPAW	B/D	HUBLERSBURG	C	INMAN	C
HAYFIELD	P	HEXT	B	HOLROYD	B	HUCKLEBERRY	C	INPC	A
HAYFORD	C	HEZEL	B	HOLSINE	B	HUDSON	C	INSKIP	C
HAYMOND	B	HIALEAH	D	HOLST	B	HUECO	C	INVERNESS	D
HAYNESS	D	HIAWATHA	A	HOLSTON	B	HUEL	A	INWOOD	C
HAYNIE	B	HIBBARD	C	HOLT	B	HUENEME	B/C	IO	B
HAYPRESS	A	HIBBING	C	HOLTLE	B	HUCHPUENO	D	IOLA	A
HAYSPUR	B/D	HICKORY	C	HOLTVILLE	C	HUEY	D	IOLEAU	C
HAYTER	A	HICKS	B	HOLYOKE	C/D	HUFFINE	A	IONA	B
HAYTI	D	HIDALGO	B	HOPA	C	HUGGINS	C	IONIA	B
HAYWARD	B	HIDEAWAY	D	HOPE CAMP	C	HUGHES	C	IOSCO	B
HAZEL	C	HIDEWOOD	C	HOPELAKE	B	HUGHESVILLE	B	IPAVA	B
HAZELAIR	D	HIGHAMS	D	HOPER	C	HUGO	B	IRA	C
HAZEN	B	HIGHFIELD	B	HOPESTAKE	D	HUICHICA	C	IREDELL	D
HAZLEHURST	C	HIGH GAP	C	HOPESTEAD	B	HUIRAU	A	IRETEBA	C
HAZLETON	A	HIGHLAND	B	HONAUNAU	C	HULETT	B	IRIP	C
HEADLEY	B	HIGHMORE	A	HONCLUT	B	HULLS	C	IRCCK	B
HEADQUARTERS	B	HIGH PARK	B	HONDALE	D	HULLT	B	IRON BLOSSOM	D
HEARE	D	HIMIPANU	A	HONDO	C	HULLA	D	IRON MOUNTAIN	D
HEATH	C	HIBBER	C	HONOLHO	B	HUM	B	IRON RIVER	B
HEATLY	A	HIKO PEAK	B	HONOLYE	B	HUMACAO	B	IRONTON	C
HEBRONVILLE	D	HIKO SPRINGS	C	HONEY	D	HUMATAS	C	IRVINGTON	C

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TABLE L-1 (continued)

IRWIN	D	JONUS	B	KARLG	D	KERMIT	A	KITSAP	C
ISAAC	C	JOPLIN	B	KARLUK	C	KERR	B	KITTANNING	
ISABUAM	B/C	JOPPA	B	KARMAE	D	KERRICK	B	KITTITAS	B
ISABELL	C	JORDAN	D	KARNES	B	KERRTOWN		KITTREDGE	C
ISAN	D	JORNADO	B	KARRO	B	KERSHAW	A	KITTSON	C
ISANTI	D	JORY	C	KARS	A	KERSICK	D	KIUP	B
ISHAM	C	JOSE	C	KARTA	C	KERSTON	A/D	KIVA	B
ISHI PISHI	C	JOSEPHINE	B	KARTAR	B	KERT	C	KIWANIS	A
ISLAND	B	JOSIE	B	KASHWITNA	B	KERWIN	C	KIZHUYAK	B
ISOM	B	JOY	B	KASILOF	A	KESSLER	C	KJAR	D
ISTOKPOGA	D	JUBILEE	C	KASKI	B	KESWICK	D	KLABER	C
ITSWONT	B	JUDD	D	KASOTA	C	KETCHLY	B	KLAMATH	B/D
IUKA	C	JUDITH	A	KASSLER	A	KETTLE	A	KLAUS	A
IVA	C	JUDKINS	C	KASSON	C	KETTLEMAN	B	KLAWASI	D
IVAN	B	JUDSON	B	KATAPA	B	KETTNER	C	KLEJ	B
IVES	B	JUDY	C	KATEPCY	C	KEVIN	C	KLICKER	C
IVIE	A	JUGET	D	KATC	C	KEWAUNEE	C	KLICKITAT	C
IVINS	C	JUGHANDLE	A	KATHING	B	KEWFENAW	A	KLINE	B
IZAGUIRE	C	JULES	B	KATULA	B	KEYA	B	KLINESVILLE	C/D
IZEE	C	JULESBURG	A	KATY	C	KEYES	D	KLINGER	B
		JULIAETTA	B	KAUFMAN	D	KEYPORT	C	KLONDIKE	D
JABU	C	JUMPE	B	KAUPO	A	KEYTESVILLE	D	KLONE	B
JACAGUAS	B	JUNCAL	C	KAVETT	D	KEZAR	B	KLOOCHMAN	B
JACANA	D	JUNCOS	D	KAWAIMAE	C	KIAWAH	C	KLOTEN	B
JACINTO	B	JUNCTION	B	KAWAIMAPAI	B	KIBBIE	B	KLUTINA	B
JACK CREEK	B	JUNEAU	B	KAWBAWGAM	C	KICKERVILLE	B	KNAPPA	B
JACKLIN	B	JUNIATA		KAWICH	A	KIDD	C	KNEELAND	C
JACKWIFF	C	JUNIUS	C	KAWKAWLIN	C	KIDMAN	B	KNIFFIN	C
JACKS	D	JUNO	B	KEAAU	D	KIEHL	A	KNIGHT	C
JACKSON	B	JUNQUITOS	C	KEAPUA	B	KIEV	B	KNIK	B
JACKSONVILLE	C	JURA	C	KEALAKEKUA	C	KIKONI	B	KNIPPA	D
JACUB	D	JUVA	B	KEALIA	D	KILARC	D	KNOB HILL	B
JACUSSEN	D	JUVAN	D	KEARSBURG	D	KILAUEA	B	KNOBLES	B
JACOAY	C			KEARNS	B	KILBUCHANE	A	KNOX	B
JACQUES	C	KAALUALU	A	KEATING	C	KILAURN	A	KNULL	B
JACQUITH	C	KACHEMAK	B	KEAUKAHA	D	KILCHIS	C	KNUTSEN	A
JACWIN	B	KAUASMAN	B	KEAWAKAPU	B	KILOCR	C	KOBAR	C
JAFFREY	A	KADE	C	KEBLER	B	KILGORE	B/D	KOCH	C
JAHUEYPS	B	KAUGKA	B	KECH	C	KILKENNY	B	KODAK	C
JAL	B	KAUCKA	B	KECKO	B	KILLBUCK	C/D	KODIAK	B
JAMES CANYON	B/C	KAENA	D	KECROW	L	KILLEY	B	KOEPLER	C
JAMESTOWN	C	KAHALUU	D	KEEFERS	C	KILLINGWORTH		KOELE	B
JANE	C	KAHANA	B	KEEGAN		KILLPACK	C	KOEPKE	B
JANESE	C	KAHANUI	B	KEEI	D	KILMARQUE	C	KOERLING	B
JANSEN	A	KAHLEH	B	KEEKEE	B	KILCA	A	KOGISH	D
JARBLE	C	KAHOLA	B	KEENE	C	KILLMANA	A	KOHALA	A
JARETT	C	KAH SHEETS	D	KEENC	C	KILWINNING	C	KOKEE	B
JARRE	B	KAHUA	D	KEG	B	KIM	B	KOKC	B
JARVIS	B	KAIKLI	D	KEHEKA	C	KIMANA	B	KOKCHANI	D
JASPER	A	KAILUA	A	KEIGLEY	C	KIMBALL	C	KOKOMO	B/D
JAUCAS	A	KAIMU	A	KEISER	B	KIMBERLY	B	KOLBERG	B
JAVA	A	KAINALIU	A	KEITH	B	KIMBROUGH	C	KOLEKOLE	C
JAY	C	KAIPCIOI	B	KEKAHA	B	KINNEALING	C	KOLLS	D
JAYER	B	KAIWIKI	A	KEKAKE	D	KINO	C	KOLCA	C
JAYSON	D	KALAE	B	KELLER	C	KINA	D	KOLCKOLC	B
JEAN	A	KALAPA	C	KELLY	D	KINCC	A	KONA	D
JEANERETTE	C	KALAPAZOO	B	KELN	C	KINGFISHER	B	KONAWA	B
JEAN LAKE	A	KALAPA	B	KELSEY	C	KINGHURST	B	KONNER	C
JEDDO	D	KALALPAPA	D	KELSO	C	KINGPAN	C	KONGATI	C
JEFFERSON	B	KALIFONSKY	C	KELTNER	B	KINGS	C/D	KOCLAU	C
JEKLEY	C	KALIHI	C	KELVIN	C	KINGSBURY	D	KOGSKIA	C
JELM	D	KALISPELL	A	KEMLC	B	KINGSLEY	B	KOOTENAI	A
JENKINS	B	KALKASKA	A	KEMPSVILLE	B	KINGS RIVER	C	KOPIAH	C
JENKINSON	D	KALPIA	B	KEMPTON	B	KINGSTON	B	KOPP	B
JENNESS	B	KALORO	C	KENAI	C	KINGSVILLE	C	KOPPES	B
JENNINGS	C	KALOLOCH	E	KENANSVILLE	A	KINKEAD	D	KORCHEA	B
JENNY	D	KALSIN	C	KENCAIA	C	KINKEL	B	KORKMAN	B
JERAULD	D	KAPACK	B	KENCALL	B	KINKORA	D	KOSPOS	C
JERICHO	C	KAMAKUA	A	KENCALLVILLE	B	KINMAN	C	KOSSE	D
JEROME	B	KAMAOA	B	KENESAW	B	KINNEY	B	KOSTER	C
JERRY	C	KAMACLE	B	KENPCOR	B	KINNICK	C	KOSZTA	B
JESUEL	D	KAMPAR	B	KENNALLY	B	KINNEAD	D	KOUTS	B
JESSE CAMP	C	KANABEC	B	KENNAN	B	KINRUSS	D	KOVICH	C
JESSUP	C	KANAKA	B	KENNEBEC	B	KINSTON	D	KOYEN	B
JETT	B	KANAPAHA	A/D	KENNEDY	B	KINTON	C	KOYUKUK	B
JIGGS	C	KANDIK	B	KENNEWICK	B	KINZEL	B	KRACE	B
JIM	C	KANE	B	KENNEY	A	KIONA	B	KRANZBURG	B
JIMEREZ	C	KANECHE	B	KENNEY LAKE	C	KIPLING	D	KRATKA	C
JIMTOWN	C	KANEPUU	B	KENO	D	KIPP	C	KRAUSE	A
JOD	C	KANLEE	B	KENOMA	D	KIPPEN	B	KREAMER	
JOCOS	C	KANOSH	C	KENSAL	B	KIPSON	C	KREPLIN	B
JOLLITY	B	KANZA	C	KENSPUR	A	KIRK	B/D	KRENTZ	B
JUEL	B	KAPAA	A	KENT	D	KIRKHAM	C	KRESSON	C
JOCS	B	KAPAPALA	B	KENYON	C	KIRKLAND	D	KRUP	D
JOHNS	C	KAPCO	B	KEO	B	KIRKTON	B	KRUSE	B
JOHNSBURG	D	KAPOSIN	B	KEOLOAN	B	KIRTLEY	B	KRUZOF	B
JOHNSON	B	KAPUKIANI	C	KEOPAP	C	KIRVIN	C	KUBE	B
JOHNSTON	B/D	KAMAPIN	B	KEOTA	C	KISAING	D	KUBLER	C
JOHNSTOWN	B	KANDE	C	KEOWAS	D	KISSICK	D	KUBLI	C
JOICE	D	KARHEEN	C	KEPLER	C	KISTLER	C/D	KUCERA	B
JULIET	C	KARLAN	C	KERBY	B	KITCHELL	B	KUCK	C
JUMPSVILLE	A	KARLIN	A	KERPEL	B	KITCHEN CREEK	B	KUHL	D

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TABLE L-1 (continued)

