NEBRASKA

DEPT. OF ENVIRONMENT AND ENERGY

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18-162 March, 2021

NEBRASKA

VOLUNTARY CLEANUP PROGRAM

GUIDANCE DOCUMENT

*Produced by: Nebraska Department of Environment and Energy, P.O. Box 98922, Lincoln, NE 68509-8922; phone (402) 471-2186. To view this, and other information related to our agency, visit our web site at **http://dee.ne.gov***

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Nebraska Voluntary Cleanup Program Guidance
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ABOUT THIS GUIDANCE

Welcome to the guidance document for Nebraska's Voluntary Cleanup Program (VCP). This document has been prepared by the Nebraska Department of Environment and Energy (NDEE) to provide information and guidance for all persons and parties interested or actively involved in the VCP. It is written for two main audiences: prospective VCP applicants who want to know more about the program and technical staff or consultants who are preparing documents for VCP applicants.

The first section – **Introduction to Nebraska's Voluntary Cleanup Program** – is written for prospective applicants. It provides general information about the VCP and specific information about how to apply. It also outlines the basic process that VCP applicants follow both before and after they are accepted into the program.

The next two sections are written for technical staff or consultants doing work for a VCP applicant. The **Remedial Action Plan Technical Guidance** is intended for use *prior* to preparing a VCP Remedial Action Plan (RAP). (One of the Attachments to the Remedial Action Plan Technical Guidance includes an important element of this guidance: The **Remediation Goal Lookup Tables**. These tables allow a consultant to quickly determine cleanup levels for a site based on the intended land use. They provide flexibility to the applicant while promoting high-quality, effective, and efficient cleanups that are protective of human health and the environment.) The **Remedial Action Report Technical Guidance** is intended for use *after* initiation of cleanup activities at a contaminated site. These sections describe the information that should be submitted and provide specific information about how to present it. In addition to the narrative, detailed and convenient checklists are included to assist with understanding all of the information that should be provided to NDEE.

Finally, the **Appendices** at the back of the guidance provide the protocol used by NDEE to establish the Remediation Goal Lookup Tables, examples of specific figures, tables, and other important documents, and references to sources of technical information to make it easier for staff and consultants to collect, prepare, and submit the necessary information.

Following the information and guidelines laid out in this document will increase the likelihood of successfully achieving cleanup within a reasonable timeframe and with minimal oversight costs.

WHAT'S NEW IN 2021

The March 2021 version of NDEE's Voluntary Cleanup Program (VCP) Guidance Document is essentially limited to editorial changes within the document narrative, tables, and attachments/appendices to reflect the March 2020 transition of the Nebraska Department of Environmental Quality (NDEQ) to the Department of Environment and Energy (NDEE). Other minor revisions have also been made for contact information/questions related to the Department's VCP.

At this time, no revisions have been made to the chemical-specific and media-specific remediation goals (RGs). All other revisions documented as part of the September 2018 VCP Guidance Document update are still applicable.

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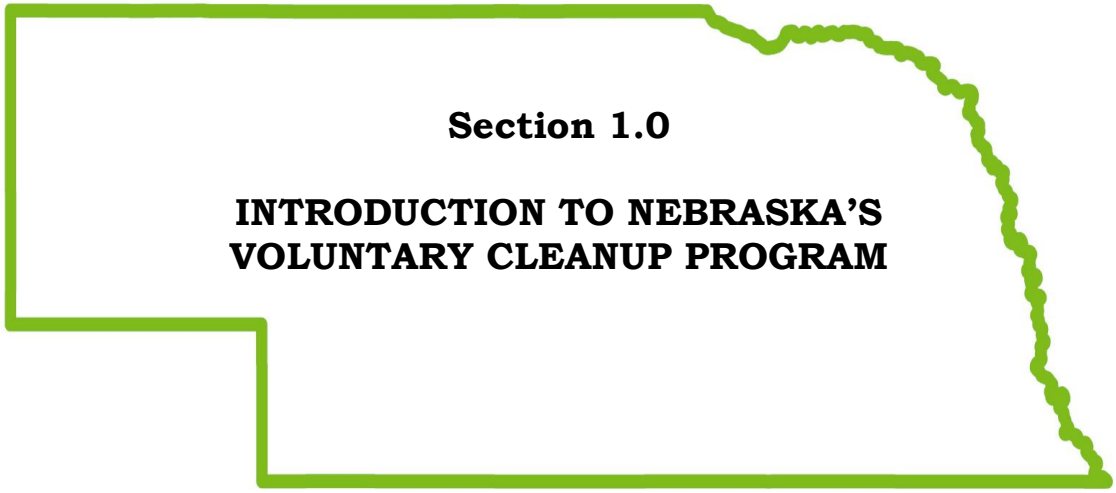

Section 1.0

INTRODUCTION TO NEBRASKA'S VOLUNTARY CLEANUP PROGRAM

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SECTION 1.0 INTRODUCTION TO NEBRASKA'S VOLUNTARY CLEANUP PROGRAM

GENERAL INFORMATION

What Is The VCP?

The Nebraska **V**oluntary **C**leanup **P**rogram (VCP) was established by the Remedial Action Plan Monitoring Act (RAPMA; see Attachment 1-5) in 1995. It is a fee-based cleanup program for all entities interested in voluntarily cleaning up contaminated properties. Fees paid by the applicant (see Section 1.1) cover costs associated with the Nebraska Department of Environment and Energy (NDEE) review, approval, and oversight of voluntary cleanup plans. The Nebraska VCP facilitates the redevelopment and reuse of brownfield sites. It utilizes a streamlined, results-based approach to environmental cleanup. It provides an alternative approach to more traditional federal cleanup programs such as the Superfund or RCRA programs. Finally, it provides state determinations of "no further action" upon successful completion of cleanup activities. These "no further action" determinations are important for those applicants seeking financing from a banking institution for redevelopment of the site following cleanup. The "no further action" determinations are also important to applicants who wish to join the program as an alternative to more traditional federal cleanup programs. In such a case, eligible response sites are provided protection from federal enforcement in EPA-approved state VCPs upon successful completion of voluntary cleanup activities.

The VCP is intended for property owners, potential property buyers, facility owners, local governments, and other interested parties who want to use this approach to voluntarily clean up contaminated properties while **maintaining compliance with all applicable State and Federal environmental regulations**.

What Are The Goals Of The VCP?

The primary goals of the VCP are to (1) protect human health and the environment, (2) return contaminated properties to productive use, (3) provide a streamlined, results-based approach to environmental cleanup, and (4) provide an alternative approach to traditional cleanup programs. An applicant achieves these goals by conducting a thorough environmental investigation and developing a conceptual site model. Then, based on the investigation, conceptual site model, and the intended land use of the site, applicants and their consultants work together to develop appropriate remedial actions. The outcomes of these actions should eliminate human exposure to contamination, mitigate adverse impacts to the environment, and prepare the site for redevelopment and reuse.

What Are The Benefits of the VCP?

Participants who have completed remedial actions, paid all applicable fees, and met the provisions and objectives agreed to with NDEE will have successfully completed the program. These participants will receive three desirable benefits:

- Determination by NDEE that no further remedial action is required at the site
- Redevelopment and productive reuse of the property
- Protection to eligible response sites from federal enforcement in EPA-approved state VCPs upon successful completion of voluntary cleanup activities

How Is the VCP Different Than Traditional Cleanup Programs?

Traditionally, environmental investigations and remedial actions were often required to follow a regimented, step-by-step process that required extensive regulatory oversight. Cleaning up and returning a contaminated property to productive use often took many years. Nebraska's VCP, however, is designed to work as quickly and simply as possible. Applicants are encouraged to use a streamlined, results-based approach tailored to accomplish site-specific goals. NDEE has developed user-friendly tables (see Attachment 2-6) that allow a consultant to quickly determine cleanup levels for a site based on its intended land use. By using these lookup tables and following this guidance carefully, the administrative procedures normally associated with environmental investigations and remedial actions can be reduced, and VCP applicants can complete remedial actions cost effectively. VCP applicants can:

- Control investigation and cleanup costs by choosing an appropriate environmental consultant
- Combine investigation and remediation activities when possible, while maintaining strict compliance with all applicable regulations
- Propose remedial actions that are appropriate for future land use (or current land use, if land use will not change) based on cleanup levels from the VCP lookup tables
- Maintain control over remediation activities
- Receive technical and regulatory assistance from NDEE

Since the VCP is designed to be more flexible than traditional cleanup programs, a greater responsibility is placed on the applicant and consultant to **collect and submit correct and complete information to NDEE**.

How Is The VCP Similar To Traditional Cleanup Programs?

While the Nebraska VCP is different in certain respects from traditional cleanup programs, it is similar to traditional cleanup programs in the following areas:

- Cleanup decisions are protective of human health and the environment
- A complete and thorough investigation is necessary
- All activities must be in compliance with all applicable state and federal laws and regulations
- Risk-based cleanup goals are within the acceptable risk range of federal cleanup programs

What Is The Streamlined, Result-Based Approach?

Nebraska's VCP is intended to be a streamlined, results-based approach to environmental cleanup. This approach minimizes the number of steps in the regulatory review process and involves setting goals to focus on achieving specific outcomes, or results, as a means of cleaning up contaminated sites. It also allows VCP applicants a number of options on how to achieve these goals.

One example of a streamlined, results-based approach could be for the VCP applicant to perform a complete and thorough investigation prior to joining the VCP. Another example of the streamlined, results-based approach would be the integration of the investigation and cleanup steps that are typically separate parts of the process in more traditional cleanup programs. This approach also bases cleanup decisions on risk assessment, future land use, and ground water use. The approach encourages the use of presumptive remedies and innovative cleanup technologies. Finally, the approach includes the use of performance-based cleanups where submittal of detailed engineering design plans are no longer necessary and focus is placed on ensuring that an adequate performance monitoring plan is submitted to demonstrate how the cleanup goals for the site will be achieved.

The streamlined, results-based approach taken by NDEE still allows the VCP applicant to submit draft workplans, reports, or other information to NDEE for review and comment.

Although the VCP program utilizes a streamlined, results-based approach, this does not mean that the remedial actions are less protective. All investigation and cleanup work must conform to federal and state environmental laws and regulations. NDEE believes that the streamlined, results-based approach is important because it helps applicants complete their project in a timely manner and it makes best use of limited government resources.

1.1 PROCESS OVERVIEW

1.1.1 Process Options

Over the history of the NDEE VCP, two basic process options have evolved for use by the VCP applicant, one in which the applicant conducts a site investigation and prepares a Remedial Action Plan (RAP) prior to applying to the VCP and the other in which an applicant first goes through the application stage and then moves forward with the site investigation and RAP preparation. The first option may be preferable to those VCP applicants wishing to proceed through the process more quickly and efficiently. The second option may be preferred by those VCP applicants wishing to have NDEE review workplans and reports prior to their final approval. The flowcharts in Attachment 1-1 provide an outline of either process that applicants might follow as they progress through the VCP.

1.1.1.1 Pre-Application Site Investigation/RAP

This process is designed to eliminate the multi-stage review process that occurs when individual workplans and reports are submitted at each stage of an investigation and cleanup. The RAP is a single, comprehensive document that describes all stages of an investigation as well as the plans for cleaning up the site. RAPs conforming to this guidance will facilitate and expedite NDEE review and approval.

The first step taken by an applicant should be to complete an investigation to define the full nature and extent of contamination at the contaminated site. Should interim remedial actions be necessary to address an imminent threat to human health or the environment, the applicant can complete these actions before proceeding to the application stage.

1.1.1.2 Application Followed by Site Investigation/RAP

This process allows a VCP applicant to enter the program with more NDEE oversight and review prior to completing an investigation to define the full nature and extent of contamination.

1.1.2 VCP Application and Written Agreement

A complete application package includes an application form, a non-refundable $2,000 application fee, a refundable $3,000 initial deposit, and a signed written agreement. The application form (see Attachment 1-2) asks the applicant to identify critical information such as the site's point of contact, the type of contamination present at the site, land use and operational history, and future use of the site.

An application consists of:

1. A completed **application form** (see Attachment 1-2)
2. A nonrefundable **$2,000** application fee
3. A refundable **$3,000** initial deposit
4. A **written agreement** signed by the applicant (see Attachment 1-3)

The written agreement (see Attachment 1-3), once signed by both parties, establishes that the applicant will reimburse NDEE for the costs of all review, oversight, and guidance. This written agreement is based on language within the RAPMA. Because the written agreement is based on state statute, flexibility within the agreement is limited. It also establishes that the applicant submit the refundable $3,000 initial deposit with the written agreement, prior to any technical reviews by NDEE. If oversight costs exceed the $3,000 initial deposit, additional fees will be required over the course of VCP participation. Typical oversight costs associated with NDEE review of a VCP site may range between $3,000 and $75,000, depending on the complexities of a site. NDEE may also request a one-time lump-sum payment for potential future oversight costs associated with a project, such as the review and evaluation of the effectiveness of any institutional controls put in place as part of the approved final remedial actions for a site. Factors that determine the amount of the requested lump-sum payment will include the size of the site, the type and mobility of the documented contaminants, the anticipated maintenance requirements of protective structures or controls, and the need for periodic inspections or audits. An applicant may be able to offset some oversight costs with EPA Brownfields funding.

NDEE typically issues invoices for additional oversight costs on a monthly basis. However, invoicing frequency may be adjusted to address site-specific issues. More complex or resource-intensive projects may require establishment of a pre-payment plan.

The complete application package must be submitted to the following address:

VCP Coordinator
Nebraska Department of Environment and Energy
245 Fallbrook Blvd.
P.O. Box 98922
Lincoln, NE 68509-8922
(402) 471-2186
NDEE.vcpbrownfields@nebraska.gov

The application will be reviewed by NDEE to determine if all requested information has been provided. Incomplete applications will be returned to the applicant for revision. The applicant has sixty (60) days to resubmit the application or the application will be denied. If an application is determined to be complete and acceptable, NDEE will approve the application, making the applicant and site valid participants in the VCP.

1.1.3 Remedial Action Plan

After an application has been approved by NDEE, the applicant will have 90 days to submit the first technical document: the Remedial Action Plan (RAP; see Section 2.0), unless an extension is granted. A RAP consists of an Investigation Report (IR), which presents a conceptual site model based on a thorough investigation, and a Remedial Action Work Plan (RAWP), which outlines the plan for cleaning up the site.

NDEE will then conduct a technical review of the RAP. While NDEE will review the RAP in as timely a manner as possible, the actual review time will be dependent on factors such as NDEE staffing levels, work load, size and complexity of the site, future land use, and quality of the documents submitted. If there are any outstanding issues identified by the technical review, the applicant will be asked to submit a complete, revised plan. NDEE may require the applicant to submit a work plan for additional investigation.

1.1.4 Public Notice and Implementation of Remedial Actions

Upon receipt of an approvable RAP, NDEE will public notice its intent to approve the plan (see Attachment 1-4). An administrative record will be prepared by NDEE containing all the information forming the basis for preliminary approval of the plan. The administrative record will be located on NDEE's website (http://www.deq.state.ne.gov). During the thirty (30) day public comment period, any person may submit written comments or request a hearing. (Sites subject to RCRA permitting and corrective action requirements that are using the VCP as an alternate cleanup program may require a 60-day public comment period.) Following the thirty (30) day public comment period, and any public hearing, if appropriate, final approval of the plan will be given and cleanup of the site may begin. Initiation of cleanup must begin within six (6) months and be completed within twenty-four (24) months, excluding long-term operation, maintenance, and monitoring. NDEE will monitor the implementation of remedial actions and provide guidance as necessary.

1.1.5 Remedial Action Report

Within sixty (60) days of completion of remedial actions, the applicant will prepare the second technical document: the Remedial Action Report (RAR; see Section 3.0). The purpose of the RAR is to document the remedial actions and to demonstrate to NDEE and the public that the site is cleaned up as proposed in the approved RAP. NDEE will then review this document. In those instances where the outcome of remedial activities is unsatisfactory, NDEE will inform the applicant and indicate the actions necessary to achieve the desired outcome. If the cleanup is satisfactory, NDEE will prepare a No Further Action (NFA) letter to declare that no further action is necessary, and the property is ready for redevelopment and reuse.

1.2 RAPMA ELIGIBILITY

RAPMA establishes that <u>any</u> entity may <u>voluntarily</u> apply for NDEE monitoring of remedial actions for land or water pollution through the VCP. This includes petroleum sites; however, in most cases, petroleum contaminated sites will be managed by the NDEE Petroleum Remediation (PR) Section, for the following reasons:

- The NDEE PR Section has technical expertise in working with petroleum releases.
- The NDEE PR Section has an established, functioning, risk-based corrective action program that may have less stringent screening or cleanup levels than those remediation

goals established for the Nebraska VCP.

- Funding for many petroleum release investigations and cleanups may be available through the PR Section Title 200 reimbursement fund and federal LUST Trust Fund.

- The property owner will not incur oversight cost fees for work through the PR Section.

1.3 FEDERAL ENFORCEMENT PROTECTION

Additionally, certain sites enrolling in the VCP may be eligible for protection from federal enforcement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund. NDEE and the U.S. Environmental Protection Agency (EPA) Region VII have negotiated a Memorandum of Agreement (Attachment 1-6) for the Nebraska Voluntary Cleanup Program. This agreement became effective on November 22, 2006 and offers protection from federal Superfund enforcement for those eligible response sites, as defined in CERCLA §101(41), that successfully complete cleanup under the VCP.

Some property owners, by conducting "All Appropriate Inquiries" into present and past uses of the property, are already eligible for protection from federal enforcement under the **Small Business Liability Relief and Brownfields Revitalization Act**. These owners include: *bona fide prospective purchasers*, *innocent landowners*, and *contiguous property owners*.

1.4 ADDRESSING MULTIPLE SITES

In some cases, a prospective applicant may want to enter multiple sites into the VCP. For example, an owner of a chain of dry cleaners may want to voluntarily clean up several sites in different geographical locations. In such cases, the applicant must submit individual VCP applications, Written Agreements, fees, Remedial Action Plans, and Remedial Action Reports <u>for each site</u> and will receive separate No Further Action letters for each site.

1.5 PARCELING AND CONSOLIDATING PROPERTIES

In some cases, an investigation and cleanup may be more practical if one large property can be addressed in pieces. This practice is referred to as parceling. For example, if your prospective VCP project site is a large industrial complex that consists of manufacturing and shipping facilities as well as a large green space that has never been used for any manufacturing, you may choose to divide the site into parcels. The advantage of dividing the project into parcels is that the green space can usually be investigated more quickly and, if the investigation confirms that the parcel does not require any remediation, the green space can be developed very quickly. Parceling also allows a large, complex VCP project to be divided into phases. If a VCP applicant decides to divide a project into parcels, the applicant may submit <u>one</u> VCP application and Written Agreement and pay only <u>one</u> set of fees. However, separate Remedial Action Plans, and Remedial Action Reports <u>for each parcel</u> will still need to be submitted and each parcel will receive separate No Further Action letters.

In other cases, an investigation and cleanup will be more practical if several generally contiguous properties are consolidated into one project. This practice is referred to as consolidating. For example, your prospective VCP project may encompass several real properties that include a former salvage yard, former landfill, fertilizer plant, and shipping terminal. One of the advantages to consolidating several real properties into one project is that you pay only one set of fees and submit one VCP application, Written Agreement, Remedial Action Plan, and Remedial Action Report for the entire project. Upon completion of the project, you will then receive one No Further Action letter for the entire project.

> Consolidating multiple real properties into one VCP project is only allowed if the properties are generally contiguous. If one or more of the properties are not generally contiguous, that property(ies) must be addressed as a separate VCP project.

It is up to each VCP applicant to determine whether one of these approaches is practical for their project. Factors that tend to influence the approach to a project include financing and project completion timeframes.

> It is important to note that because the number of VCP applications, Written Agreements, and fees are based on whether a project is divided into parcels or consolidated into one project, each applicant must decide before submitting their application whether to divide the project into parcels or consolidate multiple real properties into one project. Both the VCP application and the Written Agreement must include the geographic extent of the subject property.

Issues regarding parceling and consolidating properties will be handled on a case-by-case basis. Such issues may include the cleanup of only certain contaminants (as opposed to all contaminants discovered) or where different sources exist. Each applicant should contact NDEE to discuss how the application should be prepared.

1.6 RAPMA ENFORCEABILITY & TERMINATION

As set forth in the RAPMA, voluntary remedial action plans approved by NDEE are enforceable if NDEE demonstrates that the applicant has failed to fully implement the approved plan. NDEE may require additional actions if other state statutes administered by the agency authorize such actions.

NDEE may terminate (in writing and with explanation) a voluntary remedial action plan if the applicant:

- Violates any terms or conditions of the plan or fails to fulfill any obligations of the plan (including submission of an acceptable plan within a reasonable period of time)
- Fails to address an immediate and significant risk to public health and the environment in a timely and effective manner
- Fails to initiate the plan within six months after NDEE approval or to complete the plan within 24 months after NDEE approval, excluding long-term operation, maintenance, and monitoring (unless NDEE grants an extension)

Under RAPMA, an applicant may unilaterally terminate a voluntary remedial action plan approved by NDEE prior to completion of investigative and remedial activities if the applicant leaves the property in no worse condition, from a human health and environment perspective, than when they initiated voluntary remedial actions and NDEE is reimbursed for all outstanding costs.

1.7 GENERAL COMMENTS ON VCP GUIDANCE

Please note that the specific guidance contained herein under Sections 2.0 and 3.0 has been written for a "typical" facility or property where both soil and groundwater contamination exists. It is possible that some of the information requested within the guidance may not apply to a specific site. Where requested information does not apply, it is not necessary to collect this information. However, if such information is not collected, it should be noted in the appropriate report provided to NDEE why the information was not collected. It is the responsibility of each applicant to determine which parts of the guidance are applicable and which parts are not.

NDEE would also like to emphasize that the level of effort for conducting a complete investigation is not based on future land use. That is, even if the site land use was, and will remain as commercial or industrial use, ***the extent of soil, groundwater, and/or soil gas contamination must still be defined to the most conservative remediation goals***, as specified below, using the Remediation Goals Lookup Tables found in Attachment 2-6. Specifically:

- The extent of soil contamination should be defined to the remediation goals for the residential direct contact exposure pathway or the migration to groundwater pathway, whichever is less

- The extent of groundwater contamination should be defined to the remediation goals for the groundwater direct contact exposure pathway or the residential groundwater vapor intrusion exposure pathway, whichever is less

- The extent of soil gas contamination should be defined to the remediation goals for the residential soil gas vapor intrusion exposure pathway

The intent of the VCP guidance is to provide a process or "framework" for conducting a site investigation. Sites will vary considerably in respect to property size, historical uses, extent and degree of contamination, geology, etc. Therefore, the guidance cannot provide specific details or particulars on such investigative concerns as the number and location of analytical samples, specific sampling and analysis methods (with an exception made for potential chromium contamination, as provided in the information box below), determination of appropriate chemicals of concern, etc. Such determinations will need to be made by the applicant and their contractor based on their professional judgment.

> Any VCP site entering the program for which the metal chromium may be considered a potential contaminant of concern (such as a former metal plating facility) should plan on conducting valance-specific (i.e., chromium III and chromium VI) media sampling in characterizing the site.

A primary focus of the Nebraska VCP is to provide an applicant with options in determining remedial action objectives and remediation goals that are appropriate for their site. Towards that end, the NDEE

has developed a protocol that utilizes a three-tiered approach to establish or select specific remediation goals for a site. This tiered approach is discussed in detail in Appendix A, *Protocol for VCP Remediation Goals Lookup Tables*, Section 3.0. The NDEE recommends that applicants familiarize themselves with this protocol prior to preparing the Remedial Action Work Plan.

Lastly, NDEE wishes to note that the information requested within this guidance document is presented as ***guidance***, and are not requirements promulgated under state statute or regulation. As such, the applicant is not required to strictly follow the framework provided in the guidance. However, the applicant's project will progress more quickly if the guidance is followed. Following the guidance, as well as complying with all federal and state regulations, will provide protection to eligible response sites from federal enforcement in EPA-approved state VCPs upon successful completion of voluntary cleanup activities.

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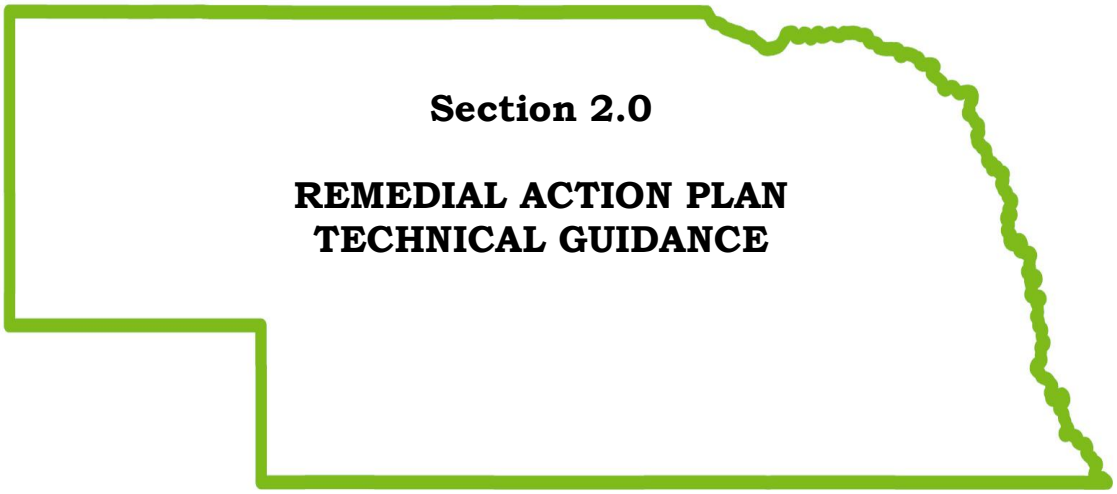

Section 2.0

REMEDIAL ACTION PLAN TECHNICAL GUIDANCE

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SECTION 2.0 REMEDIAL ACTION PLAN TECHNICAL GUIDANCE

INTRODUCTION

After NDEE approves an application, the applicant must submit a Remedial Action Plan (RAP) within ninety (90) days, unless granted an extension by NDEE. The RAP consists of two main elements:

- An Investigation Report (IR)
- A Remedial Action Work Plan (RAWP)

The IR contains fundamental information – what is known about the site, where the contamination is located, who is or could potentially be affected by the contamination – and presents a conceptual site model based on this information. The RAWP contains the cleanup plan for the site. It presents the remedial action objectives, describes how, when, and to what degree the site will be cleaned up, and explains why the proposed remedy has been chosen.

There are several ways in which this section of the technical guidance is designed to help environmental consultants prepare a complete and thorough RAP:

1) The **narrative** of the guidance describes how to collect information and present it in the RAP. The narrative also provides some discussion of the relationships among the collected data. Example figures and tables are provided in Appendix B to further illustrate how to present information in the RAP.

   The intent of the VCP guidance is to provide a process or "framework" for conducting a site investigation. Sites will vary considerably in respect to property size, historical uses, extent and degree of contamination, geology, etc. Therefore, the guidance cannot provide specific details or particulars on such investigative concerns as the number and location of analytical samples, specific sampling and analysis methods, determination of appropriate chemicals of concern (COCs), etc. Such determinations will need to be made by the applicant and their contractor based on their professional judgment.

2) The **checklist** within this guidance (Attachment 2-1) outlines the information that should be collected and where it can be found. Although it is impossible to provide an exhaustive list of every piece of information that may appear in a RAP, the checklist does provide a *detailed* list of the common pieces of information and potential sources of this information. For a more extensive list of information sources, a bibliography has been provided at the end of the guidance. To expedite NDEE review of the RAP, the checklist should be completed and submitted along with the RAP.

3) The investigation process **flowchart** (Attachment 2-2) illustrates the relationship among the various pieces of information and depicts the overall investigative sequence.

In general, the outline of the RAP should parallel the organization of the technical guidance. However, the guidance is intended to provide sufficient flexibility to accommodate different types of VCP sites. Some elements of this guidance may apply to your site, and others may not. For example, this guidance describes how you should summarize previously reported investigations at your site in the IR. If no previous investigations (other than the VCP investigation) exist for your site, you will not have such a summary in your report. It is the responsibility of each applicant to determine which parts of the guidance are applicable and which parts are not.

2.1 EXECUTIVE SUMMARY

The first part of the RAP should be an executive summary that presents an overview of the entire plan. The executive summary should be clear and concise, yet contain enough information to give the reviewer a basic understanding of the site, the nature and extent of contamination, potential receptors, and the proposed remedial action. It should include all of the following elements:

- Summary and conclusions of the completed investigation
- A list of potential receptors
- A conceptual site model
- A description of any interim remedial actions completed before entering the VCP
- Future land use plans
- The remedial action objectives (RAOs), including the proposed remediation goals from the Remediation Goals Lookup Tables
- A description of the proposed remedial action and how it meets the RAOs developed for the site. For sites receiving an EPA Brownfields cleanup grant or revolving loan funds, a description of how the remedy meets the five remedy evaluation criteria must also be addressed.
- Any other site-specific issues that should be considered during completion of remedial actions

Generally, no more than 4-5 pages are recommended. However, the length of the Executive Summary depends on the number and complexity of issues at the site. See the checklist in Attachment 2-1 for additional details about creating an Executive Summary.

2.2 INVESTIGATION REPORT

The methods and findings of this investigation should be presented in the **Investigation Report (IR)**. The IR should present background information, describe how this information was used to devise a thorough field investigation, and describe the nature and extent of contamination at the site. It should present information regarding the fate and transport of the chemicals found at the site and potential receptors that may be impacted by the contamination. Finally, the IR should present a conceptual site model based on this information. The information presented in the IR will be the basis for your selection of remedial actions. Thus, having a technically sound and complete report will facilitate and expedite NDEE's review of the feasibility and adequacy of the selected remedial action.

The IR should contain the information outlined in the checklist (see Attachment 2-1) and should be organized according to the sequence in this guidance (Sections 2.2.1 – 2.2.8). All maps, figures, tables, and graphs should be included in appendices to the RAP. While conducting the investigation, you should use the investigation process flowchart (Attachment 2-2) to visualize how the various pieces of information fit within the overall investigative sequence.

NDEE would also like to emphasize that the level of effort for conducting a complete investigation is not based on future land use. That is, even if the site land use was, and will remain as commercial or industrial use, ***the extent of soil, groundwater, and/or soil gas contamination must still be defined to the most conservative remediation goals***, as specified below, using the Remediation Goals Lookup Tables found in Attachment 2-6. Specifically:

- The extent of soil contamination should be defined to the remediation goals for the residential direct contact exposure pathway or the migration to groundwater pathway, whichever is less

- The extent of groundwater contamination should be defined to the remediation goals for the groundwater direct contact exposure pathway or the residential groundwater vapor intrusion pathway, whichever is less

- The extent of soil gas contamination should be defined to the remediation goals for the residential soil gas vapor intrusion pathway

Because sites differ in regard to setting, conditions, and contamination, IRs will vary from site to site. The checklist of information should be used and adapted to appropriately address each site, but regardless of the specific site characteristics, all IRs will share some common elements:

- A discussion of background information, including physical setting and operational history, and identification of data gaps based on review of this information

- Details of the methods, objectives, and procedures of the field investigation

- Physical characteristics of the site based on the field investigation, including site-specific hydrology, geology, and hydrogeology

- Nature and extent of contamination in impacted media and locations of contaminant sources based on the results of the field investigation

- Discussion of contaminant fate and transport based on site conditions and chemical characteristics of contaminants

- Identification of potential human and ecological receptors, including a well survey and land use survey of the site and surrounding area

- Presentation of a conceptual site model based on the investigation results, potential receptors, and the intended land use of the site

- Summary and conclusions of the investigation

The IR should provide enough information to justify the proposed remedial action presented in the Remedial Action Work Plan (RAWP) (see Section 2.3). All conclusions of the investigation should be supported by scientifically valid, defensible data. All results, whether positive or negative, should be included. For example, if samples of groundwater were taken, the IR should show the results of these samples whether or not they indicated contamination. If information from previous investigations is used to support the conclusions of the investigation, this data should be cited in the body of the report, and

copies of the source documents should be provided in the appendices. Data tables should include both compiled historical data and data collected during the field investigation.

2.2.1 Compilation and Analysis of Background Information

The compilation and analysis of background information is an essential part of a successful investigation. By researching a site's physical setting, operational history, and previous environmental investigations, an investigator can identify data gaps – those pieces of information that are unknown, but necessary in order to fully characterize the site. These data gaps can then be addressed by conducting a field investigation. The information from the background study and field investigation can be integrated to define the full nature and extent of contamination.

The search for information about the site's physical setting, historical operations, and current use need not be exhaustive, but should be comprehensive. In other words, if multiple sources of information are available about an aspect of the site, but one or two of these sources are sufficient to adequately describe it, the remaining sources need not be included in the report. However, if information about a particular aspect of the site is unavailable, the IR should clearly indicate that all available sources were reviewed.

The RAP checklist (Attachment 2-1) provides a list of sources for documents such as aerial photographs and topographic maps that can be used to collect background information. The bibliography (Appendix C) contains additional resources.

2.2.1.1 Site Information

Since the RAP is intended to be a stand-alone document, basic information about the site and its owners/operators should be provided (even though this information is also requested on the application form). The site name should be provided and the site location should be described and illustrated on a U.S. Geological Survey 7.5-minute quadrangle. This section should also include contact information for the owner of the site and the environmental contractors or consultants hired to prepare the RAP.

Documentation should be included that indicates that the applicant holds or can acquire title to all lands, or has the necessary easements and rights-of-way required for the investigation and remedial process. See the checklist in Attachment 2-1 for additional details about what to include regarding site information.

2.2.1.2 Physical Setting

This section of the IR should present information about the physical setting of the site at local as well as regional scales. Detailed descriptions of the surface features, climate, vegetation, hydrology, soils, geology, and hydrogeology of the site and the surrounding area should be included. The following discussions briefly outline the types of information that should be submitted. For a more detailed listing of information, refer to the checklist in Attachment 2-1.

Surface Features

Both natural and manmade surface features should be described. A detailed site layout map showing these features should be provided. Ideally, this map will serve as a base map for other maps throughout the rest of the report. Site grids should be based on latitude/longitude, and coordinates should be referenced to the State Plane coordinate system NAD 83. See the RAP checklist in Attachment 2-1 for more information about preparing a site layout map.

Climate and Meteorology

Climatic descriptions should include information about the average annual rainfall, temperature, wind velocity, wind direction and daily variances in these parameters. If available, figures such as wind roses and precipitation or temperature graphs should be included.

Vegetation

Descriptions of vegetative cover should address the type and density of plant cover, with an emphasis on identifying sensitive environments (e.g., wetlands, vineyards, gardens), both locally and regionally.

Topography and Hydrology

This section should provide information about surface water flow, flood frequency, drainage direction, and topography. Wetlands, floodplains, and other hydrologic features should be described and indicated on a map.

Soils and Geology

This section should include general descriptions and maps of soil units found at the site. This information can be obtained from a U.S. Department of Agriculture Soil Survey or other source.

Descriptions of regional geology should include geologic formations, lithology, unconformities, and structural features such as faults and joints. Any available geologic cross-sections and maps should be referred to in this section. Local geology should address geologic heterogeneity and complex stratigraphy. Features that might act as preferential pathways, such as coarse-grained channels or horizons, solution cavities, and/or features that may impede the downward movement of contaminants, such as paleosols or clay-rich horizons, should be emphasized.

Hydrogeology

Descriptions of regional hydrogeology should include information about the estimated depth to groundwater, estimated depth to bedrock, and groundwater flow direction and rate. Local hydrogeologic considerations should include describing the locations of springs or seeps, perched aquifers, or large-volume extraction wells nearby. Report the thickness of the primary aquifer, the orientation and general depth of the water table, and refer to any available maps for the area that show these characteristics.

2.2.1.3 Historical Operations and Site Conditions

This section should describe the results of a comprehensive review of the site's industrial or commercial history. It is important to conduct a thorough review of this information because it will be used to help focus your investigative efforts. Special emphasis should be given to potential contaminant sources throughout the site's history, as this information will be used to define the list of sampling parameters for the field investigation. This section should include detailed information regarding the following:

- A list of the previous owners and ownership dates
- Any alternative or historical facility names
- A discussion of the historical use of the site, previous business operations, and periods of operation

- Possible contaminant sources
- Information regarding historical non-hazardous wastes generated, received, disposed of, or managed at the site
- Types, quantities, management practices, and rates of hazardous wastes historically generated, received, disposed of, or managed at the site
- Historical aerial photographs
- Processing or storage locations
- A chronology and description of known or suspected environmental incidents, spills, or releases of hazardous substances or pollutants

The checklist in Attachment 2-1 contains detailed information about each of the topics listed above, including suggested sources of the information.

2.2.1.4 Current Operations and Site Conditions

This section should present the business operations and conditions under the current owner or operator. The description should emphasize possible contaminant sources currently associated with the facility. In addition to the sources listed in the checklist, interviews with the site owner, administrator, or former employees can reveal useful information. This section should include the following information:

- Discussion and illustration of site use and current business operations, including all readily available aerial photographs, topographic maps, or city directories
- Potential sources of contamination
- Types, quantities, management practices, and rates of hazardous constituents currently generated, received, disposed of, or managed at the site
- Known or suspected releases of hazardous constituents
- Location, number, type, size, age, and condition of all above and below ground product or waste storage, transfer, and/or disposal vessels/tanks and systems
- Descriptions of existing institutional controls
- List of current environmental permits
- Descriptions of interim remedial actions
- Descriptions of any ongoing investigations, remediation, or monitoring activities
- A list of search results indicating whether the site or property adjacent to the site appears on federal or state environmental databases
- Results of interviews with site owner, administrator, and/or former employees

The checklist in Attachment 2-1 contains additional information about what to submit.

2.2.1.5 Previously Reported Investigations

Previously reported investigations should be summarized, evaluated for data quality, and attached to the RAP. Examples of previous investigations may include Superfund preliminary assessments/site investigations, RCRA facility investigations, Title 118 investigations, and Phase I or II environmental site assessments. Existing information in such reports can be used to streamline the investigation by focusing the investigative efforts or eliminating some data collection efforts altogether. To determine whether previously reported data should be used in your investigation, you are encouraged to summarize these reports and thoroughly evaluate the data quality and temporal variability of data in each.

Summary of Previous Reports

Information from previously reported investigations of the site should be summarized in the narrative of this section. Data from the reports should be tabulated, and the original reports should be included in an appendix. The narrative of this section should refer to the location of these tables and reports. This summary section should include the following:

- Narrative summary of previous reports in chronological order
- Copies of any relevant correspondence from NDEE, Environmental Protection Agency (EPA), private entities (such as consulting firms), or other federal and state agencies regarding previous environmental reports
- Summary of findings, conclusions, and recommendations of previously reported investigations

Data Quality and Temporal Variability

The investigation report should include an evaluation of the quality and temporal variability of data from each of the previous reports. To minimize the labor and time spent on this task, use best professional judgment to determine the level of effort required for each type of data.

The evaluation of data quality should include a review of the Quality Assurance/Quality Control (QA/QC) standards and procedures, sample collection records, and laboratory method detection limits of the previous reports to ensure that they are adequate for the intended use of the data. The QA/QC sample results should be reviewed to determine whether any data quality problems exist. To define data quality expectations for technical defensibility, please refer to the quality assurance documents (such as EPA Requirements for Quality Assurance Project Plans [QAPP] [EPA QA/R-5]) listed in the bibliography. Field data sheets and chain-of-custody records should be reviewed to determine whether proper procedures were followed and whether the holding times for any of the sampling parameters were exceeded. It will be especially important to determine whether the laboratory method detection limits used in any of the previous reports were below the *current* maximum contaminant levels (MCLs) commonly used as groundwater cleanup standards. If the detection limits were higher than current MCLs, the previously collected data may not be appropriate to determine the lateral and vertical extent of contamination at or below the level of the MCLs. For example, if a previous report indicates that the method detection limit for trichloroethylene (TCE) was 20 micrograms per liter (µg/l) instead of 5 µg/l (the current MCL for TCE), it will not be appropriate to use this data to define the extent of a TCE plume to the level of the MCL.

You should also determine the temporal variability of the previously collected data. Temporal data is data that may change significantly over relatively short time periods, such as between separate field investigations. Examples of such data include chemical data used to define the extent of a groundwater plume and water level data from monitoring wells. An example of data that is not temporal is data from geotechnical boring logs used to define physical lithologic characteristics. If temporal data presented in previous reports is likely to be outdated, you may need to collect additional data.

Finally, this portion of the IR should include a map that depicts site features and all previous sampling locations, and a table of the sampling results from each location. Briefly discuss these maps and tables in the narrative and refer to their locations in the report.

2.2.1.6 Potential Chemicals of Concern

A list of potential chemicals of concern (COCs) should be identified based on a review of previous investigations, historical operations, and facility documents. This list will aid in identifying data gaps and selecting analytical parameters. It is important to note that the list of potential chemicals of concern should be based on all materials used on-site, not simply on a list of the wastes processed or disposed on-site.

The following narrative is an example description of potential chemicals of concern based on a hypothetical site that was previously operated as a metal salvage facility.

> *"The transformers received on-site may have contained PCBs, so PCBs were included as a potential chemical of concern. The facility had underground tanks for storage of gasoline and diesel fuel, so benzene, ethyl benzene, toluene, total xylenes, and MTBE were identified as potential chemicals of concern. The facility received demilitarized munitions, so black powder, TNT, and RDX were identified as potential chemicals of concern. The pile of lead acid batteries may have been a source of sulfuric acid, lead and other metals, so soil and groundwater were analyzed for pH, sulfate, and metals. Motor vehicle air conditioners may have been a source of CFCs, so soil and groundwater were analyzed for CFCs."*

2.2.1.7 Data Gaps

This section should summarize the significant data gaps and/or deficiencies found based on review of all existing historical data and previous investigations. Data gaps are key unknown conditions or unresolved issues that are needed to characterize the site or solve the problem being investigated. For example, if there was a coal gasification plant formerly on the property, but none of the previous field activities examined coal gasification related waste, this is a data gap. Another example of a data gap is an area or subsurface interval in which there is a lack of data points regarding contaminant concentrations. This is a data gap because without that information, you cannot fully define the horizontal and vertical extent of contamination. A third example of a data gap would be a lack of previous soil gas data for the evaluation of the vapor intrusion pathway if a volatile COC has been previously documented.

Data gaps should be summarized in bulleted lists under one or more of the following categories:

- Physical site characteristics
- Nature and extent of contamination

- Contaminant fate and transport
- Potential receptors

See the checklist in Attachment 2-1 for more information regarding data gaps.

2.2.2 Field Investigation

This section of the IR should describe how a scientific field investigation to fill data gaps and define the nature and extent of contamination at the site was planned and conducted. The following aspects of the investigation should be described in this section:

- Investigation objectives
- Data quality objectives
- Sampling and analysis procedures
- Health and safety
- Investigation-derived waste management

2.2.2.1 Investigation Objectives

This section should state the objectives of the field investigation. Investigation objectives are statements that clearly identify the major inputs needed to fill data gaps, answer key questions, and support further decisions about the investigation and cleanup of the site. Examples of investigation objectives include:

- Determine whether contamination exists at the site;
- Identify the source areas of contamination;
- Determine whether any potential human or ecological receptors are being exposed to contamination, and;
- Determine the magnitude and lateral and vertical extent of soil, groundwater, and/or soil gas contamination to the most conservative remediation goals. Specifically:
    - The extent of soil contamination should be defined to the remediation goals for the residential direct contact exposure pathway or the migration to groundwater pathway, whichever is less
    - The extent of groundwater contamination should be defined to the remediation goals for the groundwater direct contact exposure pathway or the residential groundwater vapor intrusion pathway, whichever is less
    - The extent of soil gas contamination should be defined to the remediation goals for the residential soil gas vapor intrusion pathway

For some sites, this information may already be known. For example, based on a previous Phase I environmental site assessment, it may already be known that both the soil and the groundwater are contaminated. Therefore, the investigation objectives might be more specific, such as:

- Define the extent and magnitude of soil, groundwater, and/or soil gas contamination, or;
- Determine whether nearby private drinking water supply wells are contaminated.

Briefly state the basis for each investigation objective in this section. The rationale should be based upon the compilation and analysis of background information. For example:

> *"Historical operations indicate that Building A was used to wash machine parts with industrial solvents, including PCE. Interviews with employees suggest that these solvents may have been spilled during these operations. PCE has been detected in groundwater in a down-gradient, on-site well. Based on this information, the investigation objective is to define the full nature and extent of PCE and its degradation products in the soil, soil gas, and groundwater both near and down-gradient from Building A."*

The specific details of the investigation, such as methods, design, and analysis, should be reserved for the Sampling and Analysis section (2.2.2.3) below.

2.2.2.2 Data Quality Objectives

Data Quality Objectives (DQOs) are statements that define the quality of data required to make valid, defensible conclusions about the nature and extent of contamination at the site based on the investigation objectives. DQOs may include statements about the minimum detection limits required to carry out the investigation objectives. If, for example, the investigation objective is to distinguish areas where cleanup is needed from areas where cleanup is not needed, the DQOs should specify detection limits that are lower than the concentration values given in the VCP lookup tables for that contaminant. If the investigation objective is to determine whether gross contamination exists on-site, the DQOs might specify higher detection limits that are adequate for making screening-level decisions.

By using DQOs throughout the investigation process, you are more likely to collect scientifically valid, defensible data and conserve resources by answering the right questions. The annotated bibliography contains references to material that can be used to assist you in defining DQOs.

2.2.2.3 Sampling and Analysis Procedures

This section of the report should describe and explain the design, methods, and rationale of the investigation. It should include information about field sampling as well as laboratory analyses of these samples. In addition, the QA/QC measures that were employed throughout the investigation should be described.

Field Sampling Procedures

This section should include the following information:

- *Sample Locations and Intervals*—The rationale for the selection of sampling locations and intervals should be described in this section. The rationale should be based on the review of the operational history, materials received, processed and/or disposed on-site, and the vertical and horizontal extent of the data gaps identified previously. Refer to the

page numbers of maps showing the locations of sampling points and tables listing the sampling intervals in the report. For example:

"To determine whether PCBs were present in the on-site soils, soil samples were collected from various locations. Eighteen soil samples were collected from six locations near the area where the transformers were stockpiled, and nine soil samples were collected from three locations near the transformer shear area (see Figure 5 - Sampling Locations). Soils were collected from 6"and 18" below ground surface, and from just above the water table."

- *Sample Types*—Samples for site characterization are generally collected from various media: groundwater, surface water, soil, sediment, soil gas and/or air. The media that were sampled during the investigation should be identified.

- *Sample Collection*—This section of the IR should describe the sample collection procedures, including whether grab or composite soil samples were collected, well purging method and rate, the number of samples collected, the labeling and identification system used, and the order in which they were collected. Preferred or recommended sampling methods/considerations include:

    - At sites for which the metal chromium may be considered a potential COC (such as a former metal plating facility), valance-specific (i.e., chromium III and chromium VI) media sampling should be conducted
    - At sites that have groundwater contaminated with volatile organic compounds (VOCs), samples should be collected from the upgradient well(s) first, then in order from the anticipated least contaminated to most contaminated downgradient wells
    - At sites that have groundwater contaminated with various types of chemicals, the order of sampling should be:
        1. VOCs
        2. Semi-volatile organics (SVOCs)
        3. Metals
    - Groundwater and soil gas should be sampled using low-flow rate sampling methods when using an acceptable pumping method (i.e., one that does not put a vacuum on the sample); groundwater samples specifically should be collected using a pumping rate not exceeding 100 milliliters per minute
    - Groundwater sampling utilizing no-purge sampling procedures (e.g., use of passive diffusion bags [PDBs] or HydroSleeves™) may be considered under appropriate conditions (e.g., COCs compatible with the use of PDBs)
    - Soil gas and indoor air sampling results are subject to greater temporal variability than soil or groundwater sampling results such that multiple sampling events are recommended to better evaluate potential vapor intrusion impacts
    - Soil gas collection/monitoring points should be carefully sealed to assure that samples are representative of actual subsurface conditions and not introducing ambient or indoor air into the sample

- *Field Screening Methods*— Describe all field screening methods employed during the investigation.

- *Sampling Equipment*—The equipment used during the investigation should be identified and described.

- *Analytical Parameters*—This section of the IR should describe the rationale used to select analytical parameters. The rationale should be based on the list of potential chemicals of concern described above, and the chemical and physical properties of each. All analytical parameters should be listed in the IR.

- *Analytical Methods*—The laboratory analytical methods should be appropriate to achieve the data quality objectives. For any one contaminant, there are usually several different laboratory analytical methods capable of measuring contaminant concentrations. However, some laboratory analytical methods are capable of detecting lower contaminant concentrations than other methods. The sensitivity of an analytical method is referred to as the practical quantitation limit (PQL). If the goal is to characterize a groundwater plume to the MCL, the laboratory analytical method should have a PQL that is less than the MCL. Similarly, if the goal is to demonstrate that you have identified all soils where the metals concentrations exceed the cleanup levels, the laboratory analytical method should have a PQL that is less than or equal to the levels given in the VCP lookup tables. Prepare a table, organized by media and contaminant, showing the EPA analytical method used for each parameter. For groups of parameters that have a common laboratory analytical method, such as VOCs, it is not necessary to list each analytical parameter individually. The table may specify that VOCs in groundwater were analyzed using method 8260b. See the checklist in Attachment 2-1 for a complete list of information to include regarding analytical methods.

- *Well purging data*—When groundwater samples are collected, well purging data should be reported in tables at the end of the RAP. This information includes purging dates, techniques, rates, volumes removed, and stabilization parameters, such as pH, temperature, conductivity, redox potential, turbidity, or dissolved oxygen, as recorded over time. Information regarding the detection of immiscible layers should also be included.

Quality Assurance/Quality Control

In general, the information provided in this section should explain why the data collected and analyzed is of the appropriate type, quantity, and quality for making suitable decisions about what, where, and how to clean up the site.

Careful sampling design and methodology is essential for performing a good-quality investigation. Ideally, variability among samples will be indicative of variable levels of the contaminant(s) in the environment. Such variability can be used to understand the actual nature and extent of contaminant concentrations at the site. However, other natural factors and/or human procedural errors can produce variability among samples. Such variability yields false results about the contamination at the site.

Variability between media properties (i.e. groundwater and surface water) and/or temporal variability in weather can result in natural variations in sample results. By selecting sampling location, time, and medium carefully, errors due to these variations can be minimized.

Erroneous results are also caused by sampling errors such as incorrect sampling procedures, cross-contamination, and improper sample preservation. Sampling errors may result in false negative results (a substance is not detected, but is present at the site) or false positive results (substance is detected, but is not present at the site). Because contaminant concentrations in air, soil gas, soil, and water can potentially be diluted by environmental influences, proper sampling procedures are particularly important. Even minimal sample contamination or loss could significantly affect analytical results. By choosing the

correct type of sample for site-specific conditions and contamination, you increase the likelihood of receiving accurate results.

To minimize the chance for variability due to procedural errors and poor design, a Quality Assurance Project Plan (QAPP) should be prepared and used. The QAPP should state how data collection activities will be implemented and how the results will be assessed. A QAPP defines the specific QA/QC procedures that will be applied. Defining and following the QAPP in detail can reduce erroneous results. A copy of the QAPP should be included in the Appendices to the IR. Please refer to the quality assurance documents (such as EPA QA/R-5) listed in the bibliography to define data quality expectations for technical defensibility.

Please note – Although you will generally not provide a QAPP for NDEE review prior to conducting fieldwork, if you are a recipient of Brownfields funding you must submit a QAPP for NDEE's review and approval before fieldwork begins.

Current EPA requirements for QAPPs identify four major areas that must be addressed:

- *Project management*. This section of the QAPP describes the project history, objectives, and roles and responsibilities of the investigation team. It ensures that the project goals and approach are clearly understood and that project planning is documented.

- *Measurement and data acquisition.* This section of the QAPP describes the measurement system design and implementation and the document sampling, analysis, data handling, and QC methods that will be used.

- *Assessment and oversight*. This section identifies activities for assessing the effectiveness of project implementation and associated QA/QC efforts. Assessment and oversight activities ensure that the QAPP is implemented as described.

- *Data validation and usability*. This section describes the QA/QC activities that occur after data collection. Such activities ensure that the data collected conforms to stated acceptance criteria and achieves the DQOs.

One QAPP may be developed for the entire process – from the investigation through the completion and confirmation of remedial action. Alternatively, the QAPP for the investigation may be modified for the planned remedial action if the results of the investigation indicate that this is necessary. Please refer to the bibliography (Appendix C) for more information about developing a QAPP.

The following QA/QC samples and procedures should be described in the QAPP:

- *Trip blanks*. Trip blanks are used to assess the potential for sample contamination during handling, shipment, and storage. Trip blanks are sample bottles filled with an uncontaminated medium that are sealed and transported to the field. There should be one trip blank per sample container. They are kept with empty sample bottles, and then with the investigative samples throughout the field effort. When sampling is completed, they are returned to the laboratory for analysis with the investigative samples.

- *Field blanks.* Field blanks are samples of an uncontaminated medium that are exposed to the sampling environment at the same time that investigative samples are collected. They are used to assess contamination resulting from ambient conditions. One field blank should be collected for every 20 (or fewer) investigative samples.

- *Equipment rinsate blanks*. Some equipment, such as portable pumps, soil samplers, and groundwater samplers, can introduce cross-contamination if not operated properly. Equipment rinsate blanks are collected to assess the cleanliness of the sampling equipment and the effectiveness of equipment decontamination. Equipment rinsate blanks are collected by pouring analyte-free water over the decontaminated surfaces of sampling equipment that contact sample media. Equipment rinsate blanks should be collected for each type of decontaminated sampling equipment.

- *Field split samples*. Field split samples are usually a set of two or more samples collected from a larger homogenized sample. Field split samples can be sent to two or more laboratories and are used to provide comparison data between laboratories.

- *Field duplicate samples*. Field duplicate samples are independent samples collected as close as possible in space and time to the original investigative sample, using the same collection methods. Field duplicates are sent to the same laboratory and are used to provide data on precision of the field procedures and the laboratory. Field duplicates also can provide information on the heterogeneity of the sample matrix. One field duplicate sample should be collected sequentially for every 20 (or fewer) investigative samples.

2.2.2.4 Health and Safety

All investigative field activities should be carried out according to a site-specific Health and Safety Plan (HSP), consistent with the requirements of the Occupational Health and Safety Administration (OSHA). The HSP will not be reviewed by NDEE and does not need to be attached to the RAP. However, a written statement indicating that a HSP was prepared and followed in accordance with 40 Code of Federal Regulations (CFR) 1910.120 should be provided.

2.2.2.5 Investigation-Derived Waste

Investigation-derived waste (IDW) includes soil cuttings, drilling mud, well development water, purged groundwater, decontamination fluids, disposable sampling equipment, and disposable personal protective equipment. Minimizing IDW helps to leave the site in the same condition or no worse than prior to the investigation and reduces wastes that pose an immediate threat to human health or the environment. This section of the IR should describe how IDW was managed during the investigation. In addition, this section should explain the procedures that were used to ensure compliance with all relevant federal and state regulations. NDEE has a guidance document that should be used to help you manage IDW (see Attachment 2-3).

2.2.3 Physical Site Characterization

This section of your IR will describe the occurrence and character of each of the significant physical features of the site: Surface Water, Soils, Geology, and Hydrogeology. This section should consist of a written summary of the physical site characteristics as determined by the field investigation. The summary should focus on significant findings that characterize the site **beyond what was known from the physical setting information and previously reported investigations,** as detailed in Sections 2.2.1.2 and 2.2.1.5, respectively, of this guidance. The details of the physical site characterization should be presented in tables and figures in the last part of the RAP (see example Tables and Figures in Appendix B). The narrative should discuss these results and refer to their location in the document. Categories of physical features are discussed below. Please refer to the checklist (Attachment 2-1) for a more detailed list of information that should be provided for each feature.

2.2.3.1 Surface Water

Surface water data may be collected from aerial surveys, ground mapping, surficial sampling, and measurements of water levels. The narrative of this section should contain information related to the physical aspects of surface water bodies (e.g., lakes, rivers, impoundments) and related features (e.g., gullies, sedimentation). Flow rates, channel dimensions and elevations, river stage, historical flooding characteristics, and surface water/groundwater relationships should be summarized. The specific details of these features should be provided in maps, diagrams, and tables at the end of the RAP. Refer to these details in the narrative of this section, and indicate the nature of the information shown, important findings, and the location of the relevant figure or table. Provide topographic map information that shows the relationship of the property to surface water bodies, elevation above flood stage, etc.

2.2.3.2 Soils and Geology

Soil and geologic data can be obtained from surficial soil sampling, soil borings, monitoring well borings, direct-push sampling, or geotechnical laboratory analysis. This section should summarize the findings of these sampling efforts. This summary should refer to information from the tables, figures, and appendices, and their locations in the report. The following figures should be included in the report:

- *Sampling location maps* should be prepared to show the locations of soil borings or direct-push sampling locations. If multiple media are investigated, it may be appropriate to prepare more than one sampling location map.

- *Geologic cross-sections* should be prepared to illustrate the vertical and horizontal geometry and lithology of geologic strata underlying the site. At least two cross sections oriented at right angles to each other should be prepared. If possible, one should be oriented parallel and the other perpendicular to the direction of groundwater flow. If oriented features such as paleochannels, fractures, stratigraphic terminations, or man-made structures exist in the subsurface, include additional cross sections oriented parallel and perpendicular to these features.

2.2.3.3 Hydrogeology

Hydrogeologic data may be derived from samples collected from monitoring wells or direct-push sampling points. This section should summarize these findings and refer to specific data in the tables, figures, and appendices. The following figures and tables should be included in the report:

- Sampling location maps should be prepared to show the locations of monitoring wells, piezometers, direct-push probe locations, or other investigation points used to characterize hydrogeology.

- Potentiometric surface and water table maps should be provided to illustrate the observed water levels at the site. If significant changes in the potentiometric surface or water table are observed over time, several maps should be provided to illustrate these variations. Control points, such as piezometers or monitoring wells, and water-level elevations at these points, should be shown and clearly labeled on the map(s). All elevations should be given in relation to mean sea level.

- Aquifer characteristics, such as hydraulic conductivity and transmissivity, should be summarized in the narrative and listed in tables at the end of the RAP.

- Well completion information should be reported in the tables and appendices. This information includes dates of completion, the Nebraska Department of Natural Resources well registration numbers and any other well identification system(s) used, well elevation data, screen lengths and intervals, and construction material specifications.

2.2.4 Nature and Extent of Contamination

This section of the IR should describe the full nature and extent of contamination in each of the environmental media (air, surface water and sediments, soils and vadose zone, soil gas, and groundwater) at the site. It is important to describe the horizontal *and* vertical extent of contaminants in all media, both at the site and migrating from the site. The lateral and vertical extent of contamination should be defined to the most conservative remediation goals, as specified below, using the Remediation Goals Lookup Tables found in Attachment 2-6. Specifically:

- The extent of soil contamination should be defined to the remediation goals for the residential direct contact exposure pathway or the migration to groundwater pathway, whichever is less

- The extent of groundwater contamination should be defined to the remediation goals for the groundwater direct contact exposure pathway or the residential groundwater vapor intrusion exposure pathway, whichever is less

- The extent of soil gas contamination should be defined to the remediation goals for the residential soil gas vapor intrusion exposure pathway

In assessing the nature and extent of soil gas contamination, exterior soil gas samples should be collected around a potentially impacted building. It is also advisable to consider multiple soil gas sampling events to evaluate temporal soil gas concentration variances due to potential season effects of building heating/cooling systems on soil gas migration. In some cases (e.g., addressing an industrial building of large areal extent or other site-specific complications), sub-slab sampling for soil gas contamination may be warranted.

You should also describe how the contamination relates to specific source areas identified during the investigation.

In order to make sound conclusions about the nature and extent of contamination, you should evaluate all valid data from the study as well as previous investigations, interpret the results, and describe the contamination based on scientific reasoning. You should explain your reasons for refuting or accepting certain hypotheses. For example, if a low-permeability layer separating upper and lower aquifers is observed beneath the site, you might hypothesize that the layer impedes the downward flow of contaminants. To support this hypothesis, you should provide data to show that the lower aquifer is not contaminated. If you don't have any data from the lower aquifer, you can't make valid conclusions about the ability of the low-permeability layer to impede contaminant migration.

You should summarize and interpret screening and analytical data for each of the media listed below. Field screening and laboratory analytical results should be tabulated and included at the end of the RAP. Refer to these tables in the discussion and indicate the page numbers where the tables can be found. For these tables, high values (i.e. values that exceed a remediation goal) should be formatted with a bold font

or otherwise emphasized. In addition, refer to tables containing the QA/QC sample results for each media.

A general discussion of the information that should be provided for each media is provided below. Please refer to the checklist in Attachment 2-1 for a more detailed list of information that should be considered.

2.2.4.1 Sources

The discussion of sources should identify known and suspected on-site sources, potential sources of any contamination that is migrating from off-site, and any contamination "hot spots" identified on-site. Refer to maps showing the locations of tanks, lagoons, pits, contaminated soil, "hot spots," or other sources.

Suspected source areas should be identified based on historical, background, and regulatory research, then investigated during the field activities. If contamination is confirmed, suspected source areas become known source areas. In some cases, areas of contamination are discovered during field sampling even though there is no reason to suspect contamination based on the background information. Discovery of such areas may warrant additional review of background information and/or field sampling to investigate whether the area is isolated or related to other suspected or known source areas.

There may also be contamination that is migrating from a suspected off-site source. If such sources are suspected, a reasonable attempt should be made to identify the locations of these sources based on visual observation or a review of documents such as aerial photographs and Sanborn fire insurance maps. Provide *Source Location Maps* that show the locations of known and suspected on-site source areas and potential off-site sources. These maps should indicate areas of relatively high contaminant concentrations, or "hot spots." The presence of a hot spot may indicate a former operation area, waste disposal location, or other activity that contributed to contamination. Refer to these maps in the narrative of the report.

The following example is based on a hypothetical site where three groundwater plumes were discovered. Each plume is attributable to a different source area: an on-site source discovered during historical records review and confirmed during sampling, an area of contamination discovered during field sampling that is not attributable to any known current or historical site activity, and a suspected off-site source.

> *"During the course of the investigation at the site, three groundwater contaminant plumes were identified. The first groundwater plume consists of chlorinated volatile organic compounds, TCE, 1,1,1-TCA and 1,1-DCE. This plume is located on-site under the former drum storage area (figure 5-7) and is attributable to spills of the chemicals stored in the drums."*
>
> *"The second groundwater plume is located near the north side of the site (figure 5-8) and consists of relatively low concentrations (less than 5 ppb) of several pesticides, atrazine, cyanizine, and metolachlor. A search of the available records for this site did not provide any indication of the source of these chemicals. City directories dating back to 1935, Sanborn maps dating back to 1910 and aerial photographs dating back to 1954, do not provide any indication the site was ever used as a pesticide formulation plant or distributor."*
>
> *"The third plume is located at the up-gradient (west) edge of the site (figure 5-9) and consists of benzene, ethyl benzene, toluene, and xylenes. This plume appears to be attributable to an off-site source: the gasoline station located immediately west, across*

the street from the site."

2.2.4.2 Ambient Air

Most sites in the VCP will not have an ongoing source of ambient air contaminants. In some cases, however, contaminated surface soils can release vapors and particulates into ambient air. To address such situations, ambient air inhalation of contaminant vapors and particulates are factored into the VCP lookup tables. However, if it is determined that an on-going source of ambient air contamination (such as an off-gassing lagoon) does exist, you should notify NDEE to discuss potential air sampling requirements, including sample location, number, and method. Such sites will be dealt with on a case-by-case basis. If air sampling is performed, report the sample results.

2.2.4.3 Surface Water and Sediments

Surface water and sediment sample results should be reported. This includes field screening results, target compounds, and concentrations of compounds detected. Discuss these results in the narrative and refer to specific data in tables or figures included in the report.

2.2.4.4 Soils and Vadose Zone

Discuss the nature and extent of contamination in soils and the vadose zone. Refer to cross sections and maps that illustrate the spatial distribution of these contaminants, and include tables that contain field screening results, target compounds, and concentrations of compounds detected in soils and soil gas. In some cases, it may be useful to include data tables as "call out" boxes included on sampling location or similar maps.