KUKAIAU	A	LANE	C	LEACVILLE	B	LICKDALE	D	LOLAK	D
KULA	B	LANEY	B	LEAF	D	LICKING	C	LOLALITA	B
KULAKALA	B/C	LANG	B/D	LEAHY	B	LICKSKILLET	D	LOLEKAA	B
KULLIT	B	LANGFORD	C	LEAL	B	LIDDELL	D	LOLETA	C/D
KUMA	B	LANGHEI	B	LEAPS	C	LIEBERMAN	C	LOLC	A
KUNIA	B	LANGLEY	C	LEATHAM	C	LIEN	D	LOLCN	A
KUNUMEIA	C	LANGLOIS	D	LEAVENWORTH	B	LIGGET	B	LOMA	C
KUNO	D	LANGELA	B	LEAVITT	B	LIGHTNING	D	LOMALTA	D
KUSKOKWIM	D	LANGRELL	B	LEAVITTVILLE	B	LIGNUM	C	LOMAX	B
KUSLINA	D	LANGSTON	C	LEBANON	C	LIGON	D	LOMIRA.	B
KUTCH	D	LANIER	B	LEBAN	B	LIMEN	A	LOMOC	C
KUTZTOWN	B	LANIGER	B	LEBEC	B	LIMUE	B	LOMAPINE	C
KVICHAK	B	LANKBUSH	B	LEBO	C	LIKES	A	LOMERIDGE	B
KYLE	D	LANNIN	C	LEBSACK	C	LILAM	A	LONE ROCK	A
KYLER	D	LANRTREE	C	LECK KILL	B	LILLINAUP	A	LONETREE	B
		LANDAR	B	LEDBEDER	B	LIMA	B	LONGFORD	C
LA BANGE	B	LANSDALE	B	LEDGEFORK	A	LIMANI	B	LONGLOIS	B
LABETTE	C	LANSDOWNE		LEDGER	D	LIMBAR	B	LONGMARE	B
LABISH	D	LANSING	B	LEDRU	D	LIMERICK	C	LONGMONT	C
LA BOUNTY	C	LANTIS	B	LEDY		LIMON	C	LONGRIE	C
LA BRIER	C	LANTON	C	LEE	D	LINDAES	B	LONGVAL	B
LACAMAS	C/D	LANTONIA	B	LEEDS	C	LINCOLN	A	LONG VALLEY	B
LA CASA	C	LANTZ	D	LEEFIELD	C	LINCROFT	A	LONGVIEW	C
LACITA	C	LAP	D	LEELANAU	A	LINDLEY	C	LONCKE	B
LACKAWANNA	C	LAPALMA	C	LEEPER	D	LINDSEY	D	LONTI	C
LACONA	C	LAPEER	B	LEESVILLE	B/C	LINDSIDE	C	LOOKOUT	C
LACOTA	D	LAPINE	A	LEETCH	C	LINDSTROM	B	LUON	B
LACY	D	LAPLATTA	C	LEETONIA	C	LINDY	C	LOPER	B
LADD	B	LAPORTE	C	LEFOR	B	LINEVILLE	C	LOPEZ	D
LADDER	D-	LA POSTA	A	LEGLER	B	LINGANORE	B	LORADALE	C
LADELLE	B	LA PRAIRIE	B	LEGGAE	B	LINKER	B	LORAIN	C/D
LADOGA	C	LARABEE	B	LEHEN	C	LINKVILLE	B	LORDSTOWN	C
LAGUE	C	LANCHMCUNT	B	LEHIGH	C	LINNE	C	LORELLA	D
LADYSMITH	D	LARDELL	C	LEHMANS	D	LINNET	D	LORENZO	A
LA FARGE	B	LAREDO	B	LEHR	B	LINNEUS	B	LORETTO	B
LAFE	D	LARES	C	LEICESTER	C	LINO	C	LORING	C
LA FONDA	C	LARGENT	D	LEILEHUA	B	LINSLAW	D	LOS ALAMOS	C
LAFONT	B	LARGO	C	LELA	D	LINT	B	LOS BANOS	C
LAGLORIA	B	LARIMER	B	LELAND	D	LINTON	B	LOSEE	B
LAGONDA	C	LARKIN	B	LEMETA	D	LINVILLE	B	LOS GATOS	B
LA GRANDE	C	LARKSON	C	LEMPSTER	C/D	LINWOOD	A/D	LOS GUINEOS	C
LAHAINA	B	LA ROSE	B	LEN	C	LIPAN	D	LOS OSOS	C
LA HOGUE	B	LARRY	D	LENA	A	LIPPINCOTT	B/D	LOS ROBLES	B
LAHONTAN	D	LARSON	D	LENAPAH	D	LIRICS	B	LOS TANOS	B
LAIDIG	C	LARUE	A	LENAWEE	B/D	LIRRET	D	LOST CREEK	B
LAIDLAW	B	LARVIE	D	LENNEP	D	LISADE	B	LOST HILLS	C
LAIRDSVILLE	D	LAS	C	LENCIR	D	LISAP	D	LOS TRANCOS	D
LAIREP	D	LAS ANIMAS	C	LENCX	B	LISBON	B	LOSTWELLS	B
LA JARA	C	LASAUSSES	C	LENZ	B	LISMAS	D	LOTHAIR	C
LAKE	A	LAS FLORES	D	LEO	B	LISMORE	B	LOTUS	B
LAKE CHARLES	D	LASHLEY		LEON	A/D	LITCHFIELD	A	LOUDON	C
LAKE CREEK	B	LASIL	D	LEONARD	C	LITHGOW	C	LOUGGNVILLE	C
LAKEHELEN	B	LAS LUCAS	C	LEONARDO	B	LITHIA	C	LOUIE	C
LAKEHURST	A	LAS POSAS	C	LEONARDTOWN	D	LITIMER	C	LOUISA	B
LAKE JANEE	A	LASSEN	D	LEONIDAS	B	LITLE	D	LOUISBURG	B
LAKELAND	A	LASTANCE	B	LECTA	C	LITTLEBEAR	A	LOUP	D
LAKEMINT	D	LAS VEGAS	D	LEPLEY	D	LITTLEFIELD	D	LOUROES	C
LAKEPORT	B	LATAH	C	LEROAL	C	LITTLE POLE	D	LOUVIERS	D
LAKESHORE	D	LATANCO	C	LERCY	B	LITTLETON	B	LOVEJOY	C
LAKESUL	B	LATANIER	D	LESMARA	B	LITTLE WOOD	B	LOVELAND	C
LAKETON	B	LATHAM	D	LESMC	C	LITZ	C	LOVELL	C
LAKEVIEW	C	LATINA	D	LESLIE	D	LIVERMORE	A	LOVELOCK	C/C
LAKEWIN	A	LATON	D	LESTER	B	LIVINGSTON	D	LOWELL	C
LAKEWOOD	A	LATONIA	B	LE SUEUR	B	LIVONA	A	LOWRY	B
LAKI	B	LATTY	C	LETA	C	LIZE	C	LOWVILLE	B
LAKIN	A	LAUDERDALE	A	LETCHER	D	LIZZANT	B	LOYAL	B
LAKONA	D	LAUGENOUR	B/D	LETHA	D	LOBUELL	C	LOYALTON	D
LALAAU	A	LAUGHLIN	A	LETHENT	C	LOBELVILLE	C	LOYSVILLE	D
LA LANDE	C	LAUMAIA	B	LETCRT		LOBENG	B	LOZANO	B
LALLIE	D	LAUREL	C	LETTERBOX	B	LOBERT	B	LOZIER	D
LAM	B/D	LAURELHURST	C	LEVAN	A	LOBITOS	C	LUALUALEI	D
LAMAA	A	LAURELWOOD	B	LEVASY	C	LOCEY	C	LUBBOCK	C
LAMARTINE	B	LAUREN	B	LEVERETT	C	LOCHSA	B	LUBRECHT	C
LAMBERT	B	LAVALLEE	B	LEVIATHAN	B	LOCKE	B	LUCAS	C
LAMBETH	C	LAVEEN	A	LEVIS	C	LOCKERBY	C	LUCE	C
LAMINGTON	D	LAVELOO	D	LEWIS	D	LOCKHARD	B	LUCEDALE	B
LAMO	B	LAVERKIN	C	LEWISBERRY	B	LOCKHART	B	LUCERNE	B
LAMONI	D	LAVINA	C	LEWISBURG	C	LOCKPORT	D	LUCIEN	C
LAMOLI	A	LAWAI	A	LEWISTON	C	LOCKWOOD	B	LUCILE	B
LAMONTA	D	LAWLER	B	LEWISVILLE	C	LOCUST	C	LUCILETON	B
LAMOURE	C	LAWRENCE	C	LEX	B	LODAR	D	LUCKY	B
LAMPHIER	A	LAWRENCEVILLE	C	LEXINGTON	B	LODEPA	A	LUCKY STAR	B
LAMPSHIRE	D	LAWSON	B	LIABINGS	D	LODI	C	LUCY	A
LAMSON	D	LAWTHER	D	LIBBY	B	LODO	D	LUDDEN	D
LANARK	B	LAWTON	C	LIBEG	A	LOFFTUS	C	LUDLOW	C
LANCASTER	B	LAX	C	LIBERAL	D	LOFTON	D	LUFKIN	D
LANCE	B	LAYCOCK	B	LIBERTY	C	LOGAN	C	LUHCN	B
LAND	U	LAYTON	A	LIBORY	A	LOGGERT	A	LUJANE	C
LANDCS	B	LEA	C	LIBRARY	D	LOGY	B	LUKIN	C
LANDISBURG	C	LEADER	B	LIBLITE	D	LOHLER	C	LULA	B
LANULON	C	LEADPOINT	B	LICK	B	LOHMILLER	C	LUMBEE	D
LANOUSKY	D	LEADVALE	C	LICK CREEK	D	LOHNES	A	LUMAI	B/C

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TABLE L-1 (continued)

LUR	C	MALABAR	A/D	MARKSBORO		MAYFLOWER	C	MCVICKERS	C
LURA	C	MALABON	C	MARLA	A	MAYHEW	D	MEAD	D
LURCH	C	MALACHY	B	MARLBORO	B	MAYLAND	B	MEACIN	A
LUROIRO	C	MALAGA	B	MARLEAN	B	MAYMEN	C	MEADOWVILLE	B
LUROY	B	MALAMA	A	MARLETTE	B	MAYNARD LAKE	B	MEADVILLE	
LURT	C	MALAYA	D	MARLEY	B	MAYO	B	MEANDER	D
LURTON	D	MALCOLM	B	MARLIN	D	MAYODAN	B	MECAN	B
LURA	D	MALEZA	B	MARLOW	C	MAYOWORTH	D	MECCA	B
LURAY	C/D	MALIBU	D	MARLTON	C	MAYSDORF	B	MECKESVILLE	C
LUTE	D	MALIN	C/D	MARMARTH	B	MAYSVILLE		MECKLENBURG	C
LUTH	C	MALJAMAR	A	MARNA	D	MAYTOWN	C	MEDA	B
LUTHER	B	MALLOT	A	MARPA	B	MAYVILLE	B	MEDANO	C
LUTIE	B	MALM	C	MARQUETTE	A	MAYWOOD	B	MEDARY	C
LUTON	D	MALO	B	MARR	B	MAZEPPA	B	MEDFORD	D
LUVERNE	C	MALONE	B	MARRIOTT	B	MAZON	C	MEDFRA	D
LUXOR	C	MALOTERRE	D	MARSDEN	C	MAZUMA	C	MEDICINE LODGE	A
LUZENA	D	MALPAIS	C	MARSELL	B	MCAFEE	C	MEDINA	B
LYCAN	B	MALPOSA	C	MARSHALL	B	MCALLEN	B	MEDWAY	B
LYCOMING	C	MALVERN	C	MARSHAN	D	MCALLISTER	C	MEEKS	A
LYDICK	B	MAMALA	D	MARSHDALE	C	MCALPIN	C	MEETEETSE	C
LYFORD	C	MAMOU	C	MARSHFIELD	C	MCBEE	B	MEGGETT	D
LYLES	B	MANAMAA	C	MARSING	B	MCBETH	C	MEGGON	C
LYMAN	C/D	MANALAPAN		MART	C	MCBRIDE	B	MEHL	C
LYNCH	D	MANANA	C	MARTELLA	B	MCCABE	B	MEHLMCRN	C
LYNCHBURG	B/D	MANASSA	C	MARTIN	C	MCCAFFERY	A	MEIGS	
LYNDEN	A	MANASSAS	B	MARTINA	A	MCCAIN	C	MEIKLE	D
LYNNUYL	A	MANASTASH	C	MARTINEER	D	MCCALER	B	MEISS	D
LYNN HAVEN	B/D	MANATEE	A/D	MARTINEZ	D	MCCALLY	D	MELBOURNE	B
LYNNVILLE	C	MANAWA	C	MARTINI	B	MCCAPRON	C	MELBY	C
LYNR	A	MANCELONA	A	MARTINSBURG	B	MCCARRAN	D	MELITA	B
LYONMAN	C	MANCHESTER	A	MARTINSDALE	B	MCCARTHY	B	MELLENTHIN	D
LYONS	D	MANDAN	B	MARTINSON	C	MCCLAVE	C	MELLOR	D
LYONSVILLE	B	MANDERFIELD	B	MARTINSVILLE	B	MCCLEARY	C	MELLOTT	B
LYSINE	D	MANDEVILLE	B	MARTINTON	C	MCCLELLAN	B	MELOLAND	C
LYSTAIR	B	MANFRED	C	MARTY	B	MCCLOUD	C	MELROSE	C
LYTELL	B	MANGUM	D	MARVAN	D	MCCOIN	D	MELSTONE	A
		MANHATTAN	A	MARVIN	C	MCCOLL	D	MELTON	B
MABEN	C	MANHEIM	C	MARY	C	MCCONNEL	B	MELVILLE	B
MABI	D	MANI	C	MARYDEL	B	MCCOOK	B	MELVIN	D
MABRAY	D	MANILA	C	MARYSLAND	D	MCCORMICK	C	MEPALOOSE	D
MACAY	B	MANISTEE	B	MASADA	C	MCCOY	C	MEPHIS	B
MACEDONIA	C	MANITOU	C	MASCAMP	D	MCCREE	B	MENAMGA	A
MACHETE	C	MANLEY	B	MASCOTTE	D	MCCXCRY	C	MENAN	C
MACHIAS	B	MANLIUS	C	MASHEL	B	MCCRCSKIE	D	MENANO	B
MACK	C	MANLOVE	B	MASHULAVILLE	B/D	MCCULLOUGH	C	MENCH	C
MACKEN	D	MANNING	B	MASON	B	MCCULLY	C	MENCEBOURE	C
MACKINAC	B	MANOR	B	MASONVILLE	C	MCCUNE	D	MENCOCINO	B
MACKSBURG	B	MANSFIELD		MASSACK	B	MCCUTCHEN	C	MENDON	A
MACOMB	B	MANSIC	B	MASSENA	C	MCDOLE	B	MENOLTA	B
MACOMMER	B	MANSKER	B	MASSILLON	B	MCDONALD	B	MENEFEE	D
MACON	B	MANTACHIE	C	MASTERSON	B	MCDONALDSVILLE	C	MENFRO	B
MACY	B	MANTEO	C/D	MATAMOROS	C	MCEWEN	B	MENLO	D
MADALIN	D	MANTER	A	MATANUSKA	C	MCFADDEN	B	MENO	C
MADAWASKA	B	MANTON	B	MATANZAS	B	MCFAIN	C	MENGREN	C
MADDOCK	A	MANTZ	B	MATAPEAKE	B	MCFAUL	C	MENOMINEE	B
MADDOX		MANU	C	MATAWAN	C	MCGAFFEY	C	MENTO	C
MADELIA	C	MANVEL	C	MATCHER	A	MCGARY	C	MENTOR	B
MADELINE	D	MANWOOD	D	MATFIELD	C	MCGEHEE	C	MEQUON	C
MADERA	D	MANZANITA	C	MATHERS	B	MCGILVERY	C	MERCED	C/D
MADISON	B	MANZANO	C	MATHERTON	B	MCGINTY	B	MERCEDES	D
MADONNA	C	MANZANOLA	C	MATHESON	B	MCGIRK	C	MERCER	C
MADRAS	C	MAPES	C	MATHEWS		MCGOWAN	B	MERCEY	C
MADRID	B	MAPLE HT.	B	MATHISTON	C	MCGRATH	B	MEREDITH	B
MAUUREZ	B	MAPLETON	C/D	MATLOCK	D	MCGREW	A	MERETA	C
MAGALLON	B	MARATHON	B	MATMON	D	MCHENRY	B	MERGLE	B
MAGENS	B	MARBLE	A	MATTAPEX	C	MCILWAINE	A	MERIDIAN	B
MAGINNIS	C	MARBLEMOUNT	B	MATTOLE	C	MCINTOSH	B	MERINO	D
MAGNA	D	MARCETTA	A	MAUGE	B	MCINTYRE	B	MERREL	B
MAGNOLIA	B	MARCUM	B	MAUGHAN	C	MCKAPIE	D	MERLIN	C
MAGNUS	C	MARCUS	C	MAUREY	C	MCKAY	D	MERRILL	B/D
MAGUAYO	D	MARCY	D	MAUPEE	A/D	MCKENNA	C/D	MERRA	C
MAHAFFY	C/D	MARDEN	C	MAURAGC	D	MCKENZIE	D	MERCS	A
MAHALA	C	MARDIN	C	MAURIN	C	MCKINLEY	C	MERRIFIELD	B
MAHALASVILLE	B/D	MARENGO	C/D	MAUREPAS	D	MCKINNEY	D	MERRILL	C
MAHANA	A	MARESUA	B	MAURINE	D	MCLAIN	C	MERRILLAN	C
MAHASKA	B	MARGERUM	B	MAURY	B	MCLAURIN	B	MERRIMAC	A
MAHER	C	MARGUERITE	A	MAVERICK	C	MCLEAN	C	MERRITT	B/C
MAHONING	D	MARIA	B/C	MAVIF	D	MCLECO	B	MER ROUGE	B
MAHUKONA	B	MARIANA	C	MAWAE	A	MCMAHON	C	MERTON	B
MAIDEN	B	MARIAS	D	MAX	B	MCMEEN	C	MERTZ	
MAILE	A	MARICAO	B	MAXEY	C	MCMULLIN	C	MESA	B
MAJADA	B	MARICOPA	B	MAXFIELD	C	MCMURDIE	C	MESCAL	C
MAKAALAE	B	MARIETTA	C	MAXSON	A	MCMURPHY	B	MESCALERO	C
MAKALAPA	D	MARILLA	C	MAXTON	B	MCMURRAY	D	MESITA	C
MAKAPILI	A	MARINA	A	MAYVILLE	A	MCNARY	D	MESKILL	C
MAKAWAO	B	MARION	D	MAZWELL	D	MCPAUL	B	MESPAN	C
MAKAWELI	A	MARIPOSA	C	MAY	B	MCPHERSON	C	MESSER	C
MAKENA	A	MARISSA	C	MAYBERRY	C	MCPHIE	B	MET	D
MAKIKI	B	MARKES	D	MAYBESC	C	MCQUARRIE	D	METALINE	B
MAKOTI	C	MARKEY	D	MAY DAY	D	MCQUEEN	C	METAMORA	B
MAL	B	MARKHAM	C	MAYER	D	MCRAE	B	METEA	B
MALA	B	MARKLAND	C	MAYFIELD	B	MCTAGGART	B	METIGOSHE	A

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TABLE L-1 (continued)

METOLIUS	B	MISSION	B	MORGANFIELD	B	NABESNA	C	NESS	D
METRE	D	MITCH	B	MORGNEC		NACEVILLE	C	NESSEL	B
METZ	A	MITCHELL	B	MORIARTY	D	NACHES	B	NESSOPAN	B
MEXICO	D	MITIWANGA	C	MORICAL	C	NACIMIENTO	C	NESTER	C
MHOON	D	MIZPAH	C	MORLEY	C	NACOGDOCHES	B	NESTUCCA	C
MIAMI	B	MOANC	D	MORPCN PESA	C	NADEAN	B	NETAMTS	A
MIAMIAN	C	MOAPA	D	MORCCCC	A/C	NADINA	B	NETC	B
MICCO	A/D	MOAULA	A	MORCNI	D	NAFF	B	NETTLETCN	C
MICHELSON	B	MOBEETIE	A	MORCP	C	NAGEESI	B	NEUBERT	B
MICHIGAMME	C	MOCA	D	MORRILL	B	NAGITSY	C	NEUAS	B
MICK	B	MOCHO	B	MORRIS	C	NAGLE	B	NEUSKE	B
MIDAS	D	MODA	D	MORRISON	B	NAMPA	C	NEVADCA	C
MIDOLF	C	MOCALE	C	MORROW	C	NAMUNTA	C	NEVILLE	B
MIDDLEBURY	B	MODEL	C	MORSE	D	NAINA	B	NEVIN	C
MIDESSA	B	MODENA	B	MORTENSCN	C	NAKAI	B	NEVINE	B
MIDLAND	D	MODESTO	C	MORTCN	B	NAKNEK	D	NEVCYEN	D
MIDNIGHT	C	MODOC	C	MORVAL	C	NAMRE	B	NEVTAN	C
MIDVALE	C	MOENKOPIE	D	MOSBY	C	NANAPRIN	A	NEVU	D
MIDWAY	D	MOFFAT	B	MOSCA	A	NANCY	B	NEWARK	C
MIFFLIN	B	MOGOLLON	B	MOSEL	C	NANNY	B	NEWART	B
MIFFLINBURG	B	MOGUL	B	MOSHANNCN	B	NANNYTCN	B	NEWAYGC	B
MIGUEL	C	MOHAVE	B	MOSHER	D	NANSENE	B	NEWBERG	B
MIKE	D	MOHAVE	B	MOSHERVILLE	C	NANTUCKET	C	NEWBERRY	C
MIKESELL	C	MOHAWK	B	MOSIDA	B	NANUP	C	NEWBY	B
MILACA	B	MOIRA	C	MOSQUET	D	NAPA	C	NEW CAMBRIA	C
MILAN	B	MOKELUMNE	D	MOSSYROCK	B	NAPIER	B	NEW CASTLE	B
MILES	B	MOKENA	C	MOTA	B	NAPLES	B	NEWCCMB	A
MILFORD	C	MOKULEIA	B	MOTTSVILLE	A	NAPPANEE	D	NEWDALE	B
MILHAM	C	MOLANO	B	MOULTON	B	NAPTCWKE	B	NEWELL	B
MILHEIM	C	MOLCAL	B	MOUNO	C	NAMANJETU	C	NEWELLTCN	D
MILL	B	MOLENA	A	MOUNTAINBURG	D	NAMANJC	C	NEWFANE	
MILLARD	B	MOLINIS	B	MOUNTAINVIEW	B/D	NANCISSE	B	NEWFORK	D
MILLBORO	D	MOLLY	A	MOUNTAINVILLE	B	NANO	B	NEWKIRK	B
MILLBROOK	B	MOLOKAI	B	MOUNT AIRY	A	NARLCN	C	NEWLANDS	B
MILLBURNE	B	MOLSON	B	MOUNT CARROLL	B	NARCN	B	NEWLIN	B
MILLCREEK	B	MOLYNEUX	B	MOUNT HOPE	B	NARRAGANSETT	B	NEWMARKET	B
MILLER	D	MONAD	A	MOUNT MOCO	B	NARROWS	D	NEWPORT	C
MILLERLUX	D	MONAHAN	C	MOUNT LUCAS	C	NASER	B	NEWRY	B
MILLERTON	D	MONAMANS	B	MOUNT CLIVE	D	NASH	B	NEWSKAP	A
MILLETT	B	MONARDA	C	MOUNTVIEW	B	NASHUA	A	NEWSTEAD	D
MILLGROVE	B/D	MONCLOVA	B	MOVILLE	C	NASHVILLE	B	NEWTON	A/D
MILL HOLLOW	B	MONDARIN	C	MOWATA	D	NASON	C	NEWTONIA	B
MILLICH	D	MONDOVI	B	MOWER	C	NASSAU	C/D	NEWTOWN	C
MILLINGTON	B	MONEE	D	MOYINA	D	NASSET	B	NEWVILLE	C
MILLIS	C	MONICO	B	MUCANA	D	NATALIE	C	NEZ PERCE	C
MILLRACE	B	MONIDA	B	MUCET	C	NATCHEZ	B	NIAGARA	C
MILLSAP	C	MONITEAU	D	MUDRAY	D	NATHROP	B	NIART	B
MILLSDALE	B/D	MONMOUTH	C	MUD SPRINGS	C	NATICHAL	B	NIBLEY	C
MILLSHOLM	C	MONO	D	MUGHOUSE	C	NATACHA	B	NICHOLSCN	C
MILLVILLE	B	MONOLITH	C	MUIR	B	NATURITA	B	NICHOLVILLE	C
MILLWOOD	D	MONONA	B	MUIRKIRK	B	NAUKATI	D	NICKEL	B
MILNER	C	MONONGAHELA	C	MUKILTEO	D	NAUMBURG	C	NICALE	B
MILPITAS	C	MONROE	B	MULCRCW	D	NAVAJO	D	NICCDEMUS	B
MILROY	D	MONROEVILLE	C/D	MULKEY	C	NAVAN	D	NICOLAUS	C
MILTON	C	MONSE	B	MULLINS	D	NAVARRO	B	NICOLLET	B
MIMBRES	C	MONSERATE	C	MULT	C	NAVESINK		NIELSEN	D
MIMOSA	C	MONTAGUE	D	MULTCHPOR	A	NAYLOR		NIGHTHAWK	B
MINAM	B	MONTALTO	C	MUMFORD	B	NAZ	B	NIHILL	B
MINATARE	D	MONTARA	D	MUNCFLEIN	B	NEAPOLIS	B/D	NIKISKA	B
MINCHEY	B	MONTAUK	C	MUNISING	B	NEBEKER	C	NIKLASCN	B
MINCO	B	MONTCALM	A	MUNK	C	NEBISH	B	NIKOLAI	D
MINDALE	B	MONTE CRISTO	D	MUNSON	D	NEBO		NILAND	C
MINDEGO	B	MONTEGRANDE	D	MUNUSCONG	D	NECHE	C	NILES	C
MINDERMAN	A	MONTELL	D	MUROC	B	NEUEKLAND	B	NIMROD	C
MINDEN	C	MONTELLO	C	MURDOCK	C	NEEDHAM	D	NINCH	C
MINE	B	MONTEVALLO	C	MUREN	B	NEEGLE PEAK	C	NINEPILE	D
MINEOLA		MONTGOMERY	D	MURRILL	B	NEECPORE	C	NINEVEH	B
MINER	D	MONTICELLO	B	MUSCATINE	B	NEELEY	B	NINIGRET	B
MINERAL	A	MONTIETH	A	MUSE	C	NEGITA	B	NININGER	B
MINERAL PT.	C	MONTMORENCI	B	MUSELLA	B	NEGLEY	B	NINNESCAH	B
MINERVA	B	MONTOSA	C	MUSICK	B	NEHALEM	B	NICBELL	C
MING	A	MONTOUR	D	MUSINIA	B	NEILTON	A	NICTA	D
MINGO	A	MONTOYA	C	MUSKINGUM	C	NEISSON	B	NIPE	B
MINIDOKA	C	MONTPELLIER	C	MUSKOGEE	C	NEMIA	C	NIPPERSINK	B
MINNEBAGA	C	MONTROSE	A	MUSSELSHELL	B	NELLIS	B	NIPSUP	C
MINNEHASA	A	MONTVALE	D	MUSSEY	D	NELSCOTT	B	NIRA	B
MINNEQUA	B	MONTVERDE	A/D	MUSTANG	A/D	NELSON	B	NISHNA	C
MINNETONKA	D	MONTWELL	C	MUTALA	B	NEMAH	C	NISHON	C
MINNEWAUKAN	B	MOODY	B	MUTUAL	B	NENANA	B	NISSQUALLY	A
MINNIFICE	D	MOHOO	A	MYAKKA	A/C	NENNO	B	NISSWA	B
MINOA	C	MOOSE RIVER	C	MYATT	B/C	NECLA	D	NIU	B
MINONA	C	MORA	B	MYERS	D	NEGTCMA	B	NIULII	C
MINTO	B	MORADO	C	MYERSVILLE	B	NEPESTA	C	NIVLCC	C
MINU	D	MORALES	C	MYLNEA	B	NEPHI	B	NIWOT	C
MINVALE	B	MORO	C	MYRICK	D	NEPPEL	B	NIXA	C
MIRABAL	C	MORRAU	C	MYRTLE	B	NEPTUNE	A	NIACN	B
MIRACLE	B	MORGHEAD	C	MYSTEN	A	NERESLN	B	NIZCNTCN	B
MIRAMAR	B	MOREHOUSE	C	MYSTIC	D	NESCA	A	NIZIAN	A
MIRANDA	D	MORELAND	D	MYTCN	B	NESHAMINY	B	NOBLE	B
MIRES	B	MORELANDTON	A			NESIRA	B	NOBSCOTT	A
MIRROR	B	MOREY	C	N-BAR	B	NESKOWIN	B	NODAWAY	B
MIRROR LAKE	A	MORFITT	B	NAALEHU	B	NESPELEM	B	NOEL	C

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TABLE L-1 (continued)