2.2.4.5 Soil Gas (Vapor Intrusion)

Discuss the nature and extent of contamination in the form of soil gas. Refer to cross sections and maps that illustrate the spatial distribution of contaminants in soil gas and potential impact to any on- or off-site structures. This section of the IR would also be an appropriate place to discuss the results of any indoor air sampling, if performed.

2.2.4.6 Groundwater

In this section, you should discuss the nature and extent of groundwater contamination at the site. You should draw general conclusions from the results of the investigation and refer to figures and tables containing data to support these conclusions. For example:

> *"The VOC plume extends off-site for a distance of 3,000 feet (Figure 4-1). TCE concentrations vary from 5,000 µg/l near the source area on-site, to 5 µg/l at the distal end of the plume off-site (Figure 4-1, Table 4-1). The VOC plume occurs at a depth interval from 15 feet to 25 feet below ground surface on-site, to a depth of 35 feet to 50 feet below ground surface at the distal end of the plume off-site (Figure 4-2)."*

The report should include tables containing field-screening results, target compounds, and concentrations of compounds detected. It should also include cross sections and maps to illustrate the spatial distribution of contaminants in the groundwater. The following figures should be included:

- *Isoconcentration maps* should be provided to illustrate the general horizontal extent of groundwater contamination. Concentration contours and control points should be clearly

labeled and superimposed on the site layout map. It may be necessary to prepare several isoconcentration maps showing different areas of contamination or different suites of contaminants

- *Isoconcentration cross-sections* should be provided to show the vertical extent of groundwater contamination in relation to the site geology. Concentration contours, sample points, and screened intervals should be superimposed on geologic cross-sections. If source areas can be determined, they should be shown on the cross sections as well

In some cases, in may be useful or advantageous to include sampling results tables as "call out" boxes included on sampling location or similar maps.

- *Free product isopach maps and cross sections* should be included to show the extent and thickness, if any, of free product

2.2.5 Contaminant Fate and Transport

The two main aspects that determine contaminant fate and transport are contaminant characteristics and site characteristics. In the report, these two aspects should be discussed together under one or more headings titled according to the contaminant(s) of concern. The IR should provide a detailed analysis of the contaminant characteristics, occurrence, migration and exposure pathways that have been determined to be significant for the site. The analysis will include a discussion of the chemical and physical characteristics for each type of contaminant, the site-specific characteristics that will affect migration, such as organic carbon content of the soil, and the hazard posed by the migration or accumulation of the contaminant. For example:

> *"After the excavation of the underground storage tank, benzene was detected in the soil at a concentration of 10,000 ppm and in the soil gas at 5000 ppm. Although benzene has a strong tendency to adsorb to carbon, there is relatively little carbon in the soil at this site. Therefore, attenuation through adsorption is not expected to be a significant factor. Benzene is a toxic and combustible volatile organic compound, and is likely to migrate as soil gas to any nearby below grade structures and pose a threat of vapor intrusion into such structures. The potential for lateral migration of soil gas will be enhanced at this site by the presence of the parking lot, which will act as a cap to prevent upward migration of the soil gas to the open atmosphere. Therefore, there is a significant chance that benzene will migrate toward, and possibly accumulate in, the box culvert and elevator shaft on-site."*

Chemicals with similar properties may be grouped to facilitate a concise description. For example, the description provided above could have stated:

> *"Benzene, ethyl benzene, toluene, and xylenes were detected in the soil and soil gas on-site. These chemicals are all combustible, volatile organic compounds and are likely to migrate via the vapor intrusion pathway."*

You will use this analysis, along with information about potential receptors (Section 2.2.6), to develop a conceptual site model (Section 2.2.7) and select an appropriate remedial action (Section 2.3).

2.2.5.1 Contaminant Characteristics

This section of the IR should provide a description of the contaminant characteristics that affect fate and transport. The following information should be provided.

Chemical and Physical Properties of Contaminants

This section should provide a table containing names of detected contaminants and the most relevant chemical and physical properties of each. Focus on the properties of each contaminant that are most likely to affect fate and transport, such as density, solubility, octanol/water partition coefficient, vapor pressure, volatility, and other relevant properties.

Contaminant Persistence

Describe the persistence of each contaminant that occurs in each of the major media: air, surface water and sediments, soils and vadose zone sediments, and groundwater. For example, some VOCs are easily degraded by ultraviolet light in the atmosphere. Some of the constituents of gasoline degrade relatively quickly in the groundwater under oxidizing conditions, while the primary constituents of chlorinated solvents degrade much more slowly.

Transport and Partitioning

Provide a narrative that discusses the chemical and physical properties that affect how each contaminant is transported as well as the properties that facilitate or retard transport. Examples of properties that affect transport include solubility, density, and volatility. Properties that effect partitioning include the octanol/water partition coefficient, the octanol/carbon partition coefficient and Henry's Law constant.

Transformation and Degradation

Describe the likelihood that the contaminants will be transformed or degraded into other compounds. This discussion should place special emphasis on transformation or degradation compounds that are more toxic than the parent compound (e.g., vinyl chloride derived from the degradation of trichloroethylene). Describe the significance of each of the contaminant properties, and refer to tables containing data and contaminant characteristics to support this description.

The following is an example of language that might be used to describe the contaminant characteristics of a specific COC:

> *"Benzene is a volatile compound that will partition into the gas phase when encountered as a free-phase liquid or residual product trapped in soil. Benzene is fairly soluble in water compared to other hydrocarbons, binds easily with carbon, including any organic carbon in the soil, and degrades readily under aerobic conditions. See Table 7.4 for a summary of these properties*."

It is important that this description is thorough and complete because it will be used later in the report to support evaluation of the contaminant migration, and ultimately, to support selection of the appropriate remedy(s).

For sample language and a source for some of the information requested in this portion of the guidance refer to the following web site: www.atsdr.cdc.gov/toxprofiles/index.asp. This web site provides toxicological profiles for many of the contaminants commonly found in the environment. Each

toxicological profile includes a table of chemical and physical properties as well as other information about the fate and transport of these contaminants. Although the information on this website is relatively comprehensive, other sources of information are also available and should be consulted as appropriate.

2.2.5.2 Site Characteristics

This section of the IR should provide a description of the site characteristics that affect contaminant fate and transport. Specifically, the IR should describe: the properties of the environmental media, migration pathways, presence of preferential flow paths, and exposure pathways.

Environmental Media

For the purposes of this guidance document, there are five environmental media: ambient air, surface water (and associated sediments), soil and vadose zone sediments, soil gas, and groundwater. For each of these environmental media there are different characteristics and migration pathways that can affect the fate and transport of contaminants.

The first part of this section should describe the media characteristics that might influence the fate and transport of contaminants at the surface, through the soil and soil gas, and in the groundwater. Such factors may include total organic carbon content, porosity, permeability, volumetric water content, pH, alkalinity, cation exchange capacity, hardness, alkalinity, and any observed heterogeneity associated with these properties. You should present an evaluation of the likely affect that the existing aqueous geochemical conditions will have on contaminant persistence, transport/partitioning, and transformation/degradation. For example, you might describe whether the aqueous geochemical conditions are conducive to reductive dechlorination of chlorinated solvents. If so, you would also describe the likelihood that vinyl chloride will be produced as an end product and include this as an analytical parameter for future monitoring.

Migration Pathways

This section of the IR should describe the migration pathways that exist at the site. Each environmental media can have one or more migration pathways. For example, air can migrate through the open atmosphere or through the soil as soil gas. Water can migrate via the surface water pathway or groundwater pathway. Contaminated soil can migrate as windblown dust or in surface water as sediment. Because of the interrelated nature of environmental media, contamination can be passed from one media to another media via these migration pathways. Therefore, it is important to identify and describe migration pathways that are specific to the site as well as the media involved in each.

Each migration pathway (and associated exposure pathways) will have somewhat different characteristics that may affect exposure assessment. These differences should be noted in the IR. For example, at a site with significant soil contamination, contaminant concentrations in the open air tend to be much lower than contaminant concentrations in the soil gas. In addition, soil gas contaminants tend to migrate much more slowly than contaminants in the open air. The slower migration and higher concentrations result in a greater likelihood that soil gas will pose a threat to human health. Similarly, water flows more quickly in a stream than in the groundwater. The higher flow rate and exposure to the open atmosphere in the stream results in greater dilution and loss of contaminant mass due to volatilization. Therefore, the water in the stream is not as likely to pose a significant threat to human health.

Preferential Flow Paths

One significant aspect of contaminant migration is the existence of preferential flow paths. This section of the IR should include a description of typical anthropogenic and natural preferential flow paths. Examples of anthropogenic pathways include: sewers, utility trenches, wells, basements, tunnels, and elevator shafts. It is important to note that most utilities are constructed in a trench that is backfilled with pea gravel to support the pipe or conduit. The pea gravel backfill can act as a preferential flow path for both water and soil gas. Contamination can migrate long distances along these flow paths even if monitoring of the sewer pipe or conduit indicates there isn't any contamination in the pipe. Examples of natural preferential pathways include sand lenses, paleo-channels, and fractures in bedrock.

This section of your IR should also provide a brief description of the rationale for omitting any pathways from further evaluation consideration. For example:

> *"Migration of soil vapor through utility trenches was not evaluated because all utilities have been routed around the area of soil contamination."*

Exposure Pathways

Each migration pathway can affect human health via one or more exposure pathways. For example, people can be exposed to the contaminants in groundwater by ingestion of the water or by inhalation of the contaminant vapors released during bathing or showering. People can be exposed to contaminated soil via ingestion or dermal contact with contaminated soil or inhalation of wind-blown dust, such as may occur during construction activities. People can be exposed to contaminated air in the form of vapors in the open atmosphere or through exposure to contaminated soil gas migrating into buildings through the basements.

This section should identify and describe potential exposure pathways that exist at the site. Exposure pathways can be grouped into the following categories:

- Ingestion of soil
- Inhalation of volatiles and particulates from soils
- Dermal contact with soils
- Ingestion of water
- Inhalation of volatiles from water during showering/bathing
- Inhalation of volatiles from vapor intrusion into indoor air

2.2.6 Potential Receptors

This section of the IR should identify both human and ecological receptors. Identify and quantify any human populations, sensitive environments, and natural resources (such as groundwater supplies or agricultural land) that may be affected by potential or actual contamination at the site.

2.2.6.1 Human Receptors

In this section of the IR, you should identify the human receptors that may be exposed via one of the exposure pathways identified and evaluated, as discussed in section 2.2.5.2. You should document the following information:

- Nearby population centers, including general demographic descriptions
- Nearby sensitive populations, such as child care centers, schools, hospitals, or nursing homes
- A land use survey of the area within 500 feet of the site
- A well survey of nearby wells that includes locations of drinking water (private, community, or municipal), irrigation, livestock supply, and industrial supply wells within 1 mile of the site. (This well survey should be all-inclusive and the applicant should not rely solely on a search of the Nebraska Department of Natural Resources [DNR] registered well database, as not all water wells will be registered. It may be necessary to talk with local utility officials, review aerial photographs or conduct door-to-door surveys.)
- If groundwater contamination is present on-site and drinking water supply wells exist within one mile of the site, several of the nearest down-gradient wells should be sampled to determine whether the wells are contaminated. The results of this sampling should then be presented in the IR.

Refer to the checklist in Attachment 2-1 for additional information.

2.2.6.2 Ecological Receptors

You should document the following information regarding ecological receptors:

- Nearby sensitive environments, such as wetlands or state or federally designated threatened or endangered wildlife habitats
- Area natural resources, such as groundwater supplies or agricultural land
- A surface water survey that shows the location of the closest water body, the most susceptible water body, nearby drinking water intakes, and water bodies downgradient from the site
- Answers to the questions listed in Section 2.3 of the *Protocol for VCP Remediation Goals Lookup Tables* (Appendix A).

NDEE will review this information to determine whether or not ecological receptors are likely to be exposed to contamination at the site. If so, a site-specific ecological risk assessment may need to be conducted. See the checklist in Attachment 2-1 of this guidance document and Section 2.3 of the *Protocol for VCP Remediation Goals Lookup Tables* for more information regarding this topic.

2.2.7 Conceptual Site Model

The IR should include a Conceptual Site Model. The conceptual site model will integrate all investigation results collected into a coherent representation of current site conditions. The model may be presented as a figure with explanatory text. It should provide a summary of how and where contaminants are expected to migrate and the affect that migration is expected to have on human health and the environment. Example Conceptual Site Models are included as Attachment 2-4.

In addition to describing current site conditions, the conceptual site model should illustrate intended land use at the site. This includes information about buildings and below-grade structures (i.e. basements, utility trenches, tunnels, elevator shafts, and tanks), landscaping features and decorative ponds, and any potentially sensitive environments.

It is important that all potential contaminant exposure pathways are evaluated and represented in the conceptual site model. These pathways are listed under *Exposure Pathways* in Section 2.2.5.2.

Finally, the conceptual site model should demonstrate why contamination is a problem and remedial action is necessary in light of proposed land use.

The following is a hypothetical example of part of the explanatory text that might go along with a conceptual site model:

> *"The plume of VOC contaminated groundwater that is migrating from the drum storage area has contaminated five private drinking water wells down gradient from the site at concentrations that exceed the MCLs for TCE and 1,1-DCE. The well owners were contacted in July 2003 and all have been connected to the municipal water supply. There are several homes located over the plume. During the investigation, the ACME XYZ Company evaluated the possibility for vapor migration from the site, and the possibility that VOCs would partition from the groundwater into the soil gas, and subsequently migrate into the homes. The soil gas investigation didn't reveal any evidence to suggest that VOCs are migrating via the soil gas beyond the property boundary. The concentration of TCE and 1,1-DCE in the shallow groundwater (5-25 feet below ground surface) is below the method detection limit of 1 ppb. Therefore, it does not appear that VOCs are migrating upward through the shallow groundwater into the soil gas."*

2.2.8 Summary and Conclusions

This part of the IR should summarize your findings and conclusions based on the results of the investigation. All of the conclusions should be supported by data, consistent with the conceptual site model, and valid in all other aspects so that they can be used to plan and implement remedial actions. Since this is the last section before the Remedial Action Work Plan, the narrative should be written such that the reader is left with a good understanding of the site, the nature and extent of contamination, and the potential impacts to human health and the environment. This section should be no longer than 2-3 pages, depending on the number and complexity of issues at the site.

2.3 REMEDIAL ACTION WORK PLAN

The next element of the RAP is the Remedial Action Work Plan (RAWP). The following categories of information should be described in the RAWP:

- Interim remedial actions

- Remedial action objectives
- Proposed remedial action
- Performance monitoring
- Remediation waste management plan
- Permitting and regulatory involvement
- Proposed schedule of remedial actions

The RAWP should address each of these categories as described in Sections 2.3.1 through 2.3.7, in the order given in this guidance. The level of detail will depend on site-specific conditions. It is important that you include sufficient and appropriate information to support the proposed remedial action.

2.3.1 Interim Remedial Actions

Interim remedial actions are used to control, minimize, or eliminate contamination that poses an actual or potential threat to human health or the environment. Typically, interim actions are taken in advance of the final remedial action. In some circumstances, an interim remedial action may become the final remedial action. In other cases, an interim remedial action may not be consistent with the approach chosen to meet the final remedial action.

The RAWP should provide a complete description of any interim remedial actions for the site. This description should include information about the location, duration, and method of any interim remedial actions, as well as a justification for their uses. You should evaluate the interim remedial action to determine if it is compatible with the final remedial action or whether the interim action can be the final remedial action. The results of this evaluation should be included in this section. In the event that the interim measure is not consistent with the final remedial action, the RAWP should describe the process by which the interim measure will be decommissioned or incorporated into the final remedy.

2.3.2 Remedial Action Objectives

A primary focus of the Nebraska VCP is to provide an applicant with options in determining remedial action objectives and remediation goals that are appropriate for their site. Towards that end, the NDEE has developed a protocol that utilizes a three-tiered approach to establish or select specific remediation goals for a site. This tiered approach is presented in the *Protocol for VCP Remediation Goals Lookup Tables*, Section 3.0 (Appendix A). The NDEE recommends that applicants familiarize themselves with this protocol prior to determining the RAOs.

In this section of the RAWP you should define RAOs. RAOs are statements that define qualitative goals and quantitative levels of cleanup that you intend to achieve for each of the contaminants identified at the site. Your selection of RAOs will be based on the intended land use for the site and groundwater use in the area of the site. The RAOs should be specific for the following:

- Chemicals of concern
- Exposure pathways

- Potential receptors that will be addressed.
- Cleanup levels as determined by the remediation goals lookup tables (Attachment 2-6)
- Location(s) or point of compliance at which the cleanup levels will be achieved
- Timeframe for which remedial actions will be completed

This section should also summarize the rationale for deciding which contaminants will be remediated and the level to which they will be reduced.

Provided below are examples of RAOs based on a site with PAH contamination:

> *"Remove and dispose of PAH contaminated soils from the affected residences that are above the residential remediation goals (RGs) provided below."*
>
> *"Prevent ingestion, dermal, and/or inhalation exposures by current or potential future domestic water supply well users to PAH contaminants in groundwater at concentrations greater than the maximum contaminant levels (MCLs) or RGs."*
>
> *"Restore the aquifer to the MCLs or RGs within a reasonable time frame and prevent further degradation and contaminant migration in groundwater."*

2.3.2.1 Land Use

Land use is to be based on future use considerations, especially if the property is to be redeveloped. If the intended land use is residential, the RAOs will be more stringent than if the intended land use is industrial. NDEE recognizes that future land use may be consistent with present or historical land use.

2.3.2.2 Groundwater Use

Where protection of groundwater is determined to be a RAO, attention should be paid to the requirements of Title 118 – *Ground Water Quality Standards and Use Classification*, Appendix A - Ground Water Remedial Action Protocol. Under Title 118, protection and cleanup of groundwater directly relates to the site-specific Remedial Action Class (RAC) established by NDEE for a pollution event. A RAC is essentially a pollution ranking designation defined for categories of groundwater (and overlying soils) in Nebraska, with the specific RAC determined for a specific site dependent on the current or potential use of groundwater as drinking water. The extent of remedial action required for groundwater will differ depending, in part, on the RAC of the contaminated or threatened groundwater. It should be noted that the RAC designation is determined from the condition of the groundwater prior to the occurrence of pollution. There are three RAC categories, each discussed in more detail below.

RAC-1

This category includes sites where groundwater is currently being used or has been proposed to be used for a public drinking water source, a portion of groundwater currently used as a private drinking water source, and groundwater within a designated Wellhead Protection Area (WHPA). RAC-1 will also be assigned anytime a public or private drinking water supply well has been polluted. RAC-1 sites receive the most extensive remedial action measures, including cleanup of readily removable contaminants (i.e., free product) and cleanup of dissolved phase contaminants to MCLs. If additional cleanup is not

required, the remaining contaminated groundwater will be managed and monitored to prevent further damage.

RAC-2

This category includes sites where groundwater has the potential to be used as a public or private drinking water source. Potential use exists if the groundwater is located in a highly populated area, is part of a regional, high-yielding aquifer, or is otherwise justified (e.g., the regional aquifer is low-yield but serves as the sole source of water). A RAC-2 designation would encompass the largest portion of groundwater in Nebraska. Remedial actions measures would include cleanup of readily removable contaminants (i.e., free product) and potential cleanup of dissolved phase contaminants to MCLs. If cleanup is not required, the remaining contaminated groundwater will be managed and monitored to prevent further damage.

RAC-3

This category includes sites where groundwater has little or no potential to be used as a public or private drinking water supply. Justification for assigning occurrences to RAC-3 is based on a combination of factors, including:

- Water is of such poor natural quality that it is unfit for human consumption
- Insufficient yield may limit or exclude groundwater being used for drinking water
- Historical contamination that occurred prior to the pollution event(s) currently being investigated that may have rendered groundwater unsuitable for drinking and uneconomical to treat
- Past and present intensive land use where groundwater is likely to be contaminated or will not be used as drinking water (e.g., areas of concentrated industrial development or densely populated areas)

Remedial action measures would generally be the least extensive for RAC-3 sites and would include cleanup of readily removable contaminants (i.e., free product). Monitoring may also be required.

A more extensive discussion and explanation of the RAC system may be found in Title 118, Appendix A, Step 8, pages A-4 – A-6. The applicant should be aware that drinking water criteria is not the only reason to perform additional cleanup of groundwater contamination and that other beneficial uses could necessitate such cleanup.

As stated previously, under Title 118 the RAC designation for a site is established by NDEE. Knowledge of the probable RAC will be necessary for an applicant to determine appropriate remediation goals and evaluate potential cleanup technologies where groundwater contamination is a concern. However, such a determination by NDEE under the VCP could likely hinder the intent of the VCP, namely to move sites along in as timely and efficient a manner as possible and allow the applicant to prepare an adequate Remedial Action Work Plan.

To allow a site to move as timely and efficiently through the VCP as possible, the NDEE has developed a Preliminary RAC Determination Worksheet for use by a VCP applicant (see Attachment 2-5). The purpose of the worksheet is to allow an applicant to make a preliminary determination of the likely RAC designation that a contaminated site would receive from NDEE, based on groundwater use within the area surrounding the facility. ***The conclusions reached by an applicant using this worksheet will be***

considered preliminary only and subject to a final, official RAC determination by NDEE as part of its review of the VCP RAP. The applicant should include a completed worksheet as part of the RAWP.

2.3.2.3 Remediation Goals

The cleanup levels or Remediation Goals (RGs) for the site should be determined from the attached Remediation Goals Lookup Tables (Attachment 2-6). Chemical-specific RGs are provided for specific exposure pathways and land use categories. These RGs were developed based on accepted risk assessment principles. The policy decisions and risk assessment framework used to develop the RGs, as well as documentation for the calculation of the RGs, can be found in the *Protocol for VCP Remediation Goals Lookup Tables* (Appendix A).

The RGs selected as cleanup levels should be included as a specific table (see also Section 2.4) in the RAWP. This table should include the selected RG for each COC, indicate whether the RG represents a residential or commercial exposure, and the rationale for that selection.

2.3.3 Proposed Remedial Action

As mentioned in Section 1.0, the VCP is a streamlined, results-based cleanup program. This approach minimizes the number of steps in the regulatory review process and involves setting goals. It provides VCP applicants with the responsibility and latitude to determine how to achieve these goals. You will use the conclusions from the investigation to develop adequate RAOs, including cleanup levels taken from the lookup tables. Nebraska's VCP program does not require a formal and extensive evaluation of numerous potential remediation technologies, as do more traditional programs such as CERCLA or RCRA. However, VCP applicants who are also Brownfields Cleanup and Revolving Loan Fund grantees are required by EPA to perform a remedial alternatives evaluation of at least two remedial alternatives other than the no action alternative for the following criteria:

- Protect human health and the environment
- Comply with Applicable or Relevant and Appropriate Requirements (ARAR)
- Provide short-term and long-term effectiveness
- Implementability
- Cost
- Achieve community acceptance

With the results-based approach, NDEE does not ordinarily second-guess the chosen remedial action. However, you should evaluate the proposed remedial action in terms of its effectiveness in achieving the RAOs and, if necessary, the remedy evaluation criteria. Effectiveness in achieving the RAOs will be based on monitoring and sampling results. In this guidance, such monitoring and sampling is termed *performance monitoring* (see Section 2.3.4). If performance monitoring results show that the RAOs are not met in the proposed timeframe, additional remedial actions will likely be necessary.

Performance Monitoring

In this guidance document, the term *performance* in performance monitoring refers to the effectiveness of the remedial action in achieving the RAOs. It does **not** refer to operational performance, or the ability of an engineered system to meet certain performance criteria. Since the VCP is a result-based program, NDEE does not evaluate the design and operation of the remediation system, but rather, focuses on evaluating whether the remedial action will achieve the RAOs and, if necessary, the remedy evaluation criteria.

The following sections provide information on different types of remediation technologies that you may choose to select as your proposed remedial action. Each of these sections identifies the type of information that should be included in the RAWP for the remediation technology that you select.

2.3.3.1 Presumptive Remedies

One way to simplify and streamline the remedy selection process is to use presumptive remedies. Presumptive remedies are techniques that have been used at a wide variety of sites across the country. The widespread use of these technologies means that environmental professionals, regulators and consultants alike are familiar with the effectiveness and limitations of these technologies; therefore, it generally is not necessary to perform a lengthy evaluation of the technology. Instead, efforts can be focused on collecting the site-specific information necessary to determine whether to implement the remediation technology at the site. EPA's guidance document *Presumptive Remedies: Policy and Procedures* (EPA 540-F-93-047) provides a discussion of several presumptive remedies. For more information about presumptive remedies, see the resources listed in the bibliography (Appendix C).

2.3.3.2 Innovative Technologies

NDEE encourages the use of innovative technologies. In some cases, innovative technologies can achieve cleanups that are as effective, faster, and cost less than traditional remediation technologies. Some examples of innovative technologies and the type of information that should be provided in the RAWP include:

- *In-Situ Bioremediation of Groundwater* – Describe the type of biodegradation mechanism to be used. Include maps showing the locations of wells, diagrams illustrating well construction information, and cross sections, descriptions, and construction information for any reactive barriers or other systems used to introduce reactants into the subsurface.

- *Phytoremediation* – Descriptions of phytoremediation should include type of application and details of the process employed. Types of plants, root depths, locations, and other applicable construction information should be included.

- *Monitored Natural Attenuation* – Any proposal to use monitored natural attenuation should provide sufficient and appropriate information to support the proposal. Include the results of sampling and monitoring to verify that natural attenuation is occurring at a rate that makes it suitable as a remedy. It is important to note that the occurrence of

degradation products alone is not sufficient to make this demonstration. EPA's guidance, *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (EPA/600/R-98/128) provides a description of the information to demonstrate that monitored natural attenuation will be an appropriate remedy. The methods to be used to monitor degradation should be described in detail in Section 2.3.4.

- *Other Technologies* – If another innovative technology is proposed, specify the type of technology and include maps, cross sections, and/or diagrams to illustrate the basic construction of the system.

2.3.3.3 Traditional Technologies

There are many different kinds of traditional remediation technologies available to clean up contaminated sites. Some of the more commonly used technologies are listed below. Included with each is a brief summary of the information that should be provided in the RAWP.

- *Soil Excavation and Removal* – Descriptions of soil excavation should include the extent and depth of soil to be excavated and plans for refilling and regrading excavated areas. Include maps and diagrams to illustrate the locations, sizes, and shapes of these areas.

- *In Situ Treatment of Soil* – Describe the type of in situ treatment to be used and the overall systems for injection or extraction. Include maps or cross-sections showing system components, treatment points, and radius of influence of the treatment system.

- *Groundwater Pump-and-Treat* – Describe and illustrate the basic treatment process and construction of the groundwater pump-and-treat system, including the number and locations of wells, well construction information, and capture zones. Include maps, cross sections, and diagrams as appropriate.

- *Air Sparging/Soil Vapor Extraction* – Descriptions of air sparging/soil vapor extraction systems should include maps of wells locations, well construction information, radius of influence of the system, and cross sections illustrating the relationship among wells, contaminated zones, water table, and stratigraphic features.

2.3.3.4 Engineering Controls

Engineering controls are physical barriers or other engineered measures that limit exposure to contamination or access to the site. Some common engineering controls include low-permeability barriers and containment structures (e.g., clay caps, parking lots, landfill caps) and physical access barriers (e.g., fences).

If an engineering control is the proposed remedial action, describe and illustrate the area to be addressed and the type of engineering control to be used.

- *Low-permeability barriers and containment structures* – describe and illustrate the type, thickness, and engineering properties of the cover material. Include grading plans for the site. Include maps, cross sections, and diagrams as appropriate. If a landfill cap is the proposed remedial action, contact NDEE regarding other applicable guidance and checklists of information to submit.

- *Physical access barriers* – describe and illustrate the type of barrier, location, size, and other construction information. Include maps and diagrams as appropriate.

Although some engineering controls may effectively prevent direct contact with contamination, they may not always be appropriate for the site. For example, a clean soil cap may limit exposure to contaminated soil, but the cap will not always be sufficient to prevent ongoing contamination of the groundwater. Residual contamination from contaminated soil or waste may continue to leach into the groundwater. This is especially true if it is located at or below the water table. In other cases, construction of a low-permeability barrier may exacerbate an existing contamination problem. For example, if a low-permeability cap is constructed over soils that are contaminated with volatile organic compounds, the cap may enhance lateral migration of vapors, potentially toward buildings. In this case, it may be necessary to supplement the cap with a remedial technology such as a soil vapor extraction system.

The narrative of this section should include a discussion of why the engineering control is appropriate for the site. In general, an engineering control is appropriate if the following criteria are met:

- the remedy will be protective of human health and the environment
- the wastes and contaminated media can be reliably contained to limit exposure and prevent ongoing contamination of other media
- the remedy will not cause or enhance other related contamination problems
- the wastes and contaminated media pose relatively low long-term threats
- treatment is impracticable

2.3.3.5 Institutional Controls

One way to minimize the potential for human exposure to contamination and/or protect the integrity of a remedy is through the use of institutional controls. Institutional controls are legal or administrative measures that limit land or resource use. They are typically used when the chosen remedial action involves leaving the contaminants in place or when implementing long-term cleanup actions. Often, institutional controls are used in combination with engineering controls or long-term groundwater cleanup actions.

There are four categories of institutional controls:

- *Governmental controls* – these controls use the authority of an existing governmental unit to impose land or resource restrictions. Examples include zoning, building codes, drilling permit requirements, and State or local groundwater use regulations.
- *Proprietary controls* – these controls, such as covenants and easements, are based on real property law and use a variety of tools to prohibit activities that may compromise the effectiveness of the remedy or restrict activities or future uses of resources that may result in unacceptable risk to human health or the environment. An example of this type of control is an easement that grants property access rights to a site owner/operator or regulatory agency for routine inspection and monitoring.
- *Enforcement and permit tools with institutional control components* – these tools may be used to require and ensure long-term compliance with site use restrictions. Examples

include remedy agreements, administrative orders, consent decrees, and permit conditions.

- *Informational devices* – these tools provide information or notification about whether a remedy is operating as designed and/or that residual or contained contamination may remain on-site. Examples include state registries, deed notices, and advisories.

The RAWP should list the category and type of each proposed institutional control. The narrative should describe how the institutional control will minimize the potential for human exposure to contamination and protect the integrity of the remedy.

Applicants may choose to use an environmental covenant pursuant to the Nebraska Uniform Environmental Covenants Act (Attachment 2-7). NDEE has developed a model covenant (Attachment 2-7) pursuant to the Act to assist in the preparation of an environmental covenant. Environmental covenants established pursuant to the Act must include written documentation providing, among other things, the nature of the activity and use limitations, and information on where the administrative record documenting the remedial action may be found. A copy of the control must be recorded with the county where the property is located, as well as a copy provided to NDEE.

2.3.4 Performance Monitoring

Performance monitoring is a key component of the VCP streamlined, results-based approach. Performance monitoring consists of periodic measurement of physical and/or chemical parameters to evaluate the progress of the remedial action in achieving the RAOs defined for the site. Performance monitoring can also be used to verify or adjust estimates of remediation timeframes or determine whether advances in remediation technologies or approaches could improve the ability to achieve the RAOs. Your approach to conducting performance monitoring will depend on which remedial action is chosen. For example, with remedial actions selected to control groundwater migration, both chemical analysis of groundwater samples and hydrogeologic measurements of groundwater elevations should be performed. At sites where engineering controls and institutional controls are used, performance monitoring may be necessary to demonstrate that ongoing contamination of the groundwater is prevented, groundwater contamination is not spreading to uncontaminated areas, and potential receptors are being protected.

In this section you should prepare a performance monitoring plan that includes a description of the RAOs, locations, frequency, type and quality of samples, techniques, and measurements that will be used to assess the performance of the remedial action. The plan should include sampling and analysis and quality assurance procedures consistent with the procedures discussed earlier in Section 2.2.2.3. In addition, a schedule for submittal of periodic monitoring reports should be included in the plan. The plan should also include an operation and maintenance plan for the monitoring system. Finally, the plan should discuss the proposed remediation timeframe during which performance monitoring activities will be conducted.

Performance monitoring reports should be submitted to NDEE on a periodic basis after approval of the RAP. These reports should include the following:

- Analytical results
- QA/QC results
- Chain of custody records

- Groundwater sampling and field data sheets
- Data tables containing groundwater elevations and well data
- Groundwater contour maps
- Contaminant plume concentration maps

The timeline for submittal of performance monitoring reports, in relation to approval of the RAP, submittal of the RAR, and issuance of the NFA, will vary from site to site. For sites with long-term remedies, the general sequence will be as follows: (1) approve RAP, (2) submit periodic monitoring reports, (3) submit RAR, and (4) issue NFA. The NFA will only be issued if the regulatory standard has been met in the specified long-term timeframe.

For sites where engineered controls/institutional controls are the remedy, the general sequence will be different: (1) approve RAP, (2) submit RAR, (3) issue NFA, and (4) submit periodic monitoring reports.

Startup Reports and Long-Term Remedies

If a long-term remedy is chosen as the cleanup approach, you may need to submit a startup report after the RAP is approved.

Startup reports are submitted once remedial actions have begun. They should include as-built diagrams illustrating the construction information of the remedial system. You should confer with NDEE to determine whether a startup report will be necessary.

This section should include an operation and maintenance plan (O&M plan) for the performance monitoring system. This plan should be used to ensure that that the monitoring system will continue to function properly and provide data of the appropriate quality and quantity to allow NDEE to evaluate the performance of the remedial action. The O&M plan should include:

- A description of the inspection procedures and tasks to be completed as part of the routine operation and maintenance of the system.
- A general description of the contingencies that will be used in the event the performance monitoring system requires repair or modification beyond the scope of routine operation and maintenance.

Finally, this section should include an outline of the expected remediation timeframe. An acceptable timeframe for remediation will be the period of potential exposure to the contamination in the absence of any remediation or 20 years, whichever is less. A longer period of time may be allowed on a case-by-case basis, if adequately justified by the applicant.

2.3.5 Remediation Waste Management Plan

For all remediation approaches, you should describe procedures for managing and disposing of any Remediation Waste (RW) generated during remedial action. Due to the generation of RW, remedial actions can trigger RCRA requirements at a facility that is otherwise not regulated under RCRA. Carefully selecting and implementing appropriate remedies can avoid or minimize the regulations that apply. For example, designating an area of contamination (AOC), managing waste within the AOC, and selecting in-situ treatment methods whenever possible are ways to avoid triggering the RCRA land disposal restrictions. Please refer to the NDEE guidance document in Attachment 2-3 for more information on developing a RW plan.

2.3.6 Permitting and Regulatory Involvement

Permits and regulatory requirements are commonly associated with remedial actions. For example, a RCRA permit, order, RCRA Remedial Action Plan (RAP), or other enforceable mechanism may be required when conducting ex-situ treatment or management of waste outside of an AOC, or when using corrective action management units (CAMUs), temporary units (TUs), and staging piles. A Nebraska Title 129 permit may be required when construction activities or remediation systems, such as air stripping towers, cause or create contaminated airborne dust and vapors. Therefore, it is important to work with federal, state, and local agencies to identify and address all applicable permitting and regulatory issues.

There are two important issues that should be considered when obtaining a permit. First, obtaining a permit and complying with its terms means that the project is no longer strictly voluntary. Second, you will need to allow sufficient time to complete the permit process. If the VCP project is operating according to a relatively tight schedule, the time required to obtain a permit can significantly affect the timeframe for startup and/or completion of certain parts of the project.

This section should identify all applicable local, state, and federal permitting or regulatory requirements. Some permitting or regulatory requirements typically needed for remedial action are those for:

- Air discharge
- Solid waste disposal
- Groundwater well permits
- Surface water appropriations
- Injection or re-injection activities
- Discharge to surface water or sanitary sewers
- Local building, plumbing, or electrical permits
- Easements for sampling on public property
- Access agreements

You do not need to include copies of permits in the RAWP, but you should demonstrate that the regulatory framework has been considered in the remediation design.

Finally, you should include a statement in the RAWP that a site-specific Health and Safety Plan will be used for field activities associated with the remedial action.

2.3.7 Proposed Schedule of Remedial Actions

This section should contain the proposed schedule of remedial activities. The schedule should be in tabular format and contain a brief description of the activity, date of initiation, date of completion, and other relevant information.

If the intent is to move forward with remedial action implementation at a fairly fast pace, there are several things that should be considered. First, NDEE should be notified before the remedial action is implemented. Second, the schedule should allow time for NDEE to issue a 30-day public notice. Third, fast-moving schedules may be difficult to implement because the VCP process includes some NDEE oversight and guidance. You can expedite this process by submitting a thorough, high-quality RAP. Finally, the regulatory issues identified in Section 2.3.6 can have a significant impact on the timing and overall construction schedule. To expedite the project, you should identify concurrent tasks and get NDEE involved very early in the planning stage of these tasks.

2.4 TABLES

This section should include all tables referred to in the narrative of the RAP. Several example tables have been included in Appendix B to demonstrate how to effectively communicate tabulated information. Tables should be formatted in the following manner:

- Tables should be listed in the RAP Table of Contents (with RAP page number)
- Tables themselves should be numbered and should appear in the order that they are mentioned in the RAP.
- They should have a title that describes the contents of the table and be clearly labeled and prepared with an appropriate font size so that they are easily legible and understandable
- Table rows and columns should have titles or numbers, and data presented in the respective rows and columns should be consistent with the titles
- Units within each row or column should be consistent (i.e, do not mix units within any one row or column)

2.5 FIGURES

This section should include appropriate maps, aerial photographs, cross sections, and other figures. Several example figures have been included in Appendix B. All figures in the RAP should be formatted in the following manner:

- Figures should be listed in the RAP Table of Contents (with RAP page number)
- Figures themselves should be numbered and should appear in the order that they are mentioned in the RAP
- They should have a title that describes the contents of the table and be clearly labeled and prepared with an appropriate font size so that they are easily legible and understandable
- Labels on printed figures should be part of the printed image rather than an adhesive label that is affixed to the figure or as hand-drawn labels or symbols
- Figures in every submitted copy of the RAP should be printed and in color (i.e., not a photocopy of the original figure)

- Whenever possible, historical documents such as Sanborn maps, deeds and certified survey maps included as figures should be scanned rather than photocopied, at a resolution of 1200 dpi and as grey scale (8 bit)
- Cross sections should include vertical and horizontal scale bars and legends.

2.5.1 Maps

There will be several maps included in the RAP, not only of the subject site, but also of the surrounding area/region. All maps should be properly formatted, as follows:

- Maps should contain a legend with the following information:
    - Project name, facility address, and NDEE file information (e.g., NDEE Integrated Information System Facility Number)
    - North arrow (not hand drawn)
    - Scale in standard units (e.g., 1 mile, ½ mile, 1000 feet, etc.)
- Maps should contain legible symbols and all symbols and labels should be of sufficient size and contrasting color to be readily visible. (In general, symbols smaller than 0.10 inches in diameter and/or in shades of blue or green do not contrast well with grey scale photographs. Shades of red and yellow tend to work best against a grey background.)
- Maps should use different symbols for different types of features (e.g., different types of water wells should indicated by different symbols).
- All maps that include the subject property should show the property boundaries of the subject property. On area maps, the property boundaries of the subject site should be digitally drawn on the maps.
- The latitude and longitude of the center of the subject property should be provided on at least one of the site maps, presented in decimal degrees and referenced to the State Plane Coordinate system NAD 83.
- Full size copies of any Sanborn Maps should be provided in the RAP, with the maps folded and placed in a plastic sleeve. (A full size Sanborn map will be approximately 20”x24”. If possible, the maps should be purchased/obtained in digital [i.e., *.pdf] format.)

2.5.2 Aerial Photographs

Prints of aerial photographs should be obtained whenever possible and scanned images provided in the RAP. (Some potential sources of aerial photos, such as the Nebraska State Historical Society, may not release the actual aerial photographs and will usually will not be able to make additional prints, but may be willing to allow the photographs to be scanned.) All information necessary to obtain any aerial photographs should be provided in the RAP, including:

- Source of photos, whether government agency (e.g., NDOR, EPA, USGS, NRCS) or private company (e.g., Terraserver, EDR)
- Date of photograph

- Flight and frame number, Compressed Ortho Quarter Quad (COQQ) number, or other information that would be sufficient to document or obtain the aerial photographs

Additionally, aerial photographs should be formatted as follows:

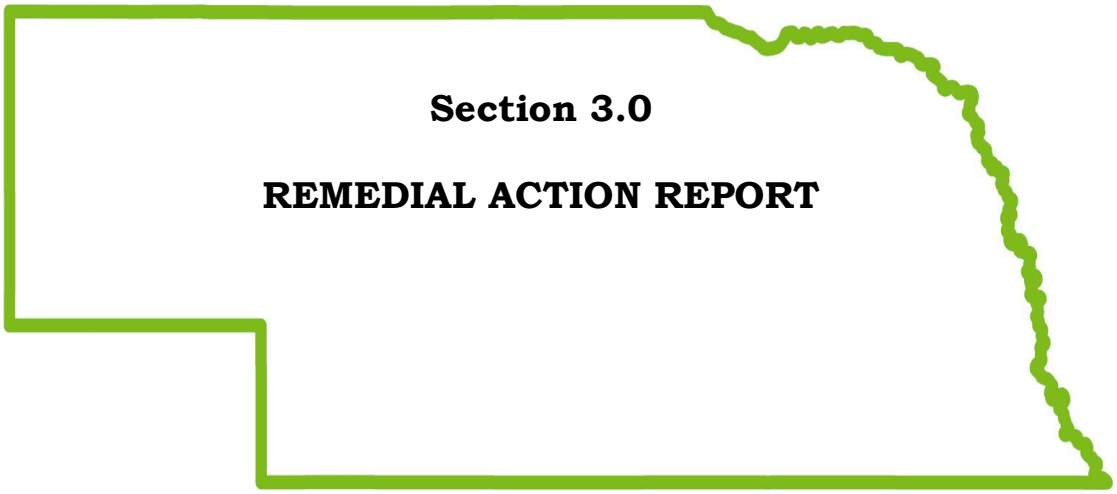
- The highest quality digital image possible of an aerial photograph should be obtained
- Aerial photographs should be scanned at 1200 or 2400 dpi (the resolution of most historical photos is unlikely to be much higher than 2400 dpi)
- Grey scale aerial photographs should be scanned as 8-bit grey scale; color aerial photographs should be scanned as 24-bit or greater color scale
- Aerial photographs used as base maps should include key features (such as property boundaries) provided in color

2.6 APPENDICES

The RAP should include appendices containing information collected during the investigation. Only one document or "type" of information should be provided per appendix. For example, monitoring well construction logs should be placed in a different appendix than the soil boring logs. Another example would be copies of previous investigation information or reports related to the facility (e.g., a LUST investigation report, Phase I or II environmental assessment report) placed into separate appendices. NDEE recommends that numbered tab dividers be used between appendices for ease of review. The following material should be included, if applicable:

- Soil boring logs
- Monitoring well construction logs
- Complete results of field screening
- Analytical reports for all soil gas, groundwater, and soil data referred to in the report, including QA/QC results
- Data validation and usability summary
- Vadose zone or aquifer testing data and estimation calculations
- Flow modeling data, calculations, and results
- Photographic documentation of investigative activities
- Copies of log books, field sheets, chain-of-custody forms, or other supporting documentation for field sampling and analysis
- Copies of waste manifests, aerial photographs, and any other document used to identify suspected source areas or probable release areas at the site

- Copies of deeds and other property documentation
- Other applicable documentation of investigation findings
- QAPP used during the investigation



Section 3.0

REMEDIAL ACTION REPORT

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SECTION 3.0 REMEDIAL ACTION REPORT

INTRODUCTION

After remedial action is complete at the site, the applicant will submit a Remedial Action Report (RAR). The RAR is a stand-alone document that has three primary functions:

1) To document the remedial activities

2) To demonstrate that the Remedial Action Objectives (RAOs) described in the Remedial Action Plan (RAP) have been met

3) To identify any deviations from the RAP

This section of the guidance is designed to help facility owners and/or environmental consultants prepare a RAR to address these issues in a consistent and thorough manner. The RAR should include all of the information identified in sections 3.1 – 3.8 in the sequence listed in this guidance. At the end of the report, it should contain the appropriate figures, tables, and/or analytical results so that NDEE and the public can understand and evaluate the conclusions of the RAR. The checklist at the end of this section should be used to make sure the RAR contains all the necessary information (see Attachment 3-1). The checklist should be completed and submitted as part of the RAR.

3.1 EXECUTIVE SUMMARY

The first part of the RAR should be an Executive Summary that presents an overview of the report. In this section you should do the following:

- State the RAOs
- Describe the remedial actions completed
- Explain any deviations from the remedial actions planned in the RAP
- Briefly demonstrate that the RAOs have been met
- Summarize the future land use plans and any institutional controls
- Describe any on-going performance monitoring that will continue at the site

The length of the executive summary will depend on the nature of contamination and the complexity of remedial actions at the site. However, a 2-3 page summary is generally recommended.

3.2 SITE SETTING, HISTORY, AND OPERATIONS

Since the RAR is meant to be a stand-alone document, it should include a brief summary of the setting, history, and operations of the site. Typically, you should include a 1-2 page summary of the following information:

- Identification of the property, the owner, and the consultants involved in developing the RAR

- Location, physical setting, and operational history of the site
- Findings of the investigation as reported in the RAP
- A brief summary of the site's VCP history, including the dates of application, submittal and approval of the RAP, and the beginning and ending of remedial actions

3.3 REMEDIAL ACTION OBJECTIVES

This section should state and explain the RAOs that were defined in the RAP. Refer to these RAOs in descriptions of remedial actions throughout the rest of the report.

3.4 OVERVIEW OF REMEDIAL ACTIONS

This section should contain an overview of the remedial actions conducted at the site. The overview should focus on important elements of the cleanup, including the remediation approach or approaches employed, the type(s) of remedial action(s) conducted, and the volumes of environmental media removed or treated.

The type of information to be provided in this section includes, but is not limited to:

- A table showing the chronology of events and remedial actions taken at the site
- A table providing the RGs selected as cleanup levels, including the RG for each COC, whether the RG represents a residential or commercial exposure, and the rationale for that selection.
- Extent, depth, and volume of soil excavated
- Total volume of soil treated and volumes of treatment chemicals used
- A figure showing areas of soil excavation or in-situ soil treatment
- Total volume of groundwater treated and volumes of treatment chemicals used
- Estimated volume of naturally attenuated contaminants
- Volume of remediation-derived waste generated, controlled, contained, transported, treated, and/or disposed
- Photographic logs of remedial activities
- Copies of relevant property deeds or other documentation of institutional controls implemented

The narrative should summarize the information and refer to the locations of the tables, figures, photos, and other documents in the RAR.

3.5 COMPLIANCE WITH RAOS

An important purpose of the RAR is to demonstrate that the RAOs described in the RAP have been achieved so that NDEE can issue an NFA letter. To do this, you should present a summary of *all* environmental sampling and monitoring results collected during the time between approval of the RAP and submittal of the RAR. As part of the RAP, you should have developed a strategy for conducting these sampling and monitoring activities (see Section 2.3.3.7 of this guidance). These activities will vary from site-to-site. For example, if the monitoring strategy in the RAP included three years of quarterly sampling, all three years of data should be included in the RAR. In this section, provide a narrative to explain why the analytical results show that the RAOs have been achieved, and refer to the documents that contain this data. The analytical data should be documented at the same level of detail as data collected during the investigation. The following information should be included:

- Figures and maps showing sample locations and depths
- Summary of collection methods and dates and any supporting tables or figures
- Figures and maps showing post-remedial action conditions, such as groundwater potentiometric surface(s), remaining contamination, and/or remaining free-product
- Soil boring and monitoring well construction logs
- Table containing results of field screening
- Analytical results and reference to laboratory reports for soil or groundwater sampling, including target compounds and contaminant concentrations detected
- Summary of QA/QC results and reference to attached lab reports
- Table of data validation qualifiers
- Explanatory text and updated version of the CSM, with concentrations and locations of remaining contamination, if applicable. The CSM should demonstrate that all exposure pathways at the site have been eliminated.
- Previously submitted startup reports or monitoring reports
- Other information as appropriate for the implemented remedies to verify that RAOs have been achieved

The narrative should summarize the information and refer to the locations of supporting tables, figures, reports, and other documents in the RAR.

3.6 DEVIATIONS FROM RAP

If any deviations from the RAP are necessary after it has been approved, you should contact NDEE as soon as possible. These deviations should be approved by NDEE *prior* to submittal of the RAR. However, the review and approval of deviations will slow the overall process. You are encouraged to submit a complete and thorough RAP so that you can minimize the chance that you will need to request deviations later on.

If deviations from the RAP are approved by NDEE, a revised RAP may be required, and it may be necessary for NDEE to reissue public notice of the changes. For example, if the deviation involves changing from a pump and treat cleanup system to chemically enhanced bioremediation, issuing a new public notice would likely be required. However, if the deviation was adding another groundwater extraction well to an existing pump and treat system, a new public notice would probably not be needed.

In this section of the RAR, you should include a summary of the timing and nature of deviations from the RAP. If changes to the proposed remedial action occurred, the following information should be included:

- Description and rationale for any changes to the proposed remedial action
- Copies of any correspondence with NDEE concerning any of these changes

If there weren't any deviations to the remedial action, this section should state so.

3.7 DEVIATIONS IN PERFORMANCE MONITORING

For some sites, performance monitoring data will be collected and submitted in reports to NDEE after the RAR has been approved and the NFA has been issued (see Section 2.3.4 of the RAP technical guidance). The monitoring plan will have been approved as part of the RAP; however, if changes to this plan are needed, these changes should be described in this section.

Update the monitoring strategy by including the following information:

- Explanation of new or modified sampling and monitoring objectives
- Explanation of new or modified sampling and monitoring methods
- Reference to maps showing new or modified monitoring and sampling locations
- Reference to cross sections and/or diagrams showing new or modified subsurface monitoring and sampling intervals
- Description of new or modified monitoring schedule
- Description of new or modified analytical parameters and reference to any supporting tables

If deviations from the RAP are approved by NDEE, a revised RAP may be required, and it may be necessary for NDEE to reissue public notice of the changes. For example, a reduction in the number of wells sampled, the frequency of sampling, or a change in sampling parameters will likely require that a new public notice be published. However, a change in sampling methodology (e.g., changing from bailers to passive diffusion bag samplers) would likely not require a new public notice.

If there weren't any deviations to the monitoring strategy, this section should state so.

3.8 APPENDICES

Figures, tables, and other documents should be included in the appendices to support the description and documentation of remedial action. The tables should be clearly labeled and written so that they are easily

legible and understandable. All maps should include standard map information, including a north arrow, graphical scale, and map legend. Cross sections should include vertical and horizontal scale bars and legends. All figures should be shown at an appropriate scale such that text, labels, and patterns are clearly legible. Only one document or "type" of information should be provided per appendix. NDEE recommends that numbered tab dividers be used between appendices for ease of review.

The appendices should include:

- Analytical laboratory reports and chain-of-custody sheets
- Monitoring well construction information
- As-built diagrams of all remedial systems
- Maps of all site features such as ponds; parking lots; buildings; green space; and subsurface structures such as utilities, parking garages, basements, and tunnels
- Copies of any legal documents used for institutional controls
- Documentation of actions related to the disposal of water and/or soil waste generated as part of the remedial action

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ATTACHMENT 3-1

REMEDIAL ACTION REPORT CHECKLIST

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ATTACHMENT 1-1

VOLUNTARY CLEANUP PROGRAM PROCESS FLOWCHART

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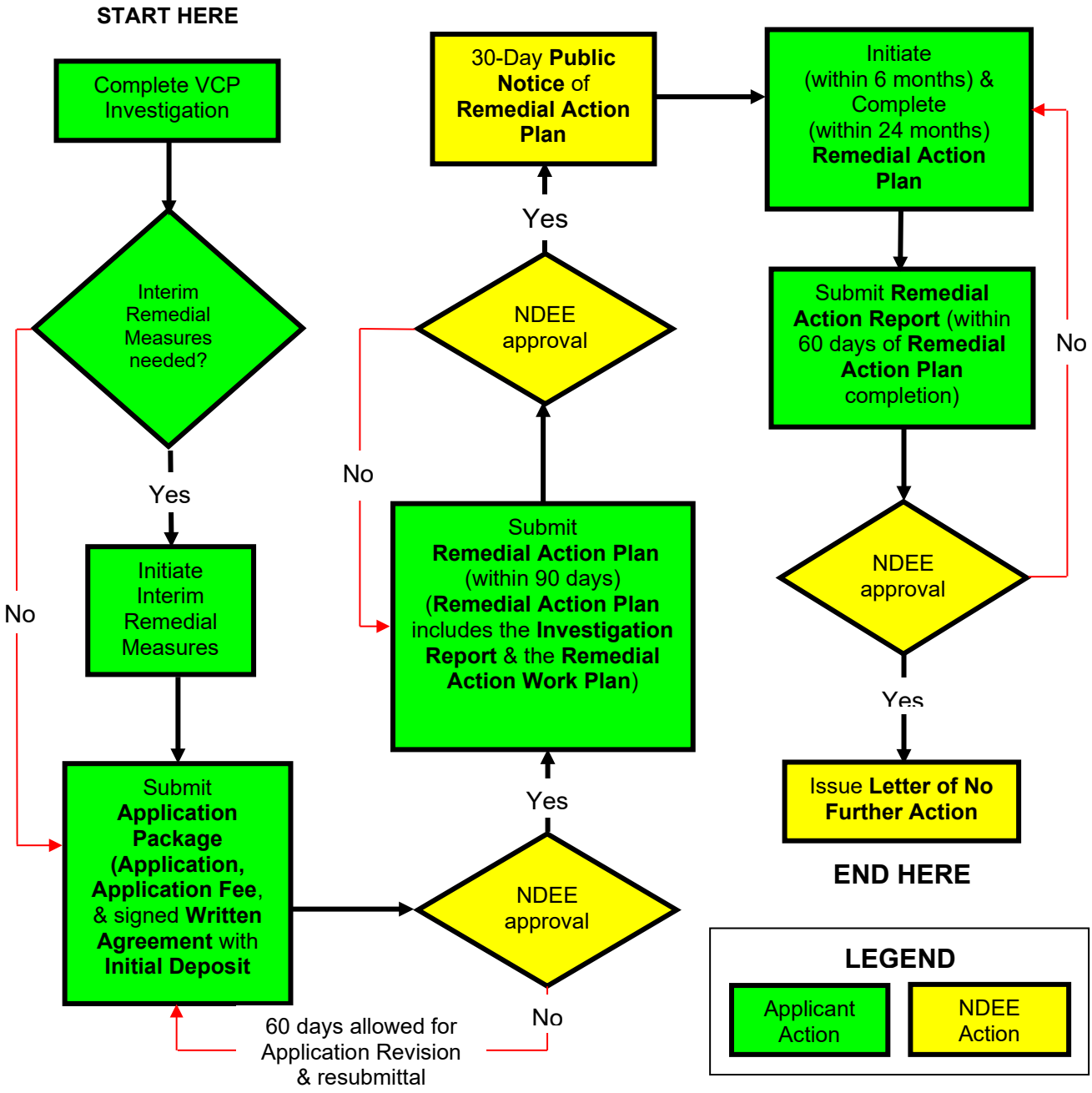
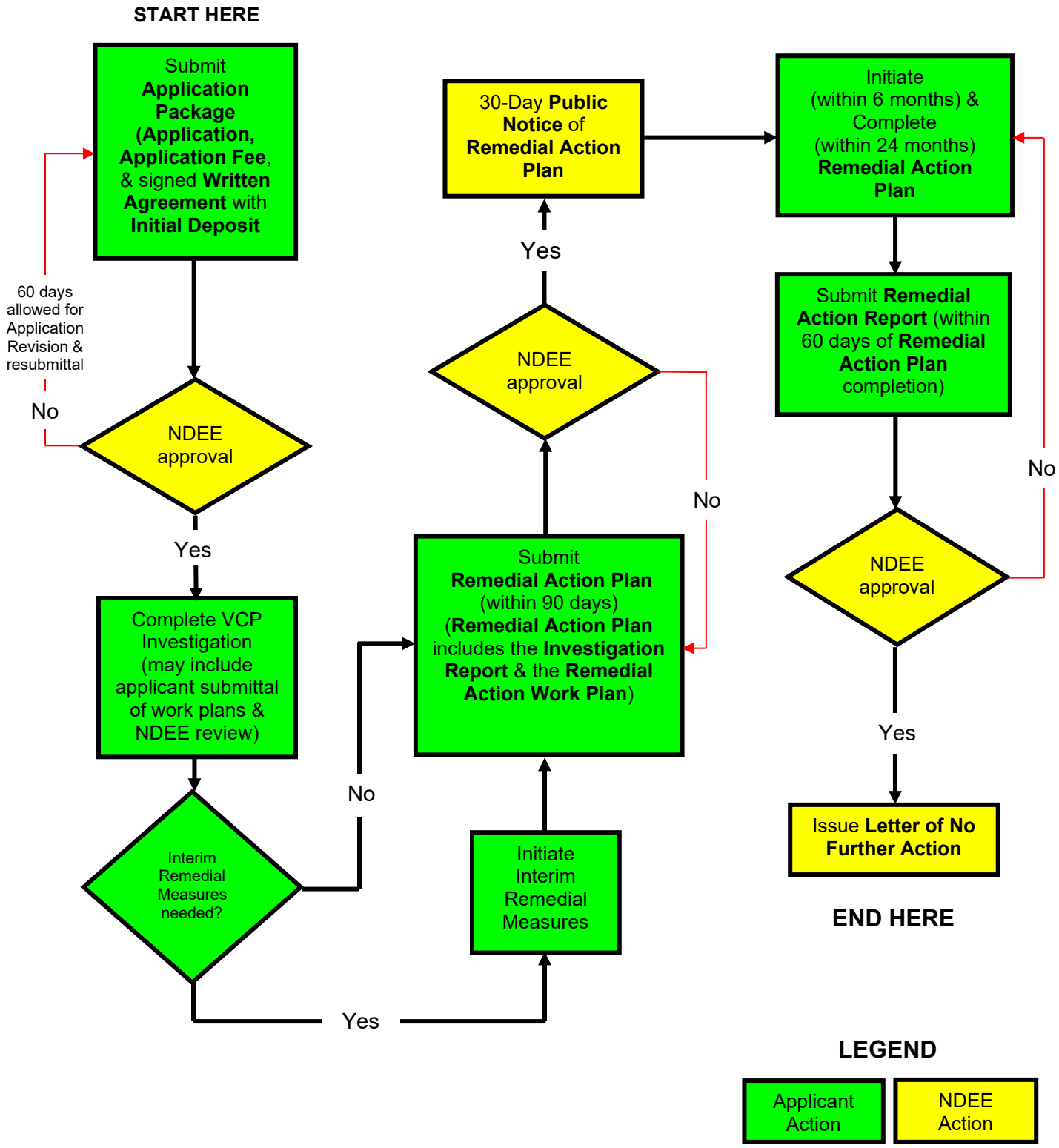
Voluntary Cleanup Program Process Flowchart A – Pre-Application Site Investigation/RAP



Voluntary Cleanup Program Process Flowchart B – Application Followed by SI/RAP



ATTACHMENT 1-2

APPLICATION FORM & INSTRUCTIONS

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NEBRASKA
DEPT. OF ENVIRONMENT AND ENERGY

REMEDIAL ACTION PLAN MONITORING ACT
VCP APPLICATION FORM

FACILITY/OPERATION INFORMATION													
						NDEE ID :		NDEE PROGRAM ID :					
1	**Name of Facility:**												
2	**Facility Phone Number:**												
3	**NAICS: (if known)**												
FACILITY/OPERATION LOCATION INFORMATION													
4	**Address of Facility:**										**PID:**		
5	**City:**					**State:**	**NE**	**Zip Code:**			**County:**		
6	**Legal Description:**		**¼ of**		**¼ of**		**¼ of**	**Section**		**Township**		**Range**	
FACILITY/OPERATION MAILING INFORMATION													
7	**Mailing Address of Facility:**												
8	**City:**								**State:**	NE	**Zip Code:**		
FACILITY/OPERATOR CONTACT INFORMATION													
9	**Person:**												
10	**Phone Number:**												
11	**Cell Number:**												
12	**Fax Number:**												
13	**Email Address:**												

14	**Certification Statement**

I/we (the undersigned) certify that the foregoing information on this application and accompanying documents, estimates, and schedules is true and accurate to the best of my knowledge and belief. I/we understand that participation in the Voluntary Cleanup Program is voluntary, and I/we agree to comply with all state and federal standards and regulations.

I/we also certify that if additional funds beyond the fee submitted with this application are required to cover oversight costs for NDEE, I/we will provide these additional funds.

☐ **This form has been completed and reviewed by the person(s) noted and signatures applied below.**

☐ **In completing this form, the following is understood:**

- $2,000 non-refundable **Application Fee** attached.
- Signed **Written Agreement** attached.
- $3,000 refundable initial **Deposit** attached.

Typed or Printed Name of Authorized Individual	**Title**
Signature of Authorized Individual	**Date**
Typed or Printed Name of Authorized Individual	**Title**
Signature of Authorized Individual	**Date**

INSTRUCTIONS:

- Please type or print legibly. Incomplete applications and/or applications not accompanied by the non-refundable $2,000 application fee, and the signed Written Agreement with the $3,000 initial deposit, will not be processed and will be returned to the applicant.
- If any of the information requested is not applicable, enter "NA" in the blank provided.

More detailed instructions and a list of abbreviations follow the application form.

SECTION A – ADDITIONAL SITE INFORMATION

Latitude: _____ Longitude: _____

Latitude/Longitude Source: _____

Latitude/Longitude Reference Location (e.g., center of property): _____

_____

Lot or Subdivision (if applicable): _____

Property Size (acres): _____

Current Land Use: _____

_____

_____

_____

Future Land Use: _____

_____

_____

_____

Will this project protect human health and the environment? ☐ Yes ☐ No Please explain.

_____

_____

_____

Will this project promote economic development? ☐ Yes ☐ No Please explain.

_____

_____

_____

Will this project enable the creation or, preservation of, or addition to parks, greenways, undeveloped property, other recreational property, or other property used for nonprofit purposes? ☐ Yes ☐ No Please explain.

_____

_____

_____

➔ **Note: Attach a map and/or site diagram.**

SECTION B – APPLICANT INFORMATION

Name: _____ Title: _____
Organization: _____
Address: _____
City: _____ State: _____ Zip: _____
Telephone: _____ Fax: _____
E-mail: _____
Applicant's Relationship to or Interest in the Site: _____

SECTION C – CURRENT OWNER/OPERATOR

☐ If Applicant is Facility Owner, check box and skip to Land Owner subsection (below).

Facility Owner

Name: _____ Title: _____
Organization: _____
Address: _____
City: _____ State: _____ Zip: _____
Telephone: _____ Fax: _____
E-mail: _____

☐ If Applicant is Land Owner, check box and skip to Section D.

Land Owner

Name: _____ Title: _____
Organization: _____
Address: _____
City: _____ State: _____ Zip: _____
Telephone: _____ Fax: _____
E-mail: _____

SECTION D – DESIGNATED POINT OF CONTACT

☐ If Applicant is Designated Point of Contact, check box and skip to Section E.