NOMILI	D	OCILLA	C	ONSLOW	B	OWOSSO	B	PARALOMA	C
NOKASIPPI	D	OCKLEY	B	ONTARIO	B	OWYHEE	B	PARAMORE	D
NOKAY	C	OCONEE	A/D	ONTIO	B/D	OXALIS	C	PARASOL	B
NOKOMIS	B	OCONEE	C	ONTONAGON	D	OXBOW	C	PARCELAS	D
NOLAN	B	OCONTO	B	OAYK	B	OXERINE	C	PARDEE	D
NOLICHUCKY	B	OCOSTA	C	OCALA	A	OXFORD	C	PAREMAT	B
NOLIN	B	OCOUEOC	B	OPAL	D	OZARIS	B/D	PARENT	C
NOLO	B	OCTAGON	B	OPEQUON	C/D	OZAN	D	PARIETTE	C
NOME	C	ODELL	B	OPHIR	C	OZAUKEE	C	PARIS	
NONDALTON	B	ODERPOTT	C	ORIPIRAC	D			PARISHVILLE	C
NONOPAMU	D	ODESSA	D	OSUAGA	C	PAAIRT	B	PARKAY	B
NOLAACHAPPS	C/D	OJIN	C	ORA	C	PAALCA	B	PARKDALE	B
NOLIKSACK	B	OONE	C	ORAN	B	PAAUMAU	A	PARKE	B
NOONAN	D	OPFALLON	D	ORANGE	D	PALHAPPA	B	PARKER	B
NORA	B	OGDEN	D	ORANGEBURG	B	PACHECO	B/C	PARKFIELD	C
NORAD	B	OGEECHEE	C	ORCAS	D	PACK	C	PARKHILL	D
NORBURNE	B	OGFAW	C	ORCHARD	B	PACKARD	B	PARKHURST	
NORGY	B	OGILVIE	C	ORD	A	PACKER	C	PARKINSON	B
NORD	B	OGLALA	B	ORONANGE	C	PACKMAP	B	PARKVILLE	C
NORDEN	B	OGLE	B	OROWAY	D	PACKSADDLE	B	PARRUCCO	A/D
NORDNESS	B	OHAYSI	C	ORELIA	D	PALAMUCCO	D	PARLEYS	B
NORFOLK	B	OHIA	A	ORELLA	D	PACOLET	B	PARLIN	C
NORGE	B	OJAI	A	OREM	A	PACTOLUS	C	PARLO	B
NORNA	B	OJATA	D	ORESTIMBA	C	PADEN	C	PARMA	C
NORNA	B	OKANOGAN	B	ORFORD	C	PADONIA	B	PARNELL	D
NORNEST	C	OKAW	D	ORIOLA	C	PAGUCAM	B	PARN	B
NORNIA	C	OKEECHOBEE	A/D	ORIP	A	PAOUS	B	PARRAN	D
NORTHDALE	C	OKEELANTA	A/D	ORIC	C	PAESL	B	PARRISH	C
NORTHFIELD	B	OKEMAH	C	ORION	B	PAGET	B	PARSHALL	B
NORTHPORT		OKLAHEO	B	ORITA	B	PAGOCA	C	PARSIPPANY	C
NORTH POWDER	C	OKLAHOMA	A/D	ORLAND	B	PAHANAGAT	C	PARSONS	D
NORTHUMBERLAND	C/D	OKMOK	C	ORLANDO	A	PAHAZAM	D	PARTRI	C
NORTON	C	OKO	D	ORMAN	C	PAHRUC	D	PASAGEMAR	B
NORTONVILLE	C	OKLAGUE	C	ORMSBY	B/C	PAIA	C	PASCO	B
NOSTURE	D	OKLLOMA	C	ORCDELL	C	PAICE	C	PASC SECO	D
NOKWALK	B	OKPEER	D	ORCFING	B	PAINESVILLE		PASCUETTI	C/D
NORWAY FLAT	A	ORTIBBEHA	D	ORC GRANDE	C	PAINTROCK	B	PASCUITAMA	B/D
NORWELL	C	OLA	C	OPENC	D	PAIT	B	PASSAR	C
NORWICH	D	OLAA	A	ORCVAGA	C	PAJARITO	B	PASS CANYON	D
NORWOOD	B	OLALLA	C	ORA	C	PAJARO	C	PASSCREEK	B
NOTI	D	OLANTA	B	ORMVILLE	C	PAKALA	B	PASTURA	D
NOTUS	A	OLATHE	C	ORSA	A	PAKIAI	B	PATAMS	B
NOVAMA	B	OLD CAMP	C	ORSINO	A	PALA	B	PATENT	C
NOVARY	B	OLDHAM	C	ORTELLO	A	PALACIO	B	PATILLAS	B
NOWOOD	C	OLDS	C	ORTIGALITA	C	PALAPALAI	B	PATILO	C
NOY	C	OLDSPAR	B/D	ORTING	C	PALATINE	A	PATIT CREEK	B
NUNY	C	OLDWICK	A	ORTIZ	C	PALESTINE	B	PATRA	C
NUKILLS	C	OLELO	B	ORWOOD	B	PALISADE	B	PATCUTVILLE	C
NUCLA	B	OLENA	A	OSACA	D	PALMA	B	PATRICIA	B
NUECES	C	OLEQUA	D	OSAKIS	B	PALMAHOJO	C	PATRICK	B
NUGGET	C	OLETA	B	OSAGEO	B	PALM BEACH	A	PATRCLE	C
NUMA	C	OLEX	B	OSPA	B	PALMEN	D	PATTANI	C
NUNDA	C	OLGA	C	OSAWA	D	PALMER CANYON	B	PATTENBURG	B
NUNICA	C	OLI	A	OSHEA	C	PALMICH	B	PATTERSON	C
NUNN	C	OLIAGA	A	OSHKOSH	C	PALMS	C	PATTON	B/C
NUSS	D	OLINDA	B	OSHTEMO	B	PALMYRA	B	PATWAY	C
NUTLEY	C	OLIPHANT	A	OSICA	B/D	PALO	B	PAUL	B
NUTMAS	C	OLIVEHAIN	C	OSKA	C	PALOMAS	B	PAULDING	D
NUTHEGOO	B	OLIVER	A	OSMUND	B	PALOMINO	D	PAULINA	C
NUVALOF	C	OLIVIER	C	OSO	B	PALOS VERDES	B	PAULSELL	D
NYALA	D	OLMITO	D	OSCEE	D	PALOUSE	B	PAULVILLE	B
NYCOR	A	OLMITZ	D	OSCHIDGE	C	PALSGROVE	B	PALPALU	B
NYSSA	C	OLMOS	C	OSLIE	A	PAPLICO	D	PALASAUGUNT	D
NYSSATON	D	OLNSTED	B/D	OSSIAN	C	PAMLA	C	PAUSANT	B
NYSTAL	C	OLNEY	B	OST	B	PAMSOEL	D	PAUBELA	B
		OLOKUI	C	OSTRANDER	B	PANA	B	PAVANNECC	B
OAHE	A	OLPE	C	OTERO	B	PANALA	D	PAVANT	D
OAKDALE	A	OLSON	C	OTHELLO	D	PANAMA	D	PAVILLION	B
OAKDEN	D	OLTON	C	OTIS	C	PANASOFFKEE	D	PAWCATUCK	D
OAKFORD	A	OLUSTEE	B/D	OTISCO	A	PANCHERI	B	PAWLET	B
OAK GLEN	A	OLYIC	A	OTISVILLE	A	PANCHUELA	C	PAWNEE	D
OAK GROVE	C	OLYMPIC	D	OTLEY	A	PANCO	B	PAXTON	C
OAK LAKE	B	OMAHA	A	OTSEGO	C	PANCOAM	C	PAYETTE	B
OAKLAND	C	OMAK	C	OTTER	B/D	PANCUAA	D	PAYMASTER	B
OAKS RIDGE	C	OMEGA	A	OTTOMEIA	C	PANCUAA	D	PAYNE	C
OAKVILLE	A	OMENA	A	OTTOMULT	B	PANE	B	PAYSON	D
OAKWOOD	D	OMNI	C	OTTOKEE	A	PANGUITCH	B	PEACHAP	D
OAKAPUKA	B	ONA	B/D	OTWAY	D	PANHILL	C	PEARL HARBOR	D
OASIS	A	ONALASKA	A	OUMELL	C	PANICOUE	B	PEARMAN	
OATMAN	B	ONAMIA	A	OUACHITA	C	PANKY	C	PEARSELL	D
OBAN	C	ONANGA	A	OUHAT	A	PANLOME	A	PEAVINE	
OBAN	B	ONAWA	C	OUTLET	C	PANOLA	D	PECATONICA	A
OBRAY	D	ONAWAY	B	OVALL	C	PANSEY	D	PECOS	
OBURN	D	ONIAMA	D	OVERGAARD	C	PANTHER	D	PEDEE	C
OCALA	D	ONIDA	B	OVERLY	C	PANTLA	D	PEDERNALES	C
OCEANET	D	ONEILL	A	OVERTON	C	PALLA	A	PEGIGO	B/C
OCEANA	A	ONEONTA	A	OVID	C	PALLI	D	PEGLAR	D
OCHEYEDAN	D	ONITA	C	OVINA	B	PAPPA	D	PEORICK	D
OCHOCOCHEE	B	ONITE	B	OWEGO	D	PAPAI	A	PEEBLES	C
OCHO	D	ONITA	C	OWYA CREEK	C	PAPAKATING	D	PEEL	C
OCHRIS	C	ONEVA	C	OXFAS	D	PAPILSO	C	PEELER	B
OCONTO	B/D	ONKAY	D	OXHI	B	PARALISL	C	PEEVER	C

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TABLE L-1 (continued)

PEGLER	D	PEE CREEK	C	PCE	B/C	PREBLE	C	QUINA	D
PEGRAM	A	PIERIAN	A	PEGANLAB	C	PRENTISS	C	QUINNEY	C
PEKIN	C	PIERPONT	C	PEGUE	B	PRESQUE ISLE	B	QUINTCN	
PELMAR	B/D	PIERRE	D	PEMARUPU	A	PRESTU	A	QUITMAN	C
PELTIC	C	PIEMONA	A	PEINSETT	B	PRESTON	A	QUONSET	A
PELLA	D	PIKE	B	PEINT	B	PREWITT	C		
PELSINA	C	PILCMUCK	A	PEINT ISABEL	C	PREY	D	RABER	C
PEMBERTON	A	PILGRIM	A	POJMAQUE	B	PRICE	C	RABEY	A
PEMPINA	C	PILOT	B	PGREGEPA	B	PRIDA	D	RABIDEUX	B
PENBROOKE	B	PILOT ROCK	C	PCREN	B	PRIDMAR	D	RABUN	B
PENA	A	PIMA	D	PELANC		PRIETA	C	RACE	D
PENCE	A	PINAL	C	PELAR	B	PRIMEAUX	C	RACHERT	D
PENDER	B	PINALENO	B	PELATIS	C	PRIMCHAR	B	RACINE	B
PENG CREILLE	B	PINATA	C	PGLE	A	PRINCETON	B	RACCCN	D
PENGUIN	D	PINAVETES	A	PCLEGAR	C	PRINEVILLE	C	RAD	C
PENISTAJA	B	PINCHER	C	PCLELINE	B	PRING	B	RADFORD	B
PENITENTE	B	PINCKNEY	C	PULEL	C	PRINS	C	RADLEY	C
PENN	C	PINCONNING	D	PCLEY	C	PRCLTCR	B	RADNOR	D
PENNFL	C	PINCUSHION	B	PELICH	C	PRGGRESSO	C	RAFAEL	D
PENNINGTON	B	PINEDA	B/D	PCLLARD	C	PRUPISE	D	RAGLAN	D
PENNISULA	C	PINEDALE	B	POLLASKY	C	PRCMC	D	RAGNAR	B
PENO	C	PINEGUEST	B	PCLLY	B	PROMPATORY	B	RAGO	C
PENOYER	C	PINELLOS	A/D	PCLG	B	PRUNG	C	RAGSDALE	B/D
PENROSE	D	PINETOP	C	PCLSCN	L	PRUSPECT	B	RAGTGUM	D
PENTHOUSE	D	PINEVILLE	B	PCLVADERA	C	PAGSPEN	B	RAMP	C
PENTZ	D	PINEY	C	PCPAT	C	PROSSER	C	RAIL	C/D
PENWOOD	A	PINICON	B	PCPELLC	C	PRLTIVIN	C	RAINOGW	C
PEOGA	C	PINKEL	C	PCPPANC	A/D	PROUT	C	RAINEY	B
PEOH	C	PINKSTON	B	PCPPCNIC	C	PRCVIDENCE	C	RAINS	B/D
PEONE	B/C	PINNACLES	C	PCPPTCN	B	PRUVC	C	RAINSBORO	C
PEUTONE	C	PINU	C	PCPRGY	B	PRCVC BAY	D	RAKE	D
PEPOON	B/C	PINULA	C	PCNCEPA	D	PRCWERS	B	RALSEN	B/C
PEQUEA	C	PINOLE	B	PCNCHA	A	PTARPIGAN	B	RAMADA	C
PERCHAS	D	PINCN	C	PCND	B/C	PUABLU	A	RAMADERO	B
PERCIVAL	C	PINLANES	D	PCNC CREEK	B	PUCHYAN	A	RAMBLER	B
PERELLA	C	PINTAS	D	PCNCILLA	A	PUDDLE	D	RAPELLI	C
PERMAN	C	PINTLAR	A	PCNIL	D	PUERCO	D	RAMIRES	D
PERICO	B	PINTO	C	PCNICTCC	B	PUETT	C	RAMPEL	C
PERKINS	C	PINTURA	A	PCNZER	D	PUGET	C	RAMC	C
PERRS	A	PINTWATER	C	PGCRU	A	PUGSLEY	B	RAMCNA	B
PERLA	C	PIOPGLIS	D	PCOLE	B/D	PUHI	A	RAMPART	B
PERNA	A	PIPER	B/C	PLCLER	D	PUHIMAU	D	RAMPARTAR	A
PERMANENTE	C	PIRQUETTE	C	PCCAMA	B	PULASKI	B	RAMSEY	D
PERRIN	B	PISGAH	C	PLPE	B	PULEHU	B	RAMSHORN	B
PERRINE	D	PISHKUN	B	PCPPLETCN	A	PULLMAN	D	RANCE	C
PERRUT	D	PISTAKEE	A	PCGGCNCCR	C	PULS	D	RANCHERIA	B
PERRY	D	PIT	C	PCHRETT	B/D	PULSIPHER	C	RANC	B
PERRYVILLE	B	PITTMAN	C	PCHT	B	PULTNEY	C	RANDADC	C
PERSAY	D	PITTSFIELD	B	PCRTAGEVILLE	D	PUMPER	C	RANDALL	D
PERSHING	C	PITTSTOWN	C	PCRTALES	C	PUNA	A	RANGOLPH	D
PERSIS	B	PITTWOOD	B	PCRT BYRCN	B	PUNALUU	C	RANCS	C
PERT	D	PLACENTIA	C	PCRTERS	B	PUNCHU	A	RANGER	D
PERU	C	PLACERITOS	C	PCRTERVILLE	D	PUNDAM	C	RANIER	C
PESCADERO	C/D	PLACID	A/D	PCRTHILL	C	PUNDY	D	RANKIN	C
PESET	C	PLACK	C	PCRTING	C	PUNGATORY	D	RANTOUL	D
PESHASTIN	B	PLAINFIELD	A	PCRTLAND	D	PUNNER	D	RANYHAN	B
PESU	C	PLAINVIEW	C	PCRTNEUF	B	PURSLEY	B	RAPELJE	C
PETERINGET	D	PLAISTED	C	PCRTCLA	C	PURVES	D	RAPHO	B
PETERMINO	B	PLANO	B	PCRTSPCUTH	D	PUSTOI	A	RAPIDAN	B
PETERS	D	PLATA	B	PCSANT	C	PUTNAM	C	RARCEN	C
PETUSKEY		PLATEA	C	PCSEY	B	PUURALA	D	RARICK	B
PETREE	D	PLATEAU	B	PCSITAS	D	PUUENE	C	RARITAN	C
PETROLIA	D	PLATNER	C	PCSKEA	C	PUU CC	A	RASBANC	B
PETTONS	C	PLATO	C	PCSCS	C	PUU CPAE	B	RASSET	B
PEWAMO	B/D	PLATTE	C	PCST	D	PUU PA	B	RATHBUN	C
PEYTON	B	PLATTVILLE	B	PCTAPC	D	PUYALLUP	B	RATLIFF	B
PHAGE	B	PLAZA	D/C	PCTERTCH	C	PYLE	A	RATCN	C
PHAGO	B	PLEASANT	C	PCTRATZ	C	PYLCN	C	RATTLER	B
PHAGELIO	D	PLEASANT GROVE	B	POTSCAP	C	PYLTE	A	RAUB	B
PHABA	C	PLEASANTON	B	PCTTER	C	PYRAMID	C	RAUVILLE	C
PHEENY	B	PLEASANT VALE	B	PCTTER	C	PYRMONT	D	RAUZI	B
PHELAN	B	PLEASANT VIEW	B	PCTTS	B			RAVALLI	C
PHELPS	B	PLEDGER	C	PCLCRE	B	QUAKER	C	RAVENDALE	D
PHIFERSON	B	PLEICR	C	PLULTNEY	B	QUAKERTCWN	B	RAVENNA	C
PHILOCH	D/D	PLEINE	C	PCVENTY	A	QUAMBA	D	RAVELA	B
PHILLIPS	C	PLEYNA	C	PCWCEN	B	QUANAM	B	RAWAM	B
PHILLIPSBURG	A	PLOPE	C	PCWCERHLRN	C	QUANDAHL	B	RAWHIDE	D
PHILO	B	PLOVER	B	PLWELL	C	QUARLES	C	RAWSCN	B
PHILIPATH	D	PLUMAS	D	PCWER	B	QUARTZBURG	C	RAY	B
PHIPPS	C	PLUMMER	B/D	PCWHITE	C	QUATAPA	C	RAYADE	
PHOENIX	B	PLUSH	B	PCWLEY	D	QUAY	C	RAYENOUD	B
PHONIX	D	PLUTH	B	PCWMATKA	C	QUEBRADA	C	RAYMONDVILLE	D
PIASA	D	PLUTOS	C	PCY	D	QUEETS	B	RAYNE	B
PICACHO	C	PLYMOUTH	A	PCYGAN	D	QUEMAC	C	RAYNESFORD	B
PICAYUNE	A	POALL	C	PCZC	C/D	QUENZ	D	RAYNHAM	C
PICKAWAY	C	POARCH	B	PCZC BLANCO	B	QUICKSILL	C	RAYNOR	D
PICKENS	D	POCALLA	A	PRAG	C	QUIGLEY	B	RAZOR	C
PICKETT	B	POCATELLO	B	PRATHER	B	QUILCENE	C	RAZCAT	B
PICKERING	D	POCKER	D	PRATLEY	C	QUILLAYUTE	B	READING	C
PECKWICK	A	POCOPORE	C	PRATT	A	QUIMBY	C	READINGTON	C
PICO	D	PODO	D	PREACHER	B	QUINCY	A	READLYN	B
PICTON	B	PODUNK	B	PHERISH	D	QUINLAN	C	REAGAN	B

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TABLE L-1 (continued)

REARDR	B	RHOADES	D	RCCK RIVER	B	RUDYARD	C	SALMON	B
REAL	D	RIB	C	RCCKTON	B	RUELLA	B	SALOL	D
REAP	D	RICCO	D	RCCKWELL	B	RUGGLES	B	SALONIE	B
REARDAN	C	RICETON	B	RCCKWOOD	B	RUIDOSO	C	SALTAIR	D
REAVILLE	C	RICEVILLE	C	RCGERS FORD	B	RUKO	D	SALT CHUCK	A
REBA	C	RICHARDSON	B	RCGOY		RULE	B	SALTER	B
REBEL	B	RICHEAU	D	RODMAN	A	RULICK	C	SALTERY	D
REBUCK		RICHEY	C	ROE		RUMBO	C	SALT LAKE	D
RECLUSE	D	RICHFIELD	C	ROEBUCK	D	RUMFORD	B	SALUDA	C
REDBANK	B	RICHFORD	A	ROELLEN	D	RUMNEY	C	SALUVIA	
RED BAY	B	RICHLIE	A	ROESIGER	B	RUMPLE	C	SALVISA	C
RED BLUFF	B	RICHMOND	C	ROHNERVILLE	B	RUN RIVER	C	SALZER	D
RED BUTTE	B	RICHTER	B	ROHRERSVILLE	C	RUNE	C	SAMBA	D
REDBY	C	RICHVALE	B	ROKEBY	D	RUNNELLS	C	SAMISH	C/D
REDCHIEF	C	RICHVIEW	C	ROLETTE	C	RUNNYMEDE	B	SAMPANISH	C
REDCLOUD	B	RICHWOOD	B	ROLFE	C	RUPERT	A	SAMPSEL	D
REDDICK	C	RICKMORE	C	ROLISS	D	RUSCO	C	SAMPSON	B
REDDING	D	RICKS	A	ROLLA	C	RUSE	D	SAMSIL	D
REDFIELD	B	RICREST	B	ROLLIN	D	RUSH	C	SAN ANGREAS	C
RED HILL	C	RIDD	C	ROLOFF	C	RUSHFORD	A	SAN ANTON	B
RED HOOK	C	RIDGEBURY	C	ROMBO	C	RUSHVILLE	C	SAN ANTONIO	C
REDLAKE	D	RIDGECREST	C	ROMEO	C	RUSS	B	SAN ARCACIO	B
REDLANDS	B	RIDGEDALE	B	ROMNEY	C	RUSSELL	B	SAN BENITO	B
REDMANSON	B	RIDGELAND	D	ROMULUS	D	RUSSELLVILLE	C	SANCHEZ	D
REDMOND	C	RIDGELAWN	A	RONO	D	RUSSLER	C	SANDALL	C
REDMUN	C	RIDGELY	B	RONNEBY	B	RUSTON	B	SANDERSON	B
REDOLA	B	RIDGEVILLE	B	RONSON	B	RUTLAND	C	SANDLAKE	D
REDONA	B	RIDGEWAY	D	ROSACHI	C	RUTLEDGE	D	SANDLEE	A
REDRIDGE	B	RIETBROCK	C	ROSAMOND	B	RYAN	C	SANELI	D
REDROB	B	RIFFE	B	ROSANE	C	RYAN PARK	B	SAN ERIGOIO	B
RED ROCK	B	RIFLE	A/D	ROSARIO	C	RYDE	B/D	SANGER	B
RED SPUR	B	RIGA	D	ROSCOE	D	RYDER	C	SAN GERMAN	D
REDSTOE	B	RIGGINS	A	ROSCOMMON	D	RYEGATE	B	SANGO	C
REDTHAYNE	B	RILEY	C	ROSEBERRY	B	RYEPATCH	D	SANGREY	A
RENTON	C	RILLA	B	ROSEBLOOM	D	RYER	C	SANILAC	C
REUVALE	C	RILLITO	B	ROSEBUD	B	RYUS	C	SAN ISABEL	B
REDVIEW	C	RIMER	C	ROSEBURG	B			SAN JOAQUIN	D
REE	B	RIMINI	A	ROSE CREEK	C	SABANA	D	SAN JON	C
REED	C	RIMROCK	D	ROSEGLEN	B	SABANA SECA	D	SAN JOSE	B
REEDER	B	RIN	B	ROSEHILL	D	SABENYO	B	SAN JUAN	A
REEDPOINT	C	RINCON	C	ROSELAND	D	SABINA	C	SAN LUIS	B
REFOY	C	RINCONADA	C	ROSELRS	D	SABINE	A	SAN MATEO	C
REELFOOT	C	RINGLING	C	ROSENCLAT	B	SABLE	D	SAN MIGUEL	C
REESER	C	RINGO	D	ROSENDALE	B	SAC	B	SANPETE	A
REESVILLE	C	RINGOLD	B	ROSEVILLE	B	SACO	D	SANPITCH	C
REFUGE	C	RINGWOOD	B	ROSEWORTH	C	SACRAMENTO	C/D	SAN POIL	B
REGAN	B	RIO	D	ROSHE SPRINGS	C	SACUL	D	SAN SABA	D
REGENT	C	RIO ARRIBA	D	ROSITAS	A	SADDLE	B	SAN SEBASTIAN	B
REHM	C	RIO GRANDE	B	ROSLYN	B	SADDLEBACK	B	SANTA	C
REICHEL	B	RIO RING	C	ROSPAW	B	SADIE	B	SANTA CLARA	C
REIFF	B	RIO LAJAS	A	ROSNEY	C	SADLER	C	SANTA FE	D
REILLY	A	RIO PIEDRAS	B	ROSS	B	SAFFELL	B	SANTA ISABEL	D
REINACH	B	RIPLEY	B	ROSS FORK	C	SAGANING	D	SANTA LUCIA	C
RELAN	A	RIPON	B	ROSSI	C	SAGE	D	SANTA MARTA	C
RELAY	B	RIRIE	B	ROSSMOYNE	B	SAGEHILL	B	SANTANA	C
RELIANCE	C	RISTA	C	ROSS VALLEY	C	SAGEMOOR	C	SANTANQUIN	A
RELIZ	D	RISUE	D	ROTAN	C	SAGERTON	C	SANTA YNEZ	C
RELSE	B	RITCHEY	B	ROTHLEPAY	B	SAGINAW		SANTEE	D
REMBERT	D	RITNER	C	ROTHSAY	B	SAGO	D	SANTIAGO	B
REMMIT	A	RITTER	B	ROUBIDEAU	C	SAGOUSPE	C	SANTIAM	C
REMSEN	D	RITTMAN	C	ROUEN	C	SAGUACHE	A	SAN TIMOTEO	C
RENHOAR	B	RITZCAC	B	ROUND BUTTE	D	SAHALI	B	SANTONI	D
RENINDA	C	RITZVILLE	B	ROUNDTOP	C	SAINT ALBANS	B	SANTOS	C
RENFRON	D	RIVERHEAD	B	ROUNDUP	C	SAINT CHARLES	B	SANTO TOMAS	B
RENO	D	RIVERSIDE	A	ROUNUY	C	SAINT CLAIR	D	SAN YSIDRO	D
RENOHILL	C	RIVERTON	B	ROUSSEAU	A	SAINT ELMO	A	SAPP	D
RENOVA	B	RIVERVIEW	B	ROUTON	D	SAINT GEORGE	C	SAPPHIRE	A
RENOX	B	RIVRA	A	ROUTT	C	SAINT HELENS	A	SAPPINGTON	B
RENSHAW	B	RIXIE	C	ROVAL	D	SAINT IGNACE	C	SARA	C
RENSLOW	B	RIZ	D	ROWE	D	SAINT JOE	B	SARALEGUI	B
RENSSELAER	C	ROANOKE	C	ROWENA	B	SAINT JOHNS	D/D	SARANAC	C
RENTIDE	C	ROBBINS	B	ROWLAND	C	SAINT LUCIE	A	SARAPH	C
RENTON	B/C	ROBBS	D	ROWLEY	B	SAINT MARTIN	C	SARATOGA	A
RENTSAC	C	ROBERTS	D	ROXBURY	B	SAINT MARYS	B	SARCO	B
REPAHAGA	D	ROBERTSDALE	C	ROY	B	SAINT NICHOLAS	C	SARGINEA	C
REPPART	B	ROBERTSVILLE	D	ROYAL	B	SAINT PAUL	B	SARGEANT	D
REPUBLIC	B	ROBIN	B	ROYALTON	C	SAINT THOMAS	C	SARITA	A
RESCUE	C	ROBINSON	D	ROYSTONE	B	SALADO	B	SARKAR	C
RESERVE	B	ROBINSONVILLE	B	ROZA	D	SALAL	B	SARPY	A
RESNER	B	ROCKDOO	D	ROZELLVILLE	B	SALAMATOF	C	SARTELL	A
RET	B/C	ROCK ROY	C	ROZETTA	B	SALAS	C	SASKA	B
RETRIEVER	D	RUBY	C	ROZEE	C	SALCHAKET	B	SASSAFRAS	B
RETSOF	C	ROCHE	C	RUARK	C	SALEM	D	SASSER	B
RETSUK	B	ROCHELLE	C	RUBICON	A	SALESBURG	B	SATANKA	C
REXBURG	B	ROCHEPORT	C	RUBIO	C	SALGA	C	SATANTA	B
REXON	A	ROCKAWAY	C	RUBY	B	SALIDA	A	SATELLITE	C
REYES	C/D	ROCKCASTLE	D	RUCH	B	SALINAS	C	SATT	D
REYNOLDS		ROCK CREEK	D	RUCKLES	D	SALISBURY	D	SATTLEY	B
REYNOSA	B	ROCKFORD	B	RUCLICK	C	SALLE	B	SATTRE	B
REYNAT	D	ROCKINGHAM	C/D	RUCO	D	SALKUM	C	SATUS	B
RHAME	B	ROCKLIN	C	RUDEEN	B	SALLISAW	B	SAUGE	B
RHINEBECK	D	ROCKPORT		RUDOLPH	C	SALLYANN	C	SAUGATUCK	C

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TABLE L-1 (continued)