Name: _____ Title: _____
Organization: _____
Address: _____
City: _____ State: _____ Zip: _____
Telephone: _____ Fax: _____
E-mail: _____

SECTION E – NATURE OF POTENTIAL CONTAMINATION

Current and historical land use with corresponding years of operation and dates of known releases

Check all known or potential sources of contamination on site:

Feature and land use	Dates of operation
☐ Aboveground Storage Tank	
☐ Underground Storage Tank	
☐ Drum	
☐ Other Container	
☐ Aboveground Pipeline	
☐ Underground Pipeline	
☐ Lagoon or Pond	
☐ Seepage Pit or Dry Well	
☐ Septic Tank or Lateral Field	
☐ Surface Spill or Discharge	
☐ Adjacent Property	
☐ Drip Tank	
☐ Pit	
☐ Grain Storage Facility	
☐ Formerly Used Defense Site	
☐ Salvage Yard	
☐ Dry Cleaners	
☐ Landfill	
☐ Former Manufactured Gas Plant	
☐ Gas Station or Auto Repair	
☐ Industrial/Manufacturing Facility	
☐ Methamphetamine Laboratory	
☐ Mine Scarred Land	
☐ Source Unknown	
☐ Other	

Check all known chemical products, hazardous substances, pollutants or contaminants used, managed or released, on site:

☐ Acids/Bases	☐ Paint/Paint Wastes	☐ Sludge
☐ Fertilizers	☐ PCBs	☐ Solvents/Degreasers
☐ Inorganics	☐ Pesticides	☐ Fumigants
☐ Metals	☐ Petroleum Products	☐ Other _____
		_____

Check all known and potentially contaminated media on site:

Surface Soil (0-3')	☐ Confirmed	☐ Potential
Subsurface Soil	☐ Confirmed	☐ Potential
Surface Water	☐ Confirmed	☐ Potential
Sediment	☐ Confirmed	☐ Potential
Groundwater	☐ Confirmed	☐ Potential

Identify known contaminants, maximum concentration detected, and media impacted (attach additional pages as needed):

Contaminant	*Maximum Concentration*	*Units*	*Media*

SECTION F – REGULATORY HISTORY

1.	Does the property meet the following CERCLA §101(39) brownfield site definition? "Real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant."	☐Yes	☐No	☐Unknown
2.	Is or was the property, or any part thereof, a permitted or interim status hazardous waste management facility regulated under RCRA? If so, complete the permit information at the end of this section.	☐Yes	☐No	☐Unknown
3.	Has a CERCLA investigation (Preliminary Assessment and/or Site Inspection) been conducted at the property? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown
4.	Is the property subject to a planned, or ongoing CERCLA removal action? Has a CERCLA removal occurred at the site? If so, provide explanation at the end of this section	☐Yes	☐No	☐Unknown
5.	Is or was the property, or any part thereof, investigated for, proposed for, or listed on the Superfund National Priorities List, as established under CERCLA? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown
6.	Is or was the property, or any part thereof, subject to (enforcement action) a unilateral administrative order, court order, administrative order on consent, or consent decree under CERCLA? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown
7.	Is or was the property, or any part thereof, subject to (enforcement action) a unilateral administrative order, court order, administrative order on consent, consent decree, or permit under RCRA, CWA, TSCA or SWDA? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown
8.	Is or was the property, or any part thereof, subject to enforcement action under city, county, state, federal or other environmental laws? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown
9.	Is or was the property, or any part thereof, the subject to corrective action under RCRA 3004(u) or 3008(h) to which a corrective action permit or order has been issued or modified requiring the implementation of corrective measures? If so, provide explanation at the end of this section.	☐Yes	☐No	☐Unknown

10. Is or was the property, or any part thereof, the subject of environmental orders or agreements with city, county, state, or federal environmental agencies? If so, provide explanation at the end of this section. ☐Yes ☐No ☐Unknown

11. Is or was the property, or any part thereof, a land disposal unit(s) with closure notification submitted and closure plan or permit? If so, provide explanation at the end of this section. ☐Yes ☐No ☐Unknown

12. Is or was the property, or any part thereof, subject to the jurisdiction, custody, or control of federal government? If so, provide explanation at the end of this section. ☐Yes ☐No ☐Unknown

13. Does or did the property, or any part thereof, have PCB contamination subject to remediation under TSCA? If so, provide explanation at the end of this section. ☐Yes ☐No ☐Unknown

14. Has the property owner received assistance from the EPA Leaking Underground Storage Tank program for a response activity on this property, or any part thereof? ☐Yes ☐No ☐Unknown

15. Are or were activities conducted at the property, or any part thereof, requiring classification as a Nebraska or EPA Hazardous Waste Generator? If so, provide the hazardous waste generator identification number at the end of this section. ☐Yes ☐No ☐Unknown

16. Has the property ever been a Nebraska Title 118 investigation site? ☐Yes ☐No ☐Unknown

Use the following space for additional information related to the questions listed in Section F. Begin answers with the question number to which it relates. List any identification numbers and permits, with dates of permit issuance and expiration.:

_____

_____

_____

_____

_____

_____

SECTION G – INVESTIGATION/REMEDIAL ACTION STATUS

Identify the type of environmental investigations performed to date at the site.

Date	Title	Type of Investigation	Investigator

Does contamination at the site pose an immediate risk to human health or the environment?	☐Yes	☐No	☐Unknown
Does contamination at the site impact or threaten to impact public or private drinking water supplies?	☐Yes	☐No	☐Unknown

Identify and briefly describe any institutional controls that are already in place or proposed for the site.

Identify any other remedial actions already implemented at the site.

SECTION H – ACCESS CERTIFICATION

The undersigned certify that the applicant holds or can acquire title to all lands or has the necessary easements and right-of-way for the project and related lands. ☐Yes ☐No

Facility Owner Signature: _____ Date: _____

Land Owner Signature: _____ Date: _____

SECTION I – APPLICATION SUBMITAL

$2,000 NON-REFUNDABLE APPLICATION FEE ATTACHED	☐Yes	☐No
SIGNED WRITTEN AGREEMENT ATTACHED	☐Yes	☐No
$3,000 REFUNDABLE INITIAL DEPOSIT ATTACHED	☐Yes	☐No

Mailing Address

Return completed application, application fee, written agreement and initial deposit, and any other attachments to:

VCP/Brownfields Coordinator
Superfund/VCP Section
Monitoring and Remediation Division
Nebraska Department of Environment and Energy
P.O. Box 98922
Lincoln, NE 68509-8922

If you have questions or need additional information, please contact the VCP/Brownfields Coordinator by phone at (402) 471-6411 or via e-mail at NDEQ.VCPBrownfield@nebraska.gov

Application Instructions

COVER SHEET

Top of page	Optional, if applicable, provide the NDEE Facility ID and Program ID numbers.
Item #1	The name of the facility.
Item #2	The phone number for contacting the facility, not necessarily tied to a person/individual.
Item #3	If known, please provide the North American Industry Classification System (NAICS) code(s) that best represent facility operation(s).
Item #4	The facility's physical address (physical location of the facility). The Parcel Identification Number per the applicable County Assessor.
Item #5	Facility City – the City or nearest city to the physical location of facility. Facility State – prefilled with NE Facility Zip Code – zip code of the physical location of the facility. Facility County – the county of the physical location of the facility (this could be a different county than that for the facility city).
Item #6	The legal description of the physical location of the facility.
Item #7	The mailing address for the facility.
Item #8	Facility mailing city. Facility mailing state. Facility mailing zip code.
Item #9	The name of the person to be listed as the contact for the facility.
Item #10	Land line phone number for the contact.
Item #11	The cell phone number for the contact.
Item #12	The fax number for the contact.
Item #13	A current e-mail address for the contact.
Item #14	Complete the Certification Statement section of the form.

SECTION A – ADDITIONAL SITE INFORMATION

Lat. and Long.	Provide latitude and longitude, source of lat./long. (i.e., 7 1/2 min. Quad. Map, GPS coordinate, etc.) and reference location from which the lat./long. coordinate are taken (center of property, entrance, etc.). Provide the subdivision and lot if applicable. Provide the approximate property acreage.
Current Land Use	Provide a summary of current business operations on site, with an emphasis on identifying possible contaminant source areas. If operations have ceased at the site, provide the date.
Future Land Use	Describe the intended future use of the property.

Health & Environment Protectiveness, Economic Development Promotion& Greenspace Creation	Explain if the project will be protective of human health and the environment, will promote economic development, and/or will enable the creation or, preservation of, or addition to park, greenways, undeveloped property, or other recreational property, or other property used for nonprofit purposes. This information is necessary to determine financial assistance eligibility on a site-by site basis to otherwise excluded CERCLA §101(39) brownfield sites.
Map(s)/Diagrams	Attach site map(s) and/or diagram(s) that include the entire area to be addressed under the VCP and that clearly identify site boundaries. Also include a map that identifies known or suspected primary source areas, such as process and storage areas, and secondary source areas, such as contaminated soils.

SECTION B – APPLICANT INFORMATION

Name/Title	Provide the name of the individual completing the application to the VCP. Provide the applicant's title as representative.
Organization	Provide the name of the organization represented by the applicant.
Address/Telephone	Provide the applicant's mailing address and direct telephone number. Provide the applicant's fax number and e-mail address, if available.
Applicant's Relationship	Describe the applicant's relationship to or interest in the site. State whether the applicant is a current, past, or prospective owner of the site; is a current, past, or prospective facility operator on the site; has disposed of contaminants on the site; or has acquired the site by default, as through bankruptcy, tax delinquency, or abandonment.

SECTION C – CURRENT OWNER/OPERATOR

Owner/Operator Info	If the applicant is not the owner of the land or facility, provide the owner contact information as described above under Section B.

SECTION D – DESIGNATED POINT OF CONTACT

Contact Information	**If the Applicant is the designated POC, skip and go onto Section E.** Provide contact information for the person who will be the designated point of contact for the site. This may or may not be the person identified for Item 9 of the Cover Sheet as the current **primary** property owner/operator.

SECTION E – NATURE OF POTENTIAL CONTAMINATION

Current & Historic Land Use; Sources of Contamination	Provide a summary of current and historical business operations on site, with an emphasis on identifying possible contaminant source areas. Check the boxes identifying all known or suspected facility operations that could have been a source of contamination on site. Provide the dates/years during which specific activities were conducted. Provide the dates of operation for each.
Chemical Products	Check the boxes indicating the general categories of chemical products or hazardous substances, pollutants or contaminants used, managed, stored, handled, released, or disposed on site. Check boxes for all categories applicable to the site, even if the chemical category is not known to be a source of contamination. If an applicable chemical category is not provided, check the "Other" box and list the applicable chemical products, hazardous substances, pollutants or contaminants.

Contaminated Media	Check the boxes indicating the environmental media confirmed to be contaminated on site. If a medium is identified as potentially contaminated, check the box to indicate that the contamination is potentially present. Surface soils are defined as 0-3' below ground surface.
Contaminants Information	Identify all known contaminants, the maximum concentration of each contaminant detected (with measurement units), and the media impacted by each contaminant. Provide additional pages if necessary.

SECTION F – REGULATORY HISTORY & BROWNFIELD FUNDING ELIGIBILITY

Questions posed offer insight into the regulatory history of the property. They also help determine property eligibility for EPA Brownfield financial assistance. Extra space is provided at the end of this section for additional details; specify respective question numbers.

Brownfield Definition	Check the box indicating whether the property meets the definition of a brownfield site as defined by CERCLA §101(39).
RCRA	Check the box indicating whether the property has, or has ever had, a RCRA permit or RCRA interim status. If the answer is yes, please provide the following information at the end of the section: (1) the type of units; (2) the EPA identification number; (3) if applicable, the date the permit was issued; and (4) the permit expiration date.
CERCLA Investigation	Check the box indicating whether any investigations have been conducted relative to the property under CERCLA, also referred to as Superfund. EPA, the State of Nebraska, or their contractors typically conduct these Preliminary Assessments, Site Inspections, and Expanded Site Investigations.
CERCLA Removal	Check the box indicating whether any removal actions have been conducted, are planned or ongoing relative to the property under CERCLA. EPA typically conducts such removals.
NPL Listing	Check the box indicating whether the property, or any portion of the property, has ever been listed or proposed for listing on the NPL established under CERCLA. Contaminated sites that have been listed on the NPL are usually referred to as Superfund sites.
CERCLA Enforcement Action	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject to an enforcement action pursuant to CERCLA. Enforcement actions may include unilateral administrative orders, court orders, administrative orders on consent, or consent decrees under CERCLA.
RCRA, CWA, TSCA or SWDA Enforcement Action	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject to an enforcement action pursuant to RCRA, CWA, TSCA or SWDA. Enforcement actions may include unilateral administrative orders, court orders, administrative orders on consent, consent decrees or permits under these specific federal laws.
Environmental Enforcement Action	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject to an enforcement action pursuant to city, county, state, or federal environmental laws (not previously mentioned). Enforcement actions include orders and civil lawsuits issued by government entities that require remedial action for non-compliance with environmental laws.

RCRA Corrective Action	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject to a corrective action under RCRA 3004(u) or 3008(h) to which a corrective action permit or order has been issued or modified requiring the implementation of corrective measures.
Orders or Agreements	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject of environmental orders or agreements with city, county, state, or federal environmental agencies. This question does not pertain to permits issued by governmental entities to conduct regulated activities at a site. Examples of agreements include consent, interim, and letter agreements.
Land Disposal	Check the box indicating whether the property, or any part thereof, is currently or has previously been, a land disposal unit(s) with closure notification submitted and closure plan or permit.
General	Check the box indicating whether the property, or any part thereof, is currently or has previously been subject to the jurisdiction, custody, or control of the federal government.
PCB	Check the box indicating whether the property, or any part thereof, has PCB contamination subject to remediation under TSCA.
LUST	Check the box indicating whether the property owner has received assistance from the EPA Leaking Underground Storage Tank program for a response activity relative to this property, or any part thereof.
Waste Generator	Check the box indicating whether any past or current activities conducted on site require classification as an EPA or Nebraska Hazardous Waste Generator. If the facility or operation on the site was or is classified as a hazardous waste generator, provide the identification number in the blank provided.
Title 118	Check the box indicating whether the site has ever been the subject of a Nebraska Title 118 groundwater investigation.

SECTION G – INVESTIGATION/REMEDIAL ACTION STATUS

Investigations Performed	Identify the dates, titles, and types of investigations performed to date.
Risk to Health/Environment	Check the box indicating whether contamination at the site poses an immediate risk to human health or the environment.
Risk to Water Supply	Check the box indicating whether contamination at the site currently impacts or threatens to impact public or private drinking water supplies.
Institutional Controls	Identify and describe any institutional controls, already in place or proposed for the site. Institutional controls are intended to restrict land use or notify potential landowners of contamination or land use concerns. Institutional controls may include government controls (such as zoning laws and ordinances), legal controls (such as restrictive covenants and deed notices), and informational controls (such as public notices and warnings).
Remedial Actions	Identify and describe any remedial actions already implemented at the site. These may include interim remedial actions, removals, engineering controls and/or long-term monitoring.

SECTION H – ACCESS CERTIFICATION

Owner Signature	The owner of the site must sign the access agreement to certify that the applicant holds or can acquire title to the property in order to complete the project as required by the RAPMA statute, or has the necessary easements and right-of-way for the project and related lands. The facility owner's signature indicates that they have knowledge of the intended project and approve access for the purposes of completing the project.

SECTION I – APPLICATION SUBMITTAL

Attachments	Check the boxes to indicate that the following are attached: • $2,000 non-refundable Application Fee. • Signed Written Agreement. • $3,000 refundable initial Deposit.

Incomplete applications and/or applications not accompanied by the required $2,000 application fee, signed Written Agreement and $3,000 Initial Deposit will not be processed and will be returned to the applicant.

If you have additional questions, please call the VCP/Brownfields Coordinator at: **(402) 471-6411** or send e-mail to NDEQ.VCPBrownfield@nebraska.gov

ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
EPA	Environmental Protection Agency (U.S.)
NDEE	Nebraska Department of Environment and Energy
NPL	National Priority List
PCB	Polychlorinated Biphenyl
RAP	Remedial Action Plan
RAPMA	Remedial Action Plan Monitoring Act
RCRA	Resource Conservation and Recovery Act
SWDA	Solid Waste Disposal Act
TSCA	Toxic Substance Control Act
VCP	Voluntary Cleanup Program

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ATTACHMENT 1-3

EXAMPLE WRITTEN AGREEMENT

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BEFORE THE NEBRASKA DEPARTMENT OF ENVIRONMENT AND ENERGY

IN THE MATTER OF
ABC BROWNFIELD SITE
AND XYZ COMPANY

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement (Agreement) is entered into voluntarily by X-Ray Yankee Zulu Company (XYZ Co.) pursuant to the authority vested in the Department of Environment and Energy (DEE) by the Remedial Action Plan Monitoring Act (RAPMA), Neb. Rev. Stat. § 81-15,181 et seq. (Reissue 2000), the Nebraska Environmental Protection Act (NEPA), Neb. Rev. Stat. § 81-1501 et seq. (Reissue 1999, Cum. Supp. 2002), and all rules and regulations promulgated thereunder.

FINDINGS

1. The DEE is the agency of the State of Nebraska authorized pursuant to Neb. Rev. Stat. § 81-1504(1) to exercise exclusive general supervision, administration, and enforcement of NEPA, and all rules, regulations, and orders promulgated thereunder, including the issuance of orders requiring the adoption of remedial action to prevent, control, or abate land and water pollution, and to encourage voluntary cooperation by persons to achieve the purposes of NEPA. The DEE is further authorized pursuant to Neb. Rev. Stat. §§ 81-15,183 through 81-15,185 to administer RAPMA.

2. XYZ Co., a Nebraska Corporation, with principal offices at 1234 Main Street, Suite 100, Omaha, Nebraska, is the party executing this Agreement. XYZ Co. is a "person" within the meaning of Neb. Rev. Stat. § 81-1502(10).

3. The property that is the subject of this Agreement is located at 5678 East Oak Street, in Lincoln, Lancaster County, Nebraska, and is part of the Southwest Quarter of the Northeast Quarter of Section 15, Township 10 North, Range 6 East, more particularly described as, Lots 1 through 8, Block 7 (the Site). The Site encompasses one city block, approximately 3.2 acres.

4. XYZ Co. has conducted an environmental investigation of the Site and has submitted information to the DEE that evidences that “land pollution,” as defined by Neb. Rev. Stat. § 81-15,182(1), and “water pollution,” as defined by Neb. Rev. Stat. § 81-15,182(2), exists at the Site.

5. Pursuant to Neb. Rev. Stat. § 81-15,184, XYZ Co. has submitted to the DEE an application for oversight of the remedial action it plans to conduct at the Site, as well as a nonrefundable application fee of $2,000. In addition, XYZ Co. has posted an initial deposit of $3,000 to be used by the DEE to cover the DEE’s direct and indirect costs related to technical review, oversight, guidance, and other activities associated with remedial action or long-term institutional controls at the Site. The DEE shall review and approve or deny the application and notify XYZ Co. in writing. If the application is denied, the notification will state the reason for the denial. If the DEE determines that an application does not contain adequate information, the DEE shall return the application to XYZ Co.. XYZ Co. will have sixty (60) days to resubmit the required information or the application will be deemed denied.

AGREEMENT

6. The intent of this Agreement is to allow XYZ Co. to voluntarily conduct remedial action in accordance with RAPMA and to seek a determination from the DEE that no further remedial action is required at the Site pursuant to Paragraph 23 of this Agreement.

7. XYZ Co. agrees to perform all remedial action at the Site in accordance with NEPA and all rules and regulations promulgated thereunder. XYZ Co. shall be responsible for obtaining any necessary permits, licenses, access and other authorizations required under this Agreement. Nothing in this Agreement shall be deemed to impose any additional liabilities or obligations on XYZ Co., other than those specifically stated herein. Nothing shall relieve XYZ Co. from complying with all other applicable federal, state and local laws, rules and regulations.

8. XYZ Co. agrees to maintain insurance coverage, including self-insurance, sufficient to cover any potential risks to XYZ Co.'s employees, agents, and contractors, performing the actions under this Agreement.

9. Nothing in this Agreement, including any document the DEE issues as agreed to herein, shall be interpreted to constitute a release or waiver of liability for any of the conditions which existed at the Site before, during, or after execution of this Agreement nor limit the DEE's authority to respond to such conditions. DEE shall have the authority to respond to such conditions in addition to requiring further remedial action from XYZ Co. under the circumstances described in Paragraph 23 of this Agreement. XYZ Co. reserves the right to raise any and all defenses, to any action brought by DEE for conditions that existed on the Site prior to acquisition by XYZ Co.

10. XYZ Co. neither admits nor denies that it caused land or water pollution at the Site in violation of Neb. Rev. Stat. § 81-1506(1)(a), but agrees that DEE may file an action against XYZ Co. if it fails to comply with or terminates this Agreement. XYZ Co. waives any affirmative defenses regarding jurisdiction. However, nothing in this Agreement shall constitute a waiver of XYZ Co.'s right to contest the authority of the DEE to take any enforcement action against XYZ Co., other than an action to enforce this Agreement.

11. Remedial Action Plan. Within ninety days of approval of the application, XYZ Co. shall provide to DEE a complete Remedial Action Plan (RAP) for the proposed project that conforms to all federal and state environmental standards and substantive requirements and that is subject to review and approval of the DEE. DEE approval shall be void upon failure to comply with the approved RAP or willful submission of false, inaccurate, or misleading information by XYZ Co.. DEE shall not commence technical review, oversight, guidance, or other activities associated with the RAP until this Agreement is executed and XYZ Co. has submitted a complete RAP to the DEE.

    The RAP shall, at a minimum, include the following:

    a. Documentation regarding the investigation of land pollution or water pollution including, when appropriate, information indicating that XYZ Co. holds or can acquire title to all lands or has the necessary easements and rights-of-way for the project and related lands;

    b. A Remedial Action Work Plan which describes the remedial action measures to be taken to address the land or water pollution; and

c. Project monitoring reports, appropriate engineering, scientific, and financial feasibility data, and other data and information as may be required by the DEE.

New information about the presence of land pollution or water pollution at the Site may require additional action. Therefore, XYZ Co. shall submit any subsequent work plans on a schedule agreed to by XYZ Co. and the DEE.

12. If XYZ Co. believes any such data or information is protected by a privilege, it will retain the data and information and notify the DEE of the nature of the document and the privilege claimed. XYZ Co. may also request that the DEE keep data or information contained in any submission confidential, pursuant to Title 115 - Rules of Practice and Procedure.

13. Upon receipt of the RAP, the DEE shall review and approve or disapprove the RAP and notify XYZ Co. of its decision in writing. If the RAP is disapproved, the notification shall state the reason for disapproval. DEE will provide XYZ Co. an opportunity to resubmit the RAP.

If the DEE intends to approve the RAP, DEE shall issue a public notice of its intent pursuant to § 81-15,185 in a local newspaper of general circulation in the area affected and make the RAP available to the public. The public shall have thirty days from the date of publication during which any person may submit written comments to the DEE regarding the proposed remedial action. Such person may also request or petition the Director of Environment and Energy, in writing, for a hearing and state the nature of the issues to be raised. The Director shall hold a public hearing if the comments, request, or petition raise legal, policy, or discretionary questions of general application and significant public interest exists.

Within six (6) months after the RAP is approved by the DEE, XYZ Co. shall begin implementation of the RAP. The RAP shall be completed within twenty-four (24) months of approval by the DEE, excluding long-term operation, maintenance, and monitoring activity, unless the DEE grants an extension of time. An approved RAP is not enforceable unless the DEE can demonstrate that the applicant has failed to fully implement the approved RAP. The DEE may require further action if such action is authorized by other state statutes administered by the DEE.

14. The DEE and its authorized representatives and contractors shall have access at all reasonable times to the Site and any related lands, to the extent access is controlled by or granted to XYZ Co. for the purpose of conducting technical review, oversight, guidance, or other activities associated with remedial action at the Site.

15. XYZ Co. shall notify the DEE at least ten (10) days before any scheduled well drilling, installation of equipment, or sampling for the purpose of affording the DEE the opportunity to collect split samples. If either party is collecting samples, the other party or its authorized representative shall be allowed to take split samples of all samples collected.

16. In addition to any other obligation required by law, XYZ Co. shall notify the DEE immediately upon knowledge of any condition posing an immediate threat to human health and welfare or the environment. In the event that any action or occurrence under this Agreement causes or threatens an emergency situation or presents an imminent threat to human health or welfare or the environment, XYZ Co. shall promptly take all appropriate action to prevent, abate, or minimize such emergency or imminent threat in accordance with applicable law. Nothing in this paragraph shall be deemed to limit the authority of the DEE or State of Nebraska to take, direct, or order all

appropriate action to protect human health or welfare and the environment or to prevent, abate, respond to, or minimize an actual or threatened release from the Site.

17. Unless otherwise directed by the DEE, XYZ Co. shall submit two copies of all documents required by this Agreement to the person identified below, who shall be DEE's contact for the Site and for all matters concerning this Agreement:

Mike Felix
Nebraska Department of Environment and Energy
P.O. Box 98922
1200 "N" Street, Suite 400
Lincoln, NE 68509-8922
Phone: (402) 471-3388
Fax: (402) 471-2909
E-mail: Mike.Felix@nebraska.gov

18. Unless otherwise directed, the contact for XYZ Co. for all matters concerning this Agreement shall be:

John Doe
XYZ Company
1234 Main Street, Suite 100
Omaha, NE 68123-0100
Phone: (402) 123-4567
Fax: (402) 123-9876
E-mail: jdoe@xyzco.com

19. If the costs incurred by DEE exceed the initial deposit, an additional amount agreed upon by the DEE and XYZ Co. may be required prior to proceeding. The DEE shall prepare a summary of all costs and submit an invoice to XYZ Co.. Within thirty (30) days of receiving the invoice, XYZ Co. shall submit to the DEE a check payable to the "Department of Environment and Energy, State of Nebraska" for the amount of the invoice. XYZ Co. will not be released from their obligations under this Agreement until all DEE costs are paid. For sites requiring institutional controls extending beyond the termination of this agreement, XYZ Co. must fully fund, or make arrangements with DEE to fund, required long-term oversight. Any balance of funds not reserved for oversight of institutional controls remaining after the mutual termination of this Agreement shall be refunded to XYZ Co. by the DEE.

20. XYZ Co. may terminate this Agreement provided XYZ Co.:

a. Notifies the DEE in writing of its intention to terminate this Agreement;

b. Submits to the DEE full payment of any outstanding costs incurred by the DEE pursuant to this Agreement; and

c. Leaves the property in no worse condition, from a human health and environment perspective, than when XYZ Co. initiated this Agreement.

d. Provides sufficient funding, using a mechanism approved by the Department, to cover the Department's long-term oversight of any indicated institutional controls.

21. The DEE will cease review of any submittals under this Agreement on the date it receives XYZ Co.'s written notice of intent to terminate. The DEE will then prepare a summary of all costs and provide it to XYZ Co. Once the DEE determines that XYZ Co. has fully complied with all the requirements set forth in (a) through (d) above, the Agreement shall be deemed terminated. The DEE reserves the right to unilaterally terminate this Agreement if XYZ Co.:

    a. Violates any terms or conditions or fails to fulfill any obligations of the RAP, including submission of an acceptable RAP within a reasonable period of time;

    b. Fails to address an imminent and significant harm to public health and welfare or the environment in a timely and effective manner;

    c. Fails to initiate the RAP within six (6) months after approval by the DEE;

    d. Fails to complete the RAP within twenty-four (24) months after approval by the DEE, excluding long-term operation, maintenance, and monitoring activity, unless the DEE grants an extension of time; and

    e. Violates any terms or conditions of this Agreement.

    The DEE shall notify XYZ Co. in writing of its intention to terminate this Agreement and include the reason for termination. The DEE will also include a summary of all outstanding costs owed to the DEE. The DEE reserves the right to suspend this Agreement for any reason. The DEE will not consider any of the unapproved work performed during any suspension to be eligible for consideration under RAPMA.

22. Within sixty (60) days after completion of the RAP, XYZ Co. shall schedule and conduct a pre-certification inspection to be attended by XYZ Co. and the DEE. If the pre-certification inspection is satisfactory, XYZ Co. shall submit to the DEE a Final Remedial Action Report within thirty (30) days, including certification by a registered professional engineer that the RAP has been completed in material satisfaction of the requirements of this Agreement. If the pre-certification inspection is unsatisfactory, the DEE shall, acting reasonably, identify any additional remedial actions necessary to satisfy this Agreement. XYZ Co. shall perform any additional remedial actions identified by DEE prior to the submission of the Final Remedial Action Report.

23. Provided that XYZ Co.: (1) completes the remedial action in accordance with the RAP; (2) is in compliance with all provisions of this Agreement; (3) is in compliance with all state and federal laws, rules and regulations; (4) agrees to impose and enforce any institutional controls the parties mutually deem appropriate and necessary at the Site; and (5) has remitted all outstanding costs and payment of anticipated long-term oversight costs to the DEE, the DEE may issue a letter to XYZ Co. a letter stating that no further action need be taken at the Site related to any land pollution or water pollution for which remedial action has been taken in accordance with the RAP. Such letter shall provide that the DEE may require XYZ Co. to conduct additional remedial action in the event that any monitoring conducted at or near the Site or other circumstance indicates that (a) contamination is reoccurring, (b) additional contamination is present which was not previously identified under RAPMA, or (c) additional contamination is present for which remedial action was not taken according to the RAP. As a condition of issuance of the no further action letter, the DEE may require payment of ongoing direct and indirect costs of oversight of any ongoing long-term operation, maintenance, and monitoring at the Site.

24. This Agreement shall not be construed as an acceptance of liability by the State of Nebraska for activities conducted pursuant to RAPMA. XYZ Co., who is proceeding under RAPMA shall indemnify and hold harmless the State of Nebraska for any further action required by the federal Environmental Protection Agency relating to land pollution or water pollution by XYZ Co. for the remedial action.

25. This Agreement shall be governed and interpreted under the laws of the State of Nebraska. The powers conferred by the RAPMA shall be independent of and in addition and supplemental to any other provisions of the laws of the State of Nebraska with reference to the matters covered hereby, and the act shall be considered as a complete and independent act and not as amendatory of or limited by any other provision of the laws of the State of Nebraska.

26. This Agreement shall be binding on each party, its successors and assignees subject to the right of termination in Paragraphs 20 and 21. No change in the ownership or corporate or business status of any party, or of the Site shall alter any signatory's responsibilities under this Agreement.

27. By entering into this Agreement, XYZ Co. certifies that, to the best of its knowledge and belief, it has fully and accurately disclosed to the DEE all information known to XYZ Co. and to the best of its knowledge and belief, disclosed information in the possession or control of its officers, employees, contractors and agents which relates in any way to any existing land or water pollution or any past or potential future release of hazardous substances, pollutants or contaminants at or from the Site. This Agreement shall be null and void upon willful submission of false, inaccurate, or misleading information by XYZ Co..

28. This Agreement shall become effective upon execution by both parties and may only be modified or amended by an agreement in writing signed by both parties.

29. Signatures. The undersigned representatives of the parties certify that they are fully authorized to enter into the terms and conditions of this Agreement.

NEBRASKA DEPARTMENT OF
ENVIRONMENT AND ENERGY

Date: _____ By: _____

(PERSON)

Date: _____ By: _____

_____
Title

ATTACHMENT 1-4

EXAMPLE PUBLIC NOTICE & FACT SHEET

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PUBLIC NOTICE
PROPOSED REMEDIAL ACTION DECISION
XYZ Company

Nebraska Department of Environment and Energy
Monitoring and Remediation Division
Superfund/VCP Section

Notice is hereby given pursuant to Neb. Rev. Stat. § 81-15, 185.01 and Nebraska Title 118 – Ground Water Quality Standards and Use Classification Chapter 11, that the Nebraska Department of Environment and Energy (NDEE) is proposing approval of the Remedial Action Plan (RAP) at the XYZ Company, 5678 East Oak Street, Lincoln, Nebraska. This proposed determination is in accordance with Neb. Rev. Stat. § 81-15, 185 and Title 118, Appendix A. The legal location for the XYZ Company is the SW ¼ of the NE ¼ of Section 15, Township 10 North, Range 6 East, Lancaster County, Nebraska.

The groundwater at this site has been contaminated as a result of previous operations. The NDEE has assigned the groundwater pollution event at this site a Remedial Action Class One (RAC-1). RAC numbers are used to prioritize the groundwater pollution events with one (1) being the highest priority and three (3) being the lowest priority. The proposed final cleanup levels in the groundwater are shown in Table 1. The NDEE is proposing the following remedial action(s): active cleanup of groundwater to the proposed final cleanup levels.

Table 1. Proposed Final Cleanup Levels for XYZ Company

Contaminant	Concentration
Lead (site soils)	800 mg/kg
Trichloroethylene (groundwater)	5 µg/L
mg/kg – milligrams per kilogram; µg/L - micrograms per liter Based on Nebraska Title 118 Maximum Contaminant Levels-MCLs and NDEE VCP Remediation Goals (RGs)	

Any person may receive additional information, submit written comments regarding the proposed actions, or request a public hearing, in writing, on or before **February 24, 2021**. A request for hearing must state the nature of the issues to be raised and all arguments and factual grounds supporting such position. If the Director grants a public hearing, the hearing will be advertised by public notice at least 30 days prior to its occurrence. Comments and requests should be mailed to:

Administrator – Monitoring and Remediation Division
Nebraska Department of Environment and Energy
PO Box 98922
Lincoln, NE 68509-8922

Digital copies of the proposed RAP and supporting documents are available online at http://deq.ne.gov/; select “Public Records Search” at the bottom of the page then “Public Records Search” again. A box will appear that needs the following information: “Start Date”, “End Date”, “DEE Facility Number, “DEE Program”. Select “Search” and all documents for that facility will appear. Use the “Index of Correspondence” to select documents related to this public notice. Please notify NDEE if alternate formats of materials are needed by February 9, 2021. Contact phone number is (402) 471-2186. TDD users please call 711 and ask the relay operator to call us at (402) 471-2186. Further information may be obtained from Mike Felix, Superfund/VCP Section, (402) 471-2186.

FACT SHEET
Proposed Remedial Action Decision
XYZ Company

The Nebraska Department of Environment and Energy (NDEE) is providing public notice of its intent to propose final cleanup levels and remedial action at the XYZ Company. This fact sheet provides background information on the site, a summary of soil and groundwater contamination, a description of the proposed action, a description of the public participation procedures, and the NDEE contact person.

Site Location: The XYZ Company is located at 5678 East Oak Street, Lincoln, NE, on the SW ¼ of the NE ¼ of Section 15, Township 10 North, Range 6 East, Lancaster County, Nebraska.

Soil and Groundwater Contamination: The soil and groundwater at this site have been contaminated as a result of previous operations. The primary contaminants of concern (COCs) detected in the soil and groundwater are lead (in soils) and trichloroethylene (TCE) (in groundwater). The NDEE compared contaminant concentrations detected in the soil and groundwater to the NDEE's Voluntary Cleanup Program (VCP) Remediation Goals (RGs) to determine the significance of the contamination.

Elevated levels of lead above industrial RGs in site soils to a depth of approximately four feet were found across the northern half of the property. A plume of dissolved TCE above the applicable Maximum Contaminant Level (MCL) in groundwater extends to the southeast of the site, approximately one mile from XYZ property boundary.

Lead contamination in the site soils present a potential direct contact exposure to employees working at the site. Private drinking water wells exist within ¼ mile of the groundwater contaminant plume, presenting a potential threat of ingestion of groundwater.

Groundwater Remedial Action Class: The NDEE assigns a Remedial Action Class (RAC) to a groundwater contamination event to determine the importance of remedial action based, in part, on the use of the groundwater in the area (Title 118, Appendix A, Step 8). Groundwater that is being used as a public drinking water supply is assigned the highest remedial action class of RAC-1. The Department typically requires extensive cleanup of groundwater that is classified as RAC-1. When the use of groundwater in the area is more limited, the groundwater is assigned a remedial action class of RAC-2 or RAC-3. Generally, groundwater cleanup will be less extensive for these classifications.

The pollution event for this site has been classified as a RAC-1, due to the fact that private drinking water wells exist downgradient of the contaminant plume. NDEE is proposing the final cleanup levels, shown in Table 1.

Table 1. Proposed Final Cleanup Levels for XYZ Company

Contaminant	Concentration[1]
Lead (site soils)	800 mg/kg
TCE (groundwater)	5 µg/L
[1] Based on NDEE Voluntary Cleanup Program (VCP) Remediation Goals (RGs) for industrial sites, direct contact exposure pathway and MCLs/RGs for groundwater ingestion. mg/kg –milligrams per kilogram; µg/L – micrograms per liter	

Proposed Remedial Actions: NDEE is proposing the following remedial actions:

- Removal of lead-contaminated soils above the industrial RG and replacement of excavated soils with clean fill to remove potential direct contact exposures.
- Cleanup of TCE-contaminated groundwater to the MCL to eliminate potential impacts to downgradient private drinking water wells.

Public Participation Procedures: You may receive additional information, submit written comments regarding the proposed actions, or request a hearing, in writing, on or before February 24, 2021. If you request a hearing, you must state the nature of the issues to be raised, present your arguments, and facts to support your position in writing to the Department. If the Director grants a public hearing, the hearing will be advertised by public notice at least 30 days prior to its occurrence. Comments and requests should be mailed to: Administrator – Monitoring & Remediation Division, Nebraska Department of Environment and Energy, PO Box 98922, Lincoln, NE 68509-8922, phone (402) 471-2186.

Contact: Digital copies of the proposed RAP and supporting documents are available online at http://deq.ne.gov/; select "Public Records Search" at the bottom of the page then "Public Records Search" again. A box will appear that needs the following information: "Start Date", "End Date", "DEE Facility Number, "DEE Program". Select "Search" and all documents for that facility will appear. Use the "Index of Correspondence" to select documents related to this public notice. Please notify the NDEE if alternate formats of materials are needed by February 9, 2021. Contact phone number is (402) 471-2186. TDD users please call 711 and ask the relay operator to call us at (402) 471-2186. Further information may be obtained from Mike Felix, Superfund/VCP Section, (402)471-2186.

ATTACHMENT 1-5

REMEDIAL ACTION PLAN MONITORING ACT STATUTE

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Remedial Action Plan Monitoring Act

81-15,181. Act, how cited.
Sections 81-15,181 to 81-15,188 shall be known and may be cited as the Remedial Action Plan Monitoring Act.

Source: Laws 1994, LB 1349, § 1; Laws 2004, LB 449, § 4. Effective date July 16, 2004.

81-15,182 Terms, defined.
For purposes of the Remedial Action Plan Monitoring Act:

1. Land pollution means the presence upon or within the land resources of the state of one or more contaminants or combinations of contaminants, including, but not limited to, solid waste, hazardous waste, petroleum, or hazardous substances, in such quantities and of such quality as will or are likely to (a) create a nuisance, (b) be harmful, detrimental, or injurious to public health, safety, or welfare, (c) be injurious to plant and animal life and property, or (d) be detrimental to the economic and social development, the scenic beauty, or the enjoyment of the natural attractions of the state; and

2. Water pollution means the manmade or man-induced alteration of the chemical, physical, biological, or radiological integrity of water.

Source: Laws 1994, LB 1349, § 2; Laws 2004, LB 449, § 5. Effective date: July 16, 2004.

81-15,183. Remedial Action Plan Monitoring Fund; created; use; investment.

1. The Remedial Action Plan Monitoring Fund is created. The fund shall be administered by the Department of Environmental Quality. Revenue from the following sources shall be credited to the fund:
   (a) Application fees collected under the Remedial Action Plan Monitoring Act;
   (b) Deposits for costs associated with administration of the act, including review, oversight, and guidance;
   (c) Gifts, grants, reimbursements, or appropriations from any source intended to be used for purposes of the act; and
   (d) Investment interest attributable to the fund.

2. The fund shall be used by the department to:
   (a) Review applications and provide technical review, oversight, guidance, and other activities associated with remedial action plans for land pollution or water pollution;
   (b) Fund activities performed by the department to address immediate or emergency threats to human health and the environment related to property under the act; and
   (c) Administer and enforce the act.

3. Any money in the fund available for investment shall be invested by the state investment officer pursuant to the Nebraska Capital Expansion Act and the Nebraska State Funds Investment Act.

Source: Laws 1994, LB 1349, § 3; Laws 1995, LB 7, § 130; Laws 2004, LB 449, § 6. Effective date: July 16, 2004.

Cross References: Nebraska Capital Expansion Act, see section 72-1269. Nebraska State Funds Investment Act, see section 72-1260.

81-15,184. Remedial action plan; application for monitoring; requirements; fees; department; duties.

1. Any entity which voluntarily chooses to make application for monitoring of remedial action plans for property where land pollution or water pollution exists shall:
   (a) Submit an application on a form approved by the Department of Environmental Quality;
   (b) Provide the department with a nonrefundable application fee of two thousand dollars; and
   (c) Execute a written agreement to provide reimbursement of all department direct and indirect costs related to technical review, oversight, guidance, and other activities associated with the remedial action plan. As part of the voluntary agreement, the department shall require the applicant to post a deposit of three thousand dollars to be used by the department to cover all costs. The department shall not commence technical review, oversight, guidance, or other activities associated with the remedial action plan until the voluntary agreement is executed and a complete remedial action plan has been submitted. If the costs of the department exceed the initial deposit, an additional amount agreed upon by the department and the applicant may be required prior to proceeding. After the mutual termination of the voluntary agreement, any balance of funds paid under this subdivision shall be refunded.

2. The department shall review and approve or deny all applications and notify the applicant in writing. If the application is denied, the notification shall state the reason for the denial. If the department determines that an application does not contain adequate information, the department shall return the application to the applicant. The applicant has sixty days to resubmit the required information or the application will be deemed denied.

3. Within ninety days of approval of the application, the applicant shall provide a complete remedial action plan for the proposed project that conforms to all federal and state environmental standards and substantive requirements, including:
   (a) Documentation regarding the investigation of land pollution or water pollution including, when appropriate, information indicating that the applicant holds or can acquire title to all lands or has the necessary easements and rights-of-way for the project and related lands;
   (b) A remedial action work plan which describes the remedial action measures to be taken to address the land or water pollution; and
   (c) Project monitoring reports, appropriate engineering, scientific, and financial feasibility data, and other data and information as may be required by the department.

Source: Laws 1994, LB 1349, § 4; Laws 2004, LB 449, § 8; Laws 2008, LB 724, § 1. Effective date: July 18, 2008.

81-15,185. Department of Environmental Quality; remedial action plan; approval or disapproval; notification.

Upon receipt of a voluntary remedial action plan for land pollution or water pollution pursuant to section 81-15,184, the Department of Environmental Quality shall review and approve or disapprove the plan and notify the applicant in writing. If the plan is disapproved, the notification shall state the reason for the disapproval and provide a reasonable opportunity to resubmit the plan.

Source: Laws 1994, LB 1349, § 5; Laws 2004, LB 449, § 9. Effective date: July 16, 2004.

81-15,185.01. Remedial action plan; notice; hearing.

The Department of Environmental Quality shall issue public notice of its intent to approve a voluntary remedial action plan pursuant to section 81-15,185 in a local newspaper of general circulation in the area affected and make the remedial action plan available to the public. The public shall have thirty days from the date of publication during which any person may submit written comments to the department regarding the proposed remedial action. Such person may also request or petition the Director of Environmental Quality, in writing, for a hearing and state the nature of the issues to be raised. The director shall hold a public hearing if the comments, request, or petition raise legal, policy, or discretionary questions of general application and significant public interest exists.

Source: Laws 2004, LB 449, § 10. Effective date: July 16, 2004.

81-15,185.02. Remedial action plan; termination; notification.

1. The applicant may unilaterally terminate a voluntary remedial action plan approved pursuant to section 81-15,185 prior to completion of investigative and remedial activities if the applicant leaves the property in no worse condition, from a human health and environment perspective, than when the applicant initiated voluntary remedial action and the applicant reimburses the Department of Environmental Quality for all outstanding costs.

2. The department may terminate a voluntary remedial action plan if the applicant:

   (a) Violates any terms or conditions of the plan or fails to fulfill any obligations of the plan, including submission of an acceptable remedial action plan within a reasonable period of time;
   (b) Fails to address an immediate and significant risk of harm to public health and the environment in a timely and effective manner; or
   (c) Fails to initiate the plan within six months after approval by the department or to complete the plan within twenty-four months after approval by the department, excluding long-term operation, maintenance, and monitoring, unless the department grants an extension of time.

3. The department shall notify the applicant in writing of the intention to terminate the voluntary remedial action plan and include the reason for the termination and a summary of any unreimbursed costs of the department that are due.

Source: Laws 2004, LB 449, § 11. Effective date: July 16, 2004.

81-15,185.03. Remedial action plan; completion; duties; enforceability.

1. Within sixty days after completion of a voluntary remedial action plan approved pursuant to section 81-15,185, the applicant shall provide the Department of Environmental Quality with a final remedial action report and assurance that the plan has been fully implemented. Department approval of a voluntary remedial action plan shall be void upon failure to comply with the approved plan or willful submission of false, inaccurate, or misleading information by the applicant.

2. Voluntary remedial action plans approved under section 81-15,185 are not enforceable unless the department can demonstrate that the applicant has failed to fully implement the approved plan. The department may require further action if such action is authorized by other state statutes administered by the department.

Source: Laws 2004, LB 449, § 12. Effective date: July 16, 2004.

81-15,186. Department of Environmental Quality; issuance of letter; contents.

If the requirements of the Remedial Action Plan Monitoring Act are met and the applicant has remitted all applicable fees, the Department of Environmental Quality may issue to the applicant a letter stating that no further action need be taken at the site related to any contamination for which remedial action has been taken in accordance with the approved remedial action plan. Such letter shall provide that the department may require the person to conduct additional remedial action in the event that any monitoring conducted at or near the real property or other circumstances indicate that (1) contamination is reoccurring, (2) additional contamination is present which was not identified pursuant to section 81-15,184, or (3) additional contamination is present for which remedial action was not taken according to the remedial action plan. As a condition of issuance, the department may require payment of ongoing direct and indirect costs of oversight of any ongoing long-term operation, maintenance, and monitoring.

Source: Laws 1994, LB 1349, § 6; Laws 2004, LB 449, § 13. Effective date: July 16, 2004.

81-15,186.01. Rules and regulations.

The Environmental Quality Council may adopt and promulgate rules and regulations necessary to administer and enforce the provisions of the Remedial Action Plan Monitoring Act.

Source: Laws 2004, LB 449, § 7. Effective date: July 16, 2004.

81-15,187. Act, how construed; indemnification.

The Remedial Action Plan Monitoring Act shall not be construed as an acceptance of liability by the State of Nebraska for activities conducted pursuant to such act. Entities proceeding under such act shall indemnify and hold harmless the State of Nebraska for any further action required by the federal Environmental Protection Agency relating to land pollution or water pollution by an entity.

Source: Laws 1994, LB 1349, § 7.

81-15,188. Act; supplemental to other laws; how construed.

The powers conferred by the Remedial Action Plan Monitoring Act shall be independent of and in addition and supplemental to any other provisions of the laws of the State of Nebraska with reference to the matters covered hereby, and the act shall be considered as a complete and independent act and not as amendatory of or limited by any other provision of the laws of the State of Nebraska.

Source: Laws 1994, LB 1349, § 8.

ATTACHMENT 1-6

NDEQ/EPA REGION VII MOA FOR NEBRASKA VCP

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MEMORANDUM OF AGREEMENT
BETWEEN THE
NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY
AND REGION 7 OF THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

I. Purpose

A. The Nebraska Department of Environmental Quality (NDEQ) on behalf of the state of Nebraska (State) and Region 7 of the United States Environmental Protection Agency ("EPA" or "Region 7") (collectively "the Agencies") enter into this Memorandum of Agreement ("MOA" or "Agreement") to: (1) facilitate NDEQ's implementation of Nebraska's Voluntary Cleanup Program (VCP) under the authority of the Nebraska Remedial Action Plan Monitoring Act (Act), Neb. Rev. Stat. § 81-15,181 to 81-15,188; and implementing guidance documents issued by the NDEQ; (2) recognize the VCP for grant funding eligibility purposes pursuant to § 128(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, (CERCLA), 42 U.S.C. § 9601 et seq.; and (3) express how the Agencies generally intend to exercise their authorities under CERCLA and the Act in the State at sites addressed by the VCP.

B. Region 7 has reviewed and evaluated the VCP and has determined that the VCP includes each of the four elements of a state response program as described in CERCLA § 128(a)(2). NDEQ agrees to maintain all of these elements for the VCP. Generally, the four elements are:

1. Timely survey and inventory of brownfield sites in Nebraska;

2. Oversight and enforcement authorities or other mechanisms and resources adequate to ensure that a response action will protect human health and the environment and be conducted in accordance with applicable federal and state law, and that if the person conducting the response activities fails to complete the necessary response activities, including the operation and maintenance or long-term monitoring, the necessary response activities will be completed;

3. Mechanisms and resources to provide meaningful opportunities for public participation; and

4. Mechanisms for approval of every cleanup plan and a requirement for verification and certification or other similar documentation that the response is complete.

C. Region 7 has determined that the NDEQ maintains a public record of sites as described in CERCLA § 128(b)(1)(C). NDEQ agrees to maintain, update at least annually, and make available to the public a record of sites as required by CERCLA Section 128(b)(1)(C).

D. Based upon such review described in Paragraph B above and further discussions, NDEQ and Region 7 have determined that entry of this MOA will facilitate the cleanup of sites addressed by the VCP in Nebraska. This MOA has been developed by mutual cooperation and consent.

II. Applicability of the MOA

A. Subject to Paragraph B of this Section and Section III, this MOA applies only to remediation of sites conducted (1) pursuant to the Act in effect as of the date of this Agreement; and (2) in compliance with the VCP and the terms of any agreement with NDEQ.

B. The VCP, pursuant to the Act, is applicable to any property in Nebraska. Notwithstanding a site's eligibility to participate in the VCP, Region 7 and NDEQ agree that this MOA shall not apply to:

1. sites that have been proposed in the *Federal Register* to be placed on the National Priorities List (NPL), unless EPA determines that no further federal action will be taken;

2. sites that have been placed on the NPL (however, such sites may become eligible if they are subsequently removed from the NPL and are not otherwise ineligible);

3. sites that are the subject of planned or ongoing federal or state enforcement actions concerning the contamination at the site or facility, or portion of the site or facility, that the applicant has proposed to address under the VCP, except where the action is limited to cost recovery only under CERCLA § 107(a);

4. sites where EPA conducts or has conducted a preliminary assessment or site inspection and, after consultation with NDEQ, determines or has determined that the site obtains a preliminary score sufficient for possible listing on the NPL; unless EPA determines that no further federal action will be taken;

5. sites at which Region 7 is conducting a removal action; and

6. sites that are subject to corrective action under a permit or order under the Resource Conservation Recovery Act, 42 U.S.C. § 6901 et seq.

III. Implementation

A. Region 7 and NDEQ intend to work in a coordinated manner to avoid, to the maximum extent possible, duplication of effort at sites, and to ensure that the remediation of sites continues in a timely fashion. NDEQ agrees to notify Region 7 in writing when sites are being addressed under the VCP and when sites in the Comprehensive Environmental Response, Compensation, and Liability Information

System (CERCLIS) are being addressed under the VCP. If a site listed in CERCLIS is being addressed under the VCP and is not excluded under Paragraph II.B. of this MOA, Region 7 generally intends to include information in CERCLIS to reflect that site's status. Once NDEQ determines that all remediation activities at the site are complete, Region 7 generally intends to archive from CERCLIS those sites remediated under the VCP and for which the NDEQ has approved the No Further Action Letter pursuant to Neb. Rev. Stat. § 81-15,186. At a minimum, Region 7 and NDEQ intend to discuss the status of sites annually, or more frequently as necessary.

B. CERCLA § 128(b) provides limitations regarding federal enforcement actions at "eligible response sites," as defined in CERCLA § 101(41), that are being addressed in compliance with a state program that (1) specifically governs response actions for the protection of public health and the environment, and (2) maintains and updates at least annually a public record pursuant to CERCLA § 128(b)(1)(C). These limitations operate as a matter of law and are subject to the exceptions listed in CERCLA § 128(b). Thus, to the extent CERCLA § 128(b) applies and subject to the exceptions therein, EPA does not plan or anticipate taking an administrative or judicial enforcement action under CERCLA § 106(a) or § 107(a) against a person regarding the specific release that is addressed by that person at an eligible response site in compliance with the VCP.

C. Generally, Region 7 does not plan or anticipate taking removal or remedial action under CERCLA, 42 U.S.C. § 9601 et seq. at a site which is addressed by this MOA and is not an "eligible response site," while (1) that site remains in compliance with the VCP and the terms of any agreement with NDEQ, or (2) when a site investigation or remediation has been completed in accordance with the VCP and NDEQ has issued a No Further Action Letter for the site. Circumstances under which EPA may take action under its authorities include but are not limited to:

1. The VCP participant fails or refuses to complete the necessary response action including but not limited to operation and maintenance or long-term monitoring, in a timely manner, and NDEQ is unable to ensure completion of response actions at the site;

2. Region 7 determines that the site may present an imminent and substantial endangerment to human health or the environment; or

3. Following issuance of the No Further Action Letter by NDEQ, Region 7 or NDEQ determines that conditions at the site (including but not limited to those previously unknown to NDEQ and Region 7, and those which result from a failure to maintain land use restrictions, institutional and/or engineering controls) indicate that the site is no longer protective of human health and the environment or suitable for the authorized or current use.

D. If a VCP participant does not complete the necessary response activities including but not limited to operation and maintenance or long-term monitoring approved

by the NDEQ, NDEQ shall ensure that necessary response activities, if such activities are authorized by State statutes administered by the NDEQ, are (1) taken to protect human health and the environment, and (2) completed in a timely manner.

E. The NDEQ will continue to demonstrate, through the reporting commitment of Section IV.C. of this MOA, that the VCP has adequate resources to ensure that voluntary response actions are conducted in an appropriate and timely manner, and that meaningful outreach efforts are made to the public.

F. The NDEQ will conduct periodic audits and inspections of voluntary response actions.

IV. Protectiveness

A. NDEQ will ensure that voluntary response activities conducted pursuant to the VCP protect human health and the environment and conform to all federal and State environmental standards and substantive requirements.

B. When necessary to ensure the protectiveness of a remedy where the VCP participant uses controls such as environmental easements, deed notices or other restrictive covenants affecting the site, NDEQ agrees that these controls shall be filed in the Register of Deeds of the county where the site is located, and with any State-wide registry.

C. In addition to complying with the public record requirements described in CERCLA § 128(b)(1)(C), NDEQ will provide or make available to Region 7 information regarding participants in the VCP that are addressed under this MOA. On an annual basis the NDEQ will report or make available to Region 7 the following:

1. Number, names, and types of sites participating in the VCP and the status of response actions at those sites;

2. Number, names, and types of sites applying for or entering the VCP in the previous three months; and

3. Names of sites that received No Further Action Letters from the NDEQ for full or partial remediation in the previous three months.

V. Modification

A. Region 7 and NDEQ plan to keep the other party informed of any relevant proposed modifications to its statutory or regulatory authority, forms, or procedures. This MOA shall be revised upon mutual agreement and as necessary by the adoption of such modifications. If the Act or its implementation is modified and no mutual agreement can be reached regarding modification of this MOA, this MOA shall terminate within 60 days of the effective date of the modifications to the Act. Region 7 and NDEQ

will review the MOA annually. If either Region 7 or NDEQ have concerns regarding implementation of the MOA, they will notify the other party of those concerns. In the event a mutual agreement cannot be reached to resolve the issue, following 60 days written notice, either party can terminate this MOA. A modification must be in writing and signed by the signatories or their designees to become effective.

VI. Reservations of Rights and Limitations

A. EPA and NDEQ reserve any and all rights or authority they respectively have including but not limited to legal, equitable, or administrative rights. This specifically includes EPA and NDEQ's authority to conduct, direct, oversee, and/or require environmental response in connection with any facility or site participating in the VCP, as well as cost recovery related thereto. Notwithstanding any other provision of this MOA to the contrary, nothing herein affects or limits EPA or NDEQ's authority or ability to take any enforcement action authorized by law. This MOA does not have any legally binding effect; does not in any way grant or otherwise create any rights, obligations, responsibilities, expectations, or benefits for any party; and does not in any way alter either EPA or NDEQ's authority under State or federal law.

B. Entry into this MOA makes NDEQ eligible for grant funding under CERCLA § 128(a)(1)(A)(ii). However, this MOA does not obligate federal funds. Any EPA funding decisions will be based on agency funding priorities specified in EPA's guidelines for the CERCLA 128 Brownfields State and Tribal Response Program grants. In addition, all activities EPA may undertake in furtherance of this MOA are subject to the availability of appropriated funds.

For the Nebraska Department of Environmental Quality:

Michael Linder, Director
Nebraska Department of Environmental Quality

Nov. 9 2006
Date

For the U.S. Environmental Protection Agency, Region 7:

John B. Askew
Regional Administrator
U.S. Environmental Protection Agency, Region 7

NOV 22 2006
Date

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ATTACHMENT 2-1

REMEDIAL ACTION PLAN CHECKLIST

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Nebraska Department of Environment and Energy

Remedial Action Plan Checklist

This checklist should be used when preparing a Remedial Action Plan (RAP). It serves two purposes: First, it helps the applicant develop an appropriate RAP, both in terms of content and format. Second, it supports NDEE's review of the RAP after the application is received.

This checklist is not an all-inclusive list of the information that may be necessary to develop an appropriate RAP. It is intended as an aid to assist in developing the RAP. NDEE may request additional information, and some categories of information may not be applicable to every RAP.

Please specify in the boxes opposite each item whether the information is present (Y), absent (N), or not applicable (NA). Indicate the page number within the RAP where the information is included. Specific information for individual elements of the RAP are indicated. Additional general information for the RAP, including specific formats for tables and figures, are included at the end of the checklist. All acronyms are defined at the end of the checklist.

Applicant Name_____

Site or Property Name_____

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
2.1 EXECUTIVE SUMMARY		
➢ Summary and conclusions of the completed investigation		
➢ Identification of potential receptors		
➢ Overview of the conceptual site model		
➢ Interim remedial measures completed to date		
➢ Future land use plans		
➢ Remedial Action Objectives (RAOs) and proposed remediation goals (from the Remediation Goals Lookup Tables)		
➢ Description of anticipated remedial actions		
• Conceptual approach		
• Rationale used to support selection of remedial action and how it meets the five remedy evaluation criteria and RAOs developed		
➢ Any other site-specific issues that shouldbe considered during completion of remedial actions		
2.2 INVESTIGATION REPORT		
2.2.1 Compilation and Analysis of Background Information		
2.2.1.1 Site Information		
➢ Site name		
➢ Site type		
➢ Standard Industrial Classification code		
➢ Facility status (active/inactive, etc.)		
➢ Street address		
➢ Directions to site relative to nearest intersection of major highways		
➢ Nearest city or town and county		
➢ Legal description (¼, ¼, ¼, section, township, range)		
➢ Latitude and longitude in decimal degrees (linked to NAD 83)		
➢ Location map based on a USGS 7.5-minute quadrangle, with a reference to the quadrangle name and date		
➢ Applicant, owner, or designated POC with contact information		
➢ Contractors or consultants to the applicant or owner, with contact information		
➢ Documentation indicating that the applicant holds or can acquire title to all lands or has the necessary easements and rights-of-way for the remedial actions		
2.2.1.2 Physical Setting		
Surface features		
➢ Site layout map showing natural and man-made (current or former) features within 2,000 feet of site		
• Property boundary		
• Primary surface and subsurface structures		
• Roads, fences, other man-made boundaries		
• Streams, lakes, wooded areas, etc.		
• Onsite and nearby utility lines and conduits		
Climate and meteorology		
➢ Sources of information		
• National Oceanic and Atmospheric Administration – National Climatic Data Center (NOAA-NCDC)		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• University of Nebraska-Lincoln – High Plains Regional Climate Center (UNL – HPRCC)		
• Natural Resources Conservation Service – National Water and Climate Center (NRCS – NWCC)		
➢ Mean annual rainfall		
➢ Mean seasonal temperatures		
➢ Mean wind velocity and direction		
• Wind rose		
➢ Daily mean variances in atmospheric parameters		
Vegetation		
➢ Sources of information		
• Natural Resources Conservation Service – National Plant Data Center (NRCS – NPDC)		
• University of Nebraska-Lincoln – Institute of Agriculture and Natural Resources (UNL – IANR)		
➢ Type of plant cover		
➢ Density of plant cover		
➢ Sensitive environments – locally and regionally		
Topography and hydrology		
➢ Source of information		
• United States Geologic Survey (USGS)		
• University of Nebraska-Lincoln – Conservation and Survey Division (UNL – CSD)		
• Nebraska Department of Natural Resources (NDNR)		
➢ Descriptions and map(s) of		
• Topography		
• Drainage direction and routes		
• On- and off-site surface water bodies		
• Flood plains		
• Wetlands		
➢ Graphs/data indicating recurrence interval of floods on and near the site		
Soils and Geology		
➢ Source of information for soils		
• USDA - NRCS County Soil Survey (online or published)		
• Personal communication with specific county NRCS personnel (surveys not available or being revised)		
➢ Description of soils typical to site		
• Topographic setting (*i.e.*, upland slope or alluvial valley)		
• Probable parent material		
• Total organic content		
• Porosity and permeability		
➢ Soil map(s)		
➢ Source of information for geology		
• United States Geologic Survey (USGS)		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• University of Nebraska-Lincoln – Conservation and Survey Division (UNL – CSD)		
• Nebraska Department of Natural Resources (NDNR)		
➢ Generalized stratigraphic section showing regional geologic formations, formal names and ages of units, lithologies, and unconformities		
➢ Map(s) showing regional structural features		
➢ Map(s) showing important surficial deposits and/or other geologic features		
➢ Regional and local geologic cross-sections with control points, emphasizing:		
• Relict channels		
• Paleosols		
• Impermeable layers or boundaries		
• Potential preferential pathways		
• Geometry of complex geologic strata		
• Other important geologic features		
Hydrogeology		
➢ Source of information		
• United States Geologic Survey (USGS)		
• University of Nebraska-Lincoln – Conservation and Survey Division (UNL – CSD)		
• Nebraska Department of Natural Resources (NDNR)		
➢ Approximate depth to groundwater		
➢ Approximate depth to bedrock		
➢ Primary, surficial, and/or perched aquifer characteristics		
• Hydraulic conductivity and porosity		
• Thickness		
• Aquifer material		
• Description of aquifer usage		
• Potentiometric surface maps or water table maps with control points		
• Approximate groundwater flow direction and rate		
➢ Confining zone or aquitard characteristics		
➢ Nearby pumping wells that influence groundwater flow		
• Well depth and completion zone		
• Pump level and pumping rate and frequency pumped		
• Radius of influence of drawdown cone		
• Capture zone		
2.2.1.3 Historical Operations and Site Conditions		
➢ A list of the previous owners and their ownership dates (provide copies of deeds or other county records in an appendix)		
➢ Any historical or alternative facility names		
➢ Discussion of historical site use, previous business operations, and periods of operation		
• Sources of information		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
▪ Nebraska Department of Natural Resources (NDNR)		
▪ Nebraska Department of Transportation (NDOT)		
▪ University of Nebraska-Lincoln – Conservation and Survey Division (UNL – CSD)		
▪ United States Department of Agriculture (USDA) – Farm Service Agency		
▪ United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)		
▪ Environmental Protection Agency (EPA) Environmental Monitoring Systems Laboratory		
▪ Department of Defense (DOD)		
▪ United States Geological Survey USGS – Earth Resources Observation Systems		
▪ County government		
▪ City government		
▪ Local library historical collections		
▪ Local newspaper archives		
▪ Private historical collection		
• Dates that the site was active		
• Site map showing historical operation areas		
• Historical aerial photographs		
• Topographic maps		
• Sanborn or other fire insurance maps		
• Local historical collections, or city directories that illustrate site use and periods of operation		
• Types of historical operations		
▪ Landfill		
▪ Grain storage facility		
▪ Former manufactured gas plant		
▪ Dry cleaners		
▪ Salvage yard		
▪ Formerly Used Defense Site (FUDS)		
▪ Gas station		
▪ Drum storage		
▪ Pesticide formulation		
▪ Agricultural chemical distribution or cooperative		
▪ Explosive or fireworks manufacturing		
▪ Ammunition production or disposal		
▪ Battery-breaking operation		
▪ Mining operation, including mills and smelters		
▪ Solvent recycler		
▪ Waste oil recycler		
▪ Metals plating operation		
▪ Other industrial, manufacturing, or potentially hazardous waste generation, treatment, storage or disposal operation at the site.		
▪ Previous site uses believed to be nonhazardous		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
➢ Possible contaminant sources		
• Aboveground storage tank		
• Underground storage tank		
• Drum		
• Other container		
• Aboveground pipeline		
• Underground pipeline		
• Lagoon or pond		
• Seepage pit or dry well		
• Septic tank or lateral field		
• Surface spill or discharge		
• Pit		
• Drip tank		
• Adjacent property		
➢ Detailed description of information regarding historical non-hazardous solid waste generated or managed at the site		
➢ Detailed description of information regarding historical hazardous wastes generated, received, disposed of, or managed at the site		
• Types of hazardous wastes		
• Quantities and rates of hazardous wastes generated, received, disposed of, or managed		
• Discussion of historical waste management practices		
• Source of information		
▪ Load or waste manifests		
▪ Safety Data Sheets (SDSs; aka, MSDSs)		
▪ Bills of lading		
▪ Historical sources regarding facility production		
➢ Detailed description of processing or storage locations		
• Transformer shear area		
• Chemical storage/ formulation areas		
• Battery storage area		
➢ Detailed description of information regarding historical environmental incidents, spills, or releases of hazardous constituents, for all previous businesses		
• Source of information		
▪ NDEE Petroleum Remediation files		
▪ NDEE National Pollutant Discharge Elimination System files		
▪ NDEE Integrated Waste Management files		
▪ NDEE environmental assessment files		
▪ NDEE release assessment files		
▪ NDEE Superfund files		
▪ NDEE RCRA files		
▪ NDEE RAPMA files		
▪ EPA CERCLIS		
▪ EPA RCRA INFO		
▪ EPA TRIS		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
▪ USDA		
▪ DOD – FUDS		
▪ County health department		
▪ Other sources (i.e., interviews, newspaper accounts, internet)		
2.2.1.4 Current Operations and Site Conditions		
➢ Discussion and illustration of current site use and business operations		
• Aerial photographs		
• Topographic maps		
• City directories		
• Types of operations		
▪ Landfill		
▪ Grain storage facilty		
▪ Former manufactured gas plant		
▪ Dry cleaner		
▪ Salvage yard		
▪ Formerly Used Defense Site (FUDS)		
▪ Gas station		
▪ Drum storage		
▪ Pesticide formulation		
▪ Agricultural chemical distribution or cooperative		
▪ Explosive or fireworks manufacturing		
▪ Ammunition production or disposal		
▪ Battery-breaking operation		
▪ Mining operation, including mills and smelters		
▪ Solvent recycler		
▪ Waste oil recycler		
▪ Metals plating operation		
▪ Other industrial, manufacturing, or potentially hazardous waste generation, treatment, storage or disposal operation at the site.		
▪ Previous site uses believed to be nonhazardous		
➢ Possible contaminant sources		
• Aboveground storage tank		
• Underground storage tank		
• Drum		
• Other container		
• Aboveground pipeline		
• Underground pipeline		
• Lagoon or pond		
• Seepage pit or dry well		
• Septic tank or lateral field		
• Surface spill or discharge		
• Pit		
• Drip tank		
• Adjacent property		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
➢ A detailed description of information regarding current hazardous wastes generated, received, disposed, or managed at the site		
• Types of hazardous wastes		
• Quantities and rates of hazardous wastes generated, received, disposed, or managed		
• Discussion of current waste management practices		
• Source of information		
▪ Load or waste manifests		
▪ Landfill invoices		
▪ Safety Data Sheets (SDSs; aka MSDSs)		
▪ Bills of lading		
• Generation rates of hazardous constituents		
➢ A detailed description of information regarding current releases of hazardous constituents		
➢ Descriptions of all storage or disposal vessels, above and below ground, including the following information:		
• Location		
• Number		
• Type		
• Size		
• Age		
• Condition		
• Labels present		
• Contents, past or current		
• Any conduits or disposal systems associated with the vessels		
• Any piping, particularly below ground, to or from vessel		
➢ Existing institutional controls affecting the site		
• Description of institutional controls		
• Name and contact information for person(s) responsible for implementing, monitoring, and enforcing institutional controls		
➢ List of current environmental permits		
➢ Descriptions of any ongoing interim remedial actions		
➢ Descriptions of any ongoing investigations, remediation, or monitoring activities		
➢ Results of searching the following databases for the site or property adjacent to the site:		
• Federal National Priorities List		
• Federal CERCLIS		
• Federal RCRA treatment, storage, or disposal facilities (RCRIS)		
• Federal RCRA generators		
• Federal Emergency Response Notification System list		
• NDEE's Integrated Information System (IIS)		
▪ State hazardous waste sites		
▪ State landfills		
▪ State Leaking Underground Storage Tanks		
• State Fire Marshal registered underground storage tanks		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• EPA TRIS database		
• Other database or source identifying relevant information		
➢ Results of interviews with the site owner, administrator, and/or former employees with attached questionnaire		
2.2.1.5 Previously Reported Investigations		
Summary of previous reports		
➢ Summary and chronology of previous reports with reference to location of attached report in RAP		
➢ Summary of any relevant correspondence from NDEE, EPA, or private entities (such as consulting firms) regarding previous environmental reports, with copies of correspondence provided in an appendix		
➢ Summary of findings, conclusions, and recommendations of previously reported investigations		
Data Quality and Temporal Variability		
➢ Were appropriate QA/QC standards and procedures in-place during the collection of these data? Explain.		
➢ Did the results of QA/QC samples indicate any potential problems with the data? Explain.		
➢ Were laboratory methods, detection limits, and holding times adequate for the intended use of the data (i.e. if data is to be used for defining nature and extend of contamination at MCLs, were detection limits below currently established MCLs)? Explain.		
➢ Is any of the data variable temporally (i.e. are conditions likely to have changed significantly since the data was last collected)? Explain.		
2.2.1.6 Potential Chemicals of Concern		
➢ Bulleted list of potential chemicals of concern based on review of all existing historical data and previous investigations		
➢ Discussion of the relationship between each type of material received or processed on site and each of the chemicals of concern		
2.2.1.7 Data Gaps		
➢ Bulleted list of data gaps and/or deficiencies identified based on review of all existing historical data and previous investigations (see sections 2.2.1.2 – 2.2.1.5 of the guidance and this checklist)		
➢ Some commonly encountered data gaps are:		
• Physical site characteristics		
▪ Geology, hydrologeology, soils, etc.		
• Nature and extent of contamination		
▪ Source areas and sources		
▪ Lateral and vertical extent of contamination in soils, groundwater, and/or soil gas		
▪ Magnitude of contamination		
▪ Highest concentrations detected		
• Geologic and hydrogeologic characteristics affecting fate and transport		
▪ Carbon content of soils		
▪ Cation exchange capacity of soils		
▪ Dissolved oxygen concentration		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
▪ Oxidation-reduction potential		
• Potential receptors		
▪ Water supply wells within 1 mile		
▪ Sensitive populations: daycares, schools, nursing homes		
▪ Sensitive habitats		
➢ For additional information that may help you identify data gaps, see sections 2.2.3 – 2.2.6 of the guidance and this checklist		
2.2.2 Field Investigation		
2.2.2.1 Investigation Objectives		
➢ Bulletted list of objectives for investigation		
➢ Rationale for selection of each objective		
2.2.2.2 Data Quality Objectives		
➢ Bulletted list of objectives for data quality, organized by media		
➢ Rationale to support selection of each objective		
2.2.2.3 Sampling and Analysis Procedures		
Field Sampling Procedures		
➢ Sample (i.e. soil boring, direct-push well) locations		
• Descriptions of locations (latitude/longitude coordinates referenced to NAD 83)		
• Map showing sampling locations		
• Description of location survey method (Global Positioning System – GPS – preferred)		
• Explanation of methods for locating future follow-up samples (e.g. property may be redeveloped and site layout may change)		
• Location and number of background samples		
• Rationale to support selection of sampling locations		
➢ Sampling intervals		
• Descriptions of intervals		
• Table, diagram, or cross section indicating intervals for each sampling point		
• Rationale to support selection of sampling intervals		
➢ Sample types		
• Sampling information for each medium sampled		
• Sampling methods, with justification for method		
➢ Sample collection		
• Collection methods for soil sampling		
▪ Were grab or composite soil samples taken?		
▪ Drilling method (hollow stem, direct push, mud rotary)		
▪ Auger size		
▪ Sampler type (split spoon, continuous, etc.)		
▪ Center bit type		
• Collection methods for groundwater sampling		
▪ Sampling methods (traditional, low-flow purging, passive-diffusive bags, etc.)		
▪ Purging rate and volume		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
▪ Measured stabilization parameters – dissolved oxygen, oxidation-reduction potential, pH, specific conductance, etc.		
• Collection methods for soil gas/indoor air sampling		
▪ Sampling methods (low-flow air methods)		
▪ Sample collection vessel (Summa canister, Tetlar bag, etc.)		
▪ Purging rate and volume		
• Total number of samples taken		
• Description of sample labeling/identification system		
• Order of sample collection with regards to volatilization and expected contamination levels		
➢ Field screening methods		
➢ Sampling equipment		
• Equipment used		
• Cleaning procedures		
• Was calibration of instruments performed?		
➢ Table or list of analytical parameters		
➢ Analytical methods		
• Analytical laboratory, with contact information		
• Holding times for all samples analyzed		
• Practical Quantitation Limits (PQLs) for each media:		
▪ For groundwater, PQLs must be less than the VCP RGs for the groundwater direct exposure pathway or the sandy-soil residential vapor intrusion exposure pathway, whichever is less		
▪ For soil, PQLs must be less than the VCP RGs for residential direct contact exposure pathway or the migration to groundwater pathway, whichever is less		
▪ For soil gas, PQLs must be less than the VCP RGs for the sandy-soil residential vapor intrusion exposure pathway, whichever is less		
▪ For surface water, PQLs must be less than the applicable regulatory limit (Nebraska Title 117) or otherwise approved by NDEE		
• Description and table of analytical laboratory methods used for each parameter and media		
▪ Standard method for VOCs: 8260b		
▪ Standards method for SVOCs: 8270		
▪ Various methods for metals		
▪ Methods for Dioxins 8280 or 8290 depending on detection limit needed.		
▪ Phenols: 8270 or 8310. 8310 will be necessary for most groundwater analysis because the detection limit for 8270 is above the MCL for some contaminants.		
• Description of any alternative laboratory methods used, including explanation of why the methods were appropriate		
➢ Well purging data		
• Purging technique		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Purging dates		
• Volumes purged		
• Rate of purging		
• Temporal variations in parameter values, such as pH, temperature, conductivity, redox, turbidity, or dissolved oxygen		
• Detection of immiscible layers		
Quality Assurance/Quality Control		
➢ Description (i.e. number and location) of QA/QC samples		
• Trip blanks – one per every cooler used to transport and store samples		
• Field blanks – minimum of 5% (i.e. 1 field blank for every 20 investigative samples)		
• Equipment rinsate blanks – blanks for each type of decontaminated sampling equipment		
• Field split samples		
• Field duplicate samples – minimum of 5% (i.e. 1 duplicate for every 20 investigative samples)		
• Matrix spike and matrix spike duplicates		
2.2.2.4 Health and Safety		
➢ Brief statement that a health and safety plan was prepared and used during the investigation		
2.2.2.5 Investigation-Derived Waste		
➢ Source of information: NDEE Investigation-Derived Waste (IDW) Environmental Guidance		
➢ Description of strategy for managing and disposing of investigation-derived waste		
• Procedures for segregation of hazardous and non-hazardous waste		
• Description of how hazardous waste sent off-site was managed		
▪ Location(s) of disposal site		
▪ Supporting documentation such as load manifests or disposal receipts		
➢ Description of procedures used to ensure compliance with federal and state rules		
• Analyze total metals first, then TCLP for any samples that exceed 20X the TCLP limit		
2.2.3 Physical Site Characterization		
2.2.3.1 Surface Water		
➢ Description of physical aspects of surface water bodies, including lakes, rivers, and impoundments		
➢ Maps, diagrams, or tables containing flow rates, channel dimensions and elevations, river stages, and historical flooding characteristics		
➢ Maps and diagrams illustrating surface water/groundwater relationships		
➢ Topographic maps		
2.2.3.2 Soils and Geology		
➢ Sampling location maps		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Locations of soil borings, direct-push sampling, or other investigation points used to characterize soils and geology		
➢ Geologic cross-sections		
• Cross section showing geologic strata and water table, oriented parallel to groundwater flow direction		
• Cross section showing geologic strata and water table, oriented perpendicular to groundwater flow direction		
• Cross section(s) showing other geologic or man-made features that might influence the transport of contaminants in the subsurface, such as fractures zones, highly permeable channels, and/or utility conduits		
2.2.3.3 Hydrogeology		
➢ Sampling location maps		
• Locations of monitoring wells, piezometers, direct-push sampling locations, or other investigation points used to characterize hydrogeology		
➢ Potentiometric surface and/or water table maps		
• Control points at which the static water level is measured		
• Water-level elevations at control points		
• Contour interval appropriate for gradient across site		
• Arrow indicating groundwater flow direction		
• Additional maps depicting seasonal and/or long-term changes in water table elevation and groundwater flow direction		
➢ Aquifer characteristics		
• Hydraulic conductivity		
• Storativity		
• Transmissivity		
• Specific yield		
➢ Well completion information		
• Well identification numbers and coordinates in decimal degrees, linked to NAD 83		
• Elevations of ground surface, top of well casing, relative to mean sea level		
• Static water level		
• Screen length		
• Screened interval, in depth below ground surface and estimated elevation above mean sea level		
• Dates of well completion and water level measurements		
2.2.4 Nature and Extent of Contamination		
2.2.4.1 Sources		
➢ Discussion of known and suspected on-site sources, 'hot spots,' and potential sources of contamination migrating from off-site		
➢ Source location maps		
• Tanks, lagoons, pits, or other potential or known source areas		
• Areas of contaminated soil identified based on historical information or sampling and analysis		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• 'Hot spots'		
• Potential sources of contamination migrating from off-site		
2.2.4.2 Ambient Air		
➢ Descriptions of each source of airborne contaminants (e.g. contaminated soils, off-gassing lagoon, etc.)		
➢ Other appropriate information that can be used to determine the extent and direction of migration		
➢ Notify NDEE if it is determined that an on-going source of air contamination exists at the site		
• Information gathered as a result of discussions with NDEE, including sampling locations, methods, and analytical results in tabular form		
2.2.4.3 Surface water and sediments		
➢ Discussion of nature and extent of contamination in surface water and sediments		
➢ Sample location maps		
➢ Table(s) containing sample information and laboratory analytical results		
• Sample identification		
• Sample collection method		
• Sampling date		
• Sample location (linked to NAD 83)		
• Target compounds		
• Results from field screening		
• Concentrations of contaminants detected (values exceeding applicable regulatory limits should be highlighted)		
• Analytical method and detection limits for each compound		
• Appropriate data validation qualifiers		
• QA/QC sample results		
➢ Maps showing the distribution of contamination in surface water and sediment		
2.2.4.4 Soils and vadose zone		
➢ Discussion of nature and extent of contamination in soils and vadose zone		
➢ Lateral and vertical extent of contamination defined to most conservative RGs (from RG Lookup Tables)		
➢ Table(s) containing sample information and laboratory analytical results		
• Sample identification		
• Sample collection method		
• Sampling date		
• Sample location (linked to NAD 83) and depth		
• Target compounds		
• Results from field screening		
• Concentrations of contaminants detected (values exceeding RGs should be highlighted)		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Analytical method and detection limits for each compound		
• Appropriate data validation qualifiers		
• QA/QC sample results		
➢ Sample location maps		
➢ Maps illustrating the horizontal distribution of soil contamination		
➢ At least two (2) cross sections oriented perpendicular to each other showing the vertical distribution of soil contamination		
2.2.4.5 Soil Gas/Indoor Air		
➢ Discussion of nature and extent of contamination in soil gas		
• Discussion of indoor air and/or sub-slab soil gas sampling results, if performed as part of vapor intrusion invesigation/assessment		
• Discussion of tempral variability based on results of multiple sample rounds		
➢ Lateral and vertical extent of soil gas contamination defined to most conservative RGs (from RG Lookup Tables)		
➢ Table(s) containing sample information and laboratory analytical results		
• Sample identification		
• Sampling collection method		
• Sampling date		
• Sample location (linked to NAD 83) and depth		
• Target compounds		
• Results from field screening or mobile lab		
• Concentrations of contaminants detected (values exceeding RGs shoud be highlighted)		
• Analytical method and detection limits for each compound		
• Appropriate data validation qualifiers		
• QA/QC sample results		
➢ Sample location maps		
➢ Maps illustrating the horizontal distribution of soil gas contamination		
➢ At least two (2) cross sections oriented perpendicular to each other showing the vertical distribution of soil gas contamination		
2.2.4.6 Groundwater		
➢ Discussion of nature and extent of contamination in groundwater		
➢ Lateral and vertical extent of contamination defined to MCLs		
➢ Table(s) containing sample information and laboratory analytical results		
• Well identification		
• Sample collection method		
• Sampling date		
• Sample location (linked to NAD 83) and depth		
• Target compounds		
• Results from field screening		
• Concentrations of contaminants detected (values exceeding RGs should be highlighted)		
• Analytical method and detection limits for each compound		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Appropriate data validation qualifiers		
• QA/QC sample results		
➢ Sample location maps		
➢ Isoconcentration maps showing horizontal distribution of contamination in groundwater		
➢ At least two (2) isoconcentration cross-sections, oriented parallel and perpendicular to groundwater flow direction, showing vertical distribution of contamination in groundwater		
➢ Isopach maps and cross sections showing locations, horizontal extent, and thickness of free product		
2.2.5 Contaminant Fate and Transport		
2.2.5.1 Contaminant characteristics		
➢ Narrative description of each contaminant's characteristics affecting fate and transport		
Chemical and physical properties of contaminants		
➢ Table of contaminant properties		
➢ Name of contaminant		
➢ Density		
➢ Solubility		
➢ Octanol/water partition coefficient		
➢ Vapor pressure, volatility, Henry'e Law constant		
➢ Other relevant properties		
Contaminant persistence		
➢ Description of each contaminant's persistence in air		
➢ Description of each contaminant's persistence in surface water and sediments		
➢ Description of each contaminant's persistence in soil and vadose zone sediments		
➢ Description of each contaminant's persistence in groundwater		
Transport and Partitioning		
➢ Description of the chemical and physical properties of each contaminant that affect transport (i.e. solubility, density)		
➢ Description of the chemical and physical properties of each contaminant that affect partitioning (i.e. octanol/water partition coefficient, octanol/carbon coefficient)		
Transformation and Degradation		
➢ Discussion of the likelihood that contaminants will be transformed or degraded into other compounds		
➢ Table listing each contaminant and its transformation and/or degradation products		
➢ Description of the chemical characteristics affecting fate and transport of transformation and/or degradation products		
2.2.5.2 Site characteristics		
Environmental media		
➢ Description of media characteristics that might influence contaminant fate and transport		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Evaluation of the potential affect of existing aqueous geochemical conditions on contaminant fate and transport		
• Total organic carbon content		
• Porosity		
• Permeability		
• pH		
• Alkalinity		
• Cation exchange capacity		
• Hardness		
• Any observed heterogeneity associated with the media characteristics		
Migration pathways		
➢ Description of migration pathways that exist at the site		
• Ambient air (from surface soil contamination)		
• Surface water (including surface water sediments)		
• Soil (surface and vadose zone; includes leaching to groundwater)		
• Soil gas (vapor intrusion)		
• Groundwater		
Preferential flow paths		
➢ Anthropogenic		
• Sewers		
• Utility trenches		
• Wells		
• Basements		
• Tunnels		
• Elevator shafts		
➢ Natural		
• Sand/gravel lenses		
• Paleo-channels		
• Fractures in bedrock		
➢ Rationale used to omit any preferential flow paths from further evaluation		
Exposure pathways		
➢ Dermal contact with soils		
➢ Ingestion of soil		
➢ Inhalation of volatiles and particulates from soils (e.g. windblown dust)		
➢ Ingestion of water		
➢ Inhalation of volatiles from water during showering/bathing		
➢ Inhalation of vapors from vapor intrusion into indoor air (e.g., through foundations, floor drains, etc.)		
2.2.6 Potential Receptors		
2.2.6.1 Human receptors		
➢ Description of nearby population centers, including general demographic description		
➢ Present and planned sensitive populations within 2,000 feet of the site		
• Daycare or businesses with daycare facilities		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Schools		
• Nursing homes and retirement communities		
• Hospitals and rehabilitation facilities		
➢ Land use survey of the area within 500 feet of site, including information about		
• General demographics		
• Zoning		
• Land usage at site and at adjacent properties (e.g., commercial, residential)		
• Table of adjacent landowners, with contact information		
• Any current institutional controls affecting the site		
➢ List of all water supply wells within 1 mile of site, including wells constructed before 1990s		
• Sources of information used in survey		
• Location (latitude/longitude coordinates referenced to NAD 83)		
• Well use – irrigation, private drinking water supply, industrial, etc.		
• Diameter		
• Depth		
• Screened interval		
• Capacity		
• Static and pumping water levels		
• Well head elevation		
• Owner		
• Location of the closest water supply well		
• Location and description of most susceptible water supply well		
• Location and description of any impacted water supply wells		
• Proof of notification of offsite impacted land owner		
• List of any water supply wells downgradient from the site within 5 miles		
• Map of any wellhead protection areas near the site		
➢ If groundwater contamination is present, include analytical results of samples from down-gradient drinking water supply wells (results should be presented in section 2.2.4.5)		
2.2.6.2 Ecological Receptors		
➢ Location and description of sensitive environments within 2,000 feet of the site		
• Wetlands or wildlife habitats		
• Threatened or endangered species known or suspected to live on the site		
➢ Location and description of area natural resources		
• Groundwater use(s)		
• Agricultural use(s)		
• Other natural resources		
➢ Surface water survey		
• Location of closest surface water body		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Location and description of the most susceptible surface water body		
• Location and description of any impacted surface water bodies		
• List of any surface water bodies downgradient from site within 1,000 feet		
• Surface water survey map		
➢ Answers to the questions listed in Section 2.2 of the *Protocol for VCP Remediation Goal Lookup Tables* document		
2.2.7 Conceptual Site Model		
➢ Summary of how and where contaminants are expected to move		
➢ Potential impacts to human health and the environment based on predicted movement of contaminants		
➢ Depiction of intended land use		
• Location and use of buildings		
• Location and depth of below-grade structures		
▪ basements		
▪ utility trenches		
▪ tunnels		
▪ elevator shafts		
▪ tanks		
• Description of landscaping features or decorative ponds		
• Description of any potential sensitive populations		
• Description of any current or proposed institutional controls		
➢ Potential contaminant exposure pathways		
• Ingestion of soil		
• Inhalation of volatiles and particulates from soils (e.g. windblown dust)		
• Dermal contact with soils		
• Ingestion of water		
• Inhalation of volatiles from water during showering/bathing		
• Inhalation of vapors from vapor intrusion into indoor air (e.g., through foundations, floor drains, etc.)		
➢ Illustration of why contamination is a problem and why remediation is needed, in light of proposed land use		
2.2.8 Summary and Conclusions		
➢ Summary of significant findings of investigation		
➢ Conclusions regarding the full nature and extent of contamination		
• Source areas or 'hot spots' of contamination in soil, groundwater, and/or surface water		
• Horizontal and vertical extent of contamination in each media		
➢ Potential contamination migration routes for each media		
➢ Potential impacts of contamination to human health and the environment		
2.3 REMEDIAL ACTION WORK PLAN		
2.3.1 Interim Remedial Actions		
➢ Detailed description of any interim remedial actions for the site		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Locations		
• Duration		
• Methods		
➢ Justification of the implementation of interim remedial actions		
➢ Evaluation of whether interim remedial actions are compatible with the final remedy		
➢ Evaluation of whether interim remedial actions can be the final remedy		
➢ Description of the process by which the interim remedial actions will be decommissioned or incorporated into the final remedy		
2.3.2 Remedial Action Objectives		
➢ Bulleted list of RAOs		
• Contaminant(s) of concern		
• Cleanup levels for each contaminant		
• Locations at which cleanup levels will be achieved		
• Timeframe according to which remedial actions will be completed		
• Exposure routes to be addressed		
• Potential receptors to be addressed		
➢ Rationale for deciding which contaminants will be remediated and the level to which they will be reduced		
➢ Preliminary RAC Determination worksheet provided		
2.3.3 Proposed Remedial Action		
➢ Briefly describe the selected remedial action and explan how it will achieve the following environmental results (you do not have to describe the step-by-step evaluation in the report):		
• Overall ability to protect human health and the environment		
• Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)		
• Long-and short-term effectiveness and permanence		
• Reduction of toxicity, mobility, or volume through treatment		
• Community acceptance		
➢ Description of selected remedial action, including the information described in relevant sections below		
2.3.3.1 Presumptive Remedies		
➢ Description and justification for use of presumptive remedies, if applicable		
2.3.3.2 Innovative Technologies		
➢ In-situ bioremediation of groundwater		
• Type of biodegredation mechanism		
• Maps showing the locations of injectate wells		
• Well construction information		
• Maps, cross sections, and construction information for reactive barriers or other systems used to introduce reactants into the subsurface		
➢ Phytoremediation		
• Type of application and details of process employed		
• Plant types, root depths, locations, and other information		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
➢ Passive groundwater remediation (i.e., monitored natural attenuation)		
• Methods for verifying that contaminants are degrading, rather than being diluted		
• Methods for verifying that contaminants are degrading at a rate that makes it suitable as a remedy		
• See section 2.3.3.5 for additional information regarding groundwater monitoring		
➢ Other innovative technology		
• Brief description of the technology		
• Maps, cross sections, and/or diagrams to illustrate planned remedial system		
2.3.3.3 Traditional Technologies		
➢ Soil excavation and removal		
• Extent and depth of soil to be excavated		
• Plans for refilling and regrading excavated areas		
• Maps and diagrams to illustrate locations, sizes, and shapes of these areas		
➢ In situ treatment of soil		
• Describe type of *in situ* treatment to be used		
• Overall systems for injection or extraction		
• Maps of cross-sections showing treatment points or radius of influence of the treatment system		
➢ Groundwater pump-and-treat		
• Describe basic treatment process		
• Maps showing locations of wells		
• Well construction information		
• Capture zone information		
• Other appropriate maps, cross sections, and diagrams		
➢ Air sparging/Soil vapor extraction		
• Maps of well locations		
• Well construction information		
• Radius of influence of the system		
• Cross sections illustrating relationship among wells, contaminated zones, water table, and stratigraphic features		
2.3.3.4 Engineering Controls		
➢ Low-permeability barriers and containment structures		
• Describe type of engineering control		
• Thickness and engineering properties of cover material		
• Grading plans for the site		
• Maps, cross sections, and diagrams as appropriate		
• For landfill caps, contact NDEE regarding information about other applicable guidance documents and checklists of information to submit		
➢ Physical access barriers		
• Describe type of barrier		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Maps, diagrams, and cross sections to illustrate location, size, and other construction information		
➢ Discussion of how and why the engineering control is appropriate for the site		
2.3.3.5 Institutional Controls		
➢ Descriptions of planned institutional controls, including category and type:		
• Governmental controls		
▪ Zoning		
▪ Building codes		
▪ Drilling permit requirements		
▪ State or local groundwater use regulations		
• Proprietary controls		
▪ Environmental Covenants (per NUECA)		
▪ Other Covenants		
▪ Easements		
• Enforcement and permit tools with institutional control components		
▪ Remedy agreements		
▪ Administrative orders		
▪ Consent decrees		
▪ Permit conditions		
• Informational devices		
▪ State registries		
▪ Deed notices		
▪ Advisories		
➢ Discussion of how the institutional control will minimize the potential for human exposure to contamination and protect the integrity of the remedy		
2.3.4 Performance monitoring		
➢ Strategy for conducting performance monitoring		
• Monitoring or sampling objectives		
• Planned or existing monitoring locations		
• Monitoring schedule		
• Analytical parameters		
➢ Timeline for submittal of periodic performance monitoring reports. Reports should include:		
• Analytical results		
• QA/QC results		
• Chain of custody records		
• Groundwater sampling and field data sheets		
• Data tables containing groundwater elevations and well data		
• Groundwater contour maps		
➢ Operation and maintenance plan for:		
• Inspection procedures and tasks to be completed as part of the routine operation and maintenance of the system		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• General description of the contingencies that will be used in the event the performance monitoring system requires repair or modification beyond the scope of routine operation and maintenance		
➢ Statement that you contacted NDEE to determine whether a startup report will be needed		
➢ Expected remediation timeframe (an acceptabe timeframe will be the period of potential exposure to contamination in the absence of any remediation or 20 years, whichever is less)		
2.3.5 Remediation Waste Management Plan		
➢ Procedures for managing and disposing of remediation-derived waste		
➢ Facilities or methods for on-site treatment		
➢ Other information as outlined in Attachment 2-3		
2.3.6 Permitting and Regulatory Involvement		
➢ Description of applicable permits and regulations		
• Air discharge permit		
• Solid waste disposal permit		
• Groundwater well permits		
• Surface water appropriations permit		
• Injection or reinjection permit		
• Discharge to surface water permit		
• Discharge to sanitary sewers permit		
• Local building, plumbing, and electrical permits		
• Necessary easements or variances		
• Access agreements		
➢ Statement that a site-specific Health and Safety Plan will be used for field activities associated with the remedial action		
2.3.7 Proposed Schedule of Remedial Activities		
➢ Table containing:		
• Description of activity		
• Date of planned initiation		
• Date of planned completion		
• Other relevant information		
2.4 TABLES		
➢ All tables are numbered and titled		
➢ All tables are easily legible and understandable		
➢ All abbreviations used in the table or table title are spelled out in table footnotes		
2.5 FIGURES		
➢ Horizontal and vertical scales bars on cross-sections		
➢ Horizontal scale bars on maps		
➢ Legend		
➢ Orientation labels (i.e., north arrow) on maps		
➢ Date, title, and source of base maps		
➢ Cross-section control points shown on an associated map, with reference to map on cross-section		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
➢ Date(s) data was collected indicated on map		
➢ All features on maps clearly labeled		
➢ Site boundaries clearly labeled		
➢ Photographs scanned and printed at high resolution (300 dpi scanned, 600 dpi printed), preferably in color, including aerial photographs		
2.5.1 Maps		
➢ Map legend, containing:		
• Project name, facility address, and NDEE file information (e.g., NDEE IIS Facility Number)		
• North arrow (not hand drawn)		
• Scale in standard units (e.g. one mile, 1000 feet, etc.)		
• Symbols and explanation of symbols		
➢ Legible symbols		
➢ Different symbols for different types of related features (e.g., different symbols for differnebt types of water wells)		
➢ Property boundaries of subject site		
➢ Large size maps (>11' x 17") folded and placed in plastic sleeve		
2.5.2 Aerial Photographs		
➢ Source of photos (government agency(ies) and/or private company(ies))		
➢ Date of photograph		
➢ Flight and frame number, COQQ number, or other information sufficient to document or obtain the photographs		
2.6 APPENDICES		
➢ Borehole logs		
• Facility name		
• Borehole identification		
• Borehole location, linked to NAD 83		
• Drilling method		
• Soil/bedrock lithological description (soil or rock type)		
• Soil/bedrock texture, fractures, and secondary porosity features		
• Color (Munsell soil color or Geological Society of America rock color chart identification)		
• Degree of saturation		
• Depths to water and bottom		
• Drilling rate or blow counts		
• Start and stop times and dates for drilling		
• Sampling equipment used		
• Percent sample recovered		
• Organic vapor field screening readings		
• Sample depth, number, and type		
➢ Well construction logs		
• Facility name		
• Well identification		
• Well location		
• Borehole diameter, total depth, plug back depth		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Casing and screen material		
• Casing and screen diameter		
• Screen length and interval		
• Screen slot size		
• Sump length		
• Filter pack size and interval		
• Spacing between casing and borehole wall		
• Placement and construction of seal and grout		
• Protective casing and surface structures		
➢ Complete results of field screening		
➢ Analytical reports for soil gas, groundwater, or soil samples, including QA/QC results		
➢ Data validation and usability summary		
➢ Vadose zone or aquifer testing data and estimation calculations		
➢ Flow modeling data, calculations, and results		
➢ Photographic documentation of investigative activities		
➢ Copies of log books, field sheets, chain-of-custody forms, or other relevant supporting documentation.		
➢ Copies of waste manifests, aerial photographs, and other documents used to characterize the site		
➢ Copies of relevant property deeds		
➢ Quality Assurance Project Plan (QAPP)		
➢ If QAPP has been modified for RAWP, include new document here		

ACRONYMS/ABBREVIATIONS

CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Act Information System
COQQ = Compressed Ortho Quarter Quad
CSD = Conservation and Survey Division
DOD = Department of Defense (U.S.)
Dpi = dots per inch
EPA = Environmental Protection Agency (U.S.)
FUDS = Formerly used defense sites
MCL = Maximum Contaminant Level
MSDS = Manufacturer's safety data sheet
N = Not included/absent
NA = Not applicable
NAD 83 = North American Datum 1983
NDEE = Nebraska Department of Environment and Energy
NDNR = Nebraska Department of Natural Resources
NRCS = Natural Resources Conservation Service
NUECA = Nebraska Uniform Environmental Covenants Act
PQL = Practical quantitation limit
PRG = Preliminary remediation goal
QA = Quality assurance
QC = Quality control
RAC = Remedial action class
RAO = Remedial action objective
RAP = Remedial Action Plan
RAPMA = Remedial Action Plan Monitoring Act
RAWP = Remedial action work plan
RCRA = Resource Conservation and Recovery Act
RCRIS = RCRA Information System
RG = Remediation goal
SVOC = Semi-volatile organic compound
TCLP = Toxicity Characteristic Leaching Procedure
TRIS = Toxics Release Inventory System
UNL = University of Nebraska - Lincoln
USDA = U.S. Department of Agriculture
USGS = U.S. Geological Survey
VCP = Voluntary Cleanup Program
VOC = Volatile organic compound
Y = Yes/present

ATTACHMENT 2-2

INVESTIGATION PROCESS FLOWCHART

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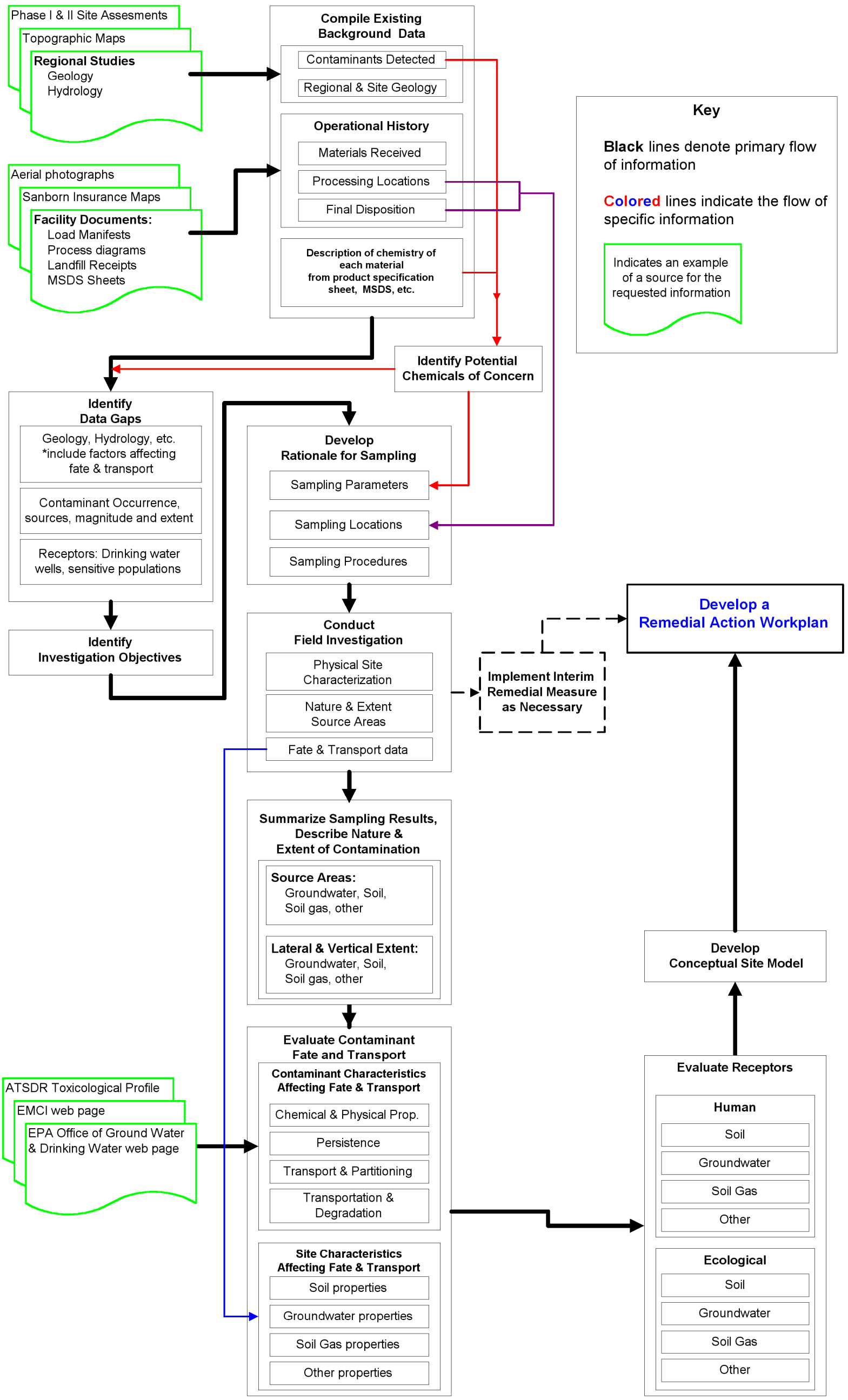
Nebraska's Voluntary Cleanup Program

Investigation Process Flowchart



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ATTACHMENT 2-3

INVESTIGATION-DERIVED WASTE (IDW)

ENVIRONMENTAL GUIDANCE

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NEBRASKA

DEPT. OF ENVIRONMENT AND ENERGY

05-161 Revised October 2021

Investigation-Derived Waste (IDW) & Remediation Waste Considerations

Scope of This Guidance Document

The objective of this document is to facilitate consistency throughout the state in managing IDW, remediation environmental media and debris potentially contaminated with hazardous waste. While this guidance is applicable to locations that do not come under the “area of contamination” (AOC) policy or have not had an AOC designated, AOC considerations are discussed in this document to better clarify the full range of options available when considering investigation and remediation questions should an AOC be appropriate. This document is not meant for use to develop cleanup plans or criteria. This document was written for environmental investigation and remediation professionals for general guidance. Always contact your DEQ remediation project manager before finalizing the details of your individual remediation projects.

What is Investigation-Derived Waste (IDW)?

IDW is a subset of remediation wastes. IDW is waste that is generated in the process of investigating or examining a known or potentially contaminated site. It includes solid and hazardous waste, media (including groundwater, surface water, soils, and sediments) and all debris that contains listed hazardous wastes or exhibits a characteristic of a hazardous waste. It also includes media and debris that is not hazardous but is contaminated with hazardous constituents. Not all IDW is hazardous waste.

IDW includes wastes that are generated from field investigation activities, typically approved and overseen by the Nebraska Department of Environment and Energy (NDEE) or the U. S. Environmental Protection Agency (EPA), that are specifically designed to determine the nature and extent of contamination. IDW will normally be generated during the site assessment, remedial investigation, and/or feasibility study stage of a cleanup project. IDW is the waste generated from an activity related to determining the nature and extent of contamination as well as the preparation or examination of the site for future remediation. Such wastes can include, but are not limited to: drilling mud, cuttings, and purge water from test borings and well installation; purge water, soil and other materials from collection of samples; contaminated personal protective equipment (PPE), and solutions used to decontaminate non-disposable protective clothing and sampling equipment; and equipment used during field investigation activities.

IDW does not include wastes that are generated from the removal or displacement of environmental media or debris as a result of other related remediation activities (these would be remediation wastes) or activities not related to remediation such as geotechnical investigation for building construction. The

generator can usually dispose of non-hazardous IDW, depending on its physical state and health–based characteristics, as any other solid waste. However, federal, state, and local waste, air, and water regulations apply. For example, most non-hazardous media cannot be disposed by open burning. As another example, land application of contaminated media is regulated in Nebraska and is usually not allowed except to permitted municipal solid waste (MSW) landfills.

Is The Waste Hazardous?

Environmental media is not, of itself, a waste. It can, however, contain listed hazardous wastes or enough hazardous constituents that it exhibits a characteristic of a hazardous waste. If the media will be actively managed and it contains listed hazardous waste or exhibits a characteristic of hazardous waste, it must be managed as a hazardous waste.

There may be circumstances where pre-existing sampling data may be used to make a hazardous waste determination. Factors such as the age of the extant sampling data, potential for changed conditions, and whether the sampling data used is representative of the IDW in question must be considered. For further information regarding hazardous waste determinations see the NDEE's Environmental Guidance Document “Waste Determinations & Hazardous Waste Testing”.

Active Management and Point of Generation

The concept of “active management” as applied to IDW or remediation waste is associated with environmental media or debris. If media or debris is being displaced on a site due to activities related to contamination investigation or remediation, the NDEE considers such activities as active management under the waste regulations. Activity not related to investigation or remediation is not considered “active management” under the waste regulations. For example, routine trench or foundation excavation spoils that are generated at a site that is not a remediation or investigation activity site, or are not related to remediation or investigation activities, are not considered a waste unless it is intended for disposal. Such spoils could normally be replaced in the excavation. In investigation or remediation activities, the point of generation (POG) of waste is where or when the media or debris is excavated or investigation or remediation related wastes are either created or rendered spent. For example, for PPE the POG is generally the location where the equipment is determined to be no longer usable. Sampling gloves are routinely rendered “spent” between sampling events. These gloves are considered waste when they are removed.

Pre-Characterized Sites.

When a site can be adequately pre-characterized as not contaminated with listed hazardous waste nor with characteristic hazardous waste, IDW from this site does not require management as hazardous waste. Examples of this type of IDW include: cuttings and purge water from wells or piezometers located a significant distance from known contamination that are being drilled to fully determine hydrologic conditions or gradient, cuttings from an uncontaminated and unsaturated zone above suspected groundwater contamination; etc.

However, if the pre-characterization is proven to be wrong by subsequent investigation, incorrect management of the IDW may result in an expansion of the scope of the cleanup or remediation, since contamination may have been spread. This could result in an enforcement action. To avoid this possibility, the department recommends that IDW be containerized and managed according to this guidance, pending the completed hazardous waste determination for any portion of a site with limited or poor historical data.

How to Manage IDW or Remediation Waste.

Often, once IDW or remediation waste is generated it needs appropriate management before a hazardous waste determination is completed (usually due to the laboratory turnaround time for analysis of field samples). Unless the area where the IDW or remediation waste was generated was pre-characterized as not containing hazardous waste, the waste should be managed as follows:

Disposable Personal Protective and Sampling Equipment:

Containerize when generated. This waste is a solid waste and could, therefore, be a hazardous waste. Personal protective and sampling equipment becomes a hazardous waste at the time it is disposed if it is contaminated with any listed hazardous waste. According to the "Mixture Rule" (See Title 128- Nebraska Hazardous Waste Regulations, Chapter 2, §005.02), any mixture of solid waste and listed hazardous waste becomes a listed hazardous waste. Although unlikely, this waste may also be a hazardous waste if it has become contaminated with enough hazardous constituents to exhibit a characteristic of a hazardous waste. (Spent filters are examples of IDW or remediation waste that are often characteristic for toxicity.)

Drill Cuttings/Soil/Sediment (including composite/grab sample waste from surface soils) and Test Pit Spoils:

Containerize when generated pending characterization. If the solid media contains a listed waste, you must obtain a determination by the department's Waste Management Division that the waste no longer "contains" listed waste before it can be considered a non-hazardous waste and disposed of as such. (See the EPA's "contained-in" policy.) The department recognizes that circumstances will vary from site to site.

Generally speaking, drill cuttings/soil/sediment may be returned to the site of original removal if the media is a non-hazardous waste and is below the EPA Regional Screening Levels (RSLs) or the Nebraska Voluntary Cleanup Program (VCP) Remediation Goals (RGs) for all constituents of concern. IDW or remediation waste drill cuttings/soil/sediment must not be allowed to be used as fill on other areas of the site or off site unless the media is not mixed with other solid wastes and does not have the potential to cause contamination that may threaten human health or the environment. Merely being below appropriate PRG or VCP Lookup Table Values does not necessarily mean the media won't have the potential to cause contamination that may threaten human health or the environment. There might also be situations where "landfarming" of some types of contaminated soils is appropriate. For example, media contaminated solely with petroleum fuels can often be landfarmed successfully and safely. Contact the NDEE Waste Management Section for more information.

If you have questions about how to implement this section for your particular situation, contact the department for clarification and assistance. (Example: Test pits might be the most convenient sampling methodology, but they generate a great deal of material that must be managed and should be used only after the depth to ground water has been established.)

Purge and Development/Decontamination Water:

Containerize this material when it is generated. If the water is a listed or is a characteristic hazardous waste it may not be discharged to the ground or back to the well. If analysis of the water determines that it is not hazardous waste and it meets ground water standards found in Title 118 – Ground Water Quality Standards and Use Classification, VCP RGs, or health-based

standards, the water may be poured on the ground at or near the point of generation, but not back to the well. If the water contains a listed waste, you must obtain a determination by the department that the waste no longer "contains" listed waste before it can be disposed of as a non-hazardous waste. (See the EPA's "contained-in" policy.)

Discharging this material to surface water or drainages should be avoided because of stringent aquatic life water quality standards.

Where there is prior approval by the affected Publicly Owned Treatment Works (POTW) (Municipal Wastewater Treatment Plant) Facility, discharges directly through an on-site sanitary sewer system to a POTW may be allowed. (Note: The water cannot be transported to a Nebraska POTW if it is a listed or characteristic hazardous waste. Nor can listed or characteristic hazardous waste water be transported to another site that has a sanitary sewer connection to a Nebraska POTW.)

The department understands that there may be a large amount of decontamination water to containerize for analysis and characterization; therefore we recommend the initial generation of decontamination water be minimized.

Water generated from dewatering IDW must be managed as a separate waste. Containerize the water upon generation. A separate waste determination is required. If analysis of the water determines that is not hazardous waste and it meets ground water standards found in Title 118 – Ground Water Quality Standards and Use Classification, VCP Lookup Table values, or health based standards, the water may be poured on the ground at or near the point of generation. If the water contains a listed waste, you must obtain a determination by the department that the waste no longer "contains" listed waste before it can be disposed of as a non-hazardous waste. (See EPA's "Contained-In" policy)

Miscellaneous Waste Issues:

The disposal of waste in unpermitted landfills is prohibited. In other words, you can't put waste in or on the ground or put it back in or on the ground if it's not a permitted landfill. There may be times during investigation or remediation activities when excavation uncovers materials that might have been improperly disposed. In addition to excavating items that were improperly disposed, there may be times when random non-media items are excavated that had a legitimate reason for being in the ground. **Generally speaking, if waste-like items are excavated, they must not be placed back in the ground.** These items should be sent to a municipal solid waste landfill if determined to be a non-hazardous waste and can pass the "paint filter" test. Examples:

1. If you excavate an abandoned pipe or cable section, you should not re-bury that piece. There is no need to remove the remaining pipe or cable that was not excavated.
2. If you come upon a dumpsite and determine the waste was placed after October 1, 1993 (when the solid waste regulations became effective in Nebraska), all the waste might need to be removed to a properly permitted landfill. If the landfill site was closed prior to October 1, 1993, then only the waste items removed during excavation need to be sent to a properly permitted solid waste landfill. The unexcavated wastes can be recovered.
   If you come upon "free-product" material, you should consider this material to be a waste. It should not be left on site. Waste determination and proper waste management would be required.

Use As Fill:

Nebraska Title 132 – Integrated Solid Waste Management Regulations, Chapter 1, §041 defines "fill" as solid waste that consists only of one or more of the following: sand, gravel, stone, soil, rock, brick, concrete rubble, asphalt rubble, or similar material. If excavation uncovers buried material that appears to meet the above definition, the NDEE would normally allow such material to be replaced in the excavation if it is not otherwise hazardous. If the "fill" were mixed with other types of wastes not mentioned above it would not meet the above definition. This would be evidence that the location might be a former landfill. In some cases, excavation spoils might be able to be used elsewhere on site or at another site. Title 132, Chapter 2, §002.01 and §002.01A allow the use of fill for certain land improvement purposes provided the wastes used in these activities are not mixed with other wastes and do not have the potential to cause contamination that might threaten human health or the environment.

Hazardous IDW or Remediation Waste Placed on the Ground.

Hazardous IDW or remediation waste placed on the ground creates a regulated unit and constitutes a solid waste management unit (SWMU) that might be subject to RCRA permitting or closure requirements. Placement on the ground occurs even when the IDW or remediation waste is placed on plastic sheets or concrete pads. Note that the Area of Contamination Policy can change this assessment, but only when and where an AOC has been formally declared.

Storage In Containers

Hazardous waste storage in containers must meet the requirements of Title 128 - Nebraska Hazardous Waste Regulations, Chapter 9 or 10 (whichever applies), or, if applicable, a RCRA hazardous waste storage permit. Hazardous IDW or remediation waste must be stored and managed as a hazardous waste because returning it to a SWMU might exacerbate the contamination cleanup regulatory issues. Facilities will need a hazardous waste storage permit after accumulating hazardous IDW or remediation waste for longer than;

- 90 days for Large Quantity Generators (LQGs) (See Title 128, Chapter 10), or
- 180/270 days for Small Quantity Generators (SQGs) (See Title 128, Chapter 9).

Hazardous waste accumulation is limited to the generator's accumulation timeframe. However, a special one-time 30-day extension approval may be requested from the department, if the generator can justify that an additional 30 days is essential. This request must be made in writing, within the generator's allowable accumulation timeframe. Already permitted facilities may need to modify their current RCRA permit to store the waste. If a remedy is chosen to treat the waste in tanks or containers and that remedy cannot effectively treat the hazardous IDW, it must be properly disposed of within the generator's accumulation timeframe or as delineated in a RCRA permit.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites meet applicable or relevant and appropriate requirements (ARARs) relative to on-site treatment of remediation waste.

IDW or Remediation Waste Disposal

Hazardous IDW or Remediation Waste.

If only conditionally exempt small quantity generator (CESQG) amounts are involved, then the waste may be disposed to a permitted municipal solid waste landfill with prior approval by the

landfill. In this case, no more than 19.5 kg (43 pounds) of the CESQG waste may be sent to the landfill on any one day. Such wastes must be able to pass the "paint-filter" test. Check with your local landfill, waste handler or local health department prior to disposal, as local city or county ordinances may be more stringent.

Certain liquid wastes may be sent to a publicly owned treatment works (POTW) via an onsite sanitary sewer with prior approval by the POTW.

The generator of IDW or remediation waste must meet all SQG or LQG generator requirements as appropriate.

Non-hazardous IDW.

Options follow:

Return water media to the ground at/near generation point if it meets certain criteria as explained above. Site specifics must be considered (e.g. ground water quality, distance to surface water, etc.). If the liquid is non-hazardous it could be transported to a POTW, pending acceptance from the POTW to take the liquid. Non-media IDW or remediation waste must be disposed off-site to a proper facility.

Non-hazardous environmental media should be disposed in a permitted landfill or properly treated on or off site. If the levels of contamination in the soil are protective of human health and the environment it may be allowed to be used as fill, as discussed above.

Area of Contamination Policy Considerations

As stated previously, this guidance document generally applies to non-AOC sites. **This section is intended as a source of additional information should conditions warrant application of the AOC policy.** AOCs are certain discrete areas of generally dispersed contamination that can be equated to a RCRA landfill and where movement of hazardous wastes within those areas would not be considered land disposal and would not trigger the RCRA land disposal restrictions. The AOC policy generally involves the concept of "placement." "Placement" of hazardous waste into or on a landfill or other land-based unit is considered land disposal, which triggers the land disposal restrictions and might trigger other RCRA requirements including permitting, closure, and post-closure regulations and procedures. Generally, "placement" does not occur when waste is consolidated **within** an AOC, when it is treated in situ, or when it is left in place. "Placement" does occur if wastes are moved from one AOC to another (e.g., for consolidation) or when waste is actively managed (e.g., ex situ treatment) within or outside the AOC and returned to land.

AOC Factors.

Only the EPA or NDEE can formally designate an AOC in Nebraska. The lateral extent of an AOC must be limited to the actual area of contiguous, but not necessarily homogenous, contamination. Hazardous waste placed outside an AOC would be considered land disposal and might be subject to RCRA corrective action. AOCs do not include adjacent areas used to implement response activities. The AOC policy does not include contaminated ground water or surface water that may be associated with the land-based source of hazardous waste.

AOC Designation.

The department can designate an AOC upon a formal request based on:

1. Data presented to the department,
2. Discrete areas of contamination,
3. Approval of an adequate, comprehensive sampling plan,
4. A workplan describing hazardous waste activities to be performed in the AOC, and,
5. Any other pertinent factors particular to the site.

RESOURCES:

- NDEE Home Page http://dee.ne.gov/
- EPA Office of Solid Waste http://www.epa.gov/osw *

Contacts:

- NDEE Waste Management Section (402) 471-4210
- NDEE Toll Free Number (877) 253-2603
- NDEE Hazardous Waste Compliance Assistant (402) 471-8308
- Email questions to: NDEE.moreinfo@nebraska.gov

NDEE Publications:

- Title 118 – Ground Water Quality Standards and Use Classification
- Title 128 – Nebraska Hazardous Waste Regulations
- Title 132 – Integrated Solid Waste Management Regulations
  Titles are available on the NDEE Home Page under "Laws/Regs & EQC", "Rules & Regulations"

- Guidance Document – Hazardous Waste Generator Comparison
- Guidance Document – Waste Determinations & Hazardous Waste Testing
- Guidance Document – Nebraska Voluntary Cleanup Program (VCP) Guidance
  Guidance is available on the NDEE Home Page under "Publications & Forms"

*** This document contains links to non-NDEE websites; these links will open in a new tab or window.**

*Produced by: Nebraska Department of Environment and Energy, P.O. Box 98922, Lincoln, NE 68509-8922; phone (402) 471-2186. To view this, and other information related to our agency, visit our web site at **http://dee.ne.gov**.*

ATTACHMENT 2-4

EXAMPLE CONCEPTUAL SITE MODELS

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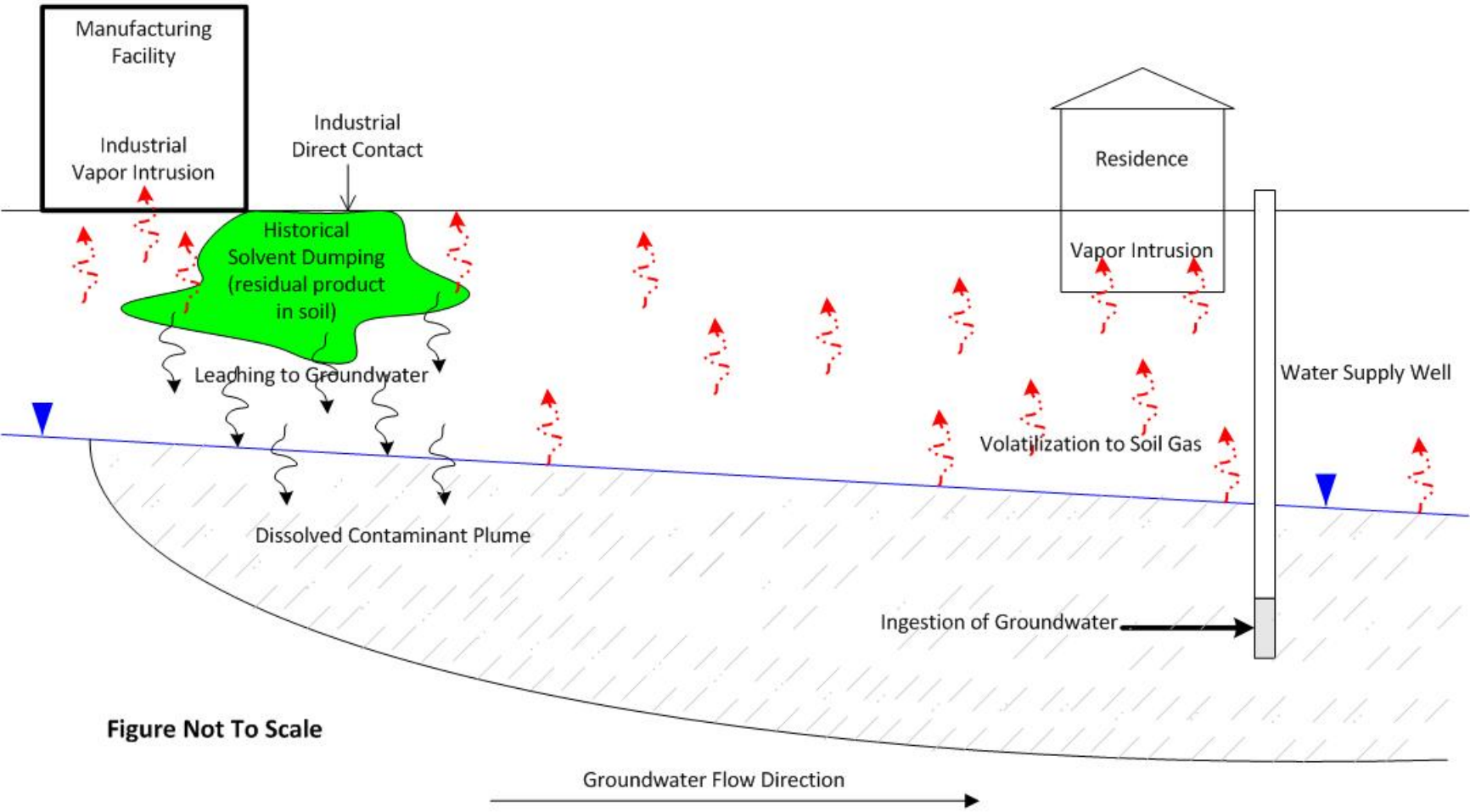
EXAMPLE CONCEPTUAL SITE MODEL - TABULAR FORMAT

Primary Sources	Primary Release Mechanisms	Secondary Source	Secondary Release Mechanism	Pathway	Exposure Route	Potential Receptors			
						Human		Ecological	
						Residents	Commercial Workers	Aquatic	Terrestrial
Solvent Waste	Dumping on Ground	Soil		Direct Contact	Dermal Contact	X	X		X
			Dust & Volatile Emmissions	Ambient Air	Inhalation	X	X		
			Soil Gas	Vapor Intrusion	Inhalation	X	X		
			Leaching to Groundwater	Groundwater	Ingestion	X	X		
Lagoon	Infiltation	Soil	Leaching to Groundwater	Groundwater	Ingestion	X	X		
					Vapor Intrusion/ Inhalation	X	X		
				Surface Water	Direct Contact/ Ingestion			X	X

X denotes potentially completed exposure pathway

EXAMPLE CONCEPTUAL SITE MODEL – GRAPHICAL FORMAT



ATTACHMENT 2-5

PRELIMINARY RAC DETERMINATION WORKSHEET

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Nebraska Department of Environment and Energy
Preliminary RAC Determination Worksheet for VCP Sites

Note: The purpose of this worksheet is to aid a user of the NDEE VCP Guidance Document in the preliminary determination of the likely Remedial Action Class (RAC) designation a contaminated site would receive from NDEE, based on groundwater use within the area surrounding the facility. Knowledge of the probable RAC will be necessary for a user to determine appropriate remediation goals and evaluate potential cleanup technologies where groundwater contamination is a concern. **The conclusions reached by a user of this worksheet are to be considered preliminary only and subject to a final, official RAC determination by the NDEE as part of its review of the VCP Remedial Action Plan.** Detailed information regarding RACs may be found in Nebraska Title 118 – Ground Water Quality Standards and Use Classification, Appendix A, Step 8, pages A-4 – A-6.

RAC-1 Determination

Has a public or private drinking water supply well been impacted by contamination from the VCP site?	Yes	No	Unk
Is the groundwater contaminant plume within 1000 feet of a public drinking water supply well?	Yes	No	
Is the groundwater contaminant plume within 500 feet of a private drinking water supply well?	Yes	No	
Has groundwater in the area around the contaminant plume been zoned or purchased by a local government for the purpose of developing a public drinking water supply well or well field?	Yes	No	
Is the groundwater contaminant plume within a designated wellhead protection area, as defined by the NDEE through the Nebraska Wellhead Protection Program?	Yes	No	

If any of the questions above have been answered "Yes," the release is classified as RAC-1.

RAC-3 Determination

Is groundwater within the area of the contaminant plume of poor natural or background quality compared to the numerical standards of Title 118, Chapter 4?	Yes	No	
Is groundwater in the area of the contaminant plume found under hydrogeologic conditions that make development of a public or private drinking water supply unlikely?	Yes	No	

If either of the previous two questions have been answered "Yes," the release may be considered RAC-3.

RAC-2 Determination

If all of the above questions have been answered "No," then the release will likely be considered RAC-2.