SAUGUS	B	SELFRIDGE	C	SHICCTCH	B	SKIVCL	B	SPARTA	A
SAUK	B	SELKIRK	D	SHIPLEY	C	SKOKCPISH	B/C	SPEARFISH	B
SAULICH	D	SELLE	B	SHIPRCCK	B	SKOOKUMCHUCK	B	SPEARVILLE	C
SAUM	C	SELLERS	A/D	SHIRK	B	SKOONEGAN	B	SPECK	D
SAUNOERS	C	SELPA	B	SHCALS	C	SKULL CREEK	D	SPECTER	D
SAUVIE	C/D	SEMIAHMOO	C	SHOEFFLER	B	SKUMPAH	C	SPEELYAI	C
SAUVULA	C	SEMINOOD	D	SHONKIN	D	SKUTUP	C	SPEIGLE	B
SAVAGE	C	SEMINARIO	D	SHOCK	A	SKYBERG	C	SPENARC	C
SAVANNAH	C	SEN	B	SHCREWOCO	C	SKYHAVEN	D	SPENCER	B
SAVC	C	SENECAVILLE	C	SHCREY	B	SKYRCHISH	B	SPERRY	C
SAWILA	B	SEQUATCHIE	B	SHCPA	B	SKYLINE	C	SPICER	C
SAWARF	D	SEQUIN	A	SHCPT CREEK	D	SKYWAY	B	SPILLVILLE	B
SAWATCH	C	SEQUOIA	C	SHCSHONE	D	SLAB	C	SPINKS	A
SAWCREEK	B	SERENE	D	SHCTWELL	D	SLATE CREEK	C	SPIRIT	B
SAWRILL	C	SERNA	C	SHCUNS	B	SLAUGHTER	C	SPIPO	B
SAWYER	C	SEROCO	A	SHCWALTER	C	SLAVEN	C	SPLENOCRA	C
SAXBY	D	SERPA	C/D	SHUBLUM	C	SLAWSON	B	SPLITROCK	D
SAXON	B	SERVOSS	D	SHREWSBURY	D	SLAYTON	C	SPOFFORD	C
SAYBROOK	B	SESARE	C	SHRINE	B	SLEETH	C	SPORANE	B
SAYLESVILLE	C	SESPE	C	SHRGUTS	D	SLETTEN	D	SPORSELLER	B
SAYLOR	A	SESSIONS	C	SHUBUTA	C	SLICKROCK	B	SPOON BUTTE	D
SCALA	B	SESSUM	D	SHULE	B	SLIGHTS	C	SPOONER	C
SCARMAN	C	SETTERS	C	SHULLSBURG	C	SLIGO	B	SPOTTSWOOD	B
SCAMOIA	B	SETTLEMEYER	D	SHUMWAY	D	SLIMOK	C	SPRAGUE	B/C
SCANTIC	C	SEVERN	B	SHUPERT	C	SLIP	B	SPRECKELS	C
SCAR	A	SEVILLE	D	SHUBAM	B	SLOAN	C	SPRING	C/D
SCARBORO	D	SEVY	C	SI	B	SLOCUM	B	SPRING CREEK	C
SCAVE	C	SEWARD	B	SIBLEYVILLE	B	SLOCLC	C	SPRINGDALE	B
SCHAFFENAKER	A	SEWELL	B	SIBYLEE	D	SLOSS	C	SPRINGER	B
SCHAMBER	A	SEXTON	D	SICILY	B	SLUICE	B	SPRINGERVILLE	D
SCHARP	C	SEYMOUR	C	SICKLESTEETS	C	SMARTS	B	SPRINGFIELD	D
SCHARVILLE	C	SHAAR	D	SIDELL	B	SMITH CREEK	A	SPRINGMEYER	C
SCHEBLY	D	SHADELAND	C	SIEANCIA	B	SMITHNECK	B	SPRINGTOWN	C
SCHERRAPO	D	SHAFFER	A	SIEBER	A	SMITHTON	D	SPUR	B
SCHLEY	B	SHAKOPEE	C	SIELC	C	SMOLAN	C	SPURLOCK	B
SCHMERHUSH	C	SHALCAR	D	SIERCCLIFF	D	SMOLT	D	SQUALICUM	B
SCHOOACK		SHAN	D	SIERRA	B	SNAG	B	SQUAW	B
SCHOOSON	C	SHANDO	B	SIERRAVILLE	B	SNAMCPISH	B	SQUILLCHUCK	B
SCHOFIELD	B	SHANEL	B	SIESTA	D	SNAKE	C	SQUIM	B
SCHOHARIE	C	SHANAMAN	B	SIFTON	B	SNAKE HOLLOW	B	SQUIRES	B
SCHULLE	C	SHANDON		SIGNAL	D	SNAKELUM	B	STAATSBURG	
SCHOOLEY	C/D	SHANE	D	SIGURD	B	SNEAD	D	STABLER	B
SCHRIER	B	SHANO	B	SIRESTON	D	SNELL	C	STACY	B
SCHROON	B.	SHANTA	B	SILCCX	B	SNELLING	B	STAGY	B
SCHUMACHER	B	SHAPLEIGH	C/D	SILENT	D	SNOHOMISH	D	STAFFORD	C
SCHUYLKILL	B	SHARATIN	B	SILER	B	SNOQUALMIE	B	STAGECOACH	B
SCIC	B	SHARKEY	D	SILERTON	B	SNOW	B	STAHL	C
SCIOTOVILLE	C	SHARON	B	SILI	D	SNOWDEN	C	STALEY	C
SCISM	B	SHARPSBURG	A	SILVER	D	SNOWLIN	B	STAMBAUGH	B
SCITUATE	C	SHARVANA	C	SILVERCCK	D	SNOWVILLE	D	STAMFORD	D
SCOBEY	C	SHASKIT	B/C	SILVER CREEK	D	SNOWY	A	STAMPEDE	D
SCOOTENEY	B	SHASTA	A	SILVERTON	C	SOAP LAKE	B	STAN	B
SCORUP	C	SHAVANO	B	SILVIES	D	SOBONA	A	STANDISH	C/D
SCOTT	D	SHAVER	B	SIMAS	C	SOBRANTE	C	STANEY	D
SCOTT LAKE	B	SHAWANO	A	SIMCOE	C	SODA LAKE	B	STANFIELD	C
SCHUT	A	SHAWMUT	B	SIMECH	A	SODHOUSE	C	STANLEY	C
SCOWLALE	C	SHAY	D	SIMPLER	D	SGOUS	C	STANSBURY	D
SCRANTON	B/D	SHEAR	C	SIMPER	A	SCELBERG	B	STANTON	D
SCRIBA	C	SHECKLER	C	SIMCA	C	SOPIA	C	STAPLETON	B
SCRIVER	B	SHECO	C	SIMCNA	B	SOGN	D	STARBUCK	D
SCROGGIN	C	SHEEGE	D	SIMPERS	B	SOGZIE	B	STARICHKOF	D
SCULLIN	C	SHEEP CREEK	C	SIMPSON	C	SOLANC	D	STARKS	C
SEABROOK	A	SHEEPHEAD	C	SIMS	D	SOLDATNA	B	STARR	B
SEAMAN	C	SHEEPROCK	A	SINAI	C	SOLGIER	D	STASER	A
SEAQUEST	C	SHEETIRON	C	SINCLAIR	B	SOL DUC	B	STATE	B
SEARCHLIGHT	C	SHEFFIELD	D	SINE	C	SOLLERS	C	STATEN	D
SEARENE	B	SHELBURNE	C	SINGLETREE	D	SOLLER	D	STAVE	C
SEARLA	B	SHELBY	B	SINGSAAS	B	SOLOMON	D	STAYTON	D
SEARLES	C	SHELBYVILLE	B	SINWIGAP	C	SOLONA	B	STEAMBOAT	D
SEATON	B	SHELDON		SINUK	B	SOMBRERO	D	STEARNS	D
SEATTLE	D	SHELIKOF	C	SION	B	SOMENS	B	STECUM	A
SEBAGL	D	SHELLABARGER	B	SIOUX	A	SOMENSET	C	STEED	A
SEBASTIAN	D	SHELLDRAKE	A	SIPPLE	A	SOMERVELL	B	STEEDMAN	D
SEBASTOPOL	C	SHELLROCK	A	SISKIYOU	B	SONSEN	C	STEEREE	C
SEBEKA	D	SHELMADINE	D	SISSETON	B	SONCITA	B	STEELE	B
SEBENA	B/D	SHELOCTA	B	SISSON	B	SONCPA	D	STEESE	C
SEBREE	D	SHELTON	C	SITES	C	SONTAG	C	STEFF	C
SEBRING	D	SHENA	C	SITKA	B	SOPEN	A	STEGALL	C
SECATA	C	SHENANDOAH	C	SIXMILE	B	SOUVEL	B	STEIGER	A
SECRET	C	SHEPPARD	A	SIZEMORE	B	SOWF	C	STEINAUER	B
SECRET CREEK	B	SHERIDAN	A	SIZER	B	SOPPATO	B	STEINBECK	B
SEDAN		SHERP	D	SKAGGS	B	SOPICA	B/D	STEINMETZ	D
SEEGSKADEE	D	SHERRYL	B	SKAGIT	B/C	SOSA	C	STEINSBURG	C
SEES	C	SHIBLE	B	SKAMA	A	SOTELLA	C	STEINER	C
SEEWEF	B	SHIELDS	C	SKALAR	C	SOUTHPCAR	D	STELLAR	D
SEGAL	D	SHIFFER	A	SKAPARIA	B	SOUTHGATE	C	STEPILT	C
SEGHO	C	SHILOH	C	SKAPCKANA	B	SOUTHWICK	C	STENDAL	C
SEMCRN	D	SHINANGU	C	SKANEE	C	SPAA	D	STEPHEN	C
SEJITA	D	SHINGLE	D	SKELLCCK	B	SPACE CITY	A	STEPHENSBURG	B
SERIU	D	SHINGLETOWN	C	SKERRY		SPADE	B	STEPHENVILLE	B
SELAH	C	SHINN	B	SKILLET	C	SPALDING	C	STERLING	A
SELDEN	C	SHINNOCK	C	SKINNER	C	SPANAWAY	B	STERLINGTON	B

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TABLE L-1 (continued)

STETSON	B	SUNSET	B	TALLAPOOSA	C	TENSAS	D	TINKER	B
STETTER	D	SUNSHINE	C	TALLEYVILLE	B	TENSED	C	TIPPERMAN	B
STEUBEN	B	SUNSWEET	C	TALLS	B	TENSLEEP	B	TIPPONS	B
STEVENS	B	SUPAN	B	TALLULA	B	TEOCULLI	B	TIPPAMUTE	D
STEVENSON	B	SUPERIOR	C	TALLY	B	TEPEE	D	TIPPAHOOSS	B
STEWART	D	SUPERSTITION	A	TALMAGE	A	TEPETE	B/D	TIPPER	D
STICKNEY	C	SUPERVISOR	C	TALMO	B	TERINO	C	TIPPOGONEKE	B
STIDHAM	A	SUPPLEE	B	TALOKA	D	TERMINAL	D	TIPULA	B
STIGLER	C	SUR	B	TALPA	D	TERMO	C	TIRA	C
STILLMAN	A	SURGH	B	TAMA	B	TEROUGE	D	TINCANAY	A
STILLWATER	D	SURPRISE	B	TAMALCO	D	TERRA CEIA	A/D	TINE	A
STILSON	B	SURREMCY	B/D	TAMBA	C/D	TERRAO	D	TINSLEY	A
STIMSON	B/C	SURVYA	C	TAMMANY CREEK	B	TERRERA	C	TINTON	A
STINGAL	B	SUSIE CREEK	D	TAMMS	C	TERRIL	B	TINYTOWN	B
STINSON	C	SUSITNA	B	TAMPICO	B	TERRY	B	TIOGANO	D
STIRK	D	SUSQUEHANNA	D	TANAMA	D	TERWILLIGER	C	TIOGA	B
STIRUM	B	SUTHER	C	TANANA	C	TESAJO	A	TIPPAH	C
STISSING		SUTHERLIN	C	TANBERG	D	TESCOTT	C	TIPPECANOE	B
STIVERSVILLE	B	SUTPHEN	D	TANDY	C	TESUGUE	B	TIPPER	A
STOCKBRIDGE	B	SUTTLER	B	TANEUM	C	TETON	A	TIPPERARY	A
STOCKLAND	B	SUTTON	B	TANEY	C	TETONIA	B	TIPPIPAH	D
STOCKPEN	D	SVEA	B	TANGAIR	C	TETONKA	C	TIPPO	C
STOCKTON	D	SVERDRUP	B	TANNA	C	TETOTUM	C	TIPTON	B
STODICK	D	SWALO	C	TANNER	C	TEW	B/D	TIPTONVILLE	B
STOKES	D	SWAGER	C	TANSER	B	TEX	B	TIRA	B
STOMAR	C	SWARANE	B	TANTALUS	A	TEXLINE	B	TISBURY	B
STONER	B	SWAN	C	TANWAX	D	TEZUMA	C	TISCH	C
STONEWALL	A	SWANBOY	D	TACPI	C	THACKERY	B	TISH TANG	B
STONO	B/D	SWANNER	D	TACS	C	THADER	C	TITUSVILLE	C
STONYFORD	D	SWANSON	C	TAPIA	C	THANYON	A	TIVERTON	A
STOOREY	B	SWANTON	B/D	TAPPEN	D	THATCHER	B	TIVOLI	A
STORDEN	B	SWANTOWN	C	TARA	B	THATUNA	C	TIVY	C
STORLA	B	SWAPPS	C	TARBIC	D	THAYNE	B	TOA	C
STORM KING	D	SWARTSWOOD	C	TARKLIN	C	THEBES	B	TOBICO	D
STORY	C	SWARTZ	D	TARPC	C	THEBC	D	TOBIN	B
STOSSEL	C	SWASEY	D	TARPAAT	C	THEDULUND	C	TOBLER	B
STOUGH	C	SWASTIKA	C	TARYALL	B	THENAS	C	TOBOSA	D
STOWELL	D	SWATARA	A	TASCOSA	B	THERESA	B	TOBY	B
STOY	D	SWAUK	C	TASSEL	D	THERIGT	D	TOCCOA	B
STRAIGHT	C	SWAWILLIA	A	TATE	B	THERMAL	C	TODD	B
STRAIN	B	SWEATMAN	C	TATIVEE	C	THERMOPOLIS	D	TODDLER	B
STRASBURG	C	SWEDE	B	TATU	C	THETFORD	A	TODDVILLE	B
STRATFORD	B	SWEDEN	B	TATUM	C	THIORCL	C	TOEHEAD	C
STRAUSS	C	SWEEK	C	TAUATCH	C	THOENY	D	TOEJA	C
STRAW	B	SWEENEY	B	TAVARES	A	THOMAS	C	TOEP	C
STRAWN	B	SWEET	C	TAWAS	A/D	THORNDALE	D	TOGC	B
STREATOR	C	SWEETGRASS	B	TAYLOR	C	THORNDIKE	C/D	TOHONA	C
STRIDE	B	SWEETWATER	D	TAYLOR CREEK	D	THORNOCK	D	TOINE	C
STRONGHURST	B	SWENUDA	A	TAYLORSFLAT	D	THORNTON	C	TOIYABE	C
STRONTIA	B	SWIFTON	A	TAYLORSVILLE	C	THORNWOOD	B	TOKEEN	C
STROUPE	D	SWIMS	A	TAYSON	B	THOROUGHFARE	B	TOKUL	B
STRYKER	B	SWINGLE	D	TAZLINA	A	THORP	C	TOLBY	B
STUART	C	SWISBOB	D	TEAL	D	THORR	B	TOLEDO	D
STUKY	B	SWITCHBACK	C	TEALWHIT	C	THURNEL	B	TOLICHA	D
STUMBLE	A	SWITZERLAND	B	TEANAWAY	C	THOW	B	TOLL	A
STUMPP	D	SWOPE	C	TEAPC	B	THREE MILE	B	TOLLGATE	B
STUMP SPRINGS	B	SWYGERT	C	TEAS	C	THUNDERBIRD	C	TOLLHOUSE	D
STUTTGART	D	SYCAMORE	B	TEASDALE	B	THURMEN	C	TOLNA	B
STUTZVILLE	B/C	SYCAN	A	TEBO	B	THURLOW	C	TOLO	B
SUBLETTE	B	SYLACAUGA	B/D	TECHICK	B	THURLOW	C	TOLSONA	D
SUDBURY	B	SYLVAN	B	TECOLOTE	B	THURMAN	A	TOLSTOI	D
SUFFIELD	C	SYMERTON	B	TECUMSAH	B	THURMONT	B	TOLT	D
SUGARLOAF	B	SYNAREP	A	TEDROW	B	THURSTON	B	TOLTEC	C
SULSUN	D	SYRACUSE	B	TEEL	B	TIAK	C	TOLUCA	B
SULA	D	SYRENE	D	TEHACHAPI	D	TIBBITTS	B	TOLVAR	B
SULLY	B	SYRETT	C	TEHAPA	C	TICA	C	TOMAH	C
SULPHURA	D			TEJA	D	TICE	C	TOMAS	B
SULTAN	A	TABERNASH	B	TEJON	B	TICHIGAN	C	TOMAST	C
SUMAS	B/C	TABIONA	B	TEKCA	C	TICHACR	D	TOMERA	D
SUMDUM	D	TABLE MOUNTAIN	B	TELA	B	TICRAPPO	C	TOMICHI	A
SUMMA	B	TABLER	D	TELEFONO	D	TICRASON	B	TOMOKA	A/D
SUMMERFIELD	C	TABOR	C	TELEPHONE	D	TIDWELL	D	TONATA	C
SUMMERS	B	TACLMA	D	TELFER	A	TIEHRA	C	TONAWANDA	C
SUMMERVILLE	C	TACUMSH	D	TELL	B	TIETON	B	TONEY	D
SUMMIT	C	TEFT	C	TELLER	B	TIFFANY	C	TONGUE RIVER	B
SUMMITVILLE	A	TAGGART	C	TELLICO	B	TIFTON	B	TONINI	B
SUMTER	C	TAHOMA	B	TELLMAN	B	TIGER CREEK	B	TONKA	C
SUN	E	TAHQUAMENON	D	TELSTAD	B	TIGERIN	A	TONKEY	E
SUNAPEE	C	TAHQUATS	C	TEMESCAL	D	TIGILDA	B	TONAS	E
SUNBURY	A	TAINTOR	C	TEMPLE	B/C	TIGRETT		TONOPAH	B
SUNCOOK	A	TAJO	C	TENVIR	B	TIGUA	D	TONOWER	B
SUNDI	C	TAKEUCHI	C	TENAUL	D	TIJERAS	B	TONSINA	B
SUNDELL	C	TAKILMA	B	TERAMA	B	TILFORD	B	TONUGU	B
SUNDERLAND	C/D	TAKOTNA	A	TERAS	C	TILLEDA	A	TOOLE	D
SUNDOWN	A	TALANTE	C	TENGEE	C	TILLICUM	B	TOOPES	D
SUNFIELD	B	TALAPUS	B	TENNIFFE	C	TILLMAN	C	TOP	C
SUNNILAND	C	TALBOTT	C	TERAX	A	TILMA	C	TOPPENISH	B/C
SUNNYBAY	D	TALCOT	C	TERIBAC	B	TILSIT	C	TOPTON	
SUNNYSIDE	B	TALIMINA	D	TERING	A	TILTON	B	TOQUERVILLE	D
SUNNYVALE	C	TALKEETNA	C	TERNO	D	TIMBERO	C	TOQUOP	A
SUNRAY	C	TALLAC	B	TENOT	C	TIMBERLY	D	TORBOT	B
SUNRISE	C	TALLADEGA	C	TERRES	B	TIMCENNA	B	TORCHLIGHT	C