PRELIMINARY RAC DETERMINATION

For the purpose of preparing the VCP site Remedial Action Plan, the groundwater contaminant plume associated with the facility under consideration is preliminarily assigned the following RAC designation (circle one):

RAC-1 ***RAC-2*** ***RAC-3***

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ATTACHMENT 2-6

REMEDIATION GOALS LOOKUP TABLES

(RESERVED)

Table A-1: Groundwater & Soil Remediation Goals (Direct Contact Exposure Pathways)

Table A-2: Indoor Air, Soil Gas & Groundwater Vapor Intrusion Remediation Goals

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Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

Version Date: March 2021

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Acephate	30560-19-1	6.0E+00	nc	1.9E+01	nc	9.1E+02	nc	2.6E-02	nc
Acetaldehyde	75-07-0	2.6E+00	ca	1.1E+01	ca	3.4E+02	nc	1.0E-02	ca
Acetochlor	34256-82-1	8.8E+01	nc	3.2E+02	nc	1.5E+04	nc	1.4E+00	nc
Acetone	67-64-1	3.5E+03	nc	1.5E+04	nc	1.0E+05	max	1.4E+01	nc
Acetone cyanohydrin	75-86-5	--		1.0E+05	max	1.0E+05	max	--	
Acetonitrile	75-05-8	3.1E+01	nc	2.0E+02	nc	3.4E+03	nc	1.3E-01	nc
Acrolein	107-02-8	1.0E-02	nc	3.6E-02	nc	6.0E-01	nc	4.2E-05	nc
Acrylamide	79-06-1	5.0E-02	ca	2.4E-01	ca	4.3E+01	ca	2.1E-04	ca
Acrylic acid	79-10-7	5.2E-01	nc	2.5E+01	nc	4.2E+02	nc	2.1E-03	nc
Acrylonitrile	107-13-1	5.2E-02	ca	2.5E-01	ca	1.1E+01	ca	2.3E-04	ca
Alachlor	15972-60-8	2.0E+00	mcl	9.7E+00	ca	3.8E+02	ca	3.3E-02	mcl
Aldicarb	116-06-3	3.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	1.5E-02	mcl
Aldicarb sulfone	1646-88-4	2.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	8.8E-03	mcl
Aldrin	309-00-2	9.2E-04	ca	3.9E-02	ca	1.8E+00	ca	3.0E-03	ca
Allyl alcohol	107-18-6	5.2E-02	nc	8.8E-01	nc	1.5E+01	nc	2.1E-04	nc
Allyl chloride	107-05-1	5.2E-01	nc	4.1E-01	nc	6.9E+00	nc	3.3E-03	nc
Aluminum	7429-90-5	5.0E+01	mcl	1.9E+04	nc	1.0E+05	max	1.5E+03	mcl
Aluminum phosphide	20859-73-8	2.0E+00	nc	7.8E+00	nc	4.7E+02	nc	--	
Ametryn	834-12-8	3.8E+01	nc	1.4E+02	nc	6.8E+03	nc	8.0E-01	nc
m-Aminophenol	591-27-5	4.0E+02	nc	1.3E+03	nc	6.1E+04	nc	3.0E+00	nc
Amitraz	33089-61-1	2.0E+00	nc	4.0E+01	nc	1.9E+03	nc	2.1E+01	nc
Ammonia +++	7664-41-7	1.0E+04	NDEE	1.0E+05	max	1.0E+05	max	4.0E+01	NDEE
Ammonium sulfamate	7773-06-0	1.0E+03	nc	3.9E+03	nc	1.0E+05	max	--	
Aniline	62-53-3	1.3E+01	ca	9.5E+01	ca	3.7E+03	ca	9.1E-02	ca
Antimony and compounds	7440-36-0	6.0E+00	mcl	7.8E+00	nc	4.7E+02	nc	5.4E+00	mcl
Antimony pentoxide	1314-60-9	2.4E+00	nc	9.8E+00	nc	5.8E+02	nc	--	
Antimony potassium tartrate	28300-74-5	6.0E+00	mcl	1.8E+01	nc	1.1E+03	nc	--	
Antimony tetroxide	1332-81-6	1.9E+00	nc	7.8E+00	nc	4.7E+02	nc	--	
Antimony trioxide	1309-64-4	--		1.0E+05	max	1.0E+05	max	--	
Arsenic (inorganic) +++	7440-38-2	1.0E+01	mcl	4.6E-01	ca	2.2E+01	ca	--	
Arsine	7784-42-1	1.7E-02	nc	6.8E-02	nc	4.1E+00	nc	--	
Assure	76578-14-8	3.1E+01	nc	1.4E+02	nc	6.8E+03	nc	9.6E+00	nc
Asulam	3337-71-1	1.8E+02	nc	5.7E+02	nc	2.7E+04	nc	9.2E-01	nc
Atrazine	1912-24-9	3.0E+00	mcl	2.4E+00	ca	9.2E+01	ca	3.9E-02	mcl
Avermectin B1	65195-55-3	3.5E-01	s	6.3E+00	nc	3.0E+02	nc	7.0E+01	nc
Azobenzene	103-33-3	1.2E-01	ca	5.6E+00	ca	2.6E+02	ca	1.9E-02	ca

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Barium and compounds	7440-39-3	2.0E+03	mcl	3.9E+03	nc	1.0E+05	max	1.6E+03	mcl
Benfluralin (Benefin)	1861-40-1	7.1E+00	nc	9.8E+01	nc	5.8E+03	nc	4.7E+00	nc
Bensulfuron-methyl (Londax)	83055-99-6	9.9E+02	nc	3.2E+03	nc	1.0E+05	max	5.0E+00	nc
Bentazone (Bentazon)	25057-89-0	1.4E+02	nc	4.7E+02	nc	2.3E+04	nc	6.2E-01	nc
Benzaldehyde	100-52-7	1.9E+01	ca	1.7E+02	ca	8.2E+03	ca	8.3E-02	ca
Benzene	71-43-2	5.0E+00	mcl	1.2E+00	ca	5.1E+01	ca	5.1E-02	mcl
Benzidine	92-87-5	1.1E-04	ca	5.3E-04	ca	9.2E-02	ca	5.5E-06	ca
Benzoic acid	65-85-0	1.9E+04	nc	6.3E+04	nc	1.0E+05	max	7.6E+01	nc
Benzotrichloride	98-07-7	3.0E-03	ca	5.3E-02	ca	2.5E+00	ca	1.3E-04	ca
Benzyl alcohol	100-51-6	4.9E+02	nc	1.6E+03	nc	7.6E+04	nc	2.4E+00	nc
Benzyl chloride	100-44-7	8.9E-02	ca	1.1E+00	ca	4.8E+01	ca	2.0E-03	ca
Beryllium and compounds	7440-41-7	4.0E+00	mcl	3.9E+01	nc	2.3E+03	nc	6.3E+01	mcl
Biphenthrin (Talstar)	82657-04-3	1.0E+00	s	2.4E+02	nc	1.1E+04	nc	6.8E+03	nc
1,1-Biphenyl	92-52-4	2.1E-01	nc	1.2E+01	nc	2.0E+02	nc	4.4E-02	nc
Bis(2-chloroethyl)ether	111-44-4	1.4E-02	ca	2.3E-01	ca	1.0E+01	ca	7.2E-05	ca
Bis(chloromethyl)ether	542-88-1	7.2E-05	ca	8.3E-05	ca	3.6E-03	ca	3.4E-07	ca
Bis(2-chloro-1-methylethyl)ether	108-60-1	1.8E+02	nc	7.8E+02	nc	4.7E+04	nc	1.3E+00	nc
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	6.0E+00	mcl	3.9E+01	ca	1.5E+03	ca	2.9E+01	mcl
Bisphenol A	80-05-7	1.9E+02	nc	7.9E+02	nc	3.8E+04	nc	2.9E+02	nc
Boron	7440-42-8	1.0E+03	nc	3.9E+03	nc	1.0E+05	max	6.4E+01	nc
Boron trifluoride	7637-07-2	6.6E+00	nc	7.8E+02	nc	4.7E+04	nc	--	
Bromate	15541-45-4	1.0E+01	mcl	9.9E-01	ca	4.7E+01	ca	1.5E+00	mcl
Bromobenzene	108-86-1	1.6E+01	nc	7.1E+01	nc	1.8E+03	nc	2.1E-01	nc
Bromodichloromethane	75-27-4	1.0E+02	mcl	2.9E-01	ca	1.3E+01	ca	5.4E-01	mcl
Bromoform (Tribromomethane)	75-25-2	1.0E+02	mcl	1.9E+01	ca	8.6E+02	ca	5.3E-01	mcl
Bromomethane	74-83-9	1.9E+00	nc	1.7E+00	nc	3.0E+01	nc	9.6E-03	nc
Bromophos	2104-96-3	8.9E+00	nc	9.8E+01	nc	5.8E+03	nc	7.5E-01	nc
Bromoxynil	1689-84-5	6.3E-01	ca	5.4E+00	ca	2.1E+02	ca	1.1E-02	ca
Bromoxynil octanoate	1689-99-2	2.5E-01	ca	7.0E+00	ca	3.3E+02	ca	4.4E-02	ca
1,3-Butadiene	106-99-0	1.8E-02	ca	5.8E-02	ca	2.6E+00	ca	2.0E-04	ca
1-Butanol	71-36-3	4.9E+02	nc	2.0E+03	nc	1.0E+05	max	2.0E+00	nc
Butylate	2008-41-5	1.1E+02	nc	9.8E+02	nc	5.8E+04	nc	2.2E+00	nc
Butyl benzyl phthalate	85-68-7	1.6E+01	ca	2.9E+02	ca	1.1E+04	ca	4.7E+00	ca
Butylphthalyl butylglycolate	85-70-1	3.4E+03	nc	1.6E+04	nc	1.0E+05	max	1.5E+03	nc
Cacodylic acid	75-60-5	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	5.7E-01	nc
Cadmium and compounds +++	7440-43-9	5.0E+00	mcl	1.8E+01	nc	9.5E+02	nc	7.5E+00	mcl
Camphechlor (Toxaphene)	8001-35-2	3.0E+00	mcl	4.9E-01	ca	1.9E+01	ca	9.3E+00	mcl

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Caprolactam	105-60-2	2.5E+03	nc	7.8E+03	nc	1.0E+05	max	1.2E+01	nc
Captafol	2425-06-1	4.0E-01	ca	3.6E+00	ca	1.4E+02	ca	1.4E-02	ca
Captan	133-06-2	3.1E+01	ca	2.4E+02	ca	9.2E+03	ca	4.4E-01	ca
Carbaryl	63-25-2	4.6E+02	nc	1.6E+03	nc	7.6E+04	nc	8.4E+00	nc
Carbofuran	1563-66-2	4.0E+01	mcl	7.9E+01	nc	3.8E+03	nc	3.1E-01	mcl
Carbon disulfide	75-15-0	2.0E+02	nc	1.9E+02	nc	3.5E+03	nc	1.2E+00	nc
Carbon tetrachloride	56-23-5	5.0E+00	mcl	6.5E-01	ca	2.9E+01	ca	3.9E-02	mcl
Carbosulfan	55285-14-8	2.2E+00	nc	1.6E+02	nc	7.6E+03	nc	1.1E+00	nc
Carboxin	5234-68-4	4.8E+02	nc	1.6E+03	nc	7.6E+04	nc	5.2E+00	nc
Chloramben	133-90-4	7.2E+01	nc	2.4E+02	nc	1.1E+04	nc	3.5E-01	nc
Chloranil	118-75-2	1.8E-01	ca	1.4E+00	ca	5.3E+01	ca	3.0E-03	ca
Chlordane	12789-03-6	2.0E+00	mcl	1.7E+00	ca	7.4E+01	ca	5.4E+00	mcl
Chlordecone (Kepone)	143-50-0	3.5E-03	ca	5.4E-02	ca	2.1E+00	ca	2.5E-03	ca
Chlorimuron-ethyl	90982-32-4	4.4E+02	nc	1.4E+03	nc	6.8E+04	nc	3.0E+00	nc
Chlorine	7782-50-5	7.8E-02	nc	4.8E-02	nc	8.0E-01	nc	7.7E-04	nc
Chlorine dioxide	10049-04-4	1.0E-01	nc	5.8E+02	nc	3.4E+04	nc	--	
Chloroacetic acid	79-11-8	6.0E+01	mcl	--		--		2.4E-01	mcl
2-Chloroacetophenone	532-27-4	--		1.6E+04	nc	1.0E+05	max	--	
4-Chloroaniline	106-47-8	3.7E-01	ca	2.7E+00	ca	1.1E+02	ca	3.1E-03	ca
Chlorobenzene	108-90-7	1.0E+02	mcl	6.9E+01	nc	1.3E+03	nc	1.4E+00	mcl
Chlorobenzilate	510-15-6	3.1E-01	ca	4.9E+00	ca	1.9E+02	ca	2.1E-02	ca
p-Chlorobenzoic acid	74-11-3	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	6.5E-01	nc
4-Chlorobenzotrifluoride	98-56-6	8.6E+00	nc	5.3E+01	nc	2.5E+03	nc	6.1E-01	nc
2-Chloro-1,3-butadiene	126-99-8	1.9E-02	ca	1.0E-02	ca	4.4E-01	ca	2.0E-04	ca
1-Chlorobutane	109-69-3	1.6E+02	nc	7.8E+02	nc	4.7E+04	nc	1.3E+00	nc
1-Chloro-1,1-difluoroethane	75-68-3	2.6E+04	nc	1.3E+04	nc	1.0E+05	max	2.6E+02	nc
Chlorodifluoromethane	75-45-6	2.6E+04	nc	1.2E+04	nc	1.0E+05	max	2.1E+02	nc
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	1.3E+00	ca	2.2E+01	ca	8.5E+02	ca	3.0E-01	ca
Chloroform	67-66-3	1.0E+02	mcl	3.2E-01	ca	1.4E+01	ca	5.5E-01	mcl
Chloromethane	74-87-3	4.7E+01	nc	2.8E+01	nc	4.6E+02	nc	2.4E-01	nc
4-Chloro-2-methylaniline hydrochloride	3165-93-3	1.7E-01	ca	1.2E+00	ca	4.6E+01	ca	3.1E-03	ca
beta-Chloronaphthalene	91-58-7	1.9E+02	nc	1.2E+03	nc	5.5E+04	nc	1.9E+01	nc
o-Chloronitrobenzene	88-73-3	2.4E-01	ca	1.8E+00	ca	7.1E+01	ca	4.4E-03	ca
p-Chloronitrobenzene	100-00-5	1.2E+00	ca	9.0E+00	ca	3.5E+02	ca	2.1E-02	ca
2-Chlorophenol	95-57-8	2.3E+01	nc	9.8E+01	nc	5.8E+03	nc	4.5E-01	nc
Chlorothalonil	1897-45-6	2.2E+01	ca	1.8E+02	ca	6.9E+03	ca	9.9E-01	ca
o-Chlorotoluene	95-49-8	5.9E+01	nc	3.9E+02	nc	2.3E+04	nc	1.2E+00	nc

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Chlorpropham	101-21-3	1.8E+02	nc	7.9E+02	nc	3.8E+04	nc	3.2E+00	nc
Chlorpyrifos	2921-88-2	2.1E+00	nc	1.6E+01	nc	7.6E+02	nc	6.2E-01	nc
Chlorpyrifos-methyl	5598-13-0	3.0E+01	nc	1.6E+02	nc	7.6E+03	nc	2.7E+00	nc
Chlorsulfuron	64902-72-3	2.5E+02	nc	7.9E+02	nc	3.8E+04	nc	4.2E+00	nc
Chlorthiophos	60238-56-4	7.1E-01	nc	1.3E+01	nc	6.1E+02	nc	3.6E-01	nc
Chromium, Total	7440-47-3	1.0E+02	mcl	--		--		1.0E+05	max
Chromium III *	16065-83-1	5.6E+03	nc	2.9E+04	nc	1.0E+05	max	1.0E+05	max
Chromium VI +++	18540-29-9	3.5E-02	ca	3.0E-01	ca	6.4E+01	ca	1.3E-02	ca
Clofentezine (Apollo)	74115-24-5	5.8E+01	nc	2.1E+02	nc	9.9E+03	nc	7.0E+01	nc
Cobalt	7440-48-4	1.5E+00	nc	5.9E+00	nc	3.5E+02	nc	1.4E+00	nc
Coke Oven Emissions	8007-45-2	3.3E-03	ca	3.3E+03	ca	1.0E+05	max	2.1E-03	ca
Copper and compounds	7440-50-8	1.3E+03	mcl	7.8E+02	nc	4.7E+04	nc	9.2E+02	mcl
Crotonaldehyde	123-73-9	--		--		1.7E+01	ca	--	
Cumene (Isopropylbenzene)	98-82-8	1.1E+02	nc	4.9E+02	nc	9.9E+03	nc	3.7E+00	nc
Cyanazine	21725-46-2	8.8E-02	ca	6.5E-01	ca	2.5E+01	ca	8.2E-04	ca
Cyanide (free)	57-12-5	2.0E+02	mcl	5.7E+00	nc	1.5E+02	nc	4.0E+01	mcl
Cyanide (hydrogen)	74-90-8	3.7E-01	nc	5.6E+00	nc	1.5E+02	nc	7.4E-02	nc
Cyanogen	460-19-5	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	--	
Cyanogen bromide	506-68-3	4.5E+02	nc	1.8E+03	nc	1.0E+05	max	--	
Cyanogen chloride	506-77-4	2.5E+02	nc	9.8E+02	nc	5.8E+04	nc	--	
Cyclohexane	110-82-7	3.1E+03	nc	1.6E+03	nc	2.7E+04	nc	6.5E+01	nc
Cyclohexanone	108-94-1	3.6E+02	nc	7.1E+03	nc	1.0E+05	max	1.7E+00	nc
Cyclohexylamine	108-91-8	9.6E+02	nc	3.9E+03	nc	1.0E+05	max	5.1E+00	nc
Cyfluthrin (Baythroid)	68359-37-5	3.0E+00	s	4.0E+02	nc	1.9E+04	nc	1.6E+02	nc
Cyhalothrin (Karate)	68085-85-8	5.0E+00	s	1.6E+01	nc	7.6E+02	nc	6.8E+01	nc
Cyromazine	66215-27-8	2.5E+03	nc	7.9E+03	nc	1.0E+05	max	1.3E+01	nc
Dacthal	1861-32-1	3.1E+01	nc	1.6E+02	nc	7.6E+03	nc	7.6E-01	nc
Dalapon	75-99-0	2.0E+02	mcl	4.7E+02	nc	2.3E+04	nc	8.3E-01	mcl
Daminozide (Alar)	1596-84-5	4.3E+00	ca	3.0E+01	ca	1.2E+03	ca	1.9E-02	ca
Demeton	8065-48-3	1.1E-01	nc	6.3E-01	nc	3.0E+01	nc	--	
Diallate	2303-16-4	5.4E-01	ca	8.9E+00	ca	3.5E+02	ca	1.6E-02	ca
Diazinon	333-41-5	2.6E+00	nc	1.1E+01	nc	5.3E+02	nc	3.2E-01	nc
Dibenzofuran	132-64-9	2.0E+00	nc	1.8E+01	nc	1.0E+03	nc	7.3E-01	nc
1,4-Dibromobenzene	106-37-6	3.3E+01	nc	2.0E+02	nc	1.2E+04	nc	6.2E-01	nc
Dibromochloromethane	124-48-1	1.0E+02	mcl	8.3E+00	ca	3.9E+02	ca	5.3E-01	mcl
1,2-Dibromo-3-chloropropane	96-12-8	2.0E-01	mcl	5.3E-03	ca	6.4E-01	ca	1.7E-03	mcl
1,2-Dibromoethane	106-93-4	5.0E-02	mcl	3.6E-02	ca	1.6E+00	ca	2.8E-04	mcl

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CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Dibutyl phthalate	84-74-2	2.3E+02	nc	1.6E+03	nc	7.6E+04	nc	1.1E+01	nc
Dicamba	1918-00-9	1.4E+02	nc	4.7E+02	nc	2.3E+04	nc	7.3E-01	nc
1,2-Dichlorobenzene	95-50-1	6.0E+02	mcl	4.5E+02	nc	9.3E+03	nc	1.2E+01	mcl
1,4-Dichlorobenzene	106-46-7	7.5E+01	mcl	2.6E+00	ca	1.1E+02	ca	1.4E+00	mcl
3,3-Dichlorobenzidine	91-94-1	1.3E-01	ca	1.2E+00	ca	4.7E+01	ca	1.6E-02	ca
4,4'-Dichlorobenzophenone	90-98-2	1.9E+01	nc	1.4E+02	nc	6.8E+03	nc	2.4E+00	nc
1,4-Dichloro-2-butene	764-41-0	1.3E-03	ca	2.1E-03	ca	9.4E-02	ca	1.3E-05	ca
Dichlorodifluoromethane	75-71-8	4.9E+01	nc	2.2E+01	nc	3.7E+02	nc	1.5E+00	nc
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	1.6E-02	nc	4.7E-01	nc	2.3E+01	nc	7.5E-02	nc
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	4.6E-02	ca	2.0E+00	ca	9.3E+01	ca	2.2E-01	ca
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.3E-01	ca	1.9E+00	ca	8.3E+01	ca	1.5E+00	ca
1,1-Dichloroethane	75-34-3	2.8E+00	ca	3.6E+00	ca	1.6E+02	ca	1.6E-02	ca
1,2-Dichloroethane	107-06-2	5.0E+00	mcl	4.6E-01	ca	2.0E+01	ca	2.8E-02	mcl
1,1-Dichloroethylene	75-35-4	7.0E+00	mcl	5.7E+01	nc	1.0E+03	nc	5.0E-02	mcl
1,2-Dichloroethylene (cis)	156-59-2	7.0E+01	mcl	3.9E+01	nc	2.3E+03	nc	4.1E-01	mcl
1,2-Dichloroethylene (trans)	156-60-5	1.0E+02	mcl	3.9E+02	nc	2.3E+04	nc	6.3E-01	mcl
2,4-Dichlorophenol	120-83-2	1.1E+01	nc	4.7E+01	nc	2.3E+03	nc	1.1E-01	nc
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	7.0E+01	mcl	1.7E+02	nc	9.2E+03	nc	3.6E-01	mcl
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	1.1E+02	nc	4.7E+02	nc	2.3E+04	nc	2.1E+00	nc
Decabromodiphenyl ether (BDE-209)	1163-19-5	1.0E-01	s	1.1E+02	nc	5.3E+03	nc	3.9E+02	nc
1,2-Dichloropropane	78-87-5	5.0E+00	mcl	2.5E+00	ca	6.6E+01	nc	3.3E-02	mcl
2,3-Dichloropropanol	616-23-9	1.5E+01	nc	4.7E+01	nc	2.3E+03	nc	6.3E-02	nc
1,3-Dichloropropene	542-75-6	4.7E-01	ca	1.8E+00	ca	8.2E+01	ca	3.4E-03	ca
Dichlorvos	62-73-7	2.6E-01	ca	1.9E+00	ca	7.3E+01	ca	1.6E-03	ca
Dicrotophos (Bidrin)	141-66-2	1.5E-01	nc	4.7E-01	nc	2.3E+01	nc	7.0E-04	nc
Dicyclopentadiene	77-73-6	1.6E-01	nc	3.2E-01	nc	5.4E+00	nc	1.1E-02	nc
Dieldrin	60-57-1	1.8E-03	ca	3.4E-02	ca	1.3E+00	ca	1.4E-03	ca
Diethylene glycol, monobutyl ether	112-34-5	1.5E+02	nc	4.7E+02	nc	2.2E+04	nc	6.6E-01	nc
Diethylene glycol, monoethyl ether	111-90-0	3.0E+02	nc	9.4E+02	nc	4.5E+04	nc	1.2E+00	nc
Diethylformamide	617-84-5	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	2.0E-02	nc
Di(2-ethylhexyl)adipate	103-23-1	4.0E+02	mcl	4.5E+02	ca	1.8E+04	ca	5.8E+02	mcl
Diethyl phthalate	84-66-2	3.7E+03	nc	1.3E+04	nc	1.0E+05	max	3.0E+01	nc
Diethylstilbestrol	56-53-1	5.1E-05	ca	1.6E-03	ca	6.1E-02	ca	5.6E-04	ca
Difenzoquat (Avenge)	43222-48-6	4.2E+02	nc	1.3E+03	nc	6.3E+04	nc	1.3E+03	nc
Diflubenzuron	35367-38-5	7.2E+01	nc	3.2E+02	nc	1.5E+04	nc	1.6E+00	nc
1,1-Difluoroethane	75-37-6	2.1E+04	nc	1.2E+04	nc	1.0E+05	max	1.4E+02	nc
Diisopropyl methylphosphonate (DIMP)	1445-75-6	4.0E+02	nc	1.6E+03	nc	9.3E+04	nc	2.3E+00	nc

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CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Dimethipin	55290-64-7	1.1E+02	nc	3.5E+02	nc	1.7E+04	nc	4.8E-01	nc
Dimethoate	60-51-5	1.1E+01	nc	3.5E+01	nc	1.7E+03	nc	4.9E-02	nc
3,3'-Dimethoxybenzidine	119-90-4	4.7E-02	ca	3.4E-01	ca	1.3E+01	ca	1.2E-03	ca
N-N-Dimethylaniline	121-69-7	2.5E+00	ca	2.6E+01	ca	1.2E+03	ca	1.8E-02	ca
2,4-Dimethylaniline	95-68-1	3.7E-01	ca	2.7E+00	ca	1.1E+02	ca	4.2E-03	ca
2,4-Dimethylaniline hydrochloride	21436-96-4	1.3E-01	ca	9.4E-01	ca	3.7E+01	ca	2.4E-03	ca
3,3'-Dimethylbenzidine	119-93-7	6.5E-03	ca	4.9E-02	ca	1.9E+00	ca	8.6E-04	ca
N,N-Dimethylformamide	68-12-2	1.5E+01	nc	6.6E+02	nc	1.5E+04	nc	6.1E-02	nc
2,4-Dimethylphenol	105-67-9	8.9E+01	nc	3.2E+02	nc	1.5E+04	nc	2.1E+00	nc
2,6-Dimethylphenol	576-26-1	2.6E+00	nc	9.5E+00	nc	4.6E+02	nc	6.3E-02	nc
3,4-Dimethylphenol	95-65-8	4.5E+00	nc	1.6E+01	nc	7.6E+02	nc	1.1E-01	nc
Dimethyl terephthalate	120-61-6	4.7E+02	nc	2.0E+03	nc	1.0E+05	max	2.4E+00	nc
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	5.8E+00	nc	3.2E+01	nc	1.5E+03	nc	3.8E+00	nc
1,2-Dinitrobenzene	528-29-0	4.8E-01	nc	1.6E+00	nc	7.6E+01	nc	8.9E-03	nc
1,3-Dinitrobenzene	99-65-0	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	8.8E-03	nc
1,4-Dinitrobenzene	100-25-4	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	8.8E-03	nc
2,4-Dinitrophenol	51-28-5	9.7E+00	nc	3.2E+01	nc	1.5E+03	nc	2.2E-01	nc
Dinitrotoluene mixture	25321-14-6	1.0E-01	ca	1.2E+00	ca	4.7E+01	ca	2.9E-03	ca
2,4-Dinitrotoluene	121-14-2	2.4E-01	ca	1.7E+00	ca	6.8E+01	ca	6.4E-03	ca
2,6-Dinitrotoluene	606-20-2	4.9E-02	ca	3.6E-01	ca	1.4E+01	ca	1.3E-03	ca
Dinoseb	88-85-7	7.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	1.2E+00	mcl
1,4-Dioxane	123-91-1	4.6E-01	ca	5.3E+00	ca	2.4E+02	ca	1.9E-03	ca
Diphenamid	957-51-7	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	2.6E+01	nc
Diphenylamine	122-39-4	3.1E+02	nc	1.6E+03	nc	7.6E+04	nc	1.2E+01	nc
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	9.0E-01	nc	4.7E+00	nc	2.3E+02	nc	1.9E+00	nc
1,2-Diphenylhydrazine	122-66-7	7.8E-02	ca	6.8E-01	ca	2.7E+01	ca	5.0E-03	ca
Diphenyl sulfone	127-63-9	3.7E+00	nc	1.3E+01	nc	6.1E+02	nc	1.8E-01	nc
Diquat dibromide (Diquat)	85-00-7	2.0E+01	mcl	3.5E+01	nc	1.7E+03	nc	7.5E+00	mcl
Direct black 38	1937-37-7	1.1E-02	ca	7.6E-02	ca	3.0E+00	ca	1.1E+02	ca
Direct blue 6	2602-46-2	1.1E-02	ca	7.3E-02	ca	2.9E+00	ca	3.3E+02	ca
Direct brown 95	16071-86-6	1.2E-02	ca	8.1E-02	ca	3.2E+00	ca	3.2E+00	ca
Disulfoton	298-04-4	1.3E-01	nc	6.3E-01	nc	3.0E+01	nc	4.7E-03	nc
1,4-Dithiane	505-29-3	5.0E+01	nc	2.0E+02	nc	1.2E+04	nc	4.9E-01	nc
Diuron	330-54-1	9.0E+00	nc	3.2E+01	nc	1.5E+03	nc	7.5E-02	nc
Dodine	2439-10-3	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	1.0E+01	nc
Endosulfan	115-29-7	2.5E+01	nc	1.2E+02	nc	7.0E+03	nc	6.9E+00	nc
Endothall	145-73-3	1.0E+02	mcl	3.2E+02	nc	1.5E+04	nc	4.8E-01	mcl

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Endrin	72-20-8	2.0E+00	mcl	4.7E+00	nc	2.3E+02	nc	1.6E+00	mcl
Enilconazole (Imazalil)	35554-44-0	9.0E-01	ca	8.9E+00	ca	3.5E+02	ca	3.1E-01	ca
Epichlorohydrin	106-89-8	5.1E-01	nc	4.7E+00	nc	8.2E+01	nc	2.3E-03	nc
1,2-Epoxybutane	106-88-7	1.0E+01	nc	4.0E+01	nc	6.7E+02	nc	4.6E-02	nc
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	1.9E+02	nc	9.8E+02	nc	5.8E+04	nc	2.0E+00	nc
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	2.5E+01	nc	7.9E+01	nc	3.8E+03	nc	1.1E-01	nc
Ethion	563-12-2	1.1E+00	nc	7.9E+00	nc	3.8E+02	nc	4.3E-02	nc
2-Ethoxyethanol	110-80-5	8.5E+01	nc	1.3E+03	nc	4.7E+04	nc	3.4E-01	nc
2-Ethoxyethanol acetate	111-15-9	2.9E+01	nc	6.4E+02	nc	1.4E+04	nc	1.2E-01	nc
Ethyl acetate	141-78-6	3.6E+01	nc	1.6E+02	nc	2.6E+03	nc	1.5E-01	nc
Ethyl acrylate	140-88-5	3.6E+00	nc	1.2E+01	nc	2.1E+02	nc	1.6E-02	nc
Ethylbenzene	100-41-4	7.0E+02	mcl	5.8E+00	ca	2.5E+02	ca	1.6E+01	mcl
Ethyl chloride (Chloroethane)	75-00-3	5.2E+03	nc	3.4E+03	nc	5.7E+04	nc	3.0E+01	nc
Ethylene cyanohydrin	109-78-4	3.5E+02	nc	1.1E+03	nc	5.3E+04	nc	1.4E+00	nc
Ethylene diamine	107-15-3	4.5E+02	nc	1.8E+03	nc	1.0E+05	max	2.1E+00	nc
Ethylene glycol	107-21-1	1.0E+04	nc	3.2E+04	nc	1.0E+05	max	4.0E+01	nc
Ethylene glycol, monobutyl ether	111-76-2	4.9E+02	nc	1.6E+03	nc	7.6E+04	nc	2.0E+00	nc
Ethylene oxide	75-21-8	6.7E-04	ca	2.0E-03	ca	2.5E-01	ca	2.8E-06	ca
Ethylene thiourea (ETU)	96-45-7	4.0E-01	nc	1.3E+00	nc	6.1E+01	nc	1.8E-03	nc
Ethyl ether	60-29-7	9.8E+02	nc	3.9E+03	nc	1.0E+05	max	4.4E+00	nc
Ethyl methacrylate	97-63-2	1.6E+02	nc	4.5E+02	nc	7.6E+03	nc	7.4E-01	nc
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	2.2E-02	nc	1.6E-01	nc	7.6E+00	nc	1.4E-02	nc
Ethylphthalyl ethyl glycolate	84-72-0	1.4E+04	nc	4.7E+04	nc	1.0E+05	max	6.5E+02	nc
Fenamiphos	22224-92-6	1.1E+00	nc	4.0E+00	nc	1.9E+02	nc	2.2E-02	nc
Fenpropathrin (Danitol)	39515-41-8	1.6E+01	nc	4.0E+02	nc	1.9E+04	nc	1.4E+01	nc
Fenvalerate (Pydrin)	51630-58-1	2.4E+01	s	4.0E+02	nc	1.9E+04	nc	1.6E+03	nc
Fluometuron	2164-17-2	6.1E+01	nc	2.1E+02	nc	9.9E+03	nc	9.3E-01	nc
Fluoride	16984-48-8	4.0E+03	mcl	7.8E+02	nc	4.7E+04	nc	1.2E+04	mcl
Fluoridone	59756-60-4	3.6E+02	nc	1.3E+03	nc	6.1E+04	nc	8.2E+02	nc
Flurprimidol	56425-91-3	1.7E+02	nc	6.3E+02	nc	3.0E+04	nc	1.6E+01	nc
Flusilazole (NuStar)	85509-19-9	7.8E+00	nc	3.9E+01	nc	2.3E+03	nc	2.5E+01	nc
Flutolanil	66332-96-5	2.0E+03	nc	7.9E+03	nc	1.0E+05	max	2.1E+02	nc
Fluvalinate	69409-94-5	5.0E+00	s	1.6E+02	nc	7.6E+03	nc	1.5E+03	nc
Folpet	133-07-3	4.1E+02	nc	1.4E+03	nc	6.8E+04	nc	1.9E+00	nc
Fomesafen	72178-02-0	1.2E+01	nc	4.0E+01	nc	1.9E+03	nc	7.9E-01	nc
Fonofos	944-22-9	6.1E+00	nc	3.2E+01	nc	1.5E+03	nc	2.3E-01	nc
Formaldehyde	50-00-0	4.3E-01	ca	1.7E+01	ca	7.3E+02	ca	1.7E-03	ca

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Formic acid	64-18-6	1.6E-01	nc	7.3E+00	nc	1.2E+02	nc	6.3E-04	nc
Fosetyl-al	39148-24-8	1.3E+04	nc	4.0E+04	nc	1.0E+05	max	3.3E+03	nc
Furan	110-00-9	4.8E+00	nc	1.8E+01	nc	1.0E+03	nc	3.7E-02	nc
Furazolidone	67-45-8	2.0E-02	ca	1.4E-01	ca	5.6E+00	ca	7.8E-04	ca
Furfural	98-01-1	9.5E+00	nc	5.4E+01	nc	2.6E+03	nc	4.0E-02	nc
Furmecyclox	60568-05-0	1.1E+00	ca	1.8E+01	ca	7.1E+02	ca	2.4E-02	ca
Furothiazole (Furium)	531-82-8	5.1E-02	ca	3.6E-01	ca	1.4E+01	ca	1.4E-03	ca
Glufosinate-ammonium	77182-82-2	3.0E+01	nc	9.5E+01	nc	4.6E+03	nc	1.3E-01	nc
Glycidaldehyde	765-34-4	4.1E-01	nc	5.8E+00	nc	2.1E+02	nc	1.7E-03	nc
Glyphosate	1071-83-6	7.0E+02	mcl	1.6E+03	nc	7.6E+04	nc	6.2E+01	mcl
Haloxyfop-methyl	69806-40-2	1.9E-01	nc	7.9E-01	nc	3.8E+01	nc	4.2E-02	nc
Thifensulfuron-methyl (Harmony)	79277-27-3	2.1E+02	nc	6.8E+02	nc	3.3E+04	nc	1.3E+00	nc
Heptachlor	76-44-8	4.0E-01	mcl	1.3E-01	ca	6.3E+00	ca	6.6E-01	mcl
Heptachlor epoxide	1024-57-3	2.0E-01	mcl	7.0E-02	ca	3.3E+00	ca	8.2E-02	mcl
Hexabromobenzene	87-82-1	1.6E-01	s	3.9E+01	nc	2.3E+03	nc	1.2E+00	nc
Hexachlorobenzene	118-74-1	1.0E+00	mcl	2.1E-01	ca	9.6E+00	ca	2.5E-01	mcl
Hexachlorobutadiene	87-68-3	1.4E-01	ca	1.2E+00	ca	5.3E+01	ca	5.3E-03	ca
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	7.2E-03	ca	8.6E-02	ca	3.4E+00	ca	8.4E-04	ca
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	2.5E-02	ca	3.0E-01	ca	1.2E+01	ca	2.9E-03	ca
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	2.0E-01	mcl	5.7E-01	ca	2.4E+01	ca	2.3E-02	mcl
Hexachlorocyclohexane technical	608-73-1	2.5E-02	ca	3.0E-01	ca	1.2E+01	ca	2.9E-03	ca
Hexachlorocyclopentadiene	77-47-4	5.0E+01	mcl	4.4E-01	nc	7.5E+00	nc	3.1E+00	mcl
Hexachloroethane	67-72-1	3.3E-01	ca	1.8E+00	ca	8.0E+01	ca	4.0E-03	ca
Hexachlorophene	70-30-4	1.5E+00	nc	4.7E+00	nc	2.3E+02	nc	4.0E+01	nc
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	7.0E-01	ca	6.1E+00	ca	2.8E+02	ca	5.3E-03	ca
1,6-Hexamethylene diisocyanate	822-06-0	5.2E-03	nc	7.8E-01	nc	1.3E+01	nc	1.0E-03	nc
n-Hexane	110-54-3	3.7E+02	nc	1.5E+02	nc	2.5E+03	nc	5.1E+01	nc
Hexazinone	51235-04-2	1.6E+02	nc	5.2E+02	nc	2.5E+04	nc	1.5E+00	nc
Hexythiazox (Savey)	78587-05-0	2.8E+01	nc	4.0E+02	nc	1.9E+04	nc	2.5E+00	nc
Hydramethylnon (Amdro)	67485-29-4	6.0E+00	s	2.7E+02	nc	1.3E+04	nc	1.0E+05	max
Hydrazine, hydrazine sulfate	302-01-2	1.1E-03	ca	2.3E-01	ca	1.1E+01	ca	--	
Hydrazine, dimethyl	57-14-7	1.0E-03	nc	1.4E-02	nc	2.4E-01	nc	4.7E-06	nc
Hydrogen chloride	7647-01-0	1.0E+01	nc	1.0E+05	max	1.0E+05	max	--	
Hydrogen sulfide	7783-06-4	1.0E+00	nc	1.0E+05	max	1.0E+05	max	--	
p-Hydroquinone	123-31-9	1.3E+00	ca	9.0E+00	ca	3.5E+02	ca	1.7E-02	ca
Imazaquin	81335-37-7	1.2E+03	nc	4.0E+03	nc	1.0E+05	max	1.2E+02	nc
Imazethapyr (Pursuit)	81335-77-5	1.2E+04	nc	4.0E+04	nc	1.0E+05	max	2.1E+02	nc

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		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Iprodione	36734-19-7	1.8E+02	nc	6.3E+02	nc	3.0E+04	nc	1.1E+00	nc
Iron	7439-89-6	3.0E+02	mcl	1.4E+04	nc	1.0E+05	max	1.5E+02	mcl
Isobutanol (Isobutyl alcohol)	78-83-1	1.5E+03	nc	5.9E+03	nc	1.0E+05	max	6.1E+00	nc
Isophorone	78-59-1	7.8E+01	ca	5.7E+02	ca	2.2E+04	ca	5.2E-01	ca
Isopropalin	33820-53-0	1.0E+01	nc	2.9E+02	nc	1.8E+04	nc	4.6E+00	nc
Isopropyl methyl phosphonic acid	1832-54-8	5.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.1E+00	nc
Isoxaben	82558-50-7	1.8E+02	nc	7.9E+02	nc	3.8E+04	nc	1.0E+01	nc
Lactofen	77501-63-4	2.5E+01	nc	1.3E+02	nc	6.1E+03	nc	2.3E+01	nc
Lead +++	7439-92-1	1.5E+01	mcl	4.0E+02	nc	8.0E+02	nc	2.7E+02	mcl
Lead (tetraethyl)	78-00-2	3.3E-04	nc	2.0E-03	nc	1.2E-01	nc	2.3E-05	nc
Linuron	330-55-2	3.2E+01	nc	1.2E+02	nc	5.8E+03	nc	5.6E-01	nc
Lithium	7439-93-2	1.0E+01	nc	4.0E+02	nc	2.3E+03	nc	6.0E+01	nc
Malathion	121-75-5	9.7E+01	nc	3.2E+02	nc	1.5E+04	nc	5.1E-01	nc
Maleic anhydride	108-31-6	4.8E+02	nc	1.6E+03	nc	7.5E+04	nc	1.9E+00	nc
Maleic hydrazide	123-33-1	2.5E+03	nc	7.9E+03	nc	1.0E+05	max	1.0E+01	nc
Malononitrile	109-77-3	5.0E-01	nc	1.6E+00	nc	7.6E+01	nc	2.1E-03	nc
Mancozeb	8018-01-7	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	3.8E+00	nc
Maneb	12427-38-2	2.4E+01	nc	7.9E+01	nc	3.8E+03	nc	6.9E-01	nc
Manganese (non-food) +++	7439-96-5	5.0E+01	mcl	2.5E+03	nc	1.0E+05	max	6.5E+01	mcl
Mephosfolan	950-10-7	4.5E-01	nc	1.4E+00	nc	6.8E+01	nc	1.3E-02	nc
Mepiquat chloride (Mepiquat)	24307-26-4	1.5E+02	nc	4.7E+02	nc	2.3E+04	nc	1.0E+00	nc
Mercury and compounds	7487-94-7	2.0E+00	mcl	5.9E+00	nc	3.5E+02	nc	--	
Mercury (elemental)	7439-97-6	2.0E+00	mcl	2.7E+00	nc	4.6E+01	nc	2.1E+00	mcl
Mercury (methyl)	22967-92-6	4.9E-01	nc	2.0E+00	nc	1.2E+02	nc	--	
Merphos	150-50-5	1.5E-01	nc	5.9E-01	nc	3.5E+01	nc	3.0E-01	nc
Merphos oxide	78-48-8	7.1E-02	nc	1.6E+00	nc	7.6E+01	nc	7.0E-03	nc
Metalaxyl	57837-19-1	3.0E+02	nc	9.5E+02	nc	4.6E+04	nc	1.6E+00	nc
Methacrylonitrile	126-98-7	4.8E-01	nc	1.9E+00	nc	1.0E+02	nc	2.2E-03	nc
Methamidophos	10265-92-6	2.5E-01	nc	7.9E-01	nc	3.8E+01	nc	1.1E-03	nc
Methanol	67-56-1	5.1E+03	nc	3.1E+04	nc	1.0E+05	max	2.1E+01	nc
Methidathion	950-37-8	7.3E+00	nc	2.4E+01	nc	1.1E+03	nc	3.5E-02	nc
Methomyl	16752-77-5	1.2E+02	nc	4.0E+02	nc	1.9E+04	nc	5.5E-01	nc
Methoxychlor	72-43-5	4.0E+01	mcl	7.9E+01	nc	3.8E+03	nc	4.3E+01	mcl
2-Methoxyethanol	109-86-4	7.4E+00	nc	8.2E+01	nc	3.5E+03	nc	3.0E-02	nc
2-Methoxyethanol acetate	110-49-6	5.1E-01	nc	2.7E+01	nc	5.1E+02	nc	2.1E-03	nc
2-Methoxy-5-nitroaniline	99-59-2	1.5E+00	ca	1.1E+01	ca	4.3E+02	ca	1.1E-02	ca
Methyl acetate	79-20-9	5.0E+03	nc	2.0E+04	nc	1.0E+05	max	2.1E+01	nc

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Methyl acrylate	96-33-3	1.0E+01	nc	3.6E+01	nc	6.1E+02	nc	4.4E-02	nc
2-Methylaniline hydrochloride	636-21-5	6.0E-01	ca	4.2E+00	ca	1.6E+02	ca	5.2E-03	ca
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	2.4E+02	nc	7.9E+02	nc	3.8E+04	nc	4.2E+00	nc
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	1.9E+00	nc	7.9E+00	nc	3.8E+02	nc	9.8E-03	nc
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	1.6E+01	nc	7.0E+01	nc	3.3E+03	nc	1.3E-01	nc
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	3.9E+00	nc	1.6E+01	nc	7.6E+02	nc	2.3E-02	nc
4,4'-Methylenebisbenzeneamine	101-77-9	4.7E-02	ca	3.4E-01	ca	1.3E+01	ca	4.2E-03	ca
4,4'-Methylene bis(2-chloroaniline)	101-14-4	1.6E-01	ca	1.2E+00	ca	2.1E+02	ca	3.7E-02	ca
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	4.8E-01	ca	1.2E+01	ca	4.6E+02	ca	5.3E-02	ca
Methylene bromide	74-95-3	2.1E+00	nc	5.9E+00	nc	9.9E+01	nc	1.0E-02	nc
Methylene chloride	75-09-2	5.0E+00	mcl	5.7E+01	ca	3.2E+03	nc	2.6E-02	mcl
4,4'-Methylenediphenyl isocyanate	101-68-8	--		1.0E+05	max	1.0E+05	max	--	
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	2.0E+01	nc	6.3E+01	nc	3.0E+03	nc	1.3E-01	nc
Methyl ethyl ketone (2-Butanone)	78-93-3	1.4E+03	nc	6.8E+03	nc	1.0E+05	max	5.8E+00	nc
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	1.6E+03	nc	8.3E+03	nc	1.0E+05	max	7.1E+00	nc
Methyl methacrylate	80-62-6	3.5E+02	nc	1.1E+03	nc	1.9E+04	nc	1.5E+00	nc
2-Methyl-5-nitroaniline	99-55-8	8.2E+00	ca	6.0E+01	ca	2.4E+03	ca	9.1E-02	ca
Methyl parathion	298-00-0	1.1E+00	nc	4.0E+00	nc	1.9E+02	nc	3.7E-02	nc
2-Methylphenol	95-48-7	2.3E+02	nc	7.9E+02	nc	3.8E+04	nc	3.8E+00	nc
3-Methylphenol	108-39-4	2.3E+02	nc	7.9E+02	nc	3.8E+04	nc	3.7E+00	nc
4-Methylphenol	106-44-5	4.6E+02	nc	1.6E+03	nc	7.6E+04	nc	7.4E+00	nc
Methyl phosphonic acid	993-13-5	3.0E+02	nc	9.5E+02	nc	4.6E+04	nc	1.2E+00	nc
Methyl styrene (mixture)	25013-15-4	5.7E+00	nc	8.0E+01	nc	2.6E+03	nc	1.9E-01	nc
Methyl styrene (alpha)	98-83-9	1.9E+02	nc	1.4E+03	nc	8.2E+04	nc	6.2E+00	nc
Methyl tertbutyl ether (MTBE)	1634-04-4	1.4E+01	ca	4.7E+01	ca	2.1E+03	ca	6.4E-02	ca
Metolaclor (Dual)	51218-45-2	6.8E+02	nc	2.4E+03	nc	1.0E+05	max	1.6E+01	nc
Metribuzin	21087-64-9	1.2E+02	nc	4.0E+02	nc	1.9E+04	nc	7.5E-01	nc
Metsulfuron-methyl (Ally)	74223-64-6	1.2E+03	nc	4.0E+03	nc	1.0E+05	max	9.5E+00	nc
Mirex	2385-85-5	8.8E-04	ca	3.6E-02	ca	1.7E+00	ca	1.3E-02	ca
Molinate	2212-67-1	7.5E+00	nc	3.2E+01	nc	1.5E+03	nc	8.4E-02	nc
Molybdenum	7439-98-7	2.5E+01	nc	9.8E+01	nc	5.8E+03	nc	1.0E+01	nc
Monochloramine	10599-90-3	4.0E+03	mcl	2.0E+03	nc	1.0E+05	max	--	
Myclobutanil (Systhane)	88671-89-0	1.1E+02	nc	4.0E+02	nc	1.9E+04	nc	2.8E+01	nc
Naled	300-76-5	1.0E+01	nc	3.9E+01	nc	2.3E+03	nc	9.0E-02	nc
Napropamide	15299-99-7	4.9E+02	nc	1.9E+03	nc	9.1E+04	nc	6.5E+01	nc
Nickel and compounds	7440-02-0	9.8E+01	nc	3.9E+02	nc	2.3E+04	nc	1.3E+02	nc
Nickel refinery dust	7440-02-0-NRD	5.4E+01	nc	2.1E+02	nc	1.2E+04	nc	1.6E+02	nc

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Nickel subsulfide	12035-72-2	4.5E-02	ca	4.1E-01	ca	1.9E+01	ca	--	
Nitrate	14797-55-8	1.0E+04	mcl	3.1E+04	nc	1.0E+05	max	--	
Nitrite	14797-65-0	1.0E+03	mcl	2.0E+03	nc	1.0E+05	max	--	
2-Nitroaniline	88-74-4	4.7E+01	nc	1.6E+02	nc	7.5E+03	nc	4.0E-01	nc
Nitrobenzene	98-95-3	1.4E-01	ca	5.1E+00	ca	2.2E+02	ca	1.8E-03	ca
Nitrofurantoin	67-20-9	3.5E+02	nc	1.1E+03	nc	5.3E+04	nc	3.0E+00	nc
Nitrofurazone	59-87-0	6.0E-02	ca	4.2E-01	ca	1.6E+01	ca	1.1E-03	ca
Nitroglycerin	55-63-0	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	4.2E-03	nc
Nitroguanidine	556-88-7	5.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.4E+00	nc
2-Nitropropane	79-46-9	2.1E-03	ca	1.4E-02	ca	6.0E-01	ca	1.1E-05	ca
N-Nitrosodi-n-butylamine	924-16-3	2.7E-03	ca	9.9E-02	ca	4.6E+00	ca	1.1E-04	ca
N-Nitrosodiethanolamine	1116-54-7	2.8E-02	ca	1.9E-01	ca	7.6E+00	ca	1.1E-04	ca
N-Nitrosodiethylamine	55-18-5	1.7E-04	ca	8.1E-04	ca	1.4E-01	ca	1.2E-06	ca
N-Nitrosodimethylamine	62-75-9	1.1E-04	ca	2.0E-03	ca	3.4E-01	ca	5.5E-07	ca
N-Nitrosodiphenylamine	86-30-6	1.2E+01	ca	1.1E+02	ca	4.3E+03	ca	1.3E+00	ca
N-Nitroso di-n-propylamine	621-64-7	1.1E-02	ca	7.8E-02	ca	3.0E+00	ca	1.6E-04	ca
N-Nitroso-N-methylethylamine	10595-95-6	7.1E-04	ca	2.0E-02	ca	9.1E-01	ca	4.1E-06	ca
N-Nitrosopyrrolidine	930-55-2	3.7E-02	ca	2.6E-01	ca	1.0E+01	ca	2.8E-04	ca
m-Nitrotoluene	99-08-1	4.4E-01	nc	1.6E+00	nc	7.6E+01	nc	8.1E-03	nc
o-Nitrotoluene	88-72-2	3.1E-01	ca	3.2E+00	ca	1.5E+02	ca	5.9E-03	ca
p-Nitrotoluene	99-99-0	4.3E+00	ca	3.4E+01	ca	1.3E+03	ca	7.9E-02	ca
Norflurazon	27314-13-2	7.2E+01	nc	2.4E+02	nc	1.1E+04	nc	9.3E+00	nc
Octabromodiphenyl ether	32536-52-0	1.1E-05	s	4.7E+01	nc	2.3E+03	nc	6.0E+01	nc
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	2.5E+02	nc	9.6E+02	nc	5.7E+04	nc	6.3E+00	nc
Octamethylpyrophosphoramide	152-16-9	1.0E+01	nc	3.2E+01	nc	1.5E+03	nc	4.8E-02	nc
Oryzalin	19044-88-3	7.9E+00	ca	7.0E+01	ca	2.7E+03	ca	2.9E-01	ca
Oxadiazon	19666-30-9	1.2E+01	nc	7.9E+01	nc	3.8E+03	nc	2.4E+00	nc
Oxamyl	23135-22-0	2.0E+02	mcl	4.0E+02	nc	1.9E+04	nc	8.8E-01	mcl
Oxyfluorfen	42874-03-3	5.4E-01	ca	7.4E+00	ca	2.9E+02	ca	8.6E-01	ca
Paclobutrazol	76738-62-0	5.7E+01	nc	2.1E+02	nc	9.9E+03	nc	2.3E+00	nc
Paraquat	4685-14-7	2.3E+01	nc	7.1E+01	nc	3.4E+03	nc	7.0E+00	nc
Parathion	56-38-2	2.1E+01	nc	9.5E+01	nc	4.6E+03	nc	2.2E+00	nc
Pebulate	1114-71-2	1.4E+02	nc	9.8E+02	nc	5.8E+04	nc	2.2E+00	nc
Pendimethalin	40487-42-1	3.4E+01	nc	4.7E+02	nc	2.3E+04	nc	7.8E+00	nc
Pentabromo-6-chloro cyclohexane	87-84-3	2.8E+00	ca	2.7E+01	ca	1.1E+03	ca	3.2E-01	ca
Pentabromodiphenyl ether	32534-81-9	2.4E+00	s	3.9E+01	nc	2.3E+03	nc	8.7E+00	nc
Pentachlorobenzene	608-93-5	7.9E-01	nc	1.6E+01	nc	9.3E+02	nc	1.2E-01	nc

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Pentachloronitrobenzene	82-68-8	1.2E-01	ca	2.7E+00	ca	1.3E+02	ca	3.0E-02	ca
Pentachlorophenol	87-86-5	1.0E+00	mcl	1.0E+00	ca	3.5E+01	ca	2.8E-02	mcl
Perchlorate	14797-73-0	1.5E+01	nc	1.4E+01	nc	8.2E+02	nc	--	
Perfluoroalkyl Compounds									
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	7.0E-02	hal	3.2E+00	nc	1.5E+02	nc	7.8E-04	mcl
Perfluorooctanoic acid (PFOA)^^	335-67-1	7.0E-02	hal	3.2E-01	nc	1.5E+01	nc	6.0E-04	mcl
Permethrin	52645-53-1	6.0E+00	s	7.9E+02	nc	3.8E+04	nc	1.2E+03	nc
Phenmedipham	13684-63-4	9.5E+02	nc	3.8E+03	nc	1.0E+05	max	1.0E+02	nc
Phenol	108-95-2	1.4E+03	nc	4.7E+03	nc	1.0E+05	max	1.7E+01	nc
m-Phenylenediamine	108-45-2	3.0E+01	nc	9.5E+01	nc	4.6E+03	nc	1.6E-01	nc
p-Phenylenediamine	106-50-3	5.0E+00	nc	1.6E+01	nc	7.6E+02	nc	2.7E-02	nc
Phenylmercuric acetate	62-38-4	4.0E-01	nc	1.3E+00	nc	6.1E+01	nc	2.5E-03	nc
2-Phenylphenol	90-43-7	3.1E+01	ca	2.9E+02	ca	1.1E+04	ca	8.3E+00	ca
Phorate	298-02-2	7.6E-01	nc	3.2E+00	nc	1.5E+02	nc	1.7E-02	nc
Phosmet	732-11-6	9.3E+01	nc	3.2E+02	nc	1.5E+04	nc	4.1E-01	nc
Phosphine	7803-51-2	1.4E-01	nc	5.9E+00	nc	3.5E+02	nc	--	
Phosphoric acid	7664-38-2	2.4E+05	nc	1.0E+05	max	1.0E+05	max	--	
Phosphorus (white)	7723-14-0	1.0E-01	nc	3.9E-01	nc	2.3E+01	nc	7.4E-03	nc
p-Phthalic acid	100-21-0	4.7E+03	nc	1.6E+04	nc	1.0E+05	max	3.4E+01	nc
Phthalic anhydride	85-44-9	9.7E+03	nc	3.2E+04	nc	1.0E+05	max	4.3E+01	nc
Picloram	1918-02-1	5.0E+02	mcl	1.1E+03	nc	5.3E+04	nc	2.8E+00	mcl
Pirimiphos-methyl	29232-93-7	2.1E-01	nc	1.1E+00	nc	5.3E+01	nc	4.0E-03	nc
Polybrominated biphenyls (PBBs)	59536-65-1	2.6E-03	ca	1.8E-02	ca	7.1E-01	ca	--	

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Polychlorinated biphenyls (PCBs)	1336-36-3	5.0E-01	mcl	2.3E-01	ca	8.6E+00	ca	1.6E+00	mcl
Aroclor 1016	12674-11-2	3.5E-01	nc	1.4E+00	nc	8.2E+01	nc	--	
Aroclor 1221	11104-28-2	4.7E-03	ca	2.0E-01	ca	7.7E+00	ca	1.6E-03	ca
Aroclor 1232	11141-16-5	4.7E-03	ca	1.7E-01	ca	6.7E+00	ca	1.6E-03	ca
Aroclor 1242	53469-21-9	7.9E-03	ca	2.3E-01	ca	8.7E+00	ca	2.5E-02	ca
Aroclor 1248	12672-29-6	7.9E-03	ca	2.3E-01	ca	8.7E+00	ca	2.4E-02	ca
Aroclor 1254	11097-69-1	7.9E-03	ca	2.4E-01	ca	8.9E+00	ca	4.1E-02	ca
Aroclor 1260	11096-82-5	7.9E-03	ca	2.4E-01	ca	9.0E+00	ca	1.1E-01	ca
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9	1.3E+02	nc	9.0E+02	nc	4.1E+04	nc	2.7E+01	nc
Anthracene	120-12-7	4.3E+01	s	4.5E+03	nc	1.0E+05	max	2.9E+02	nc
Benz[a]anthracene	56-55-3	3.0E-02	ca	1.1E+00	ca	1.9E+02	ca	2.1E-01	ca
Benzo[a]pyrene	50-32-8	2.0E-01	mcl	1.1E-01	ca	1.9E+01	ca	4.7E+00	mcl
Benzo[b]fluoranthene	205-99-2	2.5E-01	ca	1.1E+00	ca	1.9E+02	ca	6.0E+00	ca
Benzo[k]fluoranthene	207-08-9	8.0E-01	s	1.1E+01	ca	1.9E+03	ca	5.9E+01	ca
Chrysene	218-01-9	2.0E+00	s	1.1E+02	ca	1.9E+04	ca	1.8E+02	ca
Dibenz[ah]anthracene	53-70-3	2.5E-02	ca	1.1E-01	ca	1.9E+01	ca	1.9E+00	ca
Fluoranthene	206-44-0	2.0E+02	nc	6.0E+02	nc	2.7E+04	nc	4.5E+02	nc
Fluorene	86-73-7	7.4E+01	nc	6.0E+02	nc	2.7E+04	nc	2.7E+01	nc
Indeno[1,2,3-cd]pyrene	193-39-5	1.9E-01	s	1.1E+00	ca	1.9E+02	ca	2.0E+01	ca
Naphthalene	91-20-3	1.7E-01	ca	3.8E+00	ca	1.7E+02	ca	1.1E-02	ca
Pyrene	129-00-0	3.0E+01	nc	4.5E+02	nc	2.1E+04	nc	6.6E+01	nc
Prochloraz	67747-09-5	3.8E-01	ca	3.6E+00	ca	1.4E+02	ca	3.8E-02	ca
Profluralin	26399-36-0	6.5E+00	nc	1.2E+02	nc	7.0E+03	nc	8.0E+00	nc
Prometon	1610-18-0	6.3E+01	nc	2.4E+02	nc	1.1E+04	nc	6.0E-01	nc
Prometryn	7287-19-6	1.5E+02	nc	6.3E+02	nc	3.0E+04	nc	4.5E+00	nc
Propyzamide (Pronamide)	23950-58-5	2.9E+02	nc	1.2E+03	nc	5.7E+04	nc	6.0E+00	nc
Propachlor	1918-16-7	6.1E+01	nc	2.1E+02	nc	9.9E+03	nc	7.5E-01	nc
Propanil	709-98-8	2.0E+01	nc	7.9E+01	nc	3.8E+03	nc	2.3E-01	nc
Propargite	2312-35-8	1.6E-01	ca	2.9E+00	ca	1.1E+02	ca	2.3E-01	ca
Propargyl alcohol	107-19-7	1.0E+01	nc	3.9E+01	nc	2.3E+03	nc	4.1E-02	nc
Propazine	139-40-2	8.6E+01	nc	3.2E+02	nc	1.5E+04	nc	1.5E+00	nc
Propham	122-42-9	8.8E+01	nc	3.2E+02	nc	1.5E+04	nc	1.1E+00	nc
Propiconazole	60207-90-1	4.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.7E+01	nc
n-Propylbenzene	103-65-1	1.6E+02	nc	9.4E+02	nc	2.4E+04	nc	6.1E+00	nc
Propylene glycol	57-55-6	1.0E+05	nc	1.0E+05	max	1.0E+05	max	4.0E+02	nc
Propylene glycol, monoethyl ether	52125-53-8	8.0E+02	nc	1.0E+04	nc	1.0E+05	max	3.2E+01	nc

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Propylene glycol, monomethyl ether	107-98-2	8.0E+02	nc	1.0E+04	nc	1.0E+05	max	3.2E+00	nc
Propylene oxide	75-56-9	2.7E-01	ca	2.8E+00	ca	1.3E+02	ca	1.1E-02	ca
Pyridine	110-86-1	4.9E+00	nc	2.0E+01	nc	1.2E+03	nc	3.4E-02	nc
Quinalphos	13593-03-8	1.3E+00	nc	7.9E+00	nc	3.8E+02	nc	2.2E-01	nc
Quinoline	91-22-5	2.4E-02	ca	1.8E-01	ca	7.1E+00	ca	1.6E-03	ca
Resmethrin	10453-86-8	1.7E+01	nc	4.7E+02	nc	2.3E+04	nc	2.1E+02	nc
Ronnel	299-84-3	1.0E+02	nc	9.8E+02	nc	5.8E+04	nc	1.9E+01	nc
Rotenone	83-79-4	1.5E+01	nc	6.3E+01	nc	3.0E+03	nc	1.6E+02	nc
Selenious Acid	7783-00-8	2.5E+01	nc	9.8E+01	nc	5.8E+03	nc	--	
Selenium	7782-49-2	5.0E+01	mcl	9.8E+01	nc	5.8E+03	nc	5.2E+00	mcl
Sethoxydim	74051-80-2	4.0E+02	nc	2.2E+03	nc	1.0E+05	max	7.2E+01	nc
Silver and compounds	7440-22-4	1.0E+02	mcl	9.8E+01	nc	5.8E+03	nc	1.7E+01	mcl
Simazine	122-34-9	4.0E+00	mcl	4.5E+00	ca	1.8E+02	ca	3.9E-02	mcl
Sodium azide	26628-22-8	2.0E+01	nc	7.8E+01	nc	4.7E+03	nc	--	
Sodium diethyldithiocarbamate	148-18-5	2.9E-01	ca	2.0E+00	ca	7.9E+01	ca	3.5E-03	ca
Sodium fluoroacetate	62-74-8	1.0E-01	nc	3.2E-01	nc	1.5E+01	nc	4.1E-04	nc
Sodium metavanadate	13718-26-8	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	--	
Strontium, stable	7440-24-6	3.0E+03	nc	1.2E+04	nc	1.0E+05	max	2.1E+03	nc
Strychnine	57-24-9	1.5E+00	nc	4.7E+00	nc	2.3E+02	nc	3.3E-01	nc
Styrene	100-42-5	1.0E+02	mcl	1.5E+03	nc	3.5E+04	nc	2.2E+00	mcl
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	2.7E+00	nc	1.3E+01	nc	6.1E+02	nc	3.2E-01	nc
Tebuthiuron	34014-18-1	3.4E+02	nc	1.1E+03	nc	5.3E+04	nc	1.9E+00	nc
Temephos	3383-96-8	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	3.8E+02	nc
Terbacil	5902-51-2	6.3E+01	nc	2.1E+02	nc	9.9E+03	nc	3.8E-01	nc
Terbufos	13071-79-9	5.9E-02	nc	4.9E-01	nc	2.9E+01	nc	2.6E-03	nc
Terbutryn	886-50-0	3.4E+00	nc	1.6E+01	nc	7.6E+02	nc	9.5E-02	nc
1,2,4,5-Tetrachlorobenzene	95-94-3	4.3E-01	nc	5.9E+00	nc	3.5E+02	nc	4.0E-02	nc
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	3.0E-05	mcl	4.8E-06	ca	2.1E-04	ca	3.0E-04	mcl
1,1,1,2-Tetrachloroethane	630-20-6	5.7E-01	ca	2.0E+00	ca	8.8E+01	ca	4.4E-03	ca
1,1,2,2-Tetrachloroethane	79-34-5	7.6E-02	ca	6.0E-01	ca	2.7E+01	ca	5.9E-04	ca
Tetrachloroethylene (PCE)	127-18-4	5.0E+00	mcl	2.0E+01	nc	3.9E+02	nc	4.5E-02	mcl
2,3,4,6-Tetrachlorophenol	58-90-2	5.9E+01	nc	4.7E+02	nc	2.3E+04	nc	9.0E-01	nc
p,a,a,a-Tetrachlorotoluene	5216-25-1	1.3E-03	ca	3.5E-02	ca	1.6E+00	ca	9.1E-05	ca
Tetrachlorovinphos (Stirofos)	961-11-5	2.8E+00	ca	2.3E+01	ca	8.9E+02	ca	1.6E-01	ca
Tetraethyldithiopyrophosphate	3689-24-5	1.8E+00	nc	7.9E+00	nc	3.8E+02	nc	2.6E-02	nc
Thallium and compounds	7440-28-0	2.0E+00	mcl	2.0E-01	nc	1.2E+01	nc	2.8E+00	mcl
Thiobencarb	28249-77-6	4.0E+01	nc	1.6E+02	nc	7.6E+03	nc	2.8E+00	nc

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Thiofanox	39196-18-4	1.3E+00	nc	4.7E+00	nc	2.3E+02	nc	9.1E-03	nc
Thiophanate-methyl	23564-05-8	6.4E+00	ca	4.5E+01	ca	1.8E+03	ca	1.1E-01	ca
Thiram	137-26-8	7.3E+01	nc	2.4E+02	nc	1.1E+04	nc	2.1E+00	nc
Tin and compounds	7440-31-5	3.0E+03	nc	1.2E+04	nc	1.0E+05	max	1.5E+04	nc
Toluene	108-88-3	1.0E+03	mcl	1.2E+03	nc	4.7E+04	nc	1.4E+01	mcl
p-Toluidine	106-49-0	2.5E+00	ca	1.8E+01	ca	7.1E+02	ca	2.1E-02	ca
Tralomethrin	66841-25-6	3.8E+01	nc	1.2E+02	nc	5.7E+03	nc	2.9E+02	nc
Triadimefon (Bayleton)	43121-43-3	1.6E+02	nc	5.4E+02	nc	2.6E+04	nc	2.5E+00	nc
Triallate	2303-17-5	4.7E-01	ca	9.7E+00	ca	4.5E+02	ca	2.1E-02	ca
Triasulfuron	82097-50-5	5.0E+01	nc	1.6E+02	nc	7.6E+03	nc	1.1E+00	nc
Tribenuron-methyl (Express)	101200-48-0	3.9E+01	nc	1.3E+02	nc	6.1E+03	nc	3.0E-01	nc
1,2,4-Tribromobenzene	615-54-3	1.1E+01	nc	9.8E+01	nc	5.8E+03	nc	3.2E-01	nc
Tributyltin oxide (TBTO)	56-35-9	1.4E+00	nc	4.7E+00	nc	2.3E+02	nc	1.5E+03	nc
2,4,6-Trichloroaniline	634-93-5	9.9E-02	nc	4.7E-01	nc	2.3E+01	nc	1.8E-02	nc
2,4,6-Trichloroaniline hydrochloride	33663-50-2	2.7E+00	ca	1.9E+01	ca	7.3E+02	ca	1.5E-01	ca
1,2,4-Trichlorobenzene	120-82-1	7.0E+01	mcl	1.4E+01	nc	2.6E+02	nc	4.1E+00	mcl
1,1,1-Trichloroethane	71-55-6	2.0E+02	mcl	2.0E+03	nc	3.6E+04	nc	1.4E+00	mcl
1,1,2-Trichloroethane	79-00-5	5.0E+00	mcl	3.7E-01	nc	6.3E+00	nc	3.2E-02	mcl
Trichloroethylene (TCE) Long-term +++	79-01-6	5.0E+00	mcl	4.7E-01	ca	1.9E+01	nc	3.6E-02	mcl
Trichlorofluoromethane	75-69-4	1.3E+03	nc	5.9E+03	nc	1.0E+05	max	1.7E+01	nc
2,4,5-Trichlorophenol	95-95-4	3.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.0E+01	nc
2,4,6-Trichlorophenol	88-06-2	3.0E+00	nc	1.6E+01	nc	7.6E+02	nc	5.8E-02	nc
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	4.1E+01	nc	1.6E+02	nc	7.6E+03	nc	3.4E-01	nc
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	5.0E+01	mcl	1.3E+02	nc	6.1E+03	nc	5.5E-01	mcl
1,1,2-Trichloropropane	598-77-6	2.2E+01	nc	9.8E+01	nc	5.8E+03	nc	1.7E-01	nc
1,2,3-Trichloropropane	96-18-4	7.5E-04	ca	5.1E-03	ca	1.1E+00	ca	6.5E-06	ca
1,2,3-Trichloropropene	96-19-5	1.5E-01	nc	1.8E-01	nc	3.1E+00	nc	1.5E-03	nc
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	2.5E+03	nc	1.7E+03	nc	2.8E+04	nc	1.3E+02	nc
Tridiphane	58138-08-2	4.5E+00	nc	4.7E+01	nc	2.3E+03	nc	6.4E-01	nc
Triethylamine	121-44-8	3.7E+00	nc	2.9E+01	nc	4.8E+02	nc	2.2E-02	nc
Trifluralin	1582-09-8	2.6E+00	ca	9.0E+01	ca	4.2E+03	ca	1.7E+00	ca
1,2,4-Trimethylbenzene	95-63-6	1.4E+01	nc	7.6E+01	nc	1.8E+03	nc	4.0E-01	nc
1,3,5-Trimethylbenzene	108-67-8	1.5E+01	nc	6.8E+01	nc	1.5E+03	nc	4.3E-01	nc
Trimethyl phosphate	512-56-1	3.9E+00	ca	2.7E+01	ca	1.1E+03	ca	1.7E-02	ca
1,3,5-Trinitrobenzene	99-35-4	1.5E+02	nc	5.6E+02	nc	3.2E+04	nc	1.1E+01	nc
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	9.9E+00	nc	3.9E+01	nc	2.3E+03	nc	1.9E+00	nc
2,4,6-Trinitrotoluene (TNT)	118-96-7	2.5E+00	nc	9.1E+00	nc	5.0E+02	nc	2.9E-01	nc

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Triphenylphosphine oxide	791-28-6	9.1E+01	nc	3.2E+02	nc	1.5E+04	nc	7.5E+00	nc
Tris(2-chloroethyl) phosphate	115-96-8	3.8E+00	ca	2.7E+01	ca	1.1E+03	ca	7.5E-02	ca
Uranium (chemical toxicity only)	7440-61-0	3.0E+01	mcl	3.9E+00	nc	2.3E+02	nc	2.7E+02	mcl
Vanadium and compounds +++	7440-62-2	2.1E+01	nc	9.8E+01	nc	5.8E+03	nc	4.3E+02	nc
Vernolate (Vernam)	1929-77-7	2.8E+00	nc	2.0E+01	nc	1.2E+03	nc	4.4E-02	nc
Vinclozolin	50471-44-8	5.3E+00	nc	1.9E+01	nc	9.1E+02	nc	8.1E-02	nc
Vinyl acetate	108-05-4	1.0E+02	nc	2.3E+02	nc	3.8E+03	nc	4.4E-01	nc
Vinyl bromide	593-60-2	1.8E-01	ca	1.2E-01	ca	5.2E+00	ca	1.0E-03	ca
Vinyl chloride +++	75-01-4	2.0E+00	mcl	1.1E-01	ca	1.7E+01	ca	1.4E-02	mcl
Warfarin	81-81-2	1.4E+00	nc	4.7E+00	nc	2.3E+02	nc	3.0E-02	nc
Xylenes	1330-20-7	1.0E+04	mcl	1.4E+02	nc	2.5E+03	nc	2.0E+02	mcl
Zinc	7440-66-6	5.0E+03	mcl	5.9E+03	nc	1.0E+05	max	6.2E+03	mcl
Zinc phosphide	1314-84-7	1.5E+00	nc	5.9E+00	nc	3.5E+02	nc	--	
Zineb	12122-67-7	2.5E+02	nc	7.9E+02	nc	3.8E+04	nc	1.4E+01	nc

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both chromium III and chromium VI analyses.

^^ If both PFOS and PFOA are present, the sum of the concentrations for these contaminants should not exceed 0.07 µg/L.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

-- = Not available/not applicable
µg/L = Micrograms per liter
ca = cancer
CAS No. = Chemical Abstract Service Number
DAF = Dilution attenuation factor
hal = health advisory limit
max = maximum (saturation value)
mcl = Maximum Contaminant Level
nc = noncancer
NDEE = Nebraska Department of Enviroment and Energy policy value

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

Version Date: March 2021

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Acephate	30560-19-1	--		--		--	--	--	--
Acetaldehyde	75-07-0	1.3E+00	ca	3.9E+01	nc	7.9E+02	2.4E+04	4.3E+01	1.3E+03
Acetochlor	34256-82-1	--		--		--	--	--	--
Acetone	67-64-1	8.1E+03	nc	1.4E+05	nc	1.1E+07	1.8E+08	2.7E+05	4.5E+06
Acetone cyanohydrin	75-86-5	5.2E-01	nc	8.8E+00	nc	--	--	--	--
Acetonitrile	75-05-8	1.6E+01	nc	2.6E+02	nc	2.1E+04	3.5E+05	5.2E+02	8.8E+03
Acrolein	107-02-8	5.2E-03	nc	8.8E-02	nc	1.9E+00	3.2E+01	1.7E-01	2.9E+00
Acrylamide	79-06-1	1.0E-02	ca	1.2E+00	ca	--	--	--	--
Acrylic acid	79-10-7	2.6E-01	nc	4.4E+00	nc	5.2E+04	8.8E+05	8.7E+00	1.5E+02
Acrylonitrile	107-13-1	4.1E-02	ca	1.8E+00	ca	1.5E+01	6.7E+02	1.4E+00	6.0E+01
Alachlor	15972-60-8	--		--		--	--	--	--
Aldicarb	116-06-3	--		--		--	--	--	--
Aldicarb sulfone	1646-88-4	--		--		--	--	--	--
Aldrin	309-00-2	5.7E-04	ca	2.5E-02	ca	1.4E+00	NVT	1.9E-02	8.3E-01
Allyl alcohol	107-18-6	2.6E-02	nc	4.4E-01	nc	3.3E+02	5.5E+03	8.7E-01	1.5E+01
Allyl chloride	107-05-1	2.6E-01	nc	4.4E+00	nc	1.1E+00	1.8E+01	8.7E+00	1.5E+02
Aluminum	7429-90-5	1.3E+00	nc	2.2E+01	nc	--	--	--	--
Aluminum phosphide	20859-73-8	--		--		--	--	--	--
Ametryn	834-12-8	--		--		--	--	--	--
m-Aminophenol	591-27-5	--		--		--	--	--	--
Amitraz	33089-61-1	--		--		--	--	--	--
Ammonia +++	7664-41-7	1.3E+02	nc	2.2E+03	nc	3.0E+05	5.1E+06	4.3E+03	7.3E+04
Ammonium sulfamate	7773-06-0	--		--		--	--	--	--
Aniline	62-53-3	2.6E-01	nc	4.4E+00	nc	--	--	--	--
Antimony and compounds	7440-36-0	--		--		--	--	--	--
Antimony pentoxide	1314-60-9	--		--		--	--	--	--
Antimony potassium tartrate	28300-74-5	--		--		--	--	--	--
Antimony tetroxide	1332-81-6	--		--		--	--	--	--
Antimony trioxide	1309-64-4	5.2E-02	nc	8.8E-01	nc	--	--	--	--
Arsenic (inorganic) +++	7440-38-2	--		--		--	--	--	--
Arsine	7784-42-1	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Assure	76578-14-8	--		--		--	--	--	--
Asulam	3337-71-1	--		--		--	--	--	--
Atrazine	1912-24-9	--		--		--	--	--	--
Avermectin B1	65195-55-3	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Azobenzene	103-33-3	9.1E-02	ca	4.0E+00	ca	1.6E+02	NVT	3.0E+00	1.3E+02
Barium and compounds	7440-39-3	1.3E-01	nc	2.2E+00	nc	--	--	--	--
Benfluralin (Benefin)	1861-40-1	--		--		--	--	--	--
Bensulfuron-methyl (Londax)	83055-99-6	--		--		--	--	--	--
Bentazone (Bentazon)	25057-89-0	--		--		--	--	--	--
Benzaldehyde	100-52-7	--		--		--	NVT	--	--
Benzene	71-43-2	3.6E-01	ca	1.6E+01	ca	3.1E+00	1.4E+02	1.2E+01	5.2E+02
Benzidine	92-87-5	1.5E-05	ca	1.8E-03	ca	--	--	--	--
Benzoic acid	65-85-0	--		--		--	--	--	--
Benzotrichloride	98-07-7	--		--		--	--	--	--
Benzyl alcohol	100-51-6	--		--		--	--	--	--
Benzyl chloride	100-44-7	5.7E-02	ca	2.5E+00	ca	8.3E+00	3.6E+02	1.9E+00	8.3E+01
Beryllium and compounds	7440-41-7	1.2E-03	ca	5.1E-02	ca	--	--	--	--
Biphenthrin (Talstar)	82657-04-3	--		--		--	--	--	--
1,1-Biphenyl	92-52-4	1.0E-01	nc	1.8E+00	nc	2.7E+01	4.5E+02	3.5E+00	5.8E+01
Bis(2-chloroethyl)ether	111-44-4	8.5E-03	ca	3.7E-01	ca	3.8E+01	1.7E+03	2.8E-01	1.2E+01
Bis(chloromethyl)ether	542-88-1	4.5E-05	ca	2.0E-03	ca	2.5E-04	1.1E-02	1.5E-03	6.6E-02
Bis(2-chloro-1-methylethyl)ether	108-60-1	--		--		--	--	--	--
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	1.2E+00	ca	5.1E+01	ca	--	--	--	--
Bisphenol A	80-05-7	--		--		--	--	--	--
Boron	7440-42-8	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Boron trifluoride	7637-07-2	3.4E+00	nc	5.7E+01	nc	No HLC	No HLC	1.1E+02	1.9E+03
Bromate	15541-45-4	--		--		--	--	--	--
Bromobenzene	108-86-1	1.6E+01	nc	2.6E+02	nc	4.4E+02	7.4E+03	5.2E+02	8.8E+03
Bromodichloromethane	75-27-4	7.6E-02	ca	3.3E+00	ca	1.8E+00	7.9E+01	2.5E+00	1.1E+02
Bromoform (Tribromomethane)	75-25-2	2.6E+00	ca	1.1E+02	ca	3.0E+02	1.3E+04	8.5E+01	3.7E+03
Bromomethane	74-83-9	1.3E+00	nc	2.2E+01	nc	6.9E+00	1.2E+02	4.3E+01	7.3E+02
Bromophos	2104-96-3	--		--		--	--	--	--
Bromoxynil	1689-84-5	--		--		--	--	--	--
Bromoxynil octanoate	1689-99-2	--		--		--	--	--	--
1,3-Butadiene	106-99-0	9.4E-02	ca	4.1E+00	ca	--	--	3.1E+00	1.4E+02
1-Butanol	71-36-3	--		--		--	--	--	--
Butylate	2008-41-5	--		--		--	--	--	--
Butyl benzyl phthalate	85-68-7	--		--		--	--	--	--
Butylphthalyl butylglycolate	85-70-1	--		--		--	--	--	--
Cacodylic acid	75-60-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Cadmium and compounds +++	7440-43-9	1.6E-03	ca	4.4E-02	nc	--	--	--	--
Camphechlor (Toxaphene)	8001-35-2	8.8E-03	ca	3.8E-01	ca	--	--	--	--
Caprolactam	105-60-2	5.7E-01	nc	9.6E+00	nc	--	--	--	--
Captafol	2425-06-1	6.5E-02	ca	2.9E+00	ca	--	--	--	--
Captan	133-06-2	4.3E+00	ca	1.9E+02	ca	--	--	--	--
Carbaryl	63-25-2	--		--		--	--	--	--
Carbofuran	1563-66-2	--		--		--	--	--	--
Carbon disulfide	75-15-0	1.8E+02	nc	3.1E+03	nc	5.4E+02	9.1E+03	6.1E+03	1.0E+05
Carbon tetrachloride	56-23-5	4.7E-01	ca	2.0E+01	ca	8.0E-01	3.5E+01	1.6E+01	6.8E+02
Carbosulfan	55285-14-8	--		--		--	--	--	--
Carboxin	5234-68-4	--		--		--	--	--	--
Chloramben	133-90-4	--		--		--	--	--	--
Chloranil	118-75-2	--		--		--	--	--	--
Chlordane	12789-03-6	2.8E-02	ca	1.2E+00	ca	NVT	NVT	9.4E-01	4.1E+01
Chlordecone (Kepone)	143-50-0	6.1E-04	ca	2.7E-02	ca	--	--	--	--
Chlorimuron-ethyl	90982-32-4	--		--		--	--	--	--
Chlorine	7782-50-5	3.9E-02	nc	6.6E-01	nc	1.5E+01	2.5E+02	1.3E+00	2.2E+01
Chlorine dioxide	10049-04-4	5.2E-02	nc	8.8E-01	nc	No S	No S	1.7E+00	2.9E+01
Chloroacetic acid	79-11-8	--		--		--	--	--	--
2-Chloroacetophenone	532-27-4	7.8E-03	nc	1.3E-01	nc	--	--	--	--
4-Chloroaniline	106-47-8	--		--		--	--	--	--
Chlorobenzene	108-90-7	1.3E+01	nc	2.2E+02	nc	NVT	NVT	4.3E+02	7.3E+03
Chlorobenzilate	510-15-6	9.1E-02	ca	4.0E+00	ca	--	--	--	--
p-Chlorobenzoic acid	74-11-3	--		--		--	--	--	--
4-Chlorobenzotrifluoride	98-56-6	7.8E+01	nc	1.3E+03	nc	--	--	2.6E+03	4.4E+04
2-Chloro-1,3-butadiene	126-99-8	9.4E-03	ca	4.1E-01	ca	8.4E-03	3.7E-01	3.1E-01	1.4E+01
1-Chlorobutane	109-69-3	--		--		--	--	--	--
1-Chloro-1,1-difluoroethane	75-68-3	1.3E+04	nc	2.2E+05	nc	3.6E+05	NVT	4.3E+05	7.3E+06
Chlorodifluoromethane	75-45-6	1.3E+04	nc	2.2E+05	nc	1.1E+04	1.9E+05	4.3E+05	7.3E+06
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	4.0E-01	ca	1.7E+01	ca	--	--	--	--
Chloroform	67-66-3	1.2E-01	ca	5.3E+00	ca	1.5E+00	6.7E+01	4.1E+00	1.8E+02
Chloromethane	74-87-3	2.3E+01	nc	3.9E+02	nc	9.7E+01	1.6E+03	7.8E+02	1.3E+04
4-Chloro-2-methylaniline hydrochloride	3165-93-3	--		--		--	--	--	--
beta-Chloronaphthalene	91-58-7	--		--		--	--	--	--
o-Chloronitrobenzene	88-73-3	2.6E-03	nc	4.4E-02	nc	--	NVT	--	--
p-Chloronitrobenzene	100-00-5	5.2E-01	nc	8.8E+00	nc	--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
2-Chlorophenol	95-57-8	--		--		--	--	--	--
Chlorothalonil	1897-45-6	3.2E+00	ca	1.4E+02	ca	--	--	--	--
o-Chlorotoluene	95-49-8	--		--		--	--	--	--
Chlorpropham	101-21-3	--		--		--	--	--	--
Chlorpyrifos	2921-88-2	--		--		--	--	--	--
Chlorpyrifos-methyl	5598-13-0	--		--		--	--	--	--
Chlorsulfuron	64902-72-3	--		--		--	--	--	--
Chlorthiophos	60238-56-4	--		--		--	--	--	--
Chromium, Total	7440-47-3	--		--		--	--	--	--
Chromium III *	16065-83-1	--		--		--	--	--	--
Chromium VI +++	18540-29-9	1.2E-05	ca	1.5E-03	ca	--	--	--	--
Clofentezine (Apollo)	74115-24-5	--		--		--	--	--	--
Cobalt	7440-48-4	3.1E-04	ca	1.4E-02	ca	--	--	--	--
Coke Oven Emissions	7440-47-3	--		--		--	--	--	--
Copper and compounds	7440-50-8	--		--		--	--	--	--
Crotonaldehyde	123-73-9	--		--		--	--	--	--
Cumene (Isopropylbenzene)	98-82-8	1.0E+02	nc	1.8E+03	nc	6.3E+02	1.1E+04	3.5E+03	5.8E+04
Cyanazine	21725-46-2	--		--		--	--	--	--
Cyanide (free)	57-12-5	2.1E-01	nc	3.5E+00	nc	5.0E+01	8.4E+02	7.0E+00	1.2E+02
Cyanide (hydrogen)	74-90-8	2.1E-01	nc	3.5E+00	nc	--	--	--	--
Cyanogen	460-19-5	--		--		--	--	--	--
Cyanogen bromide	506-68-3	--		--		--	--	--	--
Cyanogen chloride	506-77-4	--		--		--	--	--	--
Cyclohexane	110-82-7	1.6E+03	nc	2.6E+04	nc	4.9E+02	8.3E+03	5.2E+04	8.8E+05
Cyclohexanone	108-94-1	1.8E+02	nc	3.1E+03	nc	1.5E+06	NVT	6.1E+03	1.0E+05
Cyclohexylamine	108-91-8	--		--		--	--	--	--
Cyfluthrin (Baythroid)	68359-37-5	--		--		--	--	--	--
Cyhalothrin (Karate)	68085-85-8	--		--		--	--	--	--
Cyromazine	66215-27-8	--		--		--	--	--	--
Dacthal	1861-32-1	--		--		--	NVT	--	--
Dalapon	75-99-0	--		--		--	--	--	--
Daminozide (Alar)	1596-84-5	5.5E-01	ca	2.4E+01	ca	--	--	--	--
Demeton	8065-48-3	--		--		--	--	--	--
Diallate	2303-16-4	--		--		--	--	--	--
Diazinon	333-41-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Dibenzofuran	132-64-9	--		--		--	--	--	--
1,4-Dibromobenzene	106-37-6	--		--		--	--	--	--
Dibromochloromethane	124-48-1	--		--		--	--	--	--
1,2-Dibromo-3-chloropropane	96-12-8	1.7E-04	ca	2.0E-02	ca	7.9E-02	9.6E+00	5.6E-03	6.8E-01
1,2-Dibromoethane	106-93-4	4.7E-03	ca	2.0E-01	ca	4.1E-01	1.8E+01	1.6E-01	6.8E+00
Dibutyl phthalate	84-74-2	--		--		NVT	NVT	--	--
Dicamba	1918-00-9	--		--		--	--	--	--
1,2-Dichlorobenzene	95-50-1	5.2E+01	nc	8.8E+02	nc	1.8E+03	2.9E+04	1.7E+03	2.9E+04
1,4-Dichlorobenzene	106-46-7	2.6E-01	ca	1.1E+01	ca	6.6E+00	2.9E+02	8.5E+00	3.7E+02
3,3-Dichlorobenzidine	91-94-1	8.3E-03	ca	3.6E-01	ca	--	--	--	--
4,4'-Dichlorobenzophenone	90-98-2	--		--		--	--	--	--
1,4-Dichloro-2-butene	764-41-0	6.7E-04	ca	2.9E-02	ca	1.9E-03	8.4E-02	2.2E-02	9.7E-01
Dichlorodifluoromethane	75-71-8	2.6E+01	nc	4.4E+02	nc	3.7E+00	6.3E+01	8.7E+02	1.5E+04
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	4.1E-02	ca	1.8E+00	ca	--	--	--	--
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	2.9E-02	ca	1.3E+00	ca	NVT	NVT	9.6E-01	4.2E+01
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.9E-02	ca	1.3E+00	ca	--	--	--	--
1,1-Dichloroethane	75-34-3	1.8E+00	ca	7.7E+01	ca	1.4E+01	6.2E+02	5.8E+01	2.6E+03
1,2-Dichloroethane	107-06-2	1.1E-01	ca	4.7E+00	ca	4.5E+00	2.0E+02	3.6E+00	1.6E+02
1,1-Dichloroethylene	75-35-4	5.2E+01	nc	8.8E+02	nc	8.3E+01	1.4E+03	1.7E+03	2.9E+04
1,2-Dichloroethylene (cis)	156-59-2	--		--		--	--	--	--
1,2-Dichloroethylene (trans)	156-60-5	--		--		--	--	--	--
2,4-Dichlorophenol	120-83-2	--		--		--	--	--	--
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	--		--		--	--	--	--
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	--		--		--	--	--	--
Decabromodiphenyl ether (BDE-209)	1163-19-5	--		--		--	--	--	--
1,2-Dichloropropane	78-87-5	7.5E-01	ca	1.8E+01	nc	1.3E+01	3.1E+02	2.5E+01	5.8E+02
2,3-Dichloropropanol	616-23-9	--		--		--	--	--	--
1,3-Dichloropropene	542-75-6	7.0E-01	ca	3.1E+01	ca	1.0E+01	4.5E+02	2.3E+01	1.0E+03
Dichlorvos	62-73-7	3.4E-02	ca	1.5E+00	ca	--	--	--	--
Dicrotophos (Bidrin)	141-66-2	--		--		--	--	--	--
Dicyclopentadiene	77-73-6	7.8E-02	nc	1.3E+00	nc	3.8E-02	6.4E-01	2.6E+00	4.4E+01
Dieldrin	60-57-1	6.1E-04	ca	2.7E-02	ca	--	--	--	--
Diethylene glycol, monobutyl ether	112-34-5	2.6E-02	nc	4.4E-01	nc	--	--	--	--
Diethylene glycol, monoethyl ether	111-90-0	7.8E-02	nc	1.3E+00	nc	--	--	--	--
Diethylformamide	617-84-5	--		--		--	--	--	--
Di(2-ethylhexyl)adipate	103-23-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Diethyl phthalate	84-66-2	--		--		--	--	--	--
Diethylstilbestrol	56-53-1	2.8E-05	ca	1.2E-03	ca	--	--	--	--
Difenzoquat (Avenge)	43222-48-6	--		--		--	--	--	--
Diflubenzuron	35367-38-5	--		--		--	--	--	--
1,1-Difluoroethane	75-37-6	1.0E+04	nc	1.8E+05	nc	1.8E+04	3.1E+05	3.5E+05	5.8E+06
Diisopropyl methylphosphonate (DIMP)	1445-75-6	--		--		--	--	--	--
Dimethipin	55290-64-7	--		--		--	--	--	--
Dimethoate	60-51-5	--		--		--	--	--	--
3,3'-Dimethoxybenzidine	119-90-4	--		--		--	--	--	--
N-N-Dimethylaniline	121-69-7	--		--		--	--	--	--
2,4-Dimethylaniline	95-68-1	--		--		--	--	--	--
2,4-Dimethylaniline hydrochloride	21436-96-4	--		--		--	--	--	--
3,3'-Dimethylbenzidine	119-93-7	--		--		--	--	--	--
N,N-Dimethylformamide	68-12-2	7.8E+00	nc	1.3E+02	nc	8.1E+06	1.4E+08	2.6E+02	4.4E+03
2,4-Dimethylphenol	105-67-9	--		--		--	--	--	--
2,6-Dimethylphenol	576-26-1	--		--		--	--	--	--
3,4-Dimethylphenol	95-65-8	--		--		--	--	--	--
Dimethyl terephthalate	120-61-6	--		--		--	--	--	--
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	--		--		--	--	--	--
1,2-Dinitrobenzene	528-29-0	--		--		--	--	--	--
1,3-Dinitrobenzene	99-65-0	--		--		--	--	--	--
1,4-Dinitrobenzene	100-25-4	--		--		--	--	--	--
2,4-Dinitrophenol	51-28-5	--		--		--	--	--	--
Dinitrotoluene mixture	25321-14-6	--		--		--	--	--	--
2,4-Dinitrotoluene	121-14-2	3.2E-02	ca	1.4E+00	ca	--	--	--	--
2,6-Dinitrotoluene	606-20-2	--		--		--	--	--	--
Dinoseb	88-85-7	--		--		--	--	--	--
1,4-Dioxane	123-91-1	5.6E-01	ca	2.5E+01	ca	6.5E+03	2.8E+05	1.9E+01	8.2E+02
Diphenamid	957-51-7	--		--		--	--	--	--
Diphenylamine	122-39-4	--		--		--	--	--	--
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	--		--		--	--	--	--
1,2-Diphenylhydrazine	122-66-7	1.3E-02	ca	5.6E-01	ca	--	--	--	--
Diphenyl sulfone	127-63-9	--		--		--	--	--	--
Diquat dibromide (Diquat)	85-00-7	--		--		--	--	--	--
Direct black 38	1937-37-7	2.0E-05	ca	8.8E-04	ca	--	--	--	--
Direct blue 6	2602-46-2	2.0E-05	ca	8.8E-04	ca	--	--	--	--

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TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Direct brown 95	16071-86-6	2.0E-05	ca	8.8E-04	ca	--	--	--	--
Disulfoton	298-04-4	--		--		--	--	--	--
1,4-Dithiane	505-29-3	--		--		--	--	--	--
Diuron	330-54-1	--		--		--	--	--	--
Dodine	2439-10-3	--		--		--	--	--	--
Endosulfan	115-29-7	--		--		--	--	--	--
Endothall	145-73-3	--		--		--	--	--	--
Endrin	72-20-8	--		--		--	--	--	--
Enilconazole (Imazalil)	35554-44-0	--		--		--	--	--	--
Epichlorohydrin	106-89-8	2.6E-01	nc	4.4E+00	nc	2.1E+02	3.5E+03	8.7E+00	1.5E+02
1,2-Epoxybutane	106-88-7	5.2E+00	nc	8.8E+01	nc	1.4E+03	2.3E+04	1.7E+02	2.9E+03
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	--		--		--	--	--	--
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	--		--		--	--	--	--
Ethion	563-12-2	--		--		--	--	--	--
2-Ethoxyethanol	110-80-5	5.2E+01	nc	8.8E+02	nc	7.1E+06	1.2E+08	1.7E+03	2.9E+04
2-Ethoxyethanol acetate	111-15-9	1.6E+01	nc	2.6E+02	nc	3.4E+05	5.7E+06	5.2E+02	8.8E+03
Ethyl acetate	141-78-6	1.8E+01	nc	3.1E+02	nc	6.8E+03	1.1E+05	6.1E+02	1.0E+04
Ethyl acrylate	140-88-5	2.1E+00	nc	3.5E+01	nc	3.7E+02	6.2E+03	7.0E+01	1.2E+03
Ethylbenzene	100-41-4	1.1E+00	ca	4.9E+01	ca	8.1E+00	3.5E+02	3.7E+01	1.6E+03
Ethyl chloride (Chloroethane)	75-00-3	2.6E+03	nc	4.4E+04	nc	9.4E+03	1.6E+05	8.7E+04	1.5E+06
Ethylene cyanohydrin	109-78-4	--		--		--	--	--	--
Ethylene diamine	107-15-3	--		--		--	--	--	--
Ethylene glycol	107-21-1	1.0E+02	nc	1.8E+03	nc	--	--	--	--
Ethylene glycol, monobutyl ether	111-76-2	4.2E+02	nc	7.0E+03	nc	--	--	--	--
Ethylene oxide	75-21-8	3.4E-04	ca	4.1E-02	ca	9.3E-02	1.1E+01	1.1E-02	1.4E+00
Ethylene thiourea (ETU)	96-45-7	2.2E-01	ca	9.4E+00	ca	--	--	--	--
Ethyl ether	60-29-7	--		--		--	--	--	--
Ethyl methacrylate	97-63-2	7.8E+01	nc	1.3E+03	nc	9.9E+03	1.7E+05	2.6E+03	4.4E+04
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	--		--		--	--	--	--
Ethylphthalyl ethyl glycolate	84-72-0	--		--		--	--	--	--
Fenamiphos	22224-92-6	--		--		--	--	--	--
Fenpropathrin (Danitol)	39515-41-8	--		--		--	--	--	--
Fenvalerate (Pydrin)	51630-58-1	--		--		--	--	--	--
Fluometuron	2164-17-2	--		--		--	--	--	--
Fluoride	16984-48-8	3.4E+00	nc	5.7E+01	nc	--	--	--	--
Fluoridone	59756-60-4	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Flurprimidol	56425-91-3	--		--		--	--	--	--
Flusilazole (NuStar)	85509-19-9	--		--		--	--	--	--
Flutolanil	66332-96-5	--		--		--	--	--	--
Fluvalinate	69409-94-5	--		--		--	--	--	--
Folpet	133-07-3	--		--		--	--	--	--
Fomesafen	72178-02-0	--		--		--	--	--	--
Fonofos	944-22-9	--		--		--	--	--	--
Formaldehyde	50-00-0	2.2E-01	ca	9.4E+00	ca	2.5E+04	1.1E+06	7.2E+00	3.1E+02
Formic acid	64-18-6	7.8E-02	nc	1.3E+00	nc	1.8E+04	3.0E+05	2.6E+00	4.4E+01
Fosetyl-al	39148-24-8	--		--		--	--	--	--
Furan	110-00-9	--		--		--	--	--	--
Furazolidone	67-45-8	--		--		--	--	--	--
Furfural	98-01-1	1.3E+01	nc	2.2E+02	nc	2.1E+05	3.6E+06	4.3E+02	7.3E+03
Furmecyclox	60568-05-0	3.3E-01	ca	1.4E+01	ca	--	--	--	--
Furothiazole (Furium)	531-82-8	6.5E-03	ca	2.9E-01	ca	--	--	--	--
Glufosinate-ammonium	77182-82-2	--		--		--	--	--	--
Glycidaldehyde	765-34-4	2.6E-01	nc	4.4E+00	nc	1.2E+04	2.1E+05	8.7E+00	1.5E+02
Glyphosate	1071-83-6	--		--		--	--	--	--
Haloxyfop-methyl	69806-40-2	--		--		--	--	--	--
Thifensulfuron-methyl (Harmony)	79277-27-3	--		--		--	--	--	--
Heptachlor	76-44-8	2.2E-03	ca	9.4E-02	ca	7.4E-01	3.2E+01	7.2E-02	3.1E+00
Heptachlor epoxide	1024-57-3	1.1E-03	ca	4.7E-02	ca	7.3E+00	NVT	3.6E-02	1.6E+00
Hexabromobenzene	87-82-1	--		--		--	--	--	--
Hexachlorobenzene	118-74-1	6.1E-03	ca	2.7E-01	ca	3.2E-01	NVT	2.0E-01	8.9E+00
Hexachlorobutadiene	87-68-3	1.3E-01	ca	5.6E+00	ca	8.8E-01	NVT	4.3E+00	1.9E+02
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	1.6E-03	ca	6.8E-02	ca	--	--	--	--
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	5.3E-03	ca	2.3E-01	ca	--	NVT	--	--
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	9.1E-03	ca	4.0E-01	ca	--	--	--	--
Hexachlorocyclohexane technical	608-73-1	5.5E-03	ca	2.4E-01	ca	--	--	--	--
Hexachlorocyclopentadiene	77-47-4	5.2E-02	nc	8.8E-01	nc	4.5E+00	7.5E+01	1.7E+00	2.9E+01
Hexachloroethane	67-72-1	2.6E-01	ca	1.1E+01	ca	5.2E+00	2.3E+02	8.5E+00	3.7E+02
Hexachlorophene	70-30-4	--		--		--	--	--	--
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	--		--		--	--	--	--
1,6-Hexamethylene diisocyanate	822-06-0	2.6E-03	nc	4.4E-02	nc	1.3E+00	2.2E+01	8.7E-02	1.5E+00
n-Hexane	110-54-3	1.8E+02	nc	3.1E+03	nc	4.7E+00	7.9E+01	6.1E+03	1.0E+05
Hexazinone	51235-04-2	--		--		--	--	--	--

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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Hexythiazox (Savey)	78587-05-0	--		--		--	--	--	--
Hydramethylnon (Amdro)	67485-29-4	--		--		--	--	--	--
Hydrazine, hydrazine sulfate	302-01-2	5.7E-04	ca	2.5E-02	ca	6.2E+01	2.7E+03	1.9E-02	8.3E-01
Hydrazine, dimethyl	57-14-7	5.2E-04	nc	8.8E-03	nc	2.0E+00	3.4E+01	1.7E-02	2.9E-01
Hydrogen chloride	7647-01-0	5.2E+00	nc	8.8E+01	nc	7.8E-08	1.3E-06	1.7E+02	2.9E+03
Hydrogen sulfide	7783-06-4	5.2E-01	nc	8.8E+00	nc	2.0E+00	3.4E+01	1.7E+01	2.9E+02
p-Hydroquinone	123-31-9	--		--		--	--	--	--
Imazaquin	81335-37-7	--		--		--	--	--	--
Imazethapyr (Pursuit)	81335-77-5	--		--		--	--	--	--
Iprodione	36734-19-7	--		--		--	--	--	--
Iron	7439-89-6	--		--		--	--	--	--
Isobutanol (Isobutyl alcohol)	78-83-1	--		--		--	--	--	--
Isophorone	78-59-1	5.2E+02	nc	8.8E+03	nc	--	--	--	--
Isopropalin	33820-53-0	--		--		--	--	--	--
Isopropyl methyl phosphonic acid	1832-54-8	--		--		--	--	--	--
Isoxaben	82558-50-7	--		--		--	--	--	--
Lactofen	77501-63-4	--		--		--	--	--	--
Lead +++	7439-92-1	--		--		--	--	--	--
Lead (tetraethyl)	78-00-2	--		--		--	--	--	--
Linuron	330-55-2	--		--		--	--	--	--
Lithium	7439-93-2	--		--		--	--	--	--
Malathion	121-75-5	--		--		--	--	--	--
Maleic anhydride	108-31-6	1.8E-01	nc	3.1E+00	nc	--	--	--	--
Maleic hydrazide	123-33-1	--		--		--	--	--	--
Malononitrile	109-77-3	--		--		--	--	--	--
Mancozeb	8018-01-7	--		--		--	--	--	--
Maneb	12427-38-2	--		--		--	--	--	--
Manganese (non-food) +++	7439-96-5	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Mephosfolan	950-10-7	--		--		--	--	--	--
Mepiquat chloride (Mepiquat)	24307-26-4	--		--		--	--	--	--
Mercury and compounds	7487-94-7	7.8E-02	nc	1.3E+00	nc	--	--	--	--
Mercury (elemental)	7439-97-6	7.8E-02	nc	1.3E+00	nc	7.3E-01	1.2E+01	2.6E+00	4.4E+01
Mercury (methyl)	22967-92-6	--		--		--	--	--	--
Merphos	150-50-5	--		--		--	--	--	--
Merphos oxide	78-48-8	--		--		--	--	--	--
Metalaxyl	57837-19-1	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Methacrylonitrile	126-98-7	7.8E+00	nc	1.3E+02	nc	1.6E+03	2.7E+04	2.6E+02	4.4E+03
Methamidophos	10265-92-6	--		--		--	--	--	--
Methanol	67-56-1	5.2E+03	nc	8.8E+04	nc	6.4E+07	NVT	1.7E+05	2.9E+06
Methidathion	950-37-8	--		--		--	--	--	--
Methomyl	16752-77-5	--		--		--	--	--	--
Methoxychlor	72-43-5	--		--		--	--	--	--
2-Methoxyethanol	109-86-4	5.2E+00	nc	8.8E+01	nc	9.3E+05	NVT	1.7E+02	2.9E+03
2-Methoxyethanol acetate	110-49-6	2.6E-01	nc	4.4E+00	nc	5.9E+04	9.9E+05	8.7E+00	1.5E+02
2-Methoxy-5-nitroaniline	99-59-2	2.0E-01	ca	8.8E+00	ca	--	--	--	--
Methyl acetate	79-20-9	--		--		--	--	--	--
Methyl acrylate	96-33-3	5.2E+00	nc	8.8E+01	nc	1.3E+03	2.2E+04	1.7E+02	2.9E+03
2-Methylaniline hydrochloride	636-21-5	7.6E-02	ca	3.3E+00	ca	--	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	--		--		--	--	--	--
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	--		--		--	--	--	--
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	--		--		--	--	--	--
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	--		--		--	--	--	--
4,4'-Methylenebisbenzeneamine	101-77-9	6.1E-03	ca	2.7E-01	ca	--	--	--	--
4,4'-Methylene bis(2-chloroaniline)	101-14-4	2.4E-03	ca	2.9E-01	ca	--	--	--	--
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	2.2E-01	ca	9.4E+00	ca	--	--	--	--
Methylene bromide	74-95-3	1.0E+00	nc	1.8E+01	nc	6.5E+01	1.1E+03	3.5E+01	5.8E+02
Methylene chloride	75-09-2	1.0E+02	ca	2.6E+03	nc	1.4E+03	3.5E+04	3.4E+03	8.8E+04
4,4'-Methylenediphenyl isocyanate	101-68-8	1.6E-01	nc	2.6E+00	nc	--	--	--	--
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	--		--		--	--	--	--
Methyl ethyl ketone (2-Butanone)	78-93-3	1.3E+03	nc	2.2E+04	nc	1.1E+06	1.9E+07	4.3E+04	7.3E+05
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	7.8E+02	nc	1.3E+04	nc	3.1E+05	5.3E+06	2.6E+04	4.4E+05
Methyl methacrylate	80-62-6	1.8E+02	nc	3.1E+03	nc	3.3E+04	5.6E+05	6.1E+03	1.0E+05
2-Methyl-5-nitroaniline	99-55-8	--		--		--	--	--	--
Methyl parathion	298-00-0	--		--		--	--	--	--
2-Methylphenol	95-48-7	1.6E+02	nc	2.6E+03	nc	--	--	--	--
3-Methylphenol	108-39-4	1.6E+02	nc	2.6E+03	nc	--	--	--	--
4-Methylphenol	106-44-5	1.6E+02	nc	2.6E+03	nc	--	--	--	--
Methyl phosphonic acid	993-13-5	--		--		--	--	--	--
Methyl styrene (mixture)	25013-15-4	1.0E+01	nc	1.8E+02	nc	3.3E+02	5.6E+03	3.5E+02	5.8E+03
Methyl styrene (alpha)	98-83-9	--		--		--	--	--	--
Methyl tertbutyl ether (MTBE)	1634-04-4	1.1E+01	ca	4.7E+02	ca	8.2E+02	3.6E+04	3.6E+02	1.6E+04
Metolaclor (Dual)	51218-45-2	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Metribuzin	21087-64-9	--		--		--	--	--	--
Metsulfuron-methyl (Ally)	74223-64-6	--		--		--	--	--	--
Mirex	2385-85-5	5.5E-04	ca	2.4E-02	ca	1.7E-02	7.3E-01	1.8E-02	8.0E-01
Molinate	2212-67-1	--		--		--	--	--	--
Molybdenum	7439-98-7	--		--		--	--	--	--
Monochloramine	10599-90-3	--		--		--	--	--	--
Myclobutanil (Systhane)	88671-89-0	--		--		--	--	--	--
Naled	300-76-5	--		--		--	--	--	--
Napropamide	15299-99-7	--		--		--	--	--	--
Nickel and compounds	7440-02-0	1.1E-02	ca	3.9E-01	nc	--	--	--	--
Nickel refinery dust	7440-02-0-NRD	3.7E-03	nc	6.1E-02	nc	--	--	--	--
Nickel subsulfide	12035-72-2	3.7E-03	nc	6.1E-02	nc	--	--	--	--
Nitrate	14797-55-8	--		--		--	--	--	--
Nitrite	14797-65-0	--		--		--	--	--	--
2-Nitroaniline	88-74-4	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Nitrobenzene	98-95-3	7.0E-02	ca	3.1E+00	ca	2.2E+02	9.5E+03	2.3E+00	1.0E+02
Nitrofurantoin	67-20-9	--		--		--	--	--	--
Nitrofurazone	59-87-0	7.6E-03	ca	3.3E-01	ca	--	--	--	--
Nitroglycerin	55-63-0	--		--		--	--	--	--
Nitroguanidine	556-88-7	--		--		--	--	--	--
2-Nitropropane	79-46-9	1.0E-03	ca	4.5E-02	ca	4.9E-01	2.1E+01	3.5E-02	1.5E+00
N-Nitrosodi-n-butylamine	924-16-3	1.8E-03	ca	7.7E-02	ca	3.3E+00	1.4E+02	5.8E-02	2.6E+00
N-Nitrosodiethanolamine	1116-54-7	3.5E-03	ca	1.5E-01	ca	--	--	--	--
N-Nitrosodiethylamine	55-18-5	2.4E-05	ca	2.9E-03	ca	--	--	--	--
N-Nitrosodimethylamine	62-75-9	7.2E-05	ca	8.8E-03	ca	9.7E-01	1.2E+02	2.4E-03	2.9E-01
N-Nitrosodiphenylamine	86-30-6	1.1E+00	ca	4.7E+01	ca	--	--	--	--
N-Nitroso di-n-propylamine	621-64-7	1.4E-03	ca	6.1E-02	ca	--	--	--	--
N-Nitroso-N-methylethylamine	10595-95-6	4.5E-04	ca	1.9E-02	ca	7.6E+00	3.3E+02	1.5E-02	6.5E-01
N-Nitrosopyrrolidine	930-55-2	4.6E-03	ca	2.0E-01	ca	--	--	--	--
m-Nitrotoluene	99-08-1	--		--		--	--	--	--
o-Nitrotoluene	88-72-2	--		--		--	--	--	--
p-Nitrotoluene	99-99-0	--		--		--	--	--	--
Norflurazon	27314-13-2	--		--		--	--	--	--
Octabromodiphenyl ether	32536-52-0	--		--		--	--	--	--
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--		--		--	--	--	--
Octamethylpyrophosphoramide	152-16-9	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Oryzalin	19044-88-3	--		--		--	--	--	--
Oxadiazon	19666-30-9	--		--		--	--	--	--
Oxamyl	23135-22-0	--		--		--	--	--	--
Oxyfluorfen	42874-03-3	--		--		--	--	--	--
Paclobutrazol	76738-62-0	--		--		--	--	--	--
Paraquat	4685-14-7	--		--		--	--	--	--
Parathion	56-38-2	--		--		--	--	--	--
Pebulate	1114-71-2	--		--		--	--	--	--
Pendimethalin	40487-42-1	--		--		--	--	--	--
Pentabromo-6-chloro cyclohexane	87-84-3	--		--		--	--	--	--
Pentabromodiphenyl ether	32534-81-9	--		--		--	--	--	--
Pentachlorobenzene	608-93-5	--		--		--	--	--	--
Pentachloronitrobenzene	82-68-8	--		--		--	--	--	--
Pentachlorophenol	87-86-5	5.5E-01	ca	2.4E+01	ca	--	--	--	--
Perchlorate	14797-73-0	--		--		--	--	--	--
Perfluoroalkyl Compounds									
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	--		--		--	--	--	--
Perfluorooctanoic acid (PFOA)^^	335-67-1	--		--		--	--	--	--
Permethrin	52645-53-1	--		--		--	--	--	--
Phenmedipham	13684-63-4	--		--		--	--	--	--
Phenol	108-95-2	5.2E+01	nc	8.8E+02	nc	--	--	--	--
m-Phenylenediamine	108-45-2	--		--		--	--	--	--
p-Phenylenediamine	106-50-3	--		--		--	--	--	--
Phenylmercuric acetate	62-38-4	--		--		--	--	--	--
2-Phenylphenol	90-43-7	--		--		--	--	--	--
Phorate	298-02-2	--		--		--	--	--	--
Phosmet	732-11-6	--		--		--	--	--	--
Phosphine	7803-51-2	7.8E-02	nc	1.3E+00	nc	7.8E-02	1.3E+00	2.6E+00	4.4E+01
Phosphoric acid	7664-38-2	2.6E+00	nc	4.4E+01	nc	--	--	--	--
Phosphorus (white)	7723-14-0	--		--		--	--	--	--
p-Phthalic acid	100-21-0	--		--		--	--	--	--
Phthalic anhydride	85-44-9	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Picloram	1918-02-1	--		--		--	--	--	--
Pirimiphos-methyl	29232-93-7	--		--		--	--	--	--
Polybrominated biphenyls (PBBs)	59536-65-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Polychlorinated biphenyls (PCBs)	1336-36-3	--		--		--	--	--	--
Aroclor 1016	12674-11-2	--		--		--	--	--	--
Aroclor 1221	11104-28-2	--		--		1.6E-01	7.2E+00	1.6E-01	7.2E+00
Aroclor 1232	11141-16-5	4.9E-03	ca	2.2E-01	ca	1.6E-01	NVT	1.6E-01	7.2E+00
Aroclor 1242	53469-21-9	4.9E-03	ca	2.2E-01	ca	3.5E-01	1.5E+01	1.6E-01	7.2E+00
Aroclor 1248	12672-29-6	4.9E-03	ca	2.2E-01	ca	2.7E-01	1.2E+01	1.6E-01	7.2E+00
Aroclor 1254	11097-69-1	4.9E-03	ca	2.2E-01	ca	4.3E-01	1.9E+01	1.6E-01	7.2E+00
Aroclor 1260	11096-82-5	4.9E-03	ca	2.2E-01	ca	3.6E-01	NVT	1.6E-01	7.2E+00
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9	--		--		--	--	--	--
Anthracene	120-12-7	--		--		--	--	--	--
Benz[a]anthracene	56-55-3	1.7E-02	ca	2.0E+00	ca	NVT	NVT	5.6E-01	NVT
Benzo[a]pyrene	50-32-8	5.2E-04	nc	8.8E-03	nc	--	--	--	--
Benzo[b]fluoranthene	205-99-2	1.7E-02	ca	2.0E+00	ca	NVT	NVT	--	NVT
Benzo[k]fluoranthene	207-08-9	1.7E-01	ca	2.0E+01	ca	--	--	--	--
Chrysene	218-01-9	1.7E+00	ca	2.0E+02	ca	--	--	--	--
Dibenz[ah]anthracene	53-70-3	1.7E-03	ca	2.0E-01	ca	--	--	--	--
Fluoranthene	206-44-0	--		--		--	--	--	--
Fluorene	86-73-7	--		--		--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	1.7E-02	ca	2.0E+00	ca	--	--	--	--
Naphthalene	91-20-3	8.3E-02	ca	3.6E+00	ca	1.3E+01	5.9E+02	2.8E+00	1.2E+02
Pyrene	129-00-0	--		--		--	--	--	--
Prochloraz	67747-09-5	--		--		--	--	--	--
Profluralin	26399-36-0	--		--		--	--	--	--
Prometon	1610-18-0	--		--		--	--	--	--
Prometryn	7287-19-6	--		--		--	--	--	--
Propyzamide (Pronamide)	23950-58-5	--		--		--	--	--	--
Propachlor	1918-16-7	--		--		--	--	--	--
Propanil	709-98-8	--		--		--	--	--	--
Propargite	2312-35-8	--		--		--	--	--	--
Propargyl alcohol	107-19-7	--		--		--	--	--	--
Propazine	139-40-2	--		--		--	--	--	--
Propham	122-42-9	--		--		--	--	--	--
Propiconazole	60207-90-1	--		--		--	--	--	--
n-Propylbenzene	103-65-1	2.6E+02	nc	4.4E+03	nc	1.6E+03	2.6E+04	8.7E+03	1.5E+05
Propylene glycol	57-55-6	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Propylene glycol, monoethyl ether	52125-53-8	5.2E+02	nc	8.8E+03	nc	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Propylene glycol, monomethyl ether	107-98-2	5.2E+02	nc	8.8E+03	nc	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Propylene oxide	75-56-9	7.6E-01	ca	3.3E+01	ca	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Pyridine	110-86-1	--		--		--	--	--	--
Quinalphos	13593-03-8	--		--		--	--	--	--
Quinoline	91-22-5	--		--		--	--	--	--
Resmethrin	10453-86-8	--		--		--	--	--	--
Ronnel	299-84-3	--		--		--	--	--	--
Rotenone	83-79-4	--		--		--	--	--	--
Selenious Acid	7783-00-8	--		--		--	--	--	--
Selenium	7782-49-2	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Sethoxydim	74051-80-2	--		--		--	--	--	--
Silver and compounds	7440-22-4	--		--		--	--	--	--
Simazine	122-34-9	--		--		--	--	--	--
Sodium azide	26628-22-8	--		--		--	--	--	--
Sodium diethyldithiocarbamate	148-18-5	--		--		--	--	--	--
Sodium fluoroacetate	62-74-8	--		--		--	--	--	--
Sodium metavanadate	13718-26-8	--		--		--	--	--	--
Strontium, stable	7440-24-6	--		--		--	--	--	--
Strychnine	57-24-9	--		--		--	--	--	--
Styrene	100-42-5	2.6E+02	nc	4.4E+03	nc	5.5E+03	9.3E+04	8.7E+03	1.5E+05
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	--		--		--	--	--	--
Tebuthiuron	34014-18-1	--		--		--	--	--	--
Temephos	3383-96-8	--		--		--	--	--	--
Terbacil	5902-51-2	--		--		--	--	--	--
Terbufos	13071-79-9	--		--		--	--	--	--
Terbutryn	886-50-0	--		--		--	--	--	--
1,2,4,5-Tetrachlorobenzene	95-94-3	--		--		--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	7.4E-08	ca	3.2E-06	ca	3.6E-05	1.6E-03	2.5E-06	1.1E-04
1,1,1,2-Tetrachloroethane	630-20-6	3.8E-01	ca	1.7E+01	ca	9.6E+00	4.2E+02	1.3E+01	5.5E+02
1,1,2,2-Tetrachloroethane	79-34-5	4.8E-02	ca	2.1E+00	ca	7.8E+00	3.4E+02	1.6E+00	7.0E+01
Tetrachloroethylene (PCE)	127-18-4	1.0E+01	nc	1.8E+02	nc	3.2E+01	5.4E+02	3.5E+02	5.8E+03
2,3,4,6-Tetrachlorophenol	58-90-2	--		--		--	--	--	--
p,a,a,a-Tetrachlorotoluene	5216-25-1	--		--		--	--	--	--
Tetrachlorovinphos (Stirofos)	961-11-5	--		--		--	--	--	--
Tetraethyldithiopyrophosphate	3689-24-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Thallium and compounds	7440-28-0	--		--		--	--	--	--
Thiobencarb	28249-77-6	--		--		--	--	--	--
Thiofanox	39196-18-4	--		--		--	--	--	--
Thiophanate-methyl	23564-05-8	--		--		--	--	--	--
Thiram	137-26-8	--		--		--	--	--	--
Tin and compounds	7440-31-5	--		--		--	--	--	--
Toluene	108-88-3	1.3E+03	nc	2.2E+04	nc	1.0E+04	1.7E+05	4.3E+04	7.3E+05
p-Toluidine	106-49-0	--		--		--	--	--	--
Tralomethrin	66841-25-6	--		--		--	--	--	--
Triadimefon (Bayleton)	43121-43-3	--		--		--	--	--	--
Triallate	2303-17-5	--		--		--	--	--	--
Triasulfuron	82097-50-5	--		--		--	--	--	--
Tribenuron-methyl (Express)	101200-48-0	--		--		--	--	--	--
1,2,4-Tribromobenzene	615-54-3	--		--		--	--	--	--
Tributyltin oxide (TBTO)	56-35-9	--		--		--	--	--	--
2,4,6-Trichloroaniline	634-93-5	--		--		--	--	--	--
2,4,6-Trichloroaniline hydrochloride	33663-50-2	--		--		--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	5.2E-01	nc	8.8E+00	nc	2.7E+01	4.5E+02	1.7E+01	2.9E+02
1,1,1-Trichloroethane	71-55-6	1.3E+03	nc	2.2E+04	nc	3.6E+03	6.0E+04	4.3E+04	7.3E+05
1,1,2-Trichloroethane	79-00-5	5.2E-02	nc	8.8E-01	nc	3.4E+00	5.8E+01	1.7E+00	2.9E+01
Trichloroethylene (TCE) Long-term +++	79-01-6	4.8E-01	ca	8.8E+00	nc	2.4E+00	4.4E+01	1.6E+01	2.9E+02
Trichloroethylene (TCE) Short-term ‡	79-01-6	2.0E+00	nc	6.0E+00	nc	1.0E+01	3.0E+01	6.7E+01	2.0E+02
Trichlorofluoromethane	75-69-4	--		--		--	--	--	--
2,4,5-Trichlorophenol	95-95-4	--		--		--	--	--	--
2,4,6-Trichlorophenol	88-06-2	2.0E+00	nc	6.0E+00	ca				
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	--		--		--	--	--	--
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	--		--		--	--	--	--
1,1,2-Trichloropropane	598-77-6	--		--		--	--	--	--
1,2,3-Trichloropropane	96-18-4	7.8E-02	nc	1.3E+00	nc	1.4E+01	2.4E+02	2.6E+00	4.4E+01
1,2,3-Trichloropropene	96-19-5	7.8E-02	nc	1.3E+00	nc	1.1E-01	1.8E+00	2.6E+00	4.4E+01
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	1.3E+03	nc	2.2E+04	nc	1.1E+02	1.8E+03	4.3E+04	7.3E+05
Tridiphane	58138-08-2	--		--		--	--	--	--
Triethylamine	121-44-8	1.8E+00	nc	3.1E+01	nc	6.5E+02	1.1E+04	6.1E+01	1.0E+03
Trifluralin	1582-09-8	--		--		--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	1.6E+01	nc	2.6E+02	nc	1.6E+02	2.8E+03	5.2E+02	8.8E+03
1,3,5-Trimethylbenzene	108-67-8	1.6E+01	nc	2.6E+02	nc	--	--	--	--
Trimethyl phosphate	512-56-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
1,3,5-Trinitrobenzene	99-35-4	--		--		--	--	--	--
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	--		--		--	--	--	--
2,4,6-Trinitrotoluene (TNT)	118-96-7	--		--		--	--	--	--
Triphenylphosphine oxide	791-28-6	--		--		--	--	--	--
Tris(2-chloroethyl) phosphate	115-96-8	--		--		--	--	--	--
Uranium (chemical toxicity only)	7440-61-0	1.0E-02	nc	1.8E-01	nc	--	--	--	--
Vanadium and compounds +++	7440-62-2	2.6E-02	nc	4.4E-01	nc	--	--	--	--
Vernolate (Vernam)	1929-77-7	--		--		--	--	--	--
Vinclozolin	50471-44-8	--		--		--	--	--	--
Vinyl acetate	108-05-4	5.2E+01	nc	8.8E+02	nc	5.2E+03	8.7E+04	1.7E+03	2.9E+04
Vinyl bromide	593-60-2	8.8E-02	ca	3.8E+00	ca	2.7E-01	1.2E+01	2.9E+00	1.3E+02
Vinyl chloride +++	75-01-4	1.7E-01	ca	2.8E+01	ca	2.2E-01	3.7E+01	5.6E+00	9.3E+02
Warfarin	81-81-2	--		--		--	--	--	--
Xylenes	1330-20-7	2.6E+01	nc	4.4E+02	nc	2.3E+02	3.8E+03	8.7E+02	1.5E+04
Zinc	7440-66-6	--		--		No VP	No VP	No VP	No VP
Zinc phosphide	1314-84-7	--		--		No VP	No VP	No VP	No VP
Zineb	12122-67-7	--		--		--	--	--	--

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both Chromium III and Chromium VI analyses.

‡ Short-term exposures to TCE during pregnancy are associated with many forms of developmental toxicity, with the critical develpoment endpoint being cardiac malformations. The type and severity of the resulting cardiac malformation depends on the timing and level of exposure to TCE approximately four to seven weeks after conception. Therefore, the EPA standard default exposure parameters for chronic exposures are invalid for estimating hazard quotients for potential cardiac defects and deriving screening levels protective of developmental endpoints. The EPA Region 7 Action Levels for TCE in air were used for short-term indoor air exposure to TCE and these values were used to calculcate the concentrations via the vapor intrusion pathway.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

-- = Not available/not applicable
µg/L = Micrograms per liter
µg/m^3 = Micrograms per cubic meter
ca = cancer
CAS No. = Chemical Abstract Service Number
nc = noncancer
NVT = Not sufficiently volatile or toxic (in selected exposure scenario)

ATTACHMENT 2-7

NEBRASKA UNIFORM ENVIRONMENTAL COVENANTS ACT

AND

NDEE MODEL COVENANT

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LEGISLATIVE BILL 298

Approved by the Governor March 22, 2005

Introduced by Landis, 46

AN ACT relating to environmental remediation; to amend section 76-288, Reissue Revised Statutes of Nebraska, and section 66-1510, Revised Statutes Supplement, 2004; to redefine a term under the Petroleum Release Remedial Action Act; to adopt the Uniform Environmental Covenants Act; to harmonize provisions; to provide operative dates; to provide severability; to repeal the original sections; and to declare an emergency.

Be it enacted by the people of the State of Nebraska,

Section 1. Section 66-1510, Revised Statutes Supplement, 2004, is amended to read:

66-1510. Petroleum shall mean:

(1) For purposes of the fee provisions of section 66-1521:

(a) Motor vehicle fuel as defined in section 66-482, except natural gasoline used as a denaturant by an ethanol facility as defined in section 66-1333; and

~~(2)~~ (b) Diesel fuel as defined in section 66-482, including kerosene which has been blended for use as a motor fuel; and

(2) For purposes of all provisions of the Petroleum Release Remedial Action Act other than the fee provisions of section 66-1521:

(a) The fuels defined in subdivision (1) of this section; and

(b) A fraction of crude oil that is liquid at a temperature of sixty degrees Fahrenheit and a pressure of fourteen and seven-tenths pounds per square inch absolute, except any such fraction which is regulated as a hazardous substance under section 101(14) of the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601(14), as such act existed on January 1, 2005.

Sec. 2. Sections 2 to 14 of this act may be cited as the Uniform Environmental Covenants Act.

Sec. 3. In the Uniform Environmental Covenants Act:

(1) Activity and use limitations means restrictions or obligations created under the act with respect to real property.

(2) Agency means the Department of Environmental Quality or any other Nebraska or federal agency that determines or approves the environmental response project pursuant to which the environmental covenant is created.

(3) Common interest community means a condominium, cooperative, or other real property with respect to which a person, by virtue of the person's ownership of a parcel of real property, is obligated to pay property taxes or insurance premiums, or for maintenance, or improvement of other real property described in a recorded covenant that creates the common interest community.

(4) Environmental covenant means a servitude arising under an environmental response project that imposes activity and use limitations.

(5) Environmental response project means a plan or work performed for environmental remediation of real property and conducted:

(A) Under a federal or state program governing environmental remediation of real property, including the Petroleum Release Remedial Action Act;

(B) Incident to closure of a solid or hazardous waste management unit, if the closure is conducted with approval of an agency; or

(C) Under a state voluntary cleanup program authorized by the Remedial Action Plan Monitoring Act.

(6) Holder means the grantee of an environmental covenant as specified in subsection (a) of section 4 of this act.

(7) Person means an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, public corporation, government, governmental subdivision, agency, or instrumentality, or any other legal or commercial entity.

(8) Record, used as a noun, means information that is inscribed on a tangible medium or that is stored in an electronic or other medium and is retrievable in perceivable form.

(9) State means a state of the United States, the District of Columbia, Puerto Rico, the United States Virgin Islands, or any territory or insular possession subject to the jurisdiction of the United States.

Sec. 4. (a) Any person, including a person that owns an interest in the real property, may be a holder, except that the State of Nebraska, a

municipality, or another unit of local government may not be a holder unless it is the owner of the real property. An environmental covenant may identify more than one holder. The interest of a holder is an interest in real property.

(b) A right of an agency under the Uniform Environmental Covenants Act or under an environmental covenant, other than a right as a holder, is not an interest in real property.

(c) An agency is only bound by any obligation it expressly assumes in an environmental covenant, but an agency does not assume obligations merely by signing an environmental covenant. Any other person that signs an environmental covenant is bound by the obligations the person assumes in the covenant, but signing the covenant does not change obligations, rights, or protections granted or imposed under law other than the act except as provided in the covenant.

(d) The following rules apply to interests in real property in existence at the time an environmental covenant is created or amended:

(1) A prior interest is not affected by an environmental covenant unless the person that owns the interest subordinates that interest to the covenant.

(2) The act does not require a person that owns a prior interest to subordinate that interest to an environmental covenant or to agree to be bound by the covenant.

(3) A subordination agreement may be contained in an environmental covenant covering real property or in a separate record. If the environmental covenant covers commonly owned property in a common interest community, the record may be signed by any person authorized by the governing board of the owners' association.

(4) An agreement by a person to subordinate a prior interest to an environmental covenant affects the priority of that person's interest but does not by itself impose any affirmative obligation on the person with respect to the environmental covenant.

Sec. 5. (a) An environmental covenant must:

(1) State that the instrument is an environmental covenant executed pursuant to the Uniform Environmental Covenants Act;

(2) Contain a legally sufficient description of the real property subject to the covenant;

(3) Describe the activity and use limitations on the real property;

(4) Identify every holder;

(5) Be signed by the agency, every holder, and unless waived by the agency every owner of the fee simple of the real property subject to the covenant; and

(6) Identify the name and location of any administrative record for the environmental response project reflected in the environmental covenant.

(b) In addition to the information required by subsection (a) of this section, an environmental covenant may contain other information, restrictions, and requirements agreed to by the persons who signed it, including any:

(1) Requirements for notice following transfer of a specified interest in, or concerning proposed changes in use of, applications for building permits for, or proposals for any site work affecting the contamination on, the property subject to the covenant;

(2) Requirements for periodic reporting describing compliance with the covenant;

(3) Rights of access to the property granted in connection with implementation or enforcement of the covenant;

(4) A brief narrative description of the contamination and remedy, including the contaminants of concern, the pathways of exposure, limits on exposure, and the location and extent of the contamination;

(5) Limitation on amendment or termination of the covenant in addition to those contained in sections 10 and 11 of this act;

(6) Rights of the holder in addition to its right to enforce the covenant pursuant to section 12 of this act; and

(7) Rights to enforce granted to any person.

(c) In addition to other conditions for its approval of an environmental covenant, the agency may require that those persons specified by the agency who have interests in the real property have signed the covenant.

Sec. 6. (a) An environmental covenant that complies with the Uniform Environmental Covenants Act runs with the land.

(b) An environmental covenant that is otherwise effective is valid and enforceable even if:

(1) It is not appurtenant to an interest in real property;

(2) It can be or has been assigned to a person other than the

original holder;

(3) It is not of a character that has been recognized traditionally at common law;

(4) It imposes a negative burden;

(5) It imposes an affirmative obligation on a person having an interest in the real property or on the holder;

(6) The benefit or burden does not touch or concern real property;

(7) There is no privity of estate or contract;

(8) The holder dies, ceases to exist, resigns, or is replaced; or

(9) The owner of an interest subject to the environmental covenant and the holder are the same person.

(c) An instrument that creates restrictions or obligations with respect to real property that would qualify as activity and use limitations except for the fact that the instrument was recorded before the operative date of this section is not invalid or unenforceable because of any of the limitations on enforcement of interests described in subsection (b) of this section or because it was identified as an easement, servitude, deed restriction, or other interest. The act does not apply in any other respect to such an instrument.