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TWO SOIL GROUPS SUCH AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION

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TABLE L-1 (continued)

TORHUNTA	C	TRUCKEE	C	URIAN	C	VASHTI	C	VOLINIA	B
TORNING	B	TRUCKTON	B	ULEN	B	VASQUEZ	B	VOLKE	C
TOROOA	B	TRUESDALE	C	ULLOA	B	VASSAR	B	VOLKMAR	B
TORONTO	C	TRULL	C	ULM	B	VASTINE	C	VOLNEY	B
TORPEDO LAKE	C	TRULON	B	ULRICHER	B	VAUCLUSE	C	VOLPERIE	C
TORREON	C	TRUMAN	B	ULUPALAKUA	B	VAUGHNSVILLE	C	VOLTAIRE	D
TORRES	B	TRUMBULL	D	ULYSSES	B	VAVAS	B	VOLUSIA	C
TORRINGTON	B	TRUMP	D	UMA	A	VEAL	B	VONA	B
TORRO	C	TRYON	D	UMAPINE	B/C	VEAZIE	B	VORE	B
TORTUGAS	D	TSCHICORA	C	UMBICA	B	VEBAR	B	VOSCHAN	B
TOTER	B	TUB	C	UMILL	D	VEBAR	B	VULCAN	C
TOTTEN	B	TUBAC	C	UMMAK	B	VEGA	C	VYLACH	D
TOUCHET	B	TUCANNON	C	UMPA	B	VEGA ALTA	C		
TOUHEY	B	TUCKERMAN	D	UNA	B	VEGA BAJA	C	WABANICA	D
TOULON	B	TUCUMCARI	C	UNABILLA	B	VEKOL	D	WABASH	D
TOURN	C	TUFFIT	D	UNAWEEP	B	VELMA	B	WABASHA	D
TOLANGUIST	B	TUGHILL	D	UNCOMPAGRE	C	VELVA	B	WABASSA	B/D
TOURS	B	TUJUNGA	A	UNEEDA	B	VENA	B	WABEK	B
TOUTLE	A	TULEY	C	UNGERS	B	VENANGO	C	WACA	C
TOWER	D	TUMBILA	D	UNICN	C	VENATOR	D	WACCTA	B
TOWNER	B	TULA	C	UNIONTOWN	B	VENETA	C	WACCUSTA	C
TOWNLEY	C	TULARA	C/D	UNIONVILLE	C	VENEZIA	D	WADAMS	B
TOWNSBURY	B	TULARE	C/D	UNISCA	C	VENICE	D	WADCELL	B
TOWNSEND	C	TULAROSA	C	UPSAL	C	VENLO	B	WADDOUPS	B
TOWSON	B	TULIA	B	UPSHUR	C	VENUS	B	WADENA	B
TOZAWAY	D	TULLER	D	UPTON	C	VERDCORT	D	WADESBORO	B
TOY	D	TULLOCK	B	URACCA	B	VERDE	C	WADLEIGH	C
TOYAH	B	TULLY	C	URBANA	C	VERDEL	D	WADPALAM	D
TOZE	B	TUMBEZ	D	URBO	D	VERDELLA	D	WADSWORTH	C
TRABUCO	C	TUMEY	D	URICH	D	VERDIGRIS	B	WAGES	B
TRACK	B	TUMETAS	B	URNE	B	VERDUN	D	WAGNER	D
TRACY	B	TUMWATER	A	URSINE	C	VERGENNES	C	WAGRAM	A
TRAER	C	TUNEMEAN	D	URTAN	C	VERMALEN	C	WAHA	C
TRAIL	A	TUNICA	D	UPWIL	D	VERMEJO	D	WAHEE	D
TRAIL CREEK	B	TUNIS	D	USAL	B	VERNAL	B	WAHIAWA	B
TRANSYLVANIA	B	TUNKHANNOCK	A	USMAR	B	VERNALIS	B	WAHIAWLI	B
TRAPPER	A	TUNNEL	B	USINE	B	VERNON	D	WAHEEENA	B
TRAPPIST	C	TUPELO	C	USKA	D	VERONA	C	WAHKIACUS	B
TRASK	C	TUPUKMUK	D	UTALINE	B	VESSER	C	WAHLUKE	B
TRAVER	B/C	TURBEVILLE	C	UTE	C	VESTON	C	WAHPETON	C
TRAVESSILLA	D	TURBOTVILLE	C	UTICA	A	VETAL	A	WAHTIGUP	B
TRAVIS	C	TURBYFILL	B	UTLEY	B	VETERAA	B	WAHTUM	B/C
TRAWICK	B	TURIN	B	UTUACO	B	VEYO	D	WAIAMA	C
TRAY	C	TURK	D	UVAGA	D	VIA	B	WAIAKOA	C
TREADWAY	D	TURKEYSPRINGS	C	UVALDE	C	VIAN	B	WAIALEALE	D
TREASURE	B	TURLEY	C	UWALA	B	VIBORAS	D	WAIALUA	B
TREBLOC	D	TURLIN	B			VIBORG	B	WAIAWA	D
TREGO	C	TURNBOW	C	VACHERIE	C	VICKERY	C	WAIHUNA	D
TRELONA	D	TURNER	B	VACER	B	VICKSBURG	B	WAIKALOA	B
TREMBLES	B	TURNERVILLE	B	VADO	A	VICTOR	A	WAIKANE	B
TRENPE	A	TURNEY	B	VAIDEN	D	VICTORIA	D	WAIKAPU	B
TRENPEALEAU	B	TURRET	B	VAILTON	B	VICTORY	B	WAIKOMO	D
TRENARY	B	TURRIA	C	VALCO	C	VICU	C	WAILUKU	B
TRENT	B	TUSCAN	D	VALDEZ	B/C	VIUA	B	WAIPEA	B
TRENTON	D	TUSCARAWAS	C	VALE	B	VIORINE	C	WAINEE	B
TREP	B	TUSCARORA	C	VALENCIA	B	VIENNA	B	WAINOLA	A
TRES HERMANOS	C	TUSCOLA	B	VALENT	A	VIEQUES	B	WAIPAHU	C
TRES HERMANOS	C	TUSCUMBIA	C	VALENTINE	A	VIEW	C	WAISKA	B
TRETTEN	C	TUSEL	C	VALFPA	C	VIGAR	C	WAITS	B
TREVINO	D	TUSKEEGO	C	VALKARIA	B/D	VIGO	D	WAKE	D
TREXLER	C	TUSLER	B	VALLAN	D	VIKING	D	WAKEEN	B
TRIAMI	C	TUSQUITEE	B	VALLECITOS	C	VIL	C	WAKEFIELD	B
TRIASSIC		TUSTIN	B	VALLERS	C	VILAS	A	WAKELAND	B/D
TRICON	C	TUSTUMENA	B	VALPONT	C	VILLA GROVE	B	WAKENDA	C
TRIDELL	B	TUTHILL	B	VALPY	B	VILLARS	B	WALCOTT	B
TRIDENT	D	TUTTLE	B	VALCIS	B	VINA	B	WALDECK	C
TRIGO	C	TUTWILER	B	VANAJC	D	VINCENNES	C	WALDO	D
TRIMBLE	B	TUXEDO		VANANDA	D	VINCENT	C	WALDRON	D
TRINNER	B	TUXEKAN	B	VAN BUREN		VINEYARD	C	WALDROUP	D
TRINCHERA	C	TWILACKS	A	VANCE	C	VINGO	B	WALES	C
TRINITY	D	TWIN CREEK	B	VANDA	D	VINING	C	WALFORD	C
TRIPLEN	C	TWINING	C	VANDALIA	C	VINITA	L	WALKE	C
TRIPOLI	C	TWISP	B	VANDERDASSEN	D	VINLAND	C	WALL	B
TRIPP	B	TWO DOT	C	VANDERGRIFT	C	VINTON	A	WALLACE	B
TRITON	C	TYEE	D	VANDERNOFF	D	VIRA	C	WALLA WALLA	B
TRIX	B	TYGART	D	VANDERLIP	A	VIRATON	C	WALLER	B/D
TROJAN	B	TYLER	D	VAN DUSEN	B	VIRDEN	C	WALLINGTON	C
TRUMBALD	D	TYNDALL	B/C	VANET	D	VIRGIL	B	WALLIS	B
TROMP	B/C	TYNER	A	VANG	B	VIRGIN PEAK	D	WALLKILL	C/D
TRONSEN	B	TYRONE	C	VANHORN	B	VIRGIN RIVER	D	WALLMAN	C
TROOK	B	TYSON	C	VAN NOSTERN	B	VIRTUE	B	WALLOWA	C
TROPAL	D			VANNOY	B	VISALIA	B	WALLPACK	
TROSI	D	UBAR	C	VANUSS	B	VISTA	C	WALLROCK	D
TROUP	A	UBLY	B	VANTAGE	C	VIVES	B	WALLSBURG	D
TROUT CREEK	C	UCOLA	C	VAN WAGONER	D	VIVI	B	WALLSOA	B
TROUTDALE	B	UCOPIA	B	VARCO	C	VLASATY	C	WALPOLE	C
TROUT LAKE	C	UDEL	D	VARELUM	C	VOCA	C	WALSH	B
TROUT RIVER	A	UDOLPHO	C	VARICK	D	VODEKPAIER	B	WALSHVILLE	D
TROUTVILLE	B	UFFENS	D	VARINA	C	VOLADORA	B	WALTERS	A
TROXEL	B	UGAR	D	VARNA	C	VOLENTE	L	WALTON	C
TROY	C	UMLIG	B	VARNO	B	VOLGA	D	WALLP	B
TRUCE	C	UINTA	B	VARYSBURG	B	VOLIN	B	WALVAN	B

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TABLE L-1 (continued)