(d) The act does not invalidate or render unenforceable any interest, whether designated as an environmental covenant or other interest, that is otherwise enforceable under the law of this state.

Sec. 7. The Uniform Environmental Covenants Act does not authorize a use of real property that is otherwise prohibited by zoning, by law other than the act regulating use of real property, or by a recorded instrument that has priority over the environmental covenant. An environmental covenant may prohibit or restrict uses of real property which are authorized by zoning or by law other than the act.

Sec. 8. (a) A copy of an environmental covenant shall be provided by the persons and in the manner required by the agency to:

(1) Each person that signed the covenant;

(2) Each person holding a recorded interest in the real property subject to the covenant;

(3) Each person in possession of the real property subject to the covenant;

(4) Each municipality or other unit of local government in which real property subject to the covenant is located; and

(5) Any other person the agency requires.

(b) The validity of a covenant is not affected by failure to provide a copy of the covenant as required under this section.

Sec. 9. (a) An environmental covenant, any amendment or termination of the covenant under section 10 or 11 of this act, and any subordination agreement must be recorded in every county in which any portion of the real property subject to the covenant is located. For purposes of indexing, a holder shall be treated as a grantee.

(b) Except as otherwise provided in subsection (c) of section 10 of this act, an environmental covenant is subject to the laws of this state governing recording and priority of interests in real property.

(c) A copy of a document recorded under subsection (a) of this section shall also be provided to the Department of Environmental Quality if the department has not signed the covenant.

(d) The department shall make available to the public a listing of all documents under subsection (a) of this section or documents under subsection (c) of this section which have been provided to the department.

Sec. 10. (a) An environmental covenant is perpetual unless it is:

(1) By its terms limited to a specific duration or terminated by the occurrence of a specific event;

(2) Terminated by consent pursuant to section 11 of this act;

(3) Terminated pursuant to subsection (b) of this section;

(4) Terminated by foreclosure of an interest that has priority over the environmental covenant; or

(5) Terminated or modified in an eminent domain proceeding, but only if:

(A) The agency that signed the covenant is a party to the proceeding;

(B) All persons identified in subsections (a) and (b) of section 11 of this act are given notice of the pendency of the proceeding; and

(C) The court determines, after hearing, that the termination or modification will not adversely affect human health or the environment.

(b) If the agency that signed an environmental covenant has determined that the intended benefits of the covenant can no longer be realized, a court, under the doctrine of changed circumstances, in an action

in which all persons identified in subsections (a) and (b) of section 11 of this act have been given notice, may terminate the covenant or reduce its burden on the real property subject to the covenant. The agency's determination or its failure to make a determination upon request is subject to review pursuant to the Administrative Procedure Act.

(c) Except as otherwise provided in subsections (a) and (b) of this section, an environmental covenant may not be extinguished, limited, or impaired through issuance of a tax deed, foreclosure of a tax lien, or application of the doctrine of adverse possession, prescription, abandonment, waiver, lack of enforcement, or acquiescence, or a similar doctrine.

(d) An environmental covenant may not be extinguished, limited, or impaired by application of sections 57-227 to 57-239, 72-301 to 72-314, or 76-288 to 76-298.

Sec. 11. (a) An environmental covenant may be amended or terminated by consent only if the amendment or termination is signed by:

(1) The agency;

(2) Unless waived by the agency, the current owner of the fee simple of the real property subject to the covenant;

(3) Each person that originally signed the covenant, unless the person waived in a signed record the right to consent or a court finds that the person no longer exists or cannot be located or identified with the exercise of reasonable diligence; and

(4) Except as otherwise provided in subdivision (d)(2) of this section, the holder.

(b) If an interest in real property is subject to an environmental covenant, the interest is not affected by an amendment of the covenant unless the current owner of the interest consents to the amendment or has waived in a signed record the right to consent to amendments.

(c) Except for an assignment undertaken pursuant to a governmental reorganization, assignment of an environmental covenant to a new holder is an amendment.

(d) Except as otherwise provided in an environmental covenant:

(1) A holder may not assign its interest without consent of the other parties;

(2) A holder may be removed and replaced by agreement of the other parties specified in subsection (a) of this section; and

(e) A court of competent jurisdiction may fill a vacancy in the position of holder.

Sec. 12. (a) A civil action for injunctive or other equitable relief for violation of an environmental covenant may be maintained by:

(1) A party to the covenant;

(2) The agency;

(3) Any person to whom the covenant expressly grants power to enforce;

(4) A person whose interest in the real property or whose collateral or liability may be affected by the alleged violation of the covenant; or

(5) A municipality or other unit of local government in which the real property subject to the covenant is located.

(b) The Uniform Environmental Covenants Act does not limit the regulatory authority of the agency under law other than the Uniform Environmental Covenants Act with respect to an environmental response project.

(c) A person is not responsible for or subject to liability for environmental remediation solely because it has the right to enforce an environmental covenant.

(d) The Uniform Environmental Covenants Act does not limit the right of any person to recover damages under any other provision of law.

Sec. 13. In applying and construing the Uniform Environmental Covenants Act, consideration must be given to the need to promote uniformity of the law with respect to its subject matter among states that enact it.

Sec. 14. The Uniform Environmental Covenants Act modifies, limits, or supersedes the federal Electronic Signatures in Global and National Commerce Act, 15 U.S.C. 7001 et seq., but does not modify, limit, or supersede section 101 of that act, 15 U.S.C. 7001(a), or authorize electronic delivery of any of the notices described in section 103 of that act, 15 U.S.C. 7003(b).

Sec. 15. Section 76-288, Reissue Revised Statutes of Nebraska, is amended to read:

76-288. Any person having the legal capacity to own real estate in this state, who has an unbroken chain of title to any interest in real estate by ~~himself~~ such person and his or her immediate or remote grantors under a deed of conveyance which has been recorded for a period of twenty-two years or longer, and is in possession of such real estate, shall be deemed to have a marketable record title to such interest, subject only to such claims thereto

and defects of title as are not extinguished or barred by the application of the ~~provisions of~~ Uniform Environmental Covenants Act and sections 25-207, 25-213, 40-104, and 76-288 to 76-298, instruments which have been recorded less than twenty-two years, and any encumbrances of record not barred by the statute of limitations.

Sec. 16. Sections 1 and 18 of this act become operative on January 1, 2005. Sections 2 to 15 and 19 of this act become operative three calendar months after adjournment of this legislative session. The other sections of this act become operative on their effective date.

Sec. 17. If any section in this act or any part of any section is declared invalid or unconstitutional, the declaration shall not affect the validity or constitutionality of the remaining portions.

Sec. 18. Original section 66-1510, Revised Statutes Supplement, 2004, is repealed.

Sec. 19. Original section 76-288, Reissue Revised Statutes of Nebraska, is repealed.

Sec. 20. Since an emergency exists, this act takes effect when passed and approved according to law.

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RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

[Grantor]
[Address]

Space Above for Record's Use Only

ENVIRONMENTAL COVENANT

This Environmental Covenant is executed this ____ day of _____, ____, by _____, Grantor and _____, Holder/Grantee, pursuant to the Nebraska Uniform Environmental Covenants Act, Neb. Rev. Stat. §§76-2601 to 76-2613.

RECITALS:

A. Grantor is the owner of real property located at [street address] in _____, _____ County, Nebraska, legally described as follows:

> **Example**: Lots One (1) and Two (2), Block ___, Third Addition to the City of ____, _____ County, Nebraska or Section ____, Township _____, Range, _____, _____ County, Nebraska. [A lengthy legal description may be attached and referenced as an exhibit.]

B. Holder/Grantee is [name each person signing the covenant as a holder/grantee and describe their capacity. See Neb. Rev. Stat. §76-2603 for description of persons and entities who may be holders and the nature of their rights.]

C. The Property has been used for _____ and was the site of release(s) of certain hazardous substances, pollutants, or contaminants. [Describe the use of the property that resulted in contamination.]

D. The Property is the subject of an environmental response project or action pursuant to [Identify the federal and/or state program governing environmental remediation of real property as defined in Neb. Rev. Stat. §76-2602(5) including but not limited to the Nebraska Environmental Protection Act, the Nebraska voluntary cleanup program

authorized by the Remedial Action Plan Monitoring Act, the Petroleum Release Remedial Action Act, the Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, or other environmental remediation statute.]

E. The Agency, as defined in Neb. Rev. Stat. §76-2602, is [Identify all agencies who have determined or approved the environmental response project or action, including but not limited to the Nebraska Department of Environment and Energy (NDEE) and the United State Environmental Protection Agency (USEPA).]

F. The selected environmental response project or action is documented in _____. [For example, a Remedial Action Plan approved on _____, a Record of Decision signed on _____.] The administrative record for this project or action is available to the public and located at _____. [Identify the location of the information, such as the Nebraska Department of Environment and Energy, 245 Fallbrook Blvd., Lincoln, NE.] The administrative record for this project is also available online at http://deq.ne.gov by selecting "Public Records Search" at the bottom of the NDEE webpage and providing the site-specific NDEE "Facility Number".

NOW, THEREFORE,

Grantor hereby declares that the Property will hereinafter be bound by, held, sold and conveyed subject to the following terms, conditions, obligations, and restrictions set forth herein, which will run with the land, in perpetuity, unless amended or terminated pursuant to Paragraph 11 below.

1. Representations and Warranties. The Grantor warrants to the other signatories to this Covenant that:

a. The Grantor is the sole fee title owner of the Property;
b. The Grantor holds sufficient fee title to the Property to grant the rights and interests described in this Environmental Covenant free of any conflicting legal and equitable claims; and
c. The Grantor has identified all other persons holding legal or equitable interests, including but not limited to contract buyers, mortgage holders, other consensual lien holders, and lessees and secured their consent. [The Agency may require appropriate documentation of such interests and consent.]

2. Purpose. The purpose of this Environmental Covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to contamination that remains on the Property and to ensure that the Property is not developed, used, or operated in a manner incompatible with the approved remediation.

3. Running with the Land. The Environmental Covenant is perpetual and conveys to the Holder/Grantee real property rights that will run with the land, and gives to the

Agency the right to enforce the activity and use limitations described in Paragraph 4. The terms, conditions, obligations, and limitations in this Environmental Covenant are binding on the Grantor, its successors, heirs, executors, assigns and transferees, and all persons, corporations or other entities obtaining or succeeding to any right, title or interest in the Property after the effective date of this Environmental Covenant. All real estate, lots, or parcels located within the Property are subject to the terms, conditions, obligations, and limitations in this Environmental Covenant. Acceptance of any conveyance, transfer, lease or sublease of the Property, or part thereof, will bind each transferee, its heirs, executors, successors, transferees and assigns to the terms, conditions, obligations, and limitations during their respective period of ownership or occupancy, as applicable. Notice of any transfer of any interest in the Property must be promptly provided to the Agency by the transferor. The Grantor is bound by the terms, conditions, obligations, and limitations in this Environmental Covenant only during its period of ownership or occupancy after the effective date. This Environmental Covenant in no way amends, modifies, limits, or releases the Grantor from its duties and obligations under the approved environmental response project or action.

4. Activity and Use Limitations. The Property is subject to the following activity and use limitations:

[Insert precise description of activity or use limitations and restricted areas with map and survey locations as may be appropriate. A map depicting the areas of residual contamination and engineering controls used to prevent human exposure to the contamination may be attached and referenced as an exhibit. Several limitations may be appropriate as part of a remedial action where cleanup to an unrestricted land use is not feasible. Each limitation must be considered on a site-by-site basis to determine which limitation or combination of limitations is suitable for the particular property, based on applicable standards or remedial action goals and objectives, the nature of the contamination, the affected media and the potential exposures to human health and the environment. The types of limitations may include the following:

a. Land use limitations (e.g., to limit duration and frequency of human exposure to surficial soils, surface water, or sediments such as industrial or commercial use versus residential use)
b. Ground water limitations (e.g., to prevent exposure to contaminated ground water by prohibiting extraction or use of ground water, except for investigation or remediation thereof)
c. Disturbance limitations (e.g., to protect in-place remedial systems to prevent exposures caused by digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities, which may also include limitations as to depth of disturbance and include any repair, renovation or demolition of existing structures on the property without the prior written approval of the Agency)
d. Construction limitations (e.g., to prevent exposure to volatile emissions to air from soil or ground water)
e. Resource protection limitations (e.g., to protect certain ecological features associated with the property)

f. Other appropriate institutional controls required by the approved remedial action.]

5. Reserved Rights of Grantor. The Grantor hereby reserves unto itself and its successors all rights and privileges in and to the use of the Property which are not incompatible with the limitations granted herein.

6. Compliance Reporting. One year from the effective date of this Environmental Covenant, and on an annual basis thereafter until such time as this Environmental Covenant is terminated, the then-current fee simple owner of the Property shall submit to the Agency written documentation verifying that the activity and use limitations remain in place and are being complied with. Any signatory to this Environmental Covenant shall notify the Agency as soon as possible of conditions that would constitute a breach of the activity and use limitations.

7. Enforcement. The terms of this Environmental Covenant may be enforced in a civil action for injunctive or other equitable relief by the signatories and those persons authorized by and in accordance with Neb. Rev. Stat. §76-2611. Failure to exercise such rights of enforcement will in no event bar subsequent enforcement by any signatory and shall not be deemed a waiver of the signatory's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict or limit the Agency from exercising any authority under applicable law. The prevailing party in any action to enforce any provision of this Environmental Covenant is entitled to recover all costs of such action, including reasonable attorney fees. Any Holder/Grantee and the Agency shall be entitled to recover damages for violations of this Environmental Covenant or for any injury to the remedial action required by the Agency, to the public or to the environment protected by this Environmental Covenant.

8. Rights of Access. The Grantor and any then-current owner hereby grants to the Agency, its agents, contractors, and employees, the right of access to the Property to monitor compliance with the terms, conditions, obligations, and limitations of this Environmental Covenant. Nothing in this Environmental Covenant shall limit or otherwise affect the Agency's right of entry and access or the Agency's authority to take response actions under applicable law.

9. Notice Upon Conveyance. Each instrument hereafter conveying any interest in the Property or any portion of the Property, including but not limited to, deeds, leases and mortgages, shall contain a notice of the activity and use limitations set forth in this Environmental Covenant, and provide the recorded location of this Environmental Covenant. The notice shall be in substantially the form set forth below. Within thirty (30) days of the date any such instrument of conveyance is executed, the Grantor or then-owner must provide the Agency with a certified copy of said instrument and its recording reference in the _____ County Register of Deeds.

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL COVENANT DATED _____, RECORDED IN THE OFFICE OF THE REGISTER OF DEEDS OF _____ COUNTY, NEBRASKA ON _____, IN [DOCUMENT _____, BOOK _____, PAGE ____]. THE ENVIRONMENTAL COVENANT CONTAINS THE FOLLOWING ACTIVITY AND USE LIMITATIONS: [Insert the language that describes the activity and use limitations exactly as it appears in Paragraph 4 of the Environmental Covenant.]

10. Waiver of Certain Defenses. The persons and entities bound by this Environmental Covenant hereby waive any defense to the enforcement of this Environmental Covenant based on laches, estoppel, statute of limitations, or prescription.

11. Amendment and Termination. Amendment or termination of this Environmental Covenant shall comply with Neb. Rev. Stat. §76-2610. The terms of this Environmental Covenant may be modified or terminated by written consent of the Director of the Agency, the then current fee simple title owner, and all original signatories unless exempted by Neb. Rev. Stat. §76-2610. The amendment or termination is not effective until the document evidencing consent of all necessary persons is properly recorded. If not by consent, any amendment or termination of this Environmental covenant shall be as provided by Neb. Rev. Stat. §76-2609 and such additional terms as specified in this Environmental Covenant. As provided in Neb. Rev. Stat. §76-2610(c), except for an assignment undertaken pursuant to a governmental reorganization, assignment of an environmental covenant to a new holder is an amendment.

12. Severability. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

13. Captions. The captions in this Environmental Covenant are for convenience and reference only and are not a part of this instrument and shall have no effect upon construction or interpretation.

14. Governing Law. This Environmental Covenant shall be governed by and interpreted in accordance with the laws of the State of Nebraska.

15. Recordation. Within thirty (30) days after the date of the Agency's approval of this Environmental Covenant, the Grantor shall record the Environmental Covenant, in the same manner as a deed to the property, with the _____ County Register of Deeds.

16. Effective Date. The effective date of this Environmental Covenant is the date upon which the fully executed Environmental Covenant has been recorded as a deed record for the Property with the ____ County Register of Deeds.

17. Distribution of Environmental Covenant. Within 60 days of the effective date, the Grantor shall distribute a file- and date-stamped copy of the recorded Environmental Covenant to [each person identified in Neb. Rev. Stat. §76-2607(a) and §76-2608(c).]

18. Notice. Unless otherwise notified in writing by the Agency, any document or communication required by this Environmental Covenant shall be submitted to:

Superfund/VCP Section
Monitoring & Remediation Division
Nebraska Department of Environment and Energy
P.O. Box 98922
Lincoln, NE 68509-8922

[List any other parties requiring notice under this Environmental Covenant.]

ACKNOWLEDGEMENTS

GRANTOR:

IN WITNESS WHEREOF, Grantor**,** as the owner of the Property [and the Holder] of this Environmental Covenant, has caused this Environmental Covenant to be executed on this ____ day of _____, 20__.

By: _____
[Name of Grantor]

_____
[Title]

STATE OF NEBRASKA)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ who acknowledged said Environmental Covenant on behalf of Grantor.

_____
Notary Public

(SEAL)

HOLDER/GRANTEE: [If different from the Grantor]

IN WITNESS WHEREOF, Holder/Grantee of this Environmental Covenant, has caused this Environmental Covenant to be executed on this ____ day of _____, 20__.

By: _____
[Name of Holder/Grantee]

_____
[Title]

STATE OF NEBRASKA)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ who acknowledged said Environmental Covenant on behalf of Holder/Grantee.

_____
Notary Public

(SEAL)

AGENCY:

IN WITNESS WHEREOF, NDEE, as an Agency defined in Neb. Rev. Stat. § 76-2602(2), is not a party to this Environmental Covenant and does not acquire or assume any liability, obligation, or responsibility under state or federal law by virtue of signing this Environmental Covenant, nor is NDEE a Holder under Neb. Rev. Stat. §§ 76-2602(6) and 76-2603(a).

NEBRASKA DEPARTMENT OF ENVIRONMENT AND ENERGY

By: _____

_____

Director

STATE OF NEBRASKA)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ who acknowledged said Environmental Covenant on behalf of the Agency.

_____
Notary Public

(SEAL)

ATTACHMENT 3-1

REMEDIAL ACTION REPORT CHECKLIST

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Nebraska Department of Environment and Energy

Remedial Action Report Checklist

This checklist should be used when preparing a Remedial Action Report (RAR), which is the applicant's final product of the voluntary cleanup process. This checklist serves two purposes: First, it helps the applicant to develop an appropriate RAR, both in terms of content and format. Second, it supports NDEE's review of the RAR after the report is received. This checklist is not an all-inclusive list of the information that may be necessary to develop an appropriate RAR. This list is intended as an aid to assist in developing the RAR. NDEE may request additional data, and some categories of data may not be applicable to every RAR.

Please specify in the boxes opposite each item whether the required information is present (Y), absent (N), or not applicable (NA) and indicate the page number within the RAR where the information is included. Specific information for elements in the RAR are included. Additional general information for the document, including specific formats for tables and figures, are listed at the end of the checklist. Acronyms used throughout the checklist are also included at the end of the checklist.

Applicant Name_____

Site or Property Name_____

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
3.1 EXECUTIVE SUMMARY		
➢ Summary of the RAOs at the site		
➢ Explanation of how and why the RAOs have been met		
➢ Remedial activities completed		
➢ Deviations from the remedial activities described in the RAP		
➢ Future land use at the site and any institutional controls		
➢ Any on-going monitoring at the site		
3.2 SITE SETTING, HISTORY, AND OPERATIONS		
➢ Property name and identification		
• Facility name		
• Street address		
➢ Owner and contractor information		
• Applicant, owner, or designated point of contact, with contact information		
• Contractors or consultants to the applicant or owner, with contact information		
➢ Location and physical setting		
• Location map based on a USGS 7.5-minute quadrangle, with a reference to the quadrangle name and date		
• Brief description of the physical setting, including topography, geology, hydrogeology, and climate		
➢ Operational history		
• Summary of previous ownership, business operations, and dates that the site was active		
• Summary of historical environmental incidents, spills, or releases of hazardous constituents		
➢ Findings of the investigation as reported in the Remedial Action Plan		
• Description of the horizontal and vertical extent of contamination before remedial activities		
• Potential receptors identified		
• Remedial action proposed in the Remedial Action Work Plan portion of the RAP		
➢ Summary of the site's VCP history		
• Date that the application was submitted and date approved		
• Date that the RAP was submitted and date approved		
• Date that remedial activities began		
• Date that remedial activities were completed		
• Dates of any other significant events in the remedial action		
3.3 REMEDIAL ACTION OBJECTIVES		
➢ Statement and explanation of RAOs for the site		
3.4 OVERVIEW OF REMEDIAL ACTIONS		
➢ Table showing chronology of events and remedial actions taken at the site		
➢ Description of soil excavation and removal actions		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Extent and depth of soil excavated		
• Total volume of soil excavated and removed		
➢ Description of in situ treatment of soil		
• Volumes of treatment chemicals used, materials discharged, and contaminants removed		
• Total volume of soil treated		
➢ Figure showing areas of excavated soil, treatment points, and/or radius of influence of treatment systems		
➢ Description of active groundwater remediation, including		
• Maps of cross-sections showing treatment points or radius of influence of the treatment system		
• Volumes of treatment chemicals used, water discharged, and contaminants removed		
• Total volume of groundwater treated		
➢ Estimated volumes of contaminants degraded or removed by passive groundwater remediation (e.g., monitored natural attenuation)		
➢ Description of other traditional or innovative remedial technology used at the site		
• Total volume of water or soil diverted, treated, and/or disposed		
• Total volume of contaminants removed		
• Maps and cross sections showing locations of excavation, treatment, monitoring, and/or sampling points		
➢ Description of handling and disposal of RDW, including		
• Volume of RDW generated		
• Methods used to characterize RDW		
• Procedures to control or contain RDW onsite		
• Methods of transporting, treating, and disposing of RDW		
➢ Photographic logs of remedial activities		
➢ Copies of relevant property deeds or other documentation of institutional controls implemented		
3.5 COMPLIANCE WITH REMEDIAL ACTION OBJECTIVES		
➢ Narrative explanation of why analytical results show that the RAOs have been achieved		
➢ Figures and maps showing:		
• Sample locations		
• Sample depths		
➢ Tables summarizing:		
• Sample collection methods		
• Sample collection dates		
➢ Description and illustration of post-remedial action conditions		
• Table summarizing maximum concentrations of contaminants at the site after remedial activities		
• Potentiometric surface maps		
• Isoconcentration maps and cross sections of the contaminant plume(s) at the site after remedial actions		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
• Free-product isopach maps at the site after remedial actions		
➢ Reference to soil boring and monitoring well construction logs		
➢ Table containing results of field screening		
➢ Summary of analytical results and reference to laboratory reports for soil and groundwater sampling		
• Chemicals of concern identified		
• Maximum concentration of contamination		
• Background concentrations of chemicals of concern		
• Target compounds		
• Concentrations of compounds detected		
➢ Summary of QA/QC results and reference to attached lab reports		
➢ Reference to table of data validation qualifiers		
➢ Updated Conceptual Site Model (CSM)		
• Description of the udated CSM		
• Description of intended land use		
▪ Location and use of buildings		
▪ Location and depth of below-grade structures or basements		
▪ Description of any potential sensitive populations		
• Location of any remaining contaminants and illustration or description of methods used to contain contamination		
• The impacts that moving of waste may have on human health and the environment		
• Explanation of why/how all exposure or migration pathways at the site have been eliminated		
➢ Reference to previously submitted startup reports and/or monitoring reports		
➢ Other information as appropriate for the implemented remedies to verify that RAOs have been achieved		
3.6 DEVIATIONS FROM THE RAP		
➢ Description and rationale for any changes to the proposed remedial action as described in the RAP		
➢ Attached copies of any correspondence between NDEE and the applicant concerning changes to the remedial approach		
➢ If no deviations were necessary, state so		
3.7 DEVIATIONS IN PERFORMANCE MONITORING		
➢ Explanation of changes to the monitoring strategy as outlined in the RAP (if necessary)		
• New or modified monitoring objectives		
• New or modified methods		
• Maps showing new or modified monitoring locations		
• Cross sections/diagrams showing new or modified subsurface monitoring and sampling intervals		
• Description of new or modified monitoring schedule		
• Description and tables of new or modified monitoring parameters		
➢ If no deviations were necessary, state so		

ELEMENT-SPECIFIC INFORMATION

INFORMATION	Y/N/NA	DOCUMENT PAGE NUMBER
3.8 APPENDICES		
➢ As-built diagrams		
• Subsurface structures – tunnels, parking garages, basements, etc.		
• Remedial systems – blowers, piping, utilities, towers		
• Green space, recreational space – picnic areas, gazebos		
• Buildings, surface parking lots		
• Sensitive use areas – Day care, schools, nursing homes		
➢ Maps of site features		
• Ponds		
• Parking lots		
• Buildings		
• Subsurface structures (e.g. parking garages, basements, tunnels)		
• Green space		
➢ Copies of legal documents required for institutional controls		
➢ Other information to verify that RAOs have been met		
• Soil boring and monitoring well construction logs		
• Complete results of field screening		
• Analytical reports for soil gas, groundwater, or soil samples, including quality assurance/quality control results		
• Data validation and usability summary		
• Copies of log books, field sheets, chain-of-custody forms, or other relevant supporting documentation.		

ADDITIONAL REQUIREMENTS

REQUIREMENTS	Y/N/NA
➢ Tables	
• Tables are numbered and titled	
• All abbreviations used in the table or table title are spelled out in table footnotes	
➢ Figures	
• Horizontal and vertical scales on cross-sections	
• Horizontal scale on maps	
• Orientation labels (i.e., north arrow) on maps	
• Date, title, and source of base map	
• Cross-section control points shown on an associated map, with reference to map on cross-section	
• Isoconcentration or potentiometric surface maps compiled from a single sampling event and labeled with the appropriate date	
• All features on maps clearly labeled	
• Site boundaries clearly labeled	
• Photographs scanned and printed at high resolution (300 dpi scanned, 600 dpi printed), preferably in color, including aerial photographs	
OTHER	
➢ Four complete copies of the document submitted to NDEE, at least one copy in full color	
➢ All pages numbered, including figures, tables, and appendices	
➢ Chemicals identified by consistent names throughout document	
➢ Explanations of inconsistent chemical names in laboratory reports or previous investigations	
➢ All abbreviations spelled out for first use or included in list of abbreviations	

ABBREVIATIONS

CSM = Conceptual site model
dpi = dots per inch
N = Absent/not included
NA = Not applicable
NDEE = Nebraska Department of Environment and Energy
QA/QC = Quality assurance/quality control
RAO = Remedial action objective
RAP = Remedial Action Plan
RAPMA = Remedial Action Plan Monitoring Act
RAR = Remedial Action Report
RDW = Remediation derived waste
USGS = U.S. Geological Survey
VCP = Voluntary Cleanup Program
Y = Present/included

APPENDIX A

PROTOCOL FOR VCP REMEDIATION GOALS LOOKUP TABLES

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PROTOCOL FOR VCP REMEDIATION GOAL
LOOKUP TABLES
NEBRASKA VOLUNTARY CLEANUP PROGRAM

CONTENTS

TABLES

ATTACHMENTS

PROTOCOL FOR VCP REMEDIATION GOAL LOOKUP TABLES NEBRASKA VOLUNTARY CLEANUP PROGRAM

1.0 INTRODUCTION

This guidance describes the protocol employed by Nebraska Department of Environment and Energy (NDEE) to establish chemical-specific and media-specific Remediation Goals (RGs) for soil, soil gas, and groundwater that are protective of human health and the environment. NDEE created this document to support a consistent and streamlined decision-making process for sites being managed under the Nebraska Voluntary Cleanup Program (VCP). The goal is to use this guidance as one tool to identify RGs for a site in the VCP. This document generally refers to RGs as "VCP RGs."

The protocol described in this guidance reflects approaches and procedures for establishing RGs that NDEE, other state agencies, and the U.S. Environmental Protection Agency (U.S. EPA) use in existing programs to assess potential human health risks posed by potential exposure to environmental contamination. The bases of this approach are the U.S. EPA guidance and directives established to support the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). In addition, this document relies on Nebraska standards promulgated under Title 117—Nebraska Surface Water Quality Standards (NDEE 2014) and Title 118—Ground Water Quality Standards and Use Classification (NDEE 2006). This protocol resulted from discussions between NDEE and Nebraska Health and Human Services Systems (NHHSS) personnel. Importantly, VCP RGs developed in this document are not static, but "living" benchmarks that will be periodically revised as significant new exposure and toxicological information becomes available.

Complexities of contaminated sites vary widely in physical and contaminant characteristics, exposure factors, and resultant risks and hazards. This protocol aims to provide an acceptable level of protectiveness and flexibility that will promote high-quality, effective, and efficient cleanups by:

- Streamlining decision-making
- Framing a consistent approach
- Ensuring remedial action that protects human health and the environment

- Providing flexibility either to use risk-based lookup tables or to develop site-specific risk-based cleanup goals
- Considering land use
- Maintaining consistency with NDEE and U.S. EPA guidance.

The remaining sections of this guidance provide an overview of the protocol (Section 2.0); describe the tiered approach for establishing VCP RGs (Section 3.0), specify procedures for developing the VCP RG lookup tables (Section 4.0); furnish a guide to interpreting the VCP RG lookup tables (Section 5.0); discuss the technical documentation supporting the VCP RG lookup tables, including assumptions used to calculate the VCP RGs (Section 6.0) and summarize the document (Section 7.0). The following attachments are also provided to provide the VCP RG tables and supporting information for the development of the VCP RGs:

Attachment A	VCP Remediation Goal Lookup Tables
Attachment B	Supporting Tables for Calculating the VCP Remediation Goals
Attachment C	Standardized Equations for Calculating the VCP Remediation Goals
Attachment D	Approach for the Development of Remediation Goals for the Vapor Intrusion to Indoor Air Exposure Pathway
Attachment E	Target Organs for Noncarcinogenic Effects of Various Contaminants
Attachment F	EPA Region 7 Action Levels for Trichloroethylene in Air
Attachment G	Glossary and Acronyms.

2.0 OVERVIEW

The following sections describe various aspects of the VCP RG protocol approach, including the three tiers of the VCP RG approach, as discussed in Section 2.1. This protocol focuses on Tier 2 values, referred to as VCP RGs, but also presents the Tier 1 and Tier 3 options. Section 2.2 outlines the assessment of noncancer hazards and carcinogenic risks associated with exposure to site-related contaminants, including the assessment of multiple contaminants undergoing a Tier 2 evaluation. Section 2.3 discusses the requirements for determining the assessment of risk to ecological receptors.

2.1 VCP REMEDIATION GOAL PROTOCOL

The VCP RG protocol is based on a three-tiered approach: (1) determine if contamination identified on site is greater than background levels (Tier 1); (2) use a set of VCP RG lookup tables (Tier 2); and (3) develop site-specific remediation goals (Tier 3). The Tier 2 approach is similar to methodologies followed to develop risk-based screening levels by U.S. EPA as "Regional Screening Levels" (RSLs) (U.S. EPA 2018a and b); many other state voluntary cleanup programs that use risk-based lookup tables; and the Tier 1 lookup tables in NDEE's Risk-Based Corrective Action (RBCA) at Petroleum Release Sites: Tier 1/Tier 2 Assessments (NDEE 2009). The Tier 3 approach is similar to other approaches under existing U.S. EPA and NDEE guidance. These approaches range from: (1) completing a baseline risk assessment in accordance with U.S. EPA's Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (RAGS Part A) (U.S. EPA 1989), to (2) modifying only certain exposure pathways and assumptions to reflect site-specific conditions, to (3) using site-specific values for fate and transport parameters consistent with the Tier 2 approach in NDEE's RBCA at Petroleum Release Sites (NDEE 2009).

2.2 NONCARCINOGENIC HAZARDS AND CARCINOGENIC RISKS

VCP RGs were developed to assess both adverse noncarcinogenic health effects and carcinogenic risks that may be associated with chronic (i.e. long-term) exposure to site-related contaminants. In cases where a contaminant is both a carcinogen and may also be associated with adverse noncarcinogenic effects, the VCP RG provided is based on the lower (more conservative) of the two values.

For noncarcinogenic effects, protective mechanisms in the body are believed to exist that must be overcome before adverse effect is manifested. As a result, exposure to a contaminant can be tolerated with expression of adverse effects up to a threshold level. This threshold level is referred to as the reference dose (RfD) for oral or dermal exposure or reference concentration (RfC) for inhalation exposure. The general assumption

is that exposure below the RfD or RfC will pose no appreciable risk of adverse effects on human health, including health to sensitive populations during a lifetime. For non-carcinogenic contaminants, the measure used to describe the potential for non-carcinogenic toxicity in an individual is not expressed as a probability, but as a ratio of predicted exposure to acceptable exposure. This ratio is called the hazard quotient (HQ). The HQ assumes that there is a level of exposure (i.e., a threshold) below which it is unlikely that adverse health effects would occur. If the exposure level exceeds this threshold there is a concern for potential noncarcinogenic effects.

For residential exposure to site-related contaminants that may be associated with adverse noncarcinogenic effects, the VCP RGs are set with a HQ of 0.25. This conservative assumption is believed to be protective of not only sensitive populations but considers the potential exposure to more than one contaminant. For workplace exposure, industrial VCP RGs are set at a HQ of 1.0. When an individual is exposed to multiple noncarcinogenic contaminants, the sum of HQs calculated for an exposure pathway (the way a contaminant comes in contact with an individual – e.g., ingestion, inhalation) is referred to a Hazard Index (HI). For both residential and industrial VCP RGs, a target organ-specific HI greater than 1.0 is not to be exceeded. See Section 4.3 for further information on HQs and HIs.

For carcinogens, risks are estimated as the probability of an individual developing cancer over a lifetime as a result of chronic exposure to contaminated media. A risk evaluation based on the presumption of a threshold is inappropriate for carcinogens. The underlying presumption for carcinogens is that the introduction of even one molecule of the contaminant can cause cancer in an individual even if the probability is very low. This conservative, "non-threshold" concept is used because it is presumed that there is no level of exposure to a carcinogen that does not pose a certain level of risk. Because the threshold concept is not acceptable for carcinogens, a value different from a RfD that quantifies the relationship between dose and response must be developed. This value is known as a slope factor (SF) for ingestion and dermal exposures and inhalation unit risk factor (IUR) for inhalation exposures.

The chemical-specific SF or IUR represents the carcinogenic risk factor: the greater the SF or IUR, the greater the potential for that contaminant to cause a cancer over a lifetime. The SF (along with an estimated dose) or IUR is used to calculate a probability of excess cancers occurring over a lifetime. The probability is expressed as an excess probability of an *individual* (not a population) developing cancer over a lifetime as a result of exposure to the carcinogen. This incremental or excess individual lifetime cancer risk exceeds the background cancer risk (for example, it is expressed as one excess cancer incidence per 1,000,000 population [1 in 1,000,000] or 1×10^{-6}). U.S. EPA's National Contingency Plan (NCP) (U.S. EPA 1990) has established 1×10^{-6} as a point of departure for determining remediation decisions when applicable,

relevant, and appropriate regulations are not available. For the residential VCP RGs a point of departure of 1×10^{-6} has also been selected, therefore VCP RGs that are based on carcinogenic risks were set an excess cancer risk level of 1×10^{-6}. U.S. EPA guidance indicates that action is generally warranted when the cumulative carcinogenic risk for exposure to one or more carcinogens is greater than 1×10^{-4} (1 in 10,000) EPA 1991. For residential VCP RGs, a combined cumulative cancer risk 1×10^{-5} (1 in 100,000) should not be exceeded. For workplace exposure the industrial VCP RGs are based on an excess cancer risk level of 1×10^{-5} and a combined cumulative cancer risk of 1×10^{-4} should not be exceeded. See Section 4.2 for further information.

2.3 ECOLOGICAL RECEPTORS

The VCP RG lookup tables used in Tier 2 are not designed to protect ecological receptors. U.S. EPA and other agencies have not yet developed a comprehensive set of lookup tables for ecological screening levels because ecological settings are so complex. Development of VCP RGs for ecological receptors therefore first requires reasonable support for assuming a complete exposure pathway exists for these receptors. Under the VCP, the participant is required to answer a series of questions about significant ecological receptors at or adjacent to the site. These questions address the site's proximity to sensitive habitats, known ecological receptors in the area, presence of threatened or endangered species near the site, and other information on ecological receptors. These questions are listed below:

- If contamination is present at the site, is all soil contamination below 15 feet?
- Is less than 0.25 acre of contiguous undeveloped land on or within 500 feet of any area of the site?
- Are any of the following contaminants present: chlorinated dioxins or furans, polychlorinated biphenyl mixtures, dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethene (DDE), dichlorodiphenyldichloroethane (DDD), aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene?
- For sites that do not contain any contaminants listed above, are more than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the site?
- Does the site have any features that would obviously eliminate specific exposure pathways, such as paving or other permanent barriers?
- Does the site contain or is it likely to contain special status species or habitats?
- Does groundwater from the site discharge to a water body or wetland?

The VCP participant should provide answers to these questions to NDEE, which will review them with assistance from other appropriate state or federal agencies. If a site is found to have a viable ecological population and a chemical of potential ecological concern (COPEC) is present, the participant should conduct an ecological risk assessment at the site in accordance with U.S. EPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (U.S. EPA 1997). The risk assessment will then be used to establish VCP RGs under direction of NDEE. Site-specific ecological VCP RGs then will be developed using the exposure assumptions from this assessment. For surface water, the VCP RGs should be consistent with Title 117—Nebraska Surface Water Quality Standards, Chapter 4, Section 003, Aquatic Life (NDEE 2014).

3.0 TIERED APPROACH

The following sections describe the three-tiered approach to establishing VCP RGs for contaminated sites. The protocol assumes that before the tiered approach is applied to any VCP site, the site has been thoroughly characterized according to information outlined in VCP guidance. This site characterization includes identifying the nature and extent of contamination, defining the land use (current and future), determining groundwater use, and identifying potential receptors. Development of a conceptual site model that clearly identifies all contaminant sources and their migration pathways as well as potentially exposed individuals (i.e., residents, industrial workers) is also necessary. Note that for simplicity, this document and the VCP RG lookup tables refer to industrial-commercial workers and the industrial-commercial land use scenario as "industrial" instead of industrial-commercial.

3.1 TIER 1

The Tier 1 evaluation compares contaminants identified on site with site-specific background levels for those contaminants that may also be naturally occurring. Background samples furnish a baseline measurement to assess the degree of contamination at a site. Whether background samples are truly uncontaminated should be determined—if contaminants of potential concern (COPC) are detected in the background samples, assessment should proceed as to whether they are anthropogenic (man-made) in origin and not site-related, present at naturally occurring levels, or actual site contaminants. Anthropogenic contaminant concentrations result from man-made sources (e.g., automobile traffic).

A basic assumption for Tier 1 is that contaminants at a site are related to site activities and are not considered background. The background evaluation focuses on inorganic contaminants, as most organic compounds found at contaminated sites are not naturally occurring (although they may be ubiquitous) and may also include certain contaminants naturally enriched in various environments. As part of the site investigation, site-specific background levels for soil and groundwater should be established. Analytical results for site soil should be compared to soils of similar soil type, and analytical results for site groundwater should be compared to groundwater from the same water-bearing unit.

NDEE recognizes that a number of naturally occurring inorganic contaminants are present at sites in varying concentrations. These contaminants may include metals (lead, arsenic, chromium, and others) and other inorganics (such as chloride and natural nitrate). In addition, organic contaminants may be present in background due to their widespread human sources (polycyclic aromatic hydrocarbons and dioxins) but are considered anthropogenic (man-made) contamination. Tier 1 is designed to address primarily background contaminant situations; anthropogenic concentrations should not be screened out at Tier 1 and need to be

carried through Tier 2. An assessment should be made as to whether contaminants are present at the site as naturally occurring soil and groundwater compounds or represent contamination associated with past site activity.

The VCP participant should evaluate analytical results of contaminant concentrations found at the site to determine if they are within the range of background conditions. Any contaminant found at or below inorganic background levels is not considered a COPC and does not need to be included in the remedial action plan for the site. To determine whether a contaminant is above background, the participant should follow the procedures outlined in U.S. EPA's Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (U.S. EPA 2002a), American Society for Testing and Materials (ASTM) D6312-98 "Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs" (ASTM 1998), or a functional equivalent. A contaminant found above inorganic background levels, determined either by direct comparison or appropriate statistics, is a COPC.

3.2 TIER 2

The Tier 2 evaluation compares concentrations of COPCs found on site with VCP RGs to determine if concentrations in soils, soil gas or groundwater are above the VCP RGs. The VCP RGs tables are provided in Attachment A. Table A-1 provides the VCP RGs for groundwater and soil, while Table A-2 provides the RGs for the vapor intrusion pathway from both groundwater and soil vapor. The user may select the maximum concentration of a COPC or may calculate the upper confidence limit of the arithmetic mean for each COPC and use this value to compare with the appropriate VCP RG. This calculation may be completed using U.S. EPA's ProUCL Software, available at https://www.epa.gov/land-research/proucl-software. If the maximum concentration or the upper confidence limit of the arithmetic mean for contaminant concentrations are found at concentrations above the VCP RGs, the participant has two alternatives: either remediate the site to the values in the VCP RG lookup tables or develop a site-specific VCP RG under Tier 3. If a COPC is not on the VCP RG lookup tables, the participant should contact NDEE to determine an appropriate VCP RG.

For each organic COPC, the soil's saturation concentration should be calculated (equations to calculate saturation concentrations are provided in Attachment C). At the soil saturation concentration, the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the contaminant may be present as a pure liquid phase (if the contaminant is liquid at ambient soil temperatures) or pure solid phase (if the contaminant is solid at

ambient soil temperatures). If the soil saturation concentration is lower than the risk-based VCP RG, the saturation concentration is used as the VCP RG.

VCP RGs are risk-based values designed to be protective of human health and the environment.

- For residential land use scenarios, the VCP RG in soil and soil gas is set at an excess cancer risk level of 1×10^{-6} for individual carcinogens and a cancer risk level of 1×10^{-5} for the cumulative carcinogenic effects of multiple carcinogenic COPCs. For noncarcinogens, the VCP RG is set at a HQ value of 0.25 and a target organ-specific HI for the combined effects of noncarcinogens of 1.0. The required cancer risk levels are further discussed in Section 4.2 and the required HQ and HI are further discussed in Section 4.3. Note that where the background concentration for a COPC exceeds an excess cancer risk level of 1×10^{-6} or a HQ value of 0.25, the background concentration becomes the VCP RG.

- For industrial land use scenarios, the VCP RG in soil and soil gas is set at an excess cancer risk level of 1×10^{-5} for individual carcinogens and a cancer risk level of 1×10^{-4} for the cumulative carcinogenic effects of multiple carcinogenic COPCs. The participant should contact NDEE if more than 10 carcinogenic COPCs are present, which would exceed the target risk level of 1×10^{-4}. For noncarcinogens, the VCP RG is set at a HQ value of 1.0 and a target organ-specific HI for the combined effects of noncarcinogens of 1.0. The required cancer risk levels are further discussed in Section 4.2, and the required HQ and HI are further discussed in Section 4.3. Note that where the background concentration for a COPC exceeds an excess cancer risk level of 1×10^{-5} or a HQ value of 1.0, the background concentration becomes the VCP RG. If the participant decides to use the VCP RG for an industrial worker, the site should have an institutional control in place to ensure that future land uses remain only industrial.

- For direct contact exposures to groundwater (i.e., ingestion of groundwater), NDEE has chosen to use promulgated Maximum Contaminant Levels (MCLs), where available, as the VCP RG. For COPCs not having an MCL, the VCP RG is set at an excess cancer risk level of 1×10^{-6} for individual carcinogens. For noncarcinogens with no MCL, the VCP RG is set at an HQ value of 0.25.

- For indirect exposure to groundwater (i.e., vapor intrusion from contaminated groundwater), VCP RGs are based on the appropriate land use scenario. For residential land use scenarios, the VCP RG is set at an excess cancer risk level of 1×10^{-6} for a carcinogen and an HQ value of 0.25 for noncarcinogens. For industrial land use scenarios, the VCP RG is set at an excess cancer risk level of 1×10^{-5} for carcinogens and an HQ value if 1.0 for noncarcinogens.

The VCP RG lookup tables are for protection of human health only, not for ecological receptors. Parameter values for all exposure assumptions are discussed in more detail in Section 6.0.

3.3 TIER 3

Tier 3 requires NDEE's oversight of the entire process. Under Tier 3, the participant can develop site-specific, risk-based VCP RGs that are protective of human health. This site-specific approach may consist of a complete baseline risk assessment; modification of certain exposure pathways and assumptions to

reflect site-specific conditions; or use of site-specific values for fate and transport parameters consistent with the Tier 2 approach in NDEE's RBCA at Petroleum Release Sites (NDEE 2009). Tier 3 provides the participant an option to determine VCP RGs using models, formulas, risk and exposure assessment methods, and approaches other than those specified under Tier 2. Tier 3 can involve considerably more effort than Tiers 1 and 2, since the evaluation can be more complex. Performing a Tier 3 analysis may necessitate expanding the site investigation and the risk assessment, or including sophisticated contaminant fate and transport modeling. The following is a list of information that may be required to support Tier 3 VCP RGs:

- Site-specific geologic or hydrogeologic data
- Site-specific data required to support the accuracy of predictive fate and transport models
- Site-specific data to support alternative assumptions for exposure pathways and receptor models
- Site-specific data to support an alternative exposure point or point of compliance
- Site-specific information to support alternative future land uses.

The approach to developing Tier 3 VCP RGs should be consistent with U.S. EPA's Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual Part B, Development of Risk-based Preliminary Remediation Goals (RAGS Part B) (U.S. EPA 1991a) and other relevant U.S. EPA and NDEE guidance (such as NDEE's RBCA at Petroleum Release Sites: Tier 1/Tier 2 Assessments [NDEE 2009]).

4.0 DEVELOPMENT OF VCP REMEDIATION GOAL LOOKUP TABLES

The exposure assumptions for the VCP RG lookup tables are largely based on default values, as outlined in U.S. EPA's current risk assessment guidance and NDEE guidance:

- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (U.S. EPA 2002b)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals (U.S. EPA 1991a)
- RBCA at Petroleum Release Sites: Tier 1/Tier 2 Assessments – Appendixes D and E (NDEE 2009)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Part E, Supplemental Guidance for Dermal Risk Assessment (U.S. EPA 2004)
- Child-Specific Exposure Factors Handbook (U.S. EPA 2008)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment (U.S. EPA 2009)
- Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120 (U.S. EPA 2014)

However, to be consistent with current NDEE guidance and policies, and to reflect current conditions in Nebraska, some assumptions in the guidance above were modified for calculation of the VCP RGs. For ease of discussion, these assumptions have been differentiated into groups. The remainder of this section specifies and justifies the assumptions for developing human health VCP RG lookup tables under Tier 2 for the VCP.

4.1 EXPOSED POPULATIONS

Soil, soil gas, and groundwater related to vapor intrusion VCP RGs are developed for two exposure populations based on land use: (1) residents and (2) industrial workers. These two groups are most likely to be exposed to contamination released from a site in the VCP. Moreover, children are included in the residential population, thereby assuring protection of sensitive receptors. Other populations were considered, such as trespassers, recreationalists, or construction workers. However, the resident or industrial worker is exposed for a longer duration than these other populations and therefore is at higher risk from COPC exposure. Also, RAGS Part A (U.S. EPA 1989) identifies residential, commercial/industrial, and recreational land use as the land use categories most often applicable at

Superfund sites. As mentioned above, recreationalists have less exposure than residents, so the receptors chosen for the VCP RG lookup tables include residents (children and adults) and industrial workers.

Direct contact groundwater VCP RGs are based on Title 118—Ground Water Quality Standards and Use Classification—Appendix A, which considers exposure to residents (the most sensitive population group) (NDEE 2006). In addition, exposure to volatile COPCs in groundwater via the vapor intrusion pathway are considered for both the residents (children and adults) and industrial workers. Finally, exposure to volatile COPCs in soil gas via the vapor intrusion pathway are considered for both the residents (children and adults) and industrial workers. Exposure pathways considered in the VCP RG lookup tables are as shown in Table 1.

4.2 TARGET CANCER RISK

The target cancer risk, a probability of an excess cancer over a lifetime, is set at different levels for soils, soil gas, and vapor intrusion from groundwater exposures based on two distinct populations: residential and industrial workers. The residential population is assumed to include sensitive populations such as elderly residents and children. To protect the most sensitive residential exposure groups, the target cancer risk for exposure to individual COPCs is set at 1 excess cancer in 1,000,000 population, or 1×10^{-6}. The target cancer risk level for the cumulative effects of multiple carcinogens is 1×10^{-5} for residential land use. If more than 10 carcinogenic COPCs are present for residential land use scenarios, NDEE should be contacted to determine how to best adjust the VCP RGs so the 1×10^{-5} goal is met. Note that even if the cumulative risk level of 1×10^{-5} is met, each COPC must still meet a 1×10^{-6} risk level.

TABLE 1

RECEPTORS AND EXPOSURE PATHWAYS CONSIDERED IN THE VCP REMEDIATION GOAL LOOKUP TABLES

Exposure Medium	Exposure Pathway	Land Use	Receptor(s)
Soil	Incidental ingestion	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Inhalation of volatiles and particulates	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Dermal contact	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Incidental ingestion	Industrial	Adult Worker
	Inhalation of volatiles and particulates	Industrial	Adult Worker
	Dermal contact	Industrial	Adult Worker
Soil-to-Groundwater	Groundwater	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
Groundwater	Ingestion	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Dermal contact	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Inhalation of volatiles from Domestic Use	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
	Inhalation of Volatiles from Vapor Intrusion	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
		Industrial	Adult Worker
Soil Gas	Inhalation of Volatiles from Vapor Intrusion	Residential	Age-adjusted Adult and Child – carcinogens
			Child – noncarcinogens
		Industrial	Adult Worker

Since the industrial worker population is not anticipated to include the elderly and children, its excess target cancer risk is set at 1 in 100,000 population (1×10^{-5}). The target cancer risk level for the cumulative effects of multiple carcinogens is 1×10^{-4} for industrial land use. If more than 10 carcinogenic COPCs are present for industrial land use scenarios, NDEE should be contacted to determine how to best adjust the VCP RGs so the 1×10^{-4} goal is met. Note that even if the cumulative risk level of 1×10^{-4} is met, each COPC must still meet a 1×10^{-5} risk level. As discussed earlier, if a participant decides to use the VCP RG for an industrial worker, the site should have an institutional control in place to ensure that future land uses remain only industrial.

VCP RGs for direct contact exposure to groundwater will be identified consistent with the approach outlined in Title 118—Ground Water Standards and Use Classification—Appendix A (NDEE 2006). The receptor is assumed an adult resident and the target cancer risk for those compounds without Title 118 numerical standards is 1×10^{-6}. Absent a standard, however, VCP RGs are calculated in a manner similar to that for soils. This is discussed in more detail in Section 4.6.

4.3 TARGET HAZARD INDEX

The target HQ (established for individual noncarcinogens) are set at different levels for soils, soil gas, and vapor intrusion from groundwater based on two distinct populations: residential and industrial workers. The residential population is assumed to include sensitive populations such as elderly residents and children. The selected receptor-specific target HQ provide a high level of protection for the most sensitive populations that would be exposed almost exclusively in a residential setting. In addition, calculating a VCP RG for residential exposures to noncarcinogenic COPCs assumes a child as the receptor (this ensures the VCP RG is protective, since a child is more sensitive than an adult). Importantly, U.S. EPA's NCP identifies a target HI of 1.0 as the goal for combined effects of noncarcinogenic contaminants.

To protect the residential exposure groups, the HQ for exposure to individual COPCs in soils, soil gas, and groundwater related to potential vapor intrusion is set at 0.25. An HQ of 0.25 for exposure to soils provides a level of conservatism for sites with multiple noncarcinogenic contaminants. The target organ-specific HI for the cumulative effects of multiple noncarcinogens is 1.0 for residential land use. If more than four noncarcinogenic COPCs are present for residential land use scenarios, the participant should refer to Attachment E of this document, "Target Organs for Noncarcinogenic Effects of Various Contaminants." The number of contaminants affecting each target organ should be determined. If more than four COPCs affect a single target organ or multiple target organs (thereby exceeding the target organ-specific HI of 1.0), NDEE should be contacted to determine how to best adjust the VCP RGs so the 1.0 goal is met. Note that

even if the cumulative HI of 1.0 is met, each individual COPC must still each meet an HQ of 0.25. If a COPC is present but not listed in the VCP RG lookup tables (and not on the list presented in Attachment E), the participant should contact NDEE to determine if target organ effects are applicable for the contaminant.

For industrial land use scenarios, the VCP RG in soil is set to a target HQ of 1.0. This value is less conservative than the residential target, but still considered protective of industrial workers. The target organ-specific HI for the cumulative effects of multiple noncarcinogens is 1.0 for industrial land use. If more than one noncarcinogenic COPC is present for industrial land use scenarios, the participant should refer to Attachment E of this document, "Target Organs for Noncarcinogenic Effects of Various Contaminants." The number of contaminants affecting each target organ should be determined. If more than one COPC affects a single target organ or multiple target organs (thereby exceeding the target organ-specific HI of 1.0), NDEE should be contacted to determine how to best adjust the VCP RGs so the 1.0 goal is met. As discussed earlier, if a participant decides to use the VCP RG for an industrial worker, the site should have an institutional control in place to ensure that future land uses remain only industrial. If a COPC is present but not listed in the VCP RG lookup tables (and not on the list presented in Attachment E), the participant should contact NDEE to determine if target organ effects are applicable for the contaminant.

As with the target cancer risk discussed above, VCP RGs for direct contact exposure to groundwater will be identified consistent with the approach outlined in Title 118—Ground Water Standards and Use Classification—Appendix A (NDEE 2006). The receptor is assumed an adult resident and a target HQ of 0.25 will be used for those compounds without Title 118 numerical standards. This HQ value will correspond to a concentration expected to result in no adverse health effect for longer-term or lifetime exposure, as discussed in Title 118, Appendix A. Absent a standard, however, VCP RGs are calculated in a manner similar to that for soils. This is discussed in more detail in Section 4.6.

4.4 SURFACE WATER

All surface water values for human exposure will be consistent with Title 117—Nebraska Surface Water Quality Standards, Chapter 4, Section 004—Water Supply (NDEE 2014). Note that values protective of ecological receptors will be determined separately.

4.5 SOIL EXPOSURE

Multiple exposure pathways are considered when establishing a VCP RG for soil. VCP RGs for soil are based on three major pathways: incidental ingestion, dermal contact, and inhalation. The incidental

ingestion pathway assumes a higher incidental ingestion rate of soil for children than adults, and estimates protective concentrations in soil considering these ingestion rates combined with toxicity factors, risk levels/hazard indices, and other exposure factors (e.g., duration of exposure).

The dermal contact pathway takes into account receptor-specific contact rates and the same considerations used for incidental soil ingestion. In addition, chemical-specific absorption fractions and chemical-specific modifications of oral toxicity factors for dermally absorbed contaminant doses are used.

The soil inhalation pathway takes into account inhalation of COPCs volatilizing from the soils (volatile compounds only) or inhalation of airborne particulates or dusts. Chemical-specific volatilization factors from soil (VF_s) are used to estimate exposure from volatile COPCs. Volatiles are chemicals with a Henry's Law constant greater than or equal to 1×10^{-5} atm-m^3/mole or a vapor pressure greater than or equal to 1 mm Hg. For the purposes of the VCP direct contact RGs (Table A-1), only volatile organic compounds (VOC) are considered "volatile"; inorganics are not. To estimate the inhalation of particulates from nonvolatile COPCs, a particle emission factor (PEF) is used. U.S. EPA's "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites" (U.S. EPA 2002b) provides a procedure to calculate PEFs for various locations. To calculate a default PEF for Nebraska, specific data provided for Lincoln, Nebraska, were used.

As discussed earlier, the soil's saturation concentration is also calculated for each COPC. If the soil saturation concentration is lower than the above risk-based VCP RG, the saturation concentration is used as the VCP RG.

4.6 GROUNDWATER EXPOSURE

All direct contact groundwater exposure values are set consistent with Title 118—Ground Water Standards and Use Classification—Appendix A (NDEE 2006), which establishes a groundwater classification process to protect groundwater for appropriate uses. For groundwater pollution occurrences, Title 118 identifies three remedial action classes (RACs): RAC-1, RAC-2, and RAC-3─defined in Appendix A as:

- RAC-1— This category includes groundwaters of Class GA and a portion of Class GB, a 500-foot radius around all private drinking water supply wells. In addition, RAC-1 shall be assigned automatically when a public or private drinking water supply well has been contaminated. RAC-1 shall receive the most extensive remedial action measures.

- RAC-2— This category includes groundwaters of Class GB (except for the portion of Class GB placed in RAC-1) and Class GC(R).

- RAC-3—This category includes, but is not limited to, groundwaters of Class GC, except for Class GC(R) that were placed in RAC-2. RAC-3 shall receive the least extensive remedial action measures.

Definitions of the groundwater classes GA, GB, and GC are provided in Chapter 7 of Title 118. Under Title 118, Appendix A, the VCP RGs for RAC-1 and RAC-2 are set at the maximum contaminant levels (MCLs) in Chapter 4. Absent an established MCL, U.S. EPA's Human Health Ambient Water Quality Criteria (U.S. EPA 2015a), Health Advisories (U.S. EPA 2012), and other documents are used to set the VCP RG.

For COPCs without a regulatory standard, the level is set at one of the following under Title 118: the concentration estimated to result in an excess lifetime cancer risk of 1×10^{-6}; a concentration expected to result in no adverse health effect for longer term or lifetime exposures; or a laboratory detection limit (if higher and within an acceptable range). For RAC-3, cleanup of readily removable contaminants (e.g., free product) is required, other impacts to beneficial use may be considered (e.g., wetland systems), and monitoring may also be necessary.

Note that the VCP RG protocol modifies the approach taken under Title 118, Appendix A. Instead of using only the ingestion pathway to determine the risk-based value, it also includes the inhalation pathway for volatile COPCs and uses an HQ of 0.25 for noncarcinogenic COPCs. Procedures to calculate this VCP RG follow those provided in the supporting documentation for U.S. EPA RSLs and are described in more detail in Section 6.6.

4.7 SOIL-TO-GROUNDWATER

Calculation of the VCP RGs for the soil contamination to groundwater exposure pathway assumes that contaminants are leached from the soil, migrate to the groundwater, and eventually enter a receptor well. For RAC-1 and RAC-2 sites, the receptor is assumed at the source area. For RAC-3 sites, the VCP RG should ensure no free product development on the groundwater table or no soil saturation.

The calculations follow the recommendations outlined in U.S. EPA's soil screening guidance (U.S. EPA 1996a, 1996b, and 2002b) and assume a target groundwater concentration of the MCL, if available, or the tap water VCP RG and a dilution attenuation factor (DAF) of 20. DAF represents the reduction in concentration that occurs as soil leachate moves through soil and groundwater, as a result of adsorption, degradation, and dilution by clean groundwater. DAF is defined as the ratio of soil leachate concentration to receptor point concentration. A DAF of 20, as used here, assumes a 20-fold reduction in contaminant concentration between the soil sampling location and the receptor well location. This DAF value is based

on the assumption of a 0.5-acre source and is applicable to most sites in the VCP program. In addition, a DAF of 20 is considered protective since NDEE assumes the receptor to be at the source area, while in most cases actual receptors will be off site.

4.8 SOIL DEPTH

Soil VCP RGs for exposure through direct contact pathways apply to soil depths to which a receptor will likely be exposed at the site. For a residential receptor, this is the upper 10 feet—assumption being that potential basement construction may bring soil from this depth to the surface. For an industrial receptor, this is the upper 15 feet—assuming that construction or maintenance of a utility line could occur at this depth and exposure then would occur.

4.9 INDOOR AIR

Intrusion of volatile contaminants from the subsurface (either soil gas or groundwater) into buildings is a pathway of concern for NDEE. To determine if remedial action may be required for this pathway, NDEE has developed a specific protocol (Attachment D) to evaluate potential risks associated with this exposure pathway. This protocol is consistent with the U.S. EPA vapor intrusion guidance "Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils" (U.S. EPA 2015) and U.S. EPA's Vapor Intrusion Screening Level (VISL) Calculator (U.S. EPA 2017). Intrusion of volatile contaminants may be of concern at sites meeting the following criteria:

- Volatile COPCs (as defined in Section 4.5) are identified at the site
- Volatile COPCs are located 100 feet below ground level (bgl) or less
- Volatile COPCs are located in proximity to existing or future buildings (within 100 feet horizontally).

If these criteria are met, the participant should use Lookup Table A-2 to determine if the site could pose a risk to human health from vapor intrusion to indoor air.

5.0 READING THE VCP REMEDIATION GOAL LOOKUP TABLES

This section provides an overview of the VCP RG lookup tables. Since the approach taken to develop these tables was similar to the approach taken by U.S. EPA in developing the RSLs, large portions of the text in the following two sections are taken from the U.S. EPA RSL supporting documentation (U.S. EPA 2018b). The VCP RG lookup tables are presented in Attachment A to this Protocol (as well as Attachment 2-6 to the main VCP Guidance Document above) and the supporting tables are presented in Attachment B.

5.1 GENERAL CONSIDERATIONS

NDEE requires calculation of both carcinogenic and noncarcinogenic VCP RGs; the lower (more protective) of the carcinogenic and noncarcinogenic VCP RG for each contaminant should then be used as the final value. For carcinogenic effects, risk is associated with the probability of an individual developing cancer over a lifetime. For noncarcinogenic effects, risk is expressed as a ratio (called the hazard quotient) of the expected exposure to the regulatory limit.

With the exceptions described below, VCP RGs are contaminant concentrations that correspond to fixed levels of risk and hazard in soil, soil gas, and groundwater—cancer risk of either 1×10^{-6} for residential or 1×10^{-5} for industrial, or a noncarcinogenic HQ of either 0.25 for residential or 1.0 for industrial. VCP RG concentrations that equate to the calculated cancer risk are indicated by "ca." VCP RG concentrations that equate to the calculated HQ for noncarcinogenic concerns are indicated by "nc." Note that for groundwater and soil-to-groundwater RGs, a “mcl” designation indicates that the value is based on a MCL from NDEE Title 118.

In general, concentrations in the VCP RG lookup tables are risk-based, but two important exceptions for soil exist: (1) for some contaminants, VCP RGs are based on the soil saturation equation ("sat") and (2) for relatively less toxic inorganic and semi-volatile contaminants, a non-risk-based "ceiling limit" concentration is given as $1 \times 10^{+5}$ milligram per kilogram (mg/kg) ("max"). The risk-based values for these same contaminants are also available along with the VCP RGs if the participant wants to view the risk-based concentrations before applying “sat” or “max.” For more information on why the “sat” value and not a risk-based value is presented for several volatile contaminants in the VCP RG lookup tables, see Section 6.5.

Applying a “ceiling limit” to contaminants for reasons other than exceeding the saturation limit is not universally accepted. It has been argued that all values should be risk-based to allow for scaling (for example, if the risk-based VCP RG is set at HQ = 1.0, and the participant would like to set the HQ to 0.1 to

take into account multiple contaminants, this is as simple as multiplying the risk-based VCP RG by 1/10th). If scaling is necessary, VCP RG participants can make this adjustment by referring to the VCP RG lookup tables where risk-based soil concentrations are presented for all contaminants (see soil calculations, "combined" pathways column). Participants should contact NDEE prior to conducting any scaling.

Though applying a ceiling limit is not universally accepted, NDEE has opted to continue applying a "max" soil concentration to the VCP RG lookup tables for the following reasons:

- Risk-based VCP RGs for some contaminants in soil exceed unity (>1,000,000 mg/kg), which is not possible.
- The ceiling limit of $1 \times 10^{+5}$ mg/kg is equivalent to a contaminant representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may not be accurate due to presence of the foreign contaminant itself (e.g., soil adherence, windborne dispersion may have changed).
- VCP RGs currently do not address short-term exposures (e.g., pica children [children who ingest unusually large amounts of non-food items, e.g., soil] and construction workers). Though extremely high soil VCP RGs are likely to represent relatively non-toxic contaminants, such high values might not be justified if more toxicological data were available for evaluating short-term and/or acute exposures. In other words, if more data regarding the acute toxicity of various compounds were available and considered, extremely high soil concentrations (e.g., $> 1 \times 10^{+5}$ mg/kg) may be found to be not protective. Therefore, application of the "max" soil concentration is intended to address this issue.

5.2 TOXICITY VALUES

Several issues impact toxicity values used to establish VCP RGs discussed in this section. A variety of sources are available for toxicity values, and this section identifies the toxicity source hierarchy used.

Hierarchy of Toxicity Values

In 2003, U.S. EPA's Superfund program revised its hierarchy of human health toxicity values, providing three tiers of toxicity values (U.S. EPA 2003). The toxicity values used in the VCP RG tables (see Table B-1 in Attachment B) are consistent with the 2003 guidance and the RSL tables (U.S. EPA 2018a). Toxicity values, known as noncarcinogenic RfDs and RfCs, and carcinogenic SFs and IURs, were obtained from the following hierarchy of sources:

1. U.S. EPA's Integrated Risk Information System (IRIS) (U.S. EPA 2018c).
2. The Provisional Peer Reviewed Toxicity Values (PPRTVs) derived by U.S. EPA's Superfund Health Risk Technical Support Center (STSC) for the U.S. EPA Superfund program (U.S. EPA 2018d).

3. The Human Health Benchmarks for Pesticides (HHBPs) derived by U.S. EPA's Office of Pesticide Programs (OPP). IRIS has archived 51 chemical assessments for pesticides and has recommended the use of the toxicity values presented in the HHBP table (U.S. EPA 2018c).

4. The Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRLs) (ATSDR 2017).

5. The California Environmental Protection Agency Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels (RELS) and the Cancer Potency Values (CalEPA 2018).

6. Screening toxicity values in an appendix to certain PPRTV assessments (U.S. EPA 2018d).

7. The U.S. EPA Superfund program's Health Effects Assessment Summary Table (U.S. EPA 2011a).

Toxicity values for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) are based on U.S. EPA Office of Water values (U.S. EPA 2016a, 2016b) and the U.S. National Library of Medicine ChemID*plus* database (NIH 2017).

Inhalation Toxicity Factors

Consistent with current U.S. EPA methodology, the VCP RG inhalation equations use RfCs and IURs instead of inhalation RfDs and SFs. Due to the uncertainties involved in making the surface area and/or pharmacokinetic adjustments required to estimate an internal dose (e.g., inhalation RfD), and considering possible route-of-entry effects of various contaminants, route-to-route extrapolations are not performed for the toxicity factors in the VCP RG lookup tables. Therefore, the VCP RG lookup tables do not contain any inhalation values obtained using route-to-route extrapolation methods.

Dermal Toxicity Factors

Consistent with current U.S. EPA methodology, the VCP RG dermal equations use modified toxicity values to assess dermal risk. The approach taken to modify the toxicity factors for dermal exposure was consistent with U.S. EPA guidance (U.S. EPA 2004, 2018b).

Mutagens

Some of the cancer-causing analytes in the lookup tables operate by a mutagenic mode of action for carcinogenesis. There is reason to surmise that some chemicals with a mutagenic mode of action, which would be expected to cause irreversible changes to DNA, would exhibit a greater effect in early-life versus later-life exposure. Cancer risk to children in the context of the U.S. Environmental Protection Agency's

cancer guidelines (U.S. EPA 2005) includes both early-life exposures that may result in the occurrence of cancer during childhood and early-life exposures that may contribute to cancers later in life. In keeping with this guidance, separate cancer risk equations are presented for mutagens. The following compounds included in the lookup tables are identified as mutagens: acrylamide, benzidine, hexavalent chromium, coke oven emissions, 1,2-dibromo-3-chloropropane, ethylene oxide, methylene chloride, N-nitrosodiethylamine, N-nitrosodimethylamine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and 1,2,3-trichloropropane. In addition, the mutagens trichloroethylene (TCE) and vinyl chloride each have unique sets of equations for the calculation of VCP RGs (see section 5.4).

5.3 CHEMICAL/PHYSICAL PARAMETERS

Chemical/physical parameters used to calculate the VCP RGs are presented in Attachment B, Table B-2 and were taken directly from the chemical/physical properties table listed in the U.S. EPA RSL table (EPA 2018a), except for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are based on literature values from several sources noted in the table footnotes.

5.4 VCP REMEDIATION GOALS DERIVED WITH SPECIAL CONSIDERATIONS

Most VCP RGs are readily derived via the various equations contained herein. However, for some contaminants the standard equations do not apply and/or adjustments to the toxicity values are recommended. These special case contaminants are discussed below. Note that each of these special considerations, with the exception of ammonia, is consistent with the approaches taken by U.S. EPA RSL table (U.S. EPA 2018a) and the User Guide (U.S. EPA 2018b). Ammonia is considered here based on information derived from consultation with other NDEE programs.

Ammonia

Ammonia use as a fertilizer is common in Nebraska. In the subsurface, ammonia is generally converted to nitrites via biological oxidation, and then to nitrates in the chemical nitrification process. No MCL has been established for ammonia. As established by Nebraska Title 118, the MCL for nitrite (as N) is 1 mg/L and for nitrate is 10 mg/L. By NDEE policy decision, the VCP RG for ammonia in groundwater is provided as 10,000 µg/L (10 mg/L) total combined ammonia (as N), nitrite (as N), and nitrate (as N). For the migration to groundwater exposure pathway, the soil RG for ammonia is provided as 40 mg/kg (parts per million) combined ammonia/nitrite/nitrate.

Arsenic

Consistent with the U.S. EPA RSLs (U.S. EPA 2018a), arsenic VCP RGs for ingestion of soil are calculated with a relative bioavailability factor (RBA) of 0.6. The RBA can be adjusted for site-specific conditions if supported by a bioavailability study and a Tier III HHRA is performed.

Cadmium

The VCP RGs for cadmium are based on the oral RfD for water for exposure to that medium and the RfD for food for exposure to soil. This is consistent with current U.S. EPA guidance (U.S. EPA 2018a). IRIS presents an oral "water" RfD for cadmium for use in assessment of risks to water of 0.0005 mg/kg-day. IRIS also presents an oral "food" RfD for cadmium for use in assessment of risks to soil and biota of 0.001 mg/kg-day.

Chromium VI

Valence-specific data for chromium should be collected whenever possible when chromium is likely to be a contaminant at a site based on site history, and when hexavalent chromium (chromium VI) may exist. For chromium VI, IRIS (U.S. EPA 2018c) shows an IUR of 1.2E-2 per $\mu g/m^3$. While the exact ratio of chromium VI to trivalent chromium (chromium III) in the data used to derive the IRIS IUR value is not known, it is likely that both forms of chromium were present. The RSLs and VCP RGs, calculated using the IRIS IUR, assume that the chromium VI to chromium III ratio is 1:6. Because of various sources of uncertainty, this assumption may overestimate or underestimate the risk calculated. Users are invited to review the document "Toxicological Review of Hexavalent Chromium" in support of the summary information on chromium VI on IRIS (U.S. EPA 2018c) to determine whether they believe this ratio applies to their site and to consider consulting with an U.S. EPA regional risk assessor. The uncertainty section of the risk assessment may want to address the potential for overestimating or underestimating the risk and provide quantitative analysis by deriving different IUR values based on different chromium VI to chromium III ratios from more recent studies.

In the VCP RGs table, the chromium VI specific value assuming 100% chromium VI is derived by multiplying the IRIS chromium VI value by 7. This is considered to be a health-protective assumption, and is also consistent with the State of California's basis for their estimated cancer potency of chromium VI (Cal EPA 2018).

There is uncertainty associated with the carcinogenic assessment of hexavalent chromium, particularly regarding whether it has a mutagenic mode of action for carcinogenesis (U.S. EPA 2018a). However, no

updated consensus IRIS assessment has yet appeared, and chromium is still under review by the IRIS program. With respect to VCP RGs, and consistent with the U.S. EPA RSLs (U.S. EPA 2018a), the more health-protective approach of applying age dependent adjustment factors (ADAF) for early life exposure via ingestion, dermal and inhalation was used to calculate screening levels for all exposure pathways. Application of ADAFs for all exposure pathways results in more health-protective screening levels.

Lead

U.S. EPA has no consensus RfD or SF for inorganic lead, so it is not possible to calculate VCP RGs using the same methods as for other chemicals. U.S. EPA considers lead to be a special case because of the difficulty in identifying the classic "threshold" needed to develop a RfD. U.S. EPA therefore evaluates lead exposure by using blood-lead modeling.

Derivations of residential VCP RGs for lead are based on pharmacokinetic models. U.S. EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model is designed to predict the probable blood lead concentrations for children 0 to 84 months old who have been exposed to lead through various sources (air, water, soil, dust, diet and *in utero* contributions from the mother) (U.S. EPA 1994, 2007, 2010). Run in reverse, this model also allows calculation of lead VCP RGs considered "acceptable" by U.S. EPA.

For the purposes of screening, 400 mg/kg is considered acceptable for residential soils. For water, the U.S. EPA Action Level in tap water (and Nebraska Title 118 MCL) of 15 µg/L is used as the groundwater direct contact RG, and for air, the National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

A VCP RG of 800 mg/kg has been calculated for lead in soil at commercial/industrial sites. U.S. EPA uses the Adult Lead Model to estimate screening levels for industrial settings. This lead RSL is intended to protect a fetus that may be carried by a pregnant female worker. It is assumed that a cleanup goal that is protective of a fetus will also afford protection for male or female adult workers. The model equations were developed to calculate cleanup goals such that the fetus of a pregnant female worker would not likely have an unsafe concentration of lead in blood.

However, caution should be used when both water and soil are being assessed. The IEUBK model shows that if the average soil concentration is 400 mg/kg, an average tap water concentration above 5 µg/L would yield more than 5% of the population above a 10 micrograms per deciliter (µg/dL) blood-lead level. If the average tap water concentration is 15 µg/L, an average soil concentration greater than 250 mg/kg would yield more than 5% of the population above a 10 µg/dL blood-lead level, which is considered to be an unacceptable level.

U.S. EPA currently recommends basing lead modeling on a target blood lead concentration of 10 µg/dL (U.S. EPA 2009b, 2010, 2015c). This target level is referred to as a "blood level of concern" and was used to develop U.S. EPA's industrial soil RSLs for lead (U.S. EPA 2018a). However, the Centers for Disease Control and Prevention (CDC) now recommend a target blood lead concentration of 5 µg/dL (CDC 2012). This reference value was identified by the CDC as the concentration to use in identifying children with elevated blood lead levels (CDC 2012). It is important to realize that the 5 µg/dL is not based on a direct measurement of adverse health effects. Rather, it is the 97.5th percentile of the National Health and Nutrition Examination Survey (NHANES)-generated blood lead level distribution in children 1 to 5 years old. However, numerous studies show that lead causes adverse health effects below a 5 µg/dL blood lead level. The reduced blood lead level has been adopted by several states in calculating their lead soil preliminary remediation goals (PRG). Clearly, a reduction in the target blood lead level would result in corresponding reductions in the receptor-specific lead soil PRGs.

In a memorandum dated December 22, 2016, and titled, "Updated Scientific Considerations for Lead in Soil Cleanups," U.S. EPA makes a series of recommendations regarding lead exposure (U.S. EPA 2016c). Portions of those recommendations specific to the determination of a site-specific cleanup level for lead in soil are presented below:

1. "Within the framework of existing policy, consider current scientific conclusions in conjunction with the Integrated Exposure Uptake and Biokinetic (IEUBK) model to determine soil screening levels for residential cleanups. Similarly, Regions should continue to use the most current version of the Adult Lead Methodology (ALM) to determine soil screening levels for commercial and industrial cleanups."

2. "Site-specific information is generally used to determine [preliminary remediation goals] PRGs and cleanup levels. In particular, Regions should evaluate the site-specific bioavailability of lead using the U.S. EPA's in-vitro bioaccessibility assay for lead (see: https://www.epa.gov/hw-sw846/validated-test-method-1340-vitro-bioaccessibility-assay-lead-soil) when determining cleanup levels."

3. On a site-specific basis, Regions may wish to vary some of the internal IEUBK model parameters (e.g., ingestion rate or mass soil to dust) based on peer-reviewed literature or site-specific studies.

Consistent with the December 2016 memorandum, U.S. EPA is considering changes to some of the modeling inputs identified above. In addition to possibly modifying the target blood lead level, U.S. EPA is also considering changes to PbB_o (baseline blood lead levels) and geometric standard deviation (GSD). Changes in these inputs may result in revised default residential and industrial/commercial lead soil RSLs. Based on preliminary indications, the industrial lead soil PRG may increase to about 1,200 mg/kg and the residential lead soil PRG could drop to about 200 mg/kg.

Manganese

The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommends subtracting the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) when evaluating non-food (e.g., drinking water or soil) exposures to manganese, leading to an RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating hazards associated with non-food sources due to a number of uncertainties discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day. This modified RfD is applied in the derivation of the VCP RGs for soil and groundwater.

Trichloroethylene (TCE)

The IRIS (U.S. EPA 2011b) toxicological review for TCE suggests that kidney risk be assessed using the mutagenic equations and liver and non-Hodgkin lymphoma (NHL) risk be addressed using the standard cancer equations. To generate cancer risk estimates for multiple age receptors, such as residential, the risk calculations for TCE were performed for both mutagenic mode of action (kidney) and regular cancer end-points (liver and NHL), the standard cancer and mutagen equations need to be combined. To accomplish combining of the cancer and mutagen equations U.S. EPA (2018b) calculated toxicity value adjustment factors for cancer (CAF) and mutagens (MAF), which are then incorporated into modified cancer risk equations. The adjustment factors are based on the adult-based toxicity values and are a ratio of the SF or IUR based on either the cancer endpoint or mutagenic endpoint and the generic adult cancer toxicity values presented in the VCP RG tables. The adjustments were calculated for both oral and inhalation pathways.

The mutagenic calculation incorporates the ADAFs specific to the mutagenic (kidney) endpoint. For receptors evaluated for only adults, such as workers, the cancer toxicity values account for all potential cancer endpoints. Therefore, the standard cancer risk calculation can be used and adjustment of the toxicity values is not necessary. The oral cancer adjustment factor (CAFo) is 0.804, while the inhalation cancer adjustment factor (CAFi) is 0.756. The oral mutagenic adjustment factor (MAFo) is 0.202, while the inhalation mutagenic adjustment factor (MAFi) is 0.244. The VCP RGs utilized the TCE equations presented in the RSL user guide (U.S. EPA 2018b).

The latest human health toxicity information on TCE published by U.S. EPA (2011b) identified potentially significant risks from less-than-lifetime exposures to TCE. It found that exposure to TCE within a window of susceptibility during pregnancy resulted in development toxicity. Short-term exposures to TCE during pregnancy are associated with many forms of developmental toxicity; however, the critical development

endpoint is cardiac malformations. The primary types of defects observed with TCE exposures include the development of holes in the wall between the top two chambers in the heart. The critical window of susceptibility for these types of defects is an approximate three-week period approximately four to seven weeks after conception (U.S. EPA 2016c). Given this information, U.S. EPA Region 7 has developed air action levels for both residential and industrial/commercial exposures to TCE (EPA 2016). The residential levels assume 24-hours per day exposures and the industrial/commercial levels assume an 8-hour per day exposure. The Region 7 action levels are – 2 $\mu g/m^3$ for residential exposures and 6 $\mu g/m^3$ for industrial/commercial exposures. These target air values were also used to calculate the groundwater and subslab and exterior soil gas concentrations for the vapor intrusion pathway. The full text supporting these values is provided in Attachment F.

Vanadium and compounds

The oral RfD toxicity value for vanadium, used in calculating the VCP RG, is derived from the IRIS oral RfD for vanadium pentoxide by factoring out the molecular weight (MW) of the oxide ion. Vanadium pentoxide has a molecular weight of 181.88. The two atoms of vanadium contribute 56% of the MW. Vanadium pentoxide's oral RfD of 9E-03 multiplied by 56% gives a vanadium oral RfD of 5.04E-03 (U.S. EPA 2018b).

Vinyl Chloride

Vinyl chloride has a unique mode of toxicity and thus has a unique set of equations for receptors such as residents that include early-life exposure. Cancer risk to children in the context of U.S. EPA's cancer guidelines (U.S. EPA 2005) includes both early-life exposures that may result in the occurrence of cancer during childhood and early-life exposures that may contribute to cancers later in life. In keeping with this guidance, separate cancer risk equations are presented for mutagens. Vinyl chloride is handled differently from other chemicals because of the unique aspects of its slope factor derivation. The IRIS (U.S. EPA 2000) toxicological review for vinyl chloride provides two slope factors are for this chemical, one that accounts for exposure occurring during early life and one that accounts for exposure occurring later in life. Specifically, for exposures beginning at birth an additional twofold safety factor is recommended in the toxicological review (U.S. EPA 2000). U.S. EPA considers it to be an appropriate way to deal with vinyl chloride's special ability to increase the lifetime cancer risk when exposure occurs during an undefined period of development in early life when the infant or child is particularly vulnerable to the chemical. This specific risk appears to be independent of, and in additive to, the more traditionally defined risk that is believed to be directly relative to exposure duration and frequency. For these reasons, the equations for

vinyl chloride are unique. The VCP RGs utilized the vinyl chloride equations presented in the RSL user guide (U.S. EPA 2018b).

5.5 SOIL-TO-GROUNDWATER APPROACH

The soil-to-groundwater RGs were developed using a default DAF of 20 to account for natural processes that reduce contaminant concentrations in the subsurface. The calculations follow the recommendations outlined in U.S. EPA's soil screening guidance (U.S. EPA 1996a, 1996b, and 2002b) and assume a target groundwater concentration of the MCL, if available, or the tap water VCP RG. In general, if VCP RGs are not exceeded for the migration to groundwater pathway, this pathway may be eliminated from further investigation.

5.6 MISCELLANEOUS

Volatility is defined in Section 4.5 of this document. A volatile contaminant is indicated by a "1" in the VOL column of supplemental information Table B-2 of this document. VOCs are evaluated for potential volatilization from soil and water to air but not for dermal exposure to soil per U.S. EPA guidance (2004, 2018b). Chemical-specific dermal absorption values for contaminants in soil and dust are as recommended in the Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment (U.S. EPA 2004) and consistent with the RSLs (U.S. EPA 2018a).

6.0 TECHNICAL SUPPORT DOCUMENTATION

VCP RGs are chemical- and media-specific goals for soil, soil gas, and groundwater that are designed to be protective of human health and the environment. The following section describes the approach taken to calculate exposures to soils via incidental ingestion, dermal contact, inhalation, soil to groundwater, and exposures to groundwater via ingestion and inhalation. The results of the calculations for each pathway are presented in Attachment B, Tables B-3 through B-5. The approach taken to calculate potential exposure to vapors in indoor air via the intrusion of contaminant vapors from soil gas and groundwater are described in Attachment D.

6.1 SOILS - INCIDENTAL INGESTION

Calculation of risk-based VCP RGs for incidental ingestion of soil is based on methods presented in RAGS (U.S. EPA 1991a) and soil screening guidance (U.S. EPA 1996a, 1996b, 2002b). Briefly, these methods involve calculating a soil concentration (i.e., a RG) of a contaminant that is associated with a selected target cancer risk or, for adverse noncarcinogenic effects, the selected Hazard Index.

A number of studies have shown that inadvertent ingestion of soil is common among children six years old and younger (Calabrese and others 1989; Davis and others 1990; Van Wijnen, Clausing, and Brunekreef 1990). To take into account the higher soil intake rate for children, two different approaches are used to estimate soil VCP RGs, depending on whether the adverse health effect is cancer or some effect other than cancer. For carcinogens, the method for calculating soil VCP RGs uses an age-adjusted soil ingestion factor that considers the difference in daily soil ingestion rates, body weights, and exposure duration for children from 0 to 6 years old and for individuals from 7 to 26 years old. This health-protective approach is chosen to take into account the higher daily rates of soil ingestion in children, as well as the longer duration of exposure anticipated for a long-term resident. For more on this method, see RAGS (U.S. EPA 1991a).

For the assessment of noncarcinogenic effects, childhood exposure is evaluated separately from adult exposure. An age-adjustment factor is not applied as is done when assessing carcinogenic risks. This approach is considered conservative because it combines the higher 6-year exposure for children with chronic toxicity criteria. NDEE has adopted this approach for calculating soil VCP RGs for noncarcinogenic health concerns.

6.2 SOILS - VAPOR AND PARTICULATE INHALATION

U.S. EPA toxicity criteria indicate that risk from exposure to some contaminants via inhalation far outweigh the risk via incidental ingestion; therefore, soil VCP RGs have been designed to address this pathway as well. The models used to calculate VCP RGs for inhalation of volatiles and particulates are updates of risk assessment methods presented in RAGS: Part B (U.S. EPA 1991a) and are identical to the Soil Screening Guidance: Technical Background Document and User's Guide (U.S. EPA 1996a, 1996b).

Note that the soil-to-air pathway evaluated in the VCP RG calculations is based on direct inhalation exposure that results from volatilization or particulate emissions of contaminants from soil to outdoor air. The soil VCP RG calculations currently do not evaluate the potential for volatile contaminants in soil to migrate indoors.

To address the soil-to-outdoor air pathways, the VCP RG calculations incorporate a volatilization factor for soil (VF_s) for volatile contaminants and particulate emission factor (PEF) for nonvolatile contaminants. These factors relate soil contaminant concentrations to air contaminant concentrations that may be inhaled on site. The VF_s and PEF equations can be divided into two separate models: an emission model to estimate emissions of the contaminant from the soil and a dispersion model to simulate the dispersion of the contaminant in the atmosphere.

The dispersion model for both volatiles and particulates is the AREA-ST, an updated version of the Office of Air Quality Planning and Standards, Industrial Source Complex Model, ISC2. For the VCP RGs, the Q/C term of 81.64 g/m^2-sec/kg/m^3 for Lincoln, Nebraska, was used for both the VF_s and PEF equations. A default source size of 0.5 acre was chosen for the VCP RG calculations. For unusual site conditions of an area source substantially larger than the default source area assumed here, an alternative Q/C can be applied (see U.S. EPA 1996a, 1996b).

Volatilization Factor for Soils

VOCs were screened for inhalation exposure using chemical-specific, calculated VF_s values. VF_s values are provided in Attachment B, Table B-2 and are consistent with the values in the RSL tables (U.S. EPA 2018a). The emission terms used in the VF_s calculations are chemical-specific and were calculated from physical-chemical parameters obtained from the U.S. EPA RSL tables (U.S. EPA 2018a).

The VF_s equation described herein forms the basis for deriving generic soil VCP RGs for the inhalation pathway. The following parameters in the standardized equation can be replaced with site-specific data to develop a simple site-specific VCP RG:

- Source area
- Average soil moisture content
- Average fraction organic carbon content
- Dry soil bulk density.

The basic principle of the VF_s model (Henry's Law) is applicable only if the soil contaminant concentration is at or below soil saturation ("sat"). Above the soil saturation limit, the model cannot predict an accurate VF_s-based VCP RG. How these particular cases are handled depends on whether the contaminant is liquid or solid at ambient soil temperatures (see Section 6.5).

Note that soil inhalation VCP RGs are not calculated for inorganics, even if they fit the volatility cutoffs (H >1E-05 atm-m^3/mole).

Particulate Emission Factor for Soils

Inhalation of contaminants adsorbed to respirable particles (PM_{10}) were assessed using a default PEF equal to 2.0E+9 m^3/kg that relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The PEF for the VCP RGs was derived using input values based on Lincoln, NE. The relationship is derived by Cowherd and others (1985) for a rapid assessment procedure applicable to a typical hazardous waste site where the surface contamination provides a relatively continuous and constant potential for emission over an extended period (e.g., years). This represents an annual average emission rate based on wind erosion that should be compared with chronic health criteria; it is not appropriate for evaluating the potential for more acute exposures. Note that the default PEF evaluates windborne emissions and does not consider dust emissions from traffic or other forms of mechanical disturbance that could lead to greater emissions than assumed here. For more details regarding specific parameters used in the PEF model, the reader is referred to Soil Screening Guidance: Technical Background Document (U.S. EPA 1996a).

6.3 SOILS - DERMAL EXPOSURE

Dermal Contact Assumptions

Exposure factors for dermal contact with soil are based on recommendations in Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual ("Part E, Supplemental Guidance for Dermal Risk Assessment") (U.S. EPA 2004) or as updated in the 2014 OSWER Directive: Update of Standard Default Exposure Factors (U.S. EPA 2014) and are consistent with the clause used in the U.S. EPA RSLs (U.S. EPA 2018a).

Dermal Absorption

Chemical-specific dermal absorption factors recommended by the Superfund Dermal Workgroup (U.S. EPA 2004) were applied when available. The dermal absorption factors (ABS_d) are used to estimate the percentage of applied chemical that will absorbed across the skin barrier to calculate a dermal dose. Chemical-specific values recommended in the U.S. EPA RSLs are included in the VCP RG dermal calculations.

6.4 SOILS - MIGRATION TO GROUNDWATER

VCP RGs were developed for soil contaminants that have the potential to contaminate underlying groundwater. Migration of contaminants from soil to groundwater can be envisioned as a two-stage process: (1) release of contaminant in soil leachate and (2) transport of the contaminant through the underlying soil and aquifer to a receptor well. The soil-to-groundwater VCP RG methodology considers both of these fate and transport mechanisms.

Soil-to-groundwater VCP RGs are back-calculated from acceptable groundwater concentrations (i.e., MCLs per Title 118, or risk-based VCP RGs for the remaining compounds). First, the target groundwater concentration is multiplied by a dilution factor to obtain a target leachate concentration. For example, if the dilution factor is 20 and the target groundwater concentration is 0.05 mg/L, the target soil leachate concentration would be 1.0 mg/L. The partitioning equation presented herein is then used to calculate the total soil concentration (i.e., VCP RG) corresponding to this soil leachate concentration.

The soil-to-groundwater VCP RG methodology was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, the methodology is based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface. For further information, the reader is referred to the Soil Screening Guidance documents (U.S. EPA 1996a, 1996b, and 2002b).

6.5 SOIL SATURATION LIMIT

The soil saturation concentration ("sat") corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the soil contaminant may be present in free phase, i.e., nonaqueous phase liquids (NAPLs), for contaminants that are liquid at ambient soil temperatures and pure solid phases for compounds that are solid at ambient soil temperatures. The "sat" equation included herein is used to calculate "sat" for each volatile contaminant. This equation considers the amount of contaminant that is in the vapor phase in soil in addition to the amount dissolved in the soil's pore water and sorbed to soil particles.

Chemical-specific "sat" concentrations should be compared with each VF_s-based VCP RG because a basic principle of the VCP RG volatilization model is not applicable when free-phase contaminants are present. How these cases are handled depends on whether the contaminant is liquid or solid at ambient temperatures. Note that contaminants that are solids at ambient temperatures are indicated in the VCP RG lookup tables. Liquid contaminants with a VF_s-based VCP RG that exceeds the "sat" concentration are set equal to "sat," whereas for solids (e.g., PAHs), soil screening decisions are based on the appropriate VCP RGs for other pathways of concern at the site (e.g., incidental ingestion).

6.6 GROUNDWATER—INGESTION AND INHALATION

Calculation of VCP RGs for ingestion and inhalation of contaminants in domestic water is based on the methodology presented in RAGS Part B (U.S. EPA 1991a). Ingestion of drinking water is an appropriate pathway for all contaminants. For the purposes of this guidance, however, inhalation of volatile chemicals from water is considered routinely only for those contaminants defined as volatiles (see Section 4.5). For volatile contaminants, the default volatilization factor (VF_w) of 0.5 is used that is based on all uses of household water (e.g., showering, laundering, and dish washing).

6.7 DEFAULT EXPOSURE FACTORS

Default exposure factors were obtained primarily from RAGS (U.S. EPA 1991b), and more recent information from U.S. EPA's Office of Solid Waste and Emergency Response (OSWER) (U.S. EPA 2014). Default values are identified in Attachment C, Table C-1. Because contact rates may differ for children and adults, carcinogenic risks for the resident during the first 26 years of life were calculated using age-adjusted factors ("adj"). Use of age-adjusted factors is especially important for soil ingestion exposures,

which are higher during childhood and decrease with age. Age-adjusted factors were obtained from U.S. EPA RSLs (U.S. EPA 2018a) or developed by analogy.

Noncarcinogenic contaminants are evaluated in children separately from adults. No age-adjustment factor is used in this case. The focus on children is considered protective because of the higher daily intake rates of soil and groundwater by children and their lower body weights.

The standardized equations used to calculate the VCP RGs are described in detail in Attachment C. U.S. EPA default exposure factors (U.S. EPA 1991b, 2014) were used except the following exposure factors are State of Nebraska-specific values:

- Skin Surface area – 2,690 cm^2 for worker
- Soil Adherence factor – 0.2 mg/cm^2 for worker

These assumptions result in slightly more protective VCP RGs for the worker than the comparable RSLs (U.S. EPA 2018a).

7.0 SUMMARY

This document describes the protocol followed to develop VCP RGs. The protocol provides an adequate level of protection to residential and industrial worker populations. Where possible, the values are specific to Nebraska using, for example, Title 118 for groundwater values and Nebraska-specific PEFs.

Groundwater VCP RGs are based on Nebraska Title 118—Ground Water Quality Standards, if available, and considers exposure to residents, both adult and child. In addition, exposure to volatile COPCs in groundwater via the vapor intrusion pathway are considered for both the residents (children and adults) and industrial/commercial workers. VCP RGs for soil are based on three major pathways: incidental ingestion, dermal contact, and inhalation for both the residents (children and adults) and industrial/commercial workers. Finally, exposure to volatile COPCs in soil gas via the vapor intrusion pathway are considered for both the residents (children and adults) and industrial/commercial workers. Age-adjusted intake factors were used to calculate exposure to residents (children and adults) and mutagenic-adjusted intake were used for carcinogenic chemicals identified as having a mutagenic mode of action. Chemical-specific cancer risk equations were used for TCE and vinyl chloride.

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ATTACHMENT A

VCP REMEDIATION GOALS LOOKUP TABLES

Table A-1: Groundwater & Soil Remediation Goals (Direct Contact Exposure Pathways)

Table A-2: Indoor Air, Soil Gas & Groundwater Vapor Intrusion Remediation Goals

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Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

Version Date: March 2021

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Acephate	30560-19-1	6.0E+00	nc	1.9E+01	nc	9.1E+02	nc	2.6E-02	nc
Acetaldehyde	75-07-0	2.6E+00	ca	1.1E+01	ca	3.4E+02	nc	1.0E-02	ca
Acetochlor	34256-82-1	8.8E+01	nc	3.2E+02	nc	1.5E+04	nc	1.4E+00	nc
Acetone	67-64-1	3.5E+03	nc	1.5E+04	nc	1.0E+05	max	1.4E+01	nc
Acetone cyanohydrin	75-86-5	--		1.0E+05	max	1.0E+05	max	--	
Acetonitrile	75-05-8	3.1E+01	nc	2.0E+02	nc	3.4E+03	nc	1.3E-01	nc
Acrolein	107-02-8	1.0E-02	nc	3.6E-02	nc	6.0E-01	nc	4.2E-05	nc
Acrylamide	79-06-1	5.0E-02	ca	2.4E-01	ca	4.3E+01	ca	2.1E-04	ca
Acrylic acid	79-10-7	5.2E-01	nc	2.5E+01	nc	4.2E+02	nc	2.1E-03	nc
Acrylonitrile	107-13-1	5.2E-02	ca	2.5E-01	ca	1.1E+01	ca	2.3E-04	ca
Alachlor	15972-60-8	2.0E+00	mcl	9.7E+00	ca	3.8E+02	ca	3.3E-02	mcl
Aldicarb	116-06-3	3.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	1.5E-02	mcl
Aldicarb sulfone	1646-88-4	2.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	8.8E-03	mcl
Aldrin	309-00-2	9.2E-04	ca	3.9E-02	ca	1.8E+00	ca	3.0E-03	ca
Allyl alcohol	107-18-6	5.2E-02	nc	8.8E-01	nc	1.5E+01	nc	2.1E-04	nc
Allyl chloride	107-05-1	5.2E-01	nc	4.1E-01	nc	6.9E+00	nc	3.3E-03	nc
Aluminum	7429-90-5	5.0E+01	mcl	1.9E+04	nc	1.0E+05	max	1.5E+03	mcl
Aluminum phosphide	20859-73-8	2.0E+00	nc	7.8E+00	nc	4.7E+02	nc	--	
Ametryn	834-12-8	3.8E+01	nc	1.4E+02	nc	6.8E+03	nc	8.0E-01	nc
m-Aminophenol	591-27-5	4.0E+02	nc	1.3E+03	nc	6.1E+04	nc	3.0E+00	nc
Amitraz	33089-61-1	2.0E+00	nc	4.0E+01	nc	1.9E+03	nc	2.1E+01	nc
Ammonia +++	7664-41-7	1.0E+04	NDEE	1.0E+05	max	1.0E+05	max	4.0E+01	NDEE
Ammonium sulfamate	7773-06-0	1.0E+03	nc	3.9E+03	nc	1.0E+05	max	--	
Aniline	62-53-3	1.3E+01	ca	9.5E+01	ca	3.7E+03	ca	9.1E-02	ca
Antimony and compounds	7440-36-0	6.0E+00	mcl	7.8E+00	nc	4.7E+02	nc	5.4E+00	mcl
Antimony pentoxide	1314-60-9	2.4E+00	nc	9.8E+00	nc	5.8E+02	nc	--	
Antimony potassium tartrate	28300-74-5	6.0E+00	mcl	1.8E+01	nc	1.1E+03	nc	--	
Antimony tetroxide	1332-81-6	1.9E+00	nc	7.8E+00	nc	4.7E+02	nc	--	
Antimony trioxide	1309-64-4	--		1.0E+05	max	1.0E+05	max	--	
Arsenic (inorganic) +++	7440-38-2	1.0E+01	mcl	4.6E-01	ca	2.2E+01	ca	--	
Arsine	7784-42-1	1.7E-02	nc	6.8E-02	nc	4.1E+00	nc	--	
Assure	76578-14-8	3.1E+01	nc	1.4E+02	nc	6.8E+03	nc	9.6E+00	nc
Asulam	3337-71-1	1.8E+02	nc	5.7E+02	nc	2.7E+04	nc	9.2E-01	nc
Atrazine	1912-24-9	3.0E+00	mcl	2.4E+00	ca	9.2E+01	ca	3.9E-02	mcl
Avermectin B1	65195-55-3	3.5E-01	s	6.3E+00	nc	3.0E+02	nc	7.0E+01	nc
Azobenzene	103-33-3	1.2E-01	ca	5.6E+00	ca	2.6E+02	ca	1.9E-02	ca

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Barium and compounds	7440-39-3	2.0E+03	mcl	3.9E+03	nc	1.0E+05	max	1.6E+03	mcl
Benfluralin (Benefin)	1861-40-1	7.1E+00	nc	9.8E+01	nc	5.8E+03	nc	4.7E+00	nc
Bensulfuron-methyl (Londax)	83055-99-6	9.9E+02	nc	3.2E+03	nc	1.0E+05	max	5.0E+00	nc
Bentazone (Bentazon)	25057-89-0	1.4E+02	nc	4.7E+02	nc	2.3E+04	nc	6.2E-01	nc
Benzaldehyde	100-52-7	1.9E+01	ca	1.7E+02	ca	8.2E+03	ca	8.3E-02	ca
Benzene	71-43-2	5.0E+00	mcl	1.2E+00	ca	5.1E+01	ca	5.1E-02	mcl
Benzidine	92-87-5	1.1E-04	ca	5.3E-04	ca	9.2E-02	ca	5.5E-06	ca
Benzoic acid	65-85-0	1.9E+04	nc	6.3E+04	nc	1.0E+05	max	7.6E+01	nc
Benzotrichloride	98-07-7	3.0E-03	ca	5.3E-02	ca	2.5E+00	ca	1.3E-04	ca
Benzyl alcohol	100-51-6	4.9E+02	nc	1.6E+03	nc	7.6E+04	nc	2.4E+00	nc
Benzyl chloride	100-44-7	8.9E-02	ca	1.1E+00	ca	4.8E+01	ca	2.0E-03	ca
Beryllium and compounds	7440-41-7	4.0E+00	mcl	3.9E+01	nc	2.3E+03	nc	6.3E+01	mcl
Biphenthrin (Talstar)	82657-04-3	1.0E+00	s	2.4E+02	nc	1.1E+04	nc	6.8E+03	nc
1,1-Biphenyl	92-52-4	2.1E-01	nc	1.2E+01	nc	2.0E+02	nc	4.4E-02	nc
Bis(2-chloroethyl)ether	111-44-4	1.4E-02	ca	2.3E-01	ca	1.0E+01	ca	7.2E-05	ca
Bis(chloromethyl)ether	542-88-1	7.2E-05	ca	8.3E-05	ca	3.6E-03	ca	3.4E-07	ca
Bis(2-chloro-1-methylethyl)ether	108-60-1	1.8E+02	nc	7.8E+02	nc	4.7E+04	nc	1.3E+00	nc
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	6.0E+00	mcl	3.9E+01	ca	1.5E+03	ca	2.9E+01	mcl
Bisphenol A	80-05-7	1.9E+02	nc	7.9E+02	nc	3.8E+04	nc	2.9E+02	nc
Boron	7440-42-8	1.0E+03	nc	3.9E+03	nc	1.0E+05	max	6.4E+01	nc
Boron trifluoride	7637-07-2	6.6E+00	nc	7.8E+02	nc	4.7E+04	nc	--	
Bromate	15541-45-4	1.0E+01	mcl	9.9E-01	ca	4.7E+01	ca	1.5E+00	mcl
Bromobenzene	108-86-1	1.6E+01	nc	7.1E+01	nc	1.8E+03	nc	2.1E-01	nc
Bromodichloromethane	75-27-4	1.0E+02	mcl	2.9E-01	ca	1.3E+01	ca	5.4E-01	mcl
Bromoform (Tribromomethane)	75-25-2	1.0E+02	mcl	1.9E+01	ca	8.6E+02	ca	5.3E-01	mcl
Bromomethane	74-83-9	1.9E+00	nc	1.7E+00	nc	3.0E+01	nc	9.6E-03	nc
Bromophos	2104-96-3	8.9E+00	nc	9.8E+01	nc	5.8E+03	nc	7.5E-01	nc
Bromoxynil	1689-84-5	6.3E-01	ca	5.4E+00	ca	2.1E+02	ca	1.1E-02	ca
Bromoxynil octanoate	1689-99-2	2.5E-01	ca	7.0E+00	ca	3.3E+02	ca	4.4E-02	ca
1,3-Butadiene	106-99-0	1.8E-02	ca	5.8E-02	ca	2.6E+00	ca	2.0E-04	ca
1-Butanol	71-36-3	4.9E+02	nc	2.0E+03	nc	1.0E+05	max	2.0E+00	nc
Butylate	2008-41-5	1.1E+02	nc	9.8E+02	nc	5.8E+04	nc	2.2E+00	nc
Butyl benzyl phthalate	85-68-7	1.6E+01	ca	2.9E+02	ca	1.1E+04	ca	4.7E+00	ca
Butylphthalyl butylglycolate	85-70-1	3.4E+03	nc	1.6E+04	nc	1.0E+05	max	1.5E+03	nc
Cacodylic acid	75-60-5	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	5.7E-01	nc
Cadmium and compounds +++	7440-43-9	5.0E+00	mcl	1.8E+01	nc	9.5E+02	nc	7.5E+00	mcl
Camphechlor (Toxaphene)	8001-35-2	3.0E+00	mcl	4.9E-01	ca	1.9E+01	ca	9.3E+00	mcl

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Caprolactam	105-60-2	2.5E+03	nc	7.8E+03	nc	1.0E+05	max	1.2E+01	nc
Captafol	2425-06-1	4.0E-01	ca	3.6E+00	ca	1.4E+02	ca	1.4E-02	ca
Captan	133-06-2	3.1E+01	ca	2.4E+02	ca	9.2E+03	ca	4.4E-01	ca
Carbaryl	63-25-2	4.6E+02	nc	1.6E+03	nc	7.6E+04	nc	8.4E+00	nc
Carbofuran	1563-66-2	4.0E+01	mcl	7.9E+01	nc	3.8E+03	nc	3.1E-01	mcl
Carbon disulfide	75-15-0	2.0E+02	nc	1.9E+02	nc	3.5E+03	nc	1.2E+00	nc
Carbon tetrachloride	56-23-5	5.0E+00	mcl	6.5E-01	ca	2.9E+01	ca	3.9E-02	mcl
Carbosulfan	55285-14-8	2.2E+00	nc	1.6E+02	nc	7.6E+03	nc	1.1E+00	nc
Carboxin	5234-68-4	4.8E+02	nc	1.6E+03	nc	7.6E+04	nc	5.2E+00	nc
Chloramben	133-90-4	7.2E+01	nc	2.4E+02	nc	1.1E+04	nc	3.5E-01	nc
Chloranil	118-75-2	1.8E-01	ca	1.4E+00	ca	5.3E+01	ca	3.0E-03	ca
Chlordane	12789-03-6	2.0E+00	mcl	1.7E+00	ca	7.4E+01	ca	5.4E+00	mcl
Chlordecone (Kepone)	143-50-0	3.5E-03	ca	5.4E-02	ca	2.1E+00	ca	2.5E-03	ca
Chlorimuron-ethyl	90982-32-4	4.4E+02	nc	1.4E+03	nc	6.8E+04	nc	3.0E+00	nc
Chlorine	7782-50-5	7.8E-02	nc	4.8E-02	nc	8.0E-01	nc	7.7E-04	nc
Chlorine dioxide	10049-04-4	1.0E-01	nc	5.8E+02	nc	3.4E+04	nc	--	
Chloroacetic acid	79-11-8	6.0E+01	mcl	--		--		2.4E-01	mcl
2-Chloroacetophenone	532-27-4	--		1.6E+04	nc	1.0E+05	max	--	
4-Chloroaniline	106-47-8	3.7E-01	ca	2.7E+00	ca	1.1E+02	ca	3.1E-03	ca
Chlorobenzene	108-90-7	1.0E+02	mcl	6.9E+01	nc	1.3E+03	nc	1.4E+00	mcl
Chlorobenzilate	510-15-6	3.1E-01	ca	4.9E+00	ca	1.9E+02	ca	2.1E-02	ca
p-Chlorobenzoic acid	74-11-3	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	6.5E-01	nc
4-Chlorobenzotrifluoride	98-56-6	8.6E+00	nc	5.3E+01	nc	2.5E+03	nc	6.1E-01	nc
2-Chloro-1,3-butadiene	126-99-8	1.9E-02	ca	1.0E-02	ca	4.4E-01	ca	2.0E-04	ca
1-Chlorobutane	109-69-3	1.6E+02	nc	7.8E+02	nc	4.7E+04	nc	1.3E+00	nc
1-Chloro-1,1-difluoroethane	75-68-3	2.6E+04	nc	1.3E+04	nc	1.0E+05	max	2.6E+02	nc
Chlorodifluoromethane	75-45-6	2.6E+04	nc	1.2E+04	nc	1.0E+05	max	2.1E+02	nc
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	1.3E+00	ca	2.2E+01	ca	8.5E+02	ca	3.0E-01	ca
Chloroform	67-66-3	1.0E+02	mcl	3.2E-01	ca	1.4E+01	ca	5.5E-01	mcl
Chloromethane	74-87-3	4.7E+01	nc	2.8E+01	nc	4.6E+02	nc	2.4E-01	nc
4-Chloro-2-methylaniline hydrochloride	3165-93-3	1.7E-01	ca	1.2E+00	ca	4.6E+01	ca	3.1E-03	ca
beta-Chloronaphthalene	91-58-7	1.9E+02	nc	1.2E+03	nc	5.5E+04	nc	1.9E+01	nc
o-Chloronitrobenzene	88-73-3	2.4E-01	ca	1.8E+00	ca	7.1E+01	ca	4.4E-03	ca
p-Chloronitrobenzene	100-00-5	1.2E+00	ca	9.0E+00	ca	3.5E+02	ca	2.1E-02	ca
2-Chlorophenol	95-57-8	2.3E+01	nc	9.8E+01	nc	5.8E+03	nc	4.5E-01	nc
Chlorothalonil	1897-45-6	2.2E+01	ca	1.8E+02	ca	6.9E+03	ca	9.9E-01	ca
o-Chlorotoluene	95-49-8	5.9E+01	nc	3.9E+02	nc	2.3E+04	nc	1.2E+00	nc

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Chlorpropham	101-21-3	1.8E+02	nc	7.9E+02	nc	3.8E+04	nc	3.2E+00	nc
Chlorpyrifos	2921-88-2	2.1E+00	nc	1.6E+01	nc	7.6E+02	nc	6.2E-01	nc
Chlorpyrifos-methyl	5598-13-0	3.0E+01	nc	1.6E+02	nc	7.6E+03	nc	2.7E+00	nc
Chlorsulfuron	64902-72-3	2.5E+02	nc	7.9E+02	nc	3.8E+04	nc	4.2E+00	nc
Chlorthiophos	60238-56-4	7.1E-01	nc	1.3E+01	nc	6.1E+02	nc	3.6E-01	nc
Chromium, Total	7440-47-3	1.0E+02	mcl	--		--		1.0E+05	max
Chromium III *	16065-83-1	5.6E+03	nc	2.9E+04	nc	1.0E+05	max	1.0E+05	max
Chromium VI +++	18540-29-9	3.5E-02	ca	3.0E-01	ca	6.4E+01	ca	1.3E-02	ca
Clofentezine (Apollo)	74115-24-5	5.8E+01	nc	2.1E+02	nc	9.9E+03	nc	7.0E+01	nc
Cobalt	7440-48-4	1.5E+00	nc	5.9E+00	nc	3.5E+02	nc	1.4E+00	nc
Coke Oven Emissions	8007-45-2	3.3E-03	ca	3.3E+03	ca	1.0E+05	max	2.1E-03	ca
Copper and compounds	7440-50-8	1.3E+03	mcl	7.8E+02	nc	4.7E+04	nc	9.2E+02	mcl
Crotonaldehyde	123-73-9	--		--		1.7E+01	ca	--	
Cumene (Isopropylbenzene)	98-82-8	1.1E+02	nc	4.9E+02	nc	9.9E+03	nc	3.7E+00	nc
Cyanazine	21725-46-2	8.8E-02	ca	6.5E-01	ca	2.5E+01	ca	8.2E-04	ca
Cyanide (free)	57-12-5	2.0E+02	mcl	5.7E+00	nc	1.5E+02	nc	4.0E+01	mcl
Cyanide (hydrogen)	74-90-8	3.7E-01	nc	5.6E+00	nc	1.5E+02	nc	7.4E-02	nc
Cyanogen	460-19-5	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	--	
Cyanogen bromide	506-68-3	4.5E+02	nc	1.8E+03	nc	1.0E+05	max	--	
Cyanogen chloride	506-77-4	2.5E+02	nc	9.8E+02	nc	5.8E+04	nc	--	
Cyclohexane	110-82-7	3.1E+03	nc	1.6E+03	nc	2.7E+04	nc	6.5E+01	nc
Cyclohexanone	108-94-1	3.6E+02	nc	7.1E+03	nc	1.0E+05	max	1.7E+00	nc
Cyclohexylamine	108-91-8	9.6E+02	nc	3.9E+03	nc	1.0E+05	max	5.1E+00	nc
Cyfluthrin (Baythroid)	68359-37-5	3.0E+00	s	4.0E+02	nc	1.9E+04	nc	1.6E+02	nc
Cyhalothrin (Karate)	68085-85-8	5.0E+00	s	1.6E+01	nc	7.6E+02	nc	6.8E+01	nc
Cyromazine	66215-27-8	2.5E+03	nc	7.9E+03	nc	1.0E+05	max	1.3E+01	nc
Dacthal	1861-32-1	3.1E+01	nc	1.6E+02	nc	7.6E+03	nc	7.6E-01	nc
Dalapon	75-99-0	2.0E+02	mcl	4.7E+02	nc	2.3E+04	nc	8.3E-01	mcl
Daminozide (Alar)	1596-84-5	4.3E+00	ca	3.0E+01	ca	1.2E+03	ca	1.9E-02	ca
Demeton	8065-48-3	1.1E-01	nc	6.3E-01	nc	3.0E+01	nc	--	
Diallate	2303-16-4	5.4E-01	ca	8.9E+00	ca	3.5E+02	ca	1.6E-02	ca
Diazinon	333-41-5	2.6E+00	nc	1.1E+01	nc	5.3E+02	nc	3.2E-01	nc
Dibenzofuran	132-64-9	2.0E+00	nc	1.8E+01	nc	1.0E+03	nc	7.3E-01	nc
1,4-Dibromobenzene	106-37-6	3.3E+01	nc	2.0E+02	nc	1.2E+04	nc	6.2E-01	nc
Dibromochloromethane	124-48-1	1.0E+02	mcl	8.3E+00	ca	3.9E+02	ca	5.3E-01	mcl
1,2-Dibromo-3-chloropropane	96-12-8	2.0E-01	mcl	5.3E-03	ca	6.4E-01	ca	1.7E-03	mcl
1,2-Dibromoethane	106-93-4	5.0E-02	mcl	3.6E-02	ca	1.6E+00	ca	2.8E-04	mcl

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Dibutyl phthalate	84-74-2	2.3E+02	nc	1.6E+03	nc	7.6E+04	nc	1.1E+01	nc
Dicamba	1918-00-9	1.4E+02	nc	4.7E+02	nc	2.3E+04	nc	7.3E-01	nc
1,2-Dichlorobenzene	95-50-1	6.0E+02	mcl	4.5E+02	nc	9.3E+03	nc	1.2E+01	mcl
1,4-Dichlorobenzene	106-46-7	7.5E+01	mcl	2.6E+00	ca	1.1E+02	ca	1.4E+00	mcl
3,3-Dichlorobenzidine	91-94-1	1.3E-01	ca	1.2E+00	ca	4.7E+01	ca	1.6E-02	ca
4,4'-Dichlorobenzophenone	90-98-2	1.9E+01	nc	1.4E+02	nc	6.8E+03	nc	2.4E+00	nc
1,4-Dichloro-2-butene	764-41-0	1.3E-03	ca	2.1E-03	ca	9.4E-02	ca	1.3E-05	ca
Dichlorodifluoromethane	75-71-8	4.9E+01	nc	2.2E+01	nc	3.7E+02	nc	1.5E+00	nc
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	1.6E-02	nc	4.7E-01	nc	2.3E+01	nc	7.5E-02	nc
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	4.6E-02	ca	2.0E+00	ca	9.3E+01	ca	2.2E-01	ca
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.3E-01	ca	1.9E+00	ca	8.3E+01	ca	1.5E+00	ca
1,1-Dichloroethane	75-34-3	2.8E+00	ca	3.6E+00	ca	1.6E+02	ca	1.6E-02	ca
1,2-Dichloroethane	107-06-2	5.0E+00	mcl	4.6E-01	ca	2.0E+01	ca	2.8E-02	mcl
1,1-Dichloroethylene	75-35-4	7.0E+00	mcl	5.7E+01	nc	1.0E+03	nc	5.0E-02	mcl
1,2-Dichloroethylene (cis)	156-59-2	7.0E+01	mcl	3.9E+01	nc	2.3E+03	nc	4.1E-01	mcl
1,2-Dichloroethylene (trans)	156-60-5	1.0E+02	mcl	3.9E+02	nc	2.3E+04	nc	6.3E-01	mcl
2,4-Dichlorophenol	120-83-2	1.1E+01	nc	4.7E+01	nc	2.3E+03	nc	1.1E-01	nc
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	7.0E+01	mcl	1.7E+02	nc	9.2E+03	nc	3.6E-01	mcl
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	1.1E+02	nc	4.7E+02	nc	2.3E+04	nc	2.1E+00	nc
Decabromodiphenyl ether (BDE-209)	1163-19-5	1.0E-01	s	1.1E+02	nc	5.3E+03	nc	3.9E+02	nc
1,2-Dichloropropane	78-87-5	5.0E+00	mcl	2.5E+00	ca	6.6E+01	nc	3.3E-02	mcl
2,3-Dichloropropanol	616-23-9	1.5E+01	nc	4.7E+01	nc	2.3E+03	nc	6.3E-02	nc
1,3-Dichloropropene	542-75-6	4.7E-01	ca	1.8E+00	ca	8.2E+01	ca	3.4E-03	ca
Dichlorvos	62-73-7	2.6E-01	ca	1.9E+00	ca	7.3E+01	ca	1.6E-03	ca
Dicrotophos (Bidrin)	141-66-2	1.5E-01	nc	4.7E-01	nc	2.3E+01	nc	7.0E-04	nc
Dicyclopentadiene	77-73-6	1.6E-01	nc	3.2E-01	nc	5.4E+00	nc	1.1E-02	nc
Dieldrin	60-57-1	1.8E-03	ca	3.4E-02	ca	1.3E+00	ca	1.4E-03	ca
Diethylene glycol, monobutyl ether	112-34-5	1.5E+02	nc	4.7E+02	nc	2.2E+04	nc	6.6E-01	nc
Diethylene glycol, monoethyl ether	111-90-0	3.0E+02	nc	9.4E+02	nc	4.5E+04	nc	1.2E+00	nc
Diethylformamide	617-84-5	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	2.0E-02	nc
Di(2-ethylhexyl)adipate	103-23-1	4.0E+02	mcl	4.5E+02	ca	1.8E+04	ca	5.8E+02	mcl
Diethyl phthalate	84-66-2	3.7E+03	nc	1.3E+04	nc	1.0E+05	max	3.0E+01	nc
Diethylstilbestrol	56-53-1	5.1E-05	ca	1.6E-03	ca	6.1E-02	ca	5.6E-04	ca
Difenzoquat (Avenge)	43222-48-6	4.2E+02	nc	1.3E+03	nc	6.3E+04	nc	1.3E+03	nc
Diflubenzuron	35367-38-5	7.2E+01	nc	3.2E+02	nc	1.5E+04	nc	1.6E+00	nc
1,1-Difluoroethane	75-37-6	2.1E+04	nc	1.2E+04	nc	1.0E+05	max	1.4E+02	nc
Diisopropyl methylphosphonate (DIMP)	1445-75-6	4.0E+02	nc	1.6E+03	nc	9.3E+04	nc	2.3E+00	nc

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Dimethipin	55290-64-7	1.1E+02	nc	3.5E+02	nc	1.7E+04	nc	4.8E-01	nc
Dimethoate	60-51-5	1.1E+01	nc	3.5E+01	nc	1.7E+03	nc	4.9E-02	nc
3,3'-Dimethoxybenzidine	119-90-4	4.7E-02	ca	3.4E-01	ca	1.3E+01	ca	1.2E-03	ca
N-N-Dimethylaniline	121-69-7	2.5E+00	ca	2.6E+01	ca	1.2E+03	ca	1.8E-02	ca
2,4-Dimethylaniline	95-68-1	3.7E-01	ca	2.7E+00	ca	1.1E+02	ca	4.2E-03	ca
2,4-Dimethylaniline hydrochloride	21436-96-4	1.3E-01	ca	9.4E-01	ca	3.7E+01	ca	2.4E-03	ca
3,3'-Dimethylbenzidine	119-93-7	6.5E-03	ca	4.9E-02	ca	1.9E+00	ca	8.6E-04	ca
N,N-Dimethylformamide	68-12-2	1.5E+01	nc	6.6E+02	nc	1.5E+04	nc	6.1E-02	nc
2,4-Dimethylphenol	105-67-9	8.9E+01	nc	3.2E+02	nc	1.5E+04	nc	2.1E+00	nc
2,6-Dimethylphenol	576-26-1	2.6E+00	nc	9.5E+00	nc	4.6E+02	nc	6.3E-02	nc
3,4-Dimethylphenol	95-65-8	4.5E+00	nc	1.6E+01	nc	7.6E+02	nc	1.1E-01	nc
Dimethyl terephthalate	120-61-6	4.7E+02	nc	2.0E+03	nc	1.0E+05	max	2.4E+00	nc
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	5.8E+00	nc	3.2E+01	nc	1.5E+03	nc	3.8E+00	nc
1,2-Dinitrobenzene	528-29-0	4.8E-01	nc	1.6E+00	nc	7.6E+01	nc	8.9E-03	nc
1,3-Dinitrobenzene	99-65-0	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	8.8E-03	nc
1,4-Dinitrobenzene	100-25-4	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	8.8E-03	nc
2,4-Dinitrophenol	51-28-5	9.7E+00	nc	3.2E+01	nc	1.5E+03	nc	2.2E-01	nc
Dinitrotoluene mixture	25321-14-6	1.0E-01	ca	1.2E+00	ca	4.7E+01	ca	2.9E-03	ca
2,4-Dinitrotoluene	121-14-2	2.4E-01	ca	1.7E+00	ca	6.8E+01	ca	6.4E-03	ca
2,6-Dinitrotoluene	606-20-2	4.9E-02	ca	3.6E-01	ca	1.4E+01	ca	1.3E-03	ca
Dinoseb	88-85-7	7.0E+00	mcl	1.6E+01	nc	7.6E+02	nc	1.2E+00	mcl
1,4-Dioxane	123-91-1	4.6E-01	ca	5.3E+00	ca	2.4E+02	ca	1.9E-03	ca
Diphenamid	957-51-7	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	2.6E+01	nc
Diphenylamine	122-39-4	3.1E+02	nc	1.6E+03	nc	7.6E+04	nc	1.2E+01	nc
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	9.0E-01	nc	4.7E+00	nc	2.3E+02	nc	1.9E+00	nc
1,2-Diphenylhydrazine	122-66-7	7.8E-02	ca	6.8E-01	ca	2.7E+01	ca	5.0E-03	ca
Diphenyl sulfone	127-63-9	3.7E+00	nc	1.3E+01	nc	6.1E+02	nc	1.8E-01	nc
Diquat dibromide (Diquat)	85-00-7	2.0E+01	mcl	3.5E+01	nc	1.7E+03	nc	7.5E+00	mcl
Direct black 38	1937-37-7	1.1E-02	ca	7.6E-02	ca	3.0E+00	ca	1.1E+02	ca
Direct blue 6	2602-46-2	1.1E-02	ca	7.3E-02	ca	2.9E+00	ca	3.3E+02	ca
Direct brown 95	16071-86-6	1.2E-02	ca	8.1E-02	ca	3.2E+00	ca	3.2E+00	ca
Disulfoton	298-04-4	1.3E-01	nc	6.3E-01	nc	3.0E+01	nc	4.7E-03	nc
1,4-Dithiane	505-29-3	5.0E+01	nc	2.0E+02	nc	1.2E+04	nc	4.9E-01	nc
Diuron	330-54-1	9.0E+00	nc	3.2E+01	nc	1.5E+03	nc	7.5E-02	nc
Dodine	2439-10-3	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	1.0E+01	nc
Endosulfan	115-29-7	2.5E+01	nc	1.2E+02	nc	7.0E+03	nc	6.9E+00	nc
Endothall	145-73-3	1.0E+02	mcl	3.2E+02	nc	1.5E+04	nc	4.8E-01	mcl

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Endrin	72-20-8	2.0E+00	mcl	4.7E+00	nc	2.3E+02	nc	1.6E+00	mcl
Enilconazole (Imazalil)	35554-44-0	9.0E-01	ca	8.9E+00	ca	3.5E+02	ca	3.1E-01	ca
Epichlorohydrin	106-89-8	5.1E-01	nc	4.7E+00	nc	8.2E+01	nc	2.3E-03	nc
1,2-Epoxybutane	106-88-7	1.0E+01	nc	4.0E+01	nc	6.7E+02	nc	4.6E-02	nc
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	1.9E+02	nc	9.8E+02	nc	5.8E+04	nc	2.0E+00	nc
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	2.5E+01	nc	7.9E+01	nc	3.8E+03	nc	1.1E-01	nc
Ethion	563-12-2	1.1E+00	nc	7.9E+00	nc	3.8E+02	nc	4.3E-02	nc
2-Ethoxyethanol	110-80-5	8.5E+01	nc	1.3E+03	nc	4.7E+04	nc	3.4E-01	nc
2-Ethoxyethanol acetate	111-15-9	2.9E+01	nc	6.4E+02	nc	1.4E+04	nc	1.2E-01	nc
Ethyl acetate	141-78-6	3.6E+01	nc	1.6E+02	nc	2.6E+03	nc	1.5E-01	nc
Ethyl acrylate	140-88-5	3.6E+00	nc	1.2E+01	nc	2.1E+02	nc	1.6E-02	nc
Ethylbenzene	100-41-4	7.0E+02	mcl	5.8E+00	ca	2.5E+02	ca	1.6E+01	mcl
Ethyl chloride (Chloroethane)	75-00-3	5.2E+03	nc	3.4E+03	nc	5.7E+04	nc	3.0E+01	nc
Ethylene cyanohydrin	109-78-4	3.5E+02	nc	1.1E+03	nc	5.3E+04	nc	1.4E+00	nc
Ethylene diamine	107-15-3	4.5E+02	nc	1.8E+03	nc	1.0E+05	max	2.1E+00	nc
Ethylene glycol	107-21-1	1.0E+04	nc	3.2E+04	nc	1.0E+05	max	4.0E+01	nc
Ethylene glycol, monobutyl ether	111-76-2	4.9E+02	nc	1.6E+03	nc	7.6E+04	nc	2.0E+00	nc
Ethylene oxide	75-21-8	6.7E-04	ca	2.0E-03	ca	2.5E-01	ca	2.8E-06	ca
Ethylene thiourea (ETU)	96-45-7	4.0E-01	nc	1.3E+00	nc	6.1E+01	nc	1.8E-03	nc
Ethyl ether	60-29-7	9.8E+02	nc	3.9E+03	nc	1.0E+05	max	4.4E+00	nc
Ethyl methacrylate	97-63-2	1.6E+02	nc	4.5E+02	nc	7.6E+03	nc	7.4E-01	nc
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	2.2E-02	nc	1.6E-01	nc	7.6E+00	nc	1.4E-02	nc
Ethylphthalyl ethyl glycolate	84-72-0	1.4E+04	nc	4.7E+04	nc	1.0E+05	max	6.5E+02	nc
Fenamiphos	22224-92-6	1.1E+00	nc	4.0E+00	nc	1.9E+02	nc	2.2E-02	nc
Fenpropathrin (Danitol)	39515-41-8	1.6E+01	nc	4.0E+02	nc	1.9E+04	nc	1.4E+01	nc
Fenvalerate (Pydrin)	51630-58-1	2.4E+01	s	4.0E+02	nc	1.9E+04	nc	1.6E+03	nc
Fluometuron	2164-17-2	6.1E+01	nc	2.1E+02	nc	9.9E+03	nc	9.3E-01	nc
Fluoride	16984-48-8	4.0E+03	mcl	7.8E+02	nc	4.7E+04	nc	1.2E+04	mcl
Fluoridone	59756-60-4	3.6E+02	nc	1.3E+03	nc	6.1E+04	nc	8.2E+02	nc
Flurprimidol	56425-91-3	1.7E+02	nc	6.3E+02	nc	3.0E+04	nc	1.6E+01	nc
Flusilazole (NuStar)	85509-19-9	7.8E+00	nc	3.9E+01	nc	2.3E+03	nc	2.5E+01	nc
Flutolanil	66332-96-5	2.0E+03	nc	7.9E+03	nc	1.0E+05	max	2.1E+02	nc
Fluvalinate	69409-94-5	5.0E+00	s	1.6E+02	nc	7.6E+03	nc	1.5E+03	nc
Folpet	133-07-3	4.1E+02	nc	1.4E+03	nc	6.8E+04	nc	1.9E+00	nc
Fomesafen	72178-02-0	1.2E+01	nc	4.0E+01	nc	1.9E+03	nc	7.9E-01	nc