WAMPA	B/C	WEMAUKEE	D	WHITNEY	B	WINU	C	YAMPA	C
WAMIC	B	WEIKERT	C/D	WHITORE	A	WINZ	C	YAMSAY	D
WAMPSVILLE	B	WEIMER	D	WHITSCL	B	WIOTA	B	YANA	B
WANATAH	B	WEINBALM	C	WHITSCN	D	WISHEYLU	C	YAQUINA	B/D
WANBLEE	D	WEIR	D	WHITWELL	C	WISKAH	C	YARGLEY	C
WANDI	A	WEIRMAN	B	WHCLAN	C	WISNER	D	YATES	D
WANETTA	A	WEISER	C	WIBAUX	D	WITBECK	D	YAWGIM	C
WANN	A	WEISHAUPT	C	WICHITA	C	WITCH	D	YAWKEY	C
WANA	A	WEISS	A	WICHUP	D	WITHAM	C	YAXCN	B
WAPAL	B	WEITCHPEC	B	WICKERSHAM	B	WITHEE	C	YEATES HOLLOW	C
WAPATI	C/D	WELDY	B	WICKETT	C	WITT	C	YEGEN	B
WAPELLO	B	WELCH	C	WICKHAM	B	WITZEL	C	YELP	B
WAPINITIA	A	WELD	C	WICKIUP	C	WCDEN	B	YENRAB	A
WAPPINGER	B	WELDA	C	WICKLIFFE		WODSKOW	B	YECPAR	B
WAPSIC	B	WELDON	C	WICKSBURG	B	WCLCCTTSBURG		YETULL	A
WAPWA	A	WELDONA	D	WIGTSGE	C	WOLDALE	C/D	YODER	B
WARU	D	WELLER	C	WIEHL	C	WOLF	B	YUKCHL	C
WARDWELL	A	WELLENHORN	C	WIEN	D	WOLFESEN	C	YOLLABOLLY	D
WARFELL	D	WELLINGTON	D	WIGGLETCN	B	WOLFCRD	B	YOLC	B
WARDEN	B	WELLMAN	B	WILBRAHAM	C	WOLF POINT	B	YOLCGC	D
WARDWELL	C	WELLNER	B	WILBUR	C	WOLFTEVEN	C	YCMCNT	B
WARE	A	WELLSBORO	C	WILCC	C	WOLVERINE	A	YONCALLA	C
WARFMAN	C	WELLSTCN	B	WILCCX	D	WOOBINE	B	YONGES	D
WARMAN	C	WELLSVILLE	A	WILCOXSCN	C	WOOLBRIDGE	C	YONNA	B/D
WARM SPRINGS	C	WEMPLE	A	WILDCAT	D	WOODBURN	C	YORCY	B
WARNERS	A/D	WENAS	B/C	WILDER	B	WOODBURY	D	YORK	C
WARREN		WENATCHEE	C	WILDERNESS	C	WCCDLUCK	B	YORKVILLE	D
WARRENTON	B/D	WENDEL	B/C	WILDRCSE	D	WOODEAVILLE	C	YOST	C
WARSTON		WENNAR		WILDWOOD	D	WOODGLEN	D	YOUGA	B
WASSAW	B	WENONA	C	WILEY	C	WOODHURST	A	YOUPAN	C
WARATNO	A	WENTWORTH	B	WILKES	C	WOODLY	B	YOUNGSTCN	B
WAWECK	A	WERNER	B	WILKESCN	C	WOODLYN	C	YOURAPE	A
WASATCH	A	WESU	C	WILKINS	D	WOUDPANSIE	B	YOVIMPA	D
WASCPT	B	WESSEL	B	WILL	D	WUCDPERE	B	YSIDORA	C
WASHBURN		WESTBROOK	D	WILLACY	B	WCOD RIVER	C	YTURBIDE	A
WASHINGTON	B	WESTBURY	C	WILLAMEAZIE	C	WOODROCK	B	YUBA	D
WASHIS	C	WESTCREEK	A	WILLARAD	D	WOODRCW	C	YUKON	D
WASHOUGAL	B	WESTERVILLE	C	WILLAMETTE	B	WOODS CROSS	D	YUNES	D
WASHTENAW	C/D	WESTFALL	C	WILLAPA	C	WOODSFIELD	C	YUNQUE	C
WASILLA	C	WESTFIELD		WILLARD	C	WOODSIDE	A		
WASITOA	C	WESTFORD		WILLETTE	A/D	WOODSCN	D	ZAAR	D
WASKIC	A	WESTLAND	B/D	WILLMANC	B	WOUDSTOCK	C/D	ZACA	C
WATAB	C	WESTMINSTER	C/C	WILLIAMS	B	WCCDSTCWN	C	ZACHARIAS	B
WATAUGA	A	WESTMORE	B	WILLIAMSBURG	B	WOODWARD	B	ZACHARY	D
WATCHAMG	B	WESTMORELAND	B	WILLIAMSCN	C	WOULPAN	B	ZAFRA	B
WATCHUNG	D	WESTCN	D	WILLIS	C	WOULPEK	C	ZAHILL	B
WATERA RO		WESTPHALIA	B	WILLITS	B	WOGLSEY	C	ZAHL	B
WATERBURY	D	WESTPLAIN	C	WILLLUGHBY	B	WCCSLEY	B	ZALESKI	C
WATERING	C	WESTPORT	A	WILLOW CREEK	B	WCOTER	C	ZALLA	A
WATERS	C	WESTVILLE	B	WILLOWDALE	B	WOCSTERN	B	ZAMORA	B
WATKINS	B	WETHERSFIELD	C	WILLOWS	D	WOCTON	A	ZANE	C
WATKINS RIDGE	B	WETHEY	B/C	WILLWCOD	A	WORCESTER	B	ZANEIS	B
WATOPA	B	WETZEL	D	WILMER	C	WORF	D	ZANESVILLE	C
WATRUS	B	WEYMOUTH	B	WILPAR	D	WORK	C	ZANONE	C
WATSEKA	C	WHALAN	B	WILSCN	D	WORLAND	B	ZAPATA	C
WATSON	C	WHARTON	C	WILTSHIRE	C	WORLEY	C	ZAVALA	B
WATSONIA	D	WHATCOM	C	WINANS	B/C	WORMSER	C	ZAVCO	C
WATSONVILLE	D	WHATELY	D	WINCHESTER	A	WOROCK	B	ZEB	B
WATT	D	WHEATLEY	D	WINCHUCK	C	WCASHAM	D	ZEESIX	C
WATTON	C	WHEATRIDGE	C	WINDER	B/D	WORTH	C	ZELL	B
WAUBAY	A	WHEATVILLE	B	WINCPILL	B	WORTHEN	B	ZEN	C
WAUBEEK	B	WHEELER	B	WINOCA	B	WORTHING	C	ZENCA	C
WAUBUNSEE	B	WHEELING	B	WIND RIVER	B	WORTHINGTON	C	ZENIA	B
WAUCHULA	B/D	WHEELOCK	C	WINDSOR	A	WORTMAN	C	ZENIFF	B
WAUCOMA	B	WHEELUN	D	WINCTHORST	C	WRENTHAM	C	ZECNA	A
WAUCONDA	A	WHELCHEL	B	WINDY	C	WRIGHT	C	ZIEGLER	C
WAUKEE	A	WHETSTONE	B	WINEG	B	WRIGHTSVILLE	D	ZIGBEID	B
WAUKEGAN	B	WHIDBEY	A	WINERA	C	WUNJEY	B	ZILLAH	B/C
WAUKENA	D	WHIPPANY	C	WINETTI	B	WURTSBURO	C	ZIM	D
WAUKON	B	WHIPSTOCK	C	WINFIELD	C	WYALUSING	D	ZIMMERMAN	A
WAUMEE	B	WHITLU	C	WING	D	WYARC	B	ZING	C
WAUPACA	D	WHIT	B	WINGATE	B	WYARNG	C	ZINZER	B
WAUSEON	B/D	WHITAKER	C	WINGER	C	WYATT	C	ZION	C
WAVERLY	B/D	WHITCOMB	C	WINGVILLE	B/D	WYEAST	C	ZIPP	C/D
WAWAKA	C	WHITE BIRD	C	WINIFRED	C	WYEVILLE	C	ZITA	B
WAYCUP	B	WHITECAP	D	WINK	B	WYGANT	B	ZOAR	C
WAYDEN	D	WHITEFISH	B	WINKLEMAN	C	WYKOFF	B	ZCHNER	B/D
WAYLAND	C/D	WHITEFORD	B	WINLC	D	WYMAN	B	ZOOK	C
WAYNE	A	WHITEHORSE	B	WINLCCK	C	WYMLAE	C	ZORRAVISTA	A
WAYNESBORO	B	WHITE HOUSE	C	WINN	C	WYNN	B	ZUFELT	B
WAYSIDE		WHITELAKE	B	WINNEBAGO	B	WYNOOSE	D	ZUMBRO	B
WEA	B	WHITELAW	B	WINNEMUCCA	B	WYO	B	ZUMWALT	C
WEAVER	C	WHITEMAN	D	WINNESHIEK	B	WYOCENA	B	ZUNDELL	B
WEBB	C	WHITEROCK	D	WINNETT	D			ZUNHALL	B
WEBER	B	WHITESBURG	C	WINONA	D	YACOLT	B	ZUNI	C
WEBSTER	C	WHITE STORE	D	WINOOSKI	B	YAMARA	B	ZURICH	B
WEDGE	A	WHITE SWAN	C	WINSTON	A	YAMOLA	B		
WEDUBEE	A	WHITEWATER	B	WINTERS	C	YAKIMA	B		
WEED	C	WHITEWOOD	C	WINTERSBURG	B	YAKUS	D		
WEEDING	A	WHITLEY	B	WINTERSET	C	YALLANI	B		
WEEDMARK	B	WHITLOCK	B	WINTHROP	A	YALMER	B		
WEEKSVILLE	B/D	WHITMAN	D	WINTONER	C	YARNILL	C		

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TABLE L-2

Run-Off Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land[1]: without conservation treatment		72	81	88	91
: with conservation treatment		62	71	78	81
Pasture or range land: poor condition		68	79	86	89
good condition		39	61	74	80
Meadow: good condition		30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch		45	66	77	83
good cover[2]		25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.					
good condition: grass cover on 75% or more of the area		39	61	74	80
fair condition: grass cover on 50% to 75% of the area		49	69	79	84
Commercial and business areas (85% impervious)		89	92	94	95
Industrial districts (72% impervious)		81	88	91	93
Residential:[3]					
Average lot size	Average % Impervious[4]				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[5]		98	98	98	98
Streets and roads:					
paved with curbs and storm sewers[5]		98	98	98	98
gravel		76	85	89	91
dirt		72	82	87	89

1/ For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

2/ Good cover is protected from grazing and litter and brush cover soil

3/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

4/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

5/ In some warmer climates of the country a curve number of 95 may be used.

TABLE L-3

Run-Off Depth in Inches for Selected
Curve Numbers and Rainfall Amounts

Rainfall (inches)	Curve Number (CN)[1/]								
	60	65	70	75	80	85	90	95	98
1.0	0	0	0	0.03	0.08	0.17	0.32	.56	.79
1.2	0	0	0.03	0.07	0.15	0.28	0.46	.74	.99
1.4	0	0.02	0.06	0.13	0.24	0.39	0.61	.92	1.18
1.6	0.01	0.05	0.11	0.20	0.34	0.52	0.76	1.11	1.38
1.8	0.03	0.09	0.17	0.29	0.44	0.65	0.93	1.29	1.58
2.0	0.06	0.14	0.24	0.38	0.56	0.80	1.09	1.48	1.77
2.5	0.17	0.30	0.46	0.65	0.89	1.18	1.53	1.96	2.27
3.0	0.33	0.51	0.72	0.96	1.25	1.59	1.98	2.45	2.78
4.0	0.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
5.0	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	1.92	2.35	2.80	3.28	3.78	4.31	4.85	5.41	5.76
7.0	2.60	3.10	3.62	4.15	4.69	5.26	5.82	6.41	6.76
8.0	3.33	3.90	4.47	5.04	5.62	6.22	6.81	7.40	7.76
9.0	4.10	4.72	5.34	5.95	6.57	7.19	7.79	8.40	8.76
10.0	4.90	5.57	6.23	6.88	7.52	8.16	8.78	9.40	9.76
11.0	5.72	6.44	7.13	7.82	8.48	9.14	9.77	10.39	10.76
12.0	6.56	7.32	8.05	8.76	9.45	10.12	10.76	11.39	11.76

1/ To obtain runoff depths for CN's and other rainfall amounts not shown in this table, use an arithmetic interpolation.

APPENDIX M

SAMPLING PRIORITIES FOR ENVIRONMENTAL POLLUTANTS

[INFORMATION FROM THE OFFICE OF EMERGENCY AND REMEDIAL RESPONSE]

SAMPLING PRIORITIES FOR ENVIRONMENTAL POLLUTANTS

Compounds are characterized on the basis of persistence, accumulative capacity and volatility. "X" indicates the appropriate environmental compartment(s) for initial sampling.

Compound	Environmental Compartment		
	Water	Sediment	Biota
METALS AND INORGANICS			
Antimony	X		
Arsenic		X	X
Asbestos	X		
Beryllium		X	X
Cadmium		X	X
Chromium		X	X
Copper		X	X
Cyanides	X		
Lead		X	X
Mercury		X	X
Nickel		X	X
Selenium		X	X
Silver		X	X
Thallium		X	X
Zinc		X	X
PESTICIDES			
Acrolein		X	X
Aldrin	X		X
Chlordane		X	X
DDD		X	X
DDE		X	X
DDT		X	X
Dieldrin		X	X
Endosulfan and endosulfan sulfate		X	
Endrin and endrin aldehyde	X	X	X
Heptachlor		X	X
Heptachlor epoxide	X	X	X
Hexachlorocyclohexane (α, β, δ isomers)	X	X	
γ-Hexachlorocyclohexane (lindane)	X	X	
Isophorone	X		
TCDD		X	X
Toxaphene		X	X

SAMPLING PRIORITIES FOR ENVIRONMENTAL POLLUTANTS

Compound	Environmental Compartment		
	Water	Sediment	Biota
PCBs AND RELATED COMPOUNDS			
Polychlorinated biphenyls (6 PCB arochlors)		X	X
2-Chloronaphthalene		X	X
HALOGENATED ALIPHATICS			
Chloromethane (methyl chloride)	X		
Dichloromethane (methylene chloride)	X		
Trichloromethane (chloroform)	X		
Tetrachloromethane (carbon tetrachloride)	X		
Chloroethane (ethyl chloride)	X		
1,1-Dichloroethane (ethylidine chloride)	X		
1,2-Dichloroethane (ethylene dichloride)	X		
1,1,1-Trichloroethane (methyl chloroform)	X		
1,1,2-Trichloroethane	X		
1,1,2,2-Tetrachloroethane	X		
Hexachloroethane	X		
Chloroethene (vinyl chloride)	X		
1,1-Dichloroethene (vinylidine chloride)	X		
1,2-Trans-dichloroethene	X		
Trichloroethene	X		
Tetrachloroethene (perchloroethylene)	X		
1,2-Dichloropropane	X		
1,3-Dichloropropene	X		
Hexachlorobutadiene		X	X
Hexachlorocyclopentadiene		X	X
Bromomethane (methyl bromide)	X		
Bromodichloromethane	X	X	
Dibromochloromethane	X	X	
Tribromomethane (bromoform)	X	X	
Dichlorodifluoromethane*	X	X	
Trichlorofluoromethane*	X	X	
ETHERS			
Bis(chloromethyl) ether*	X		
Bis(2-chloroethyl) ether	X		

* These compounds have been removed from the EPA priority pollutant list.

SAMPLING PRIORITIES FOR ENVIRONMENTAL POLLUTANTS

Compound	Environmental Compartment		
	Water	Sediment	Biota
ETHERS (Continued)			
Bis(2-chloroisopropyl)ether	X		
2-Chloroethyl vinyl ether	X	X	
4-Chlorophenyl phenyl ether		X	X
4-Bromophenyl phenyl ether		X	X
Bis(2-chloroethoxy) methane	X		
MONOCYCLIC AROMATICS			
Benzene		X	
Chlorobenzene		X	X
1,2-Dichlorobenzene (o-dichlorobenzene)		X	X
1,3-Dichlorobenzene (m-dichlorobenzene)		X	X
1,4-Dichlorobenzene (p-dichlorobenzene)		X	X
1,2,4-Trichlorobenzene		X	X
Hexachlorobenzene		X	X
Ethylbenzene		X	
Nitrobenzene		X	
Toluene		X	
2,4-Dinitrotoluene		X	
2,6-Dinitrotoluene		X	
PHENOLS AND CRESOLS			
Phenol	X		
2-Chlorophenol	X		
2,4-Dichlorophenol	X		
2,4,6-Trichlorophenol		X	
Pentachlorophenol		X	X
2-Nitrophenol		X	
4-Nitrophenol		X	
2,4-Dinitrophenol		X	
2,4-Dimethylphenol		X	X
p-Chloro-m-cresol		X	
4,6-Dinitro-p-cresol		X	

* These compounds have been removed from the EPA priority pollutant list.

SAMPLING PRIORITIES FOR ENVIRONMENTAL POLLUTANTS

Compound	Environmental Compartment		
	Water	Sediment	Biota
PHTHALATE ESTERS			
Dimethyl phthalate		X	X
Diethyl phthalate		X	X
Di-n-butyl phthalate		X	X
Di-n-octyl phthalate		X	X
Bis(2-ethylhexyl) phthalate		X	X
Butyl benzyl phthalate		X	X
POLYCYCLIC AROMATICS			
Acenaphthene		X	X
Acenaphthylene		X	X
Anthracene		X	X
Benzo (a) anthracene		X	X
Benzo (b) fluoranthene		X	X
Benzo (k) fluoranthene		X	X
Benzo (ghi) perylene		X	X
Benzo (a) pyrene		X	X
Chrysene		X	X
Dibenzo (a,h) anthracene		X	X
Fluoranthene		X	X
Fluorene		X	X
Indeno (1,2,3-cd) pyrene		X	X
Naphthalene		X	X
Phenanthrene		X	X
Pyrene		X	X
NITROSAMINES AND MISCELLANEOUS COMPOUNDS			
Dimethyl nitrosamine	X		
Diphenyl nitrosamine		X	X
Di-n-propyl nitrosamine	X	X	X
Benzidine		X	
3,3'-Dichlorobenzidine		X	X
1,2-Diphenylhydrazine (hydrazobenzene)		X	X
Acrylonitrile	X	X	

Adapted from Chapman, P., G. P. Romberg and G. Vigers, 1982. "Design of Monitoring Studies for Priority Pollutants." Journal Water Pollution Control Federation, Vol. 54 Number 3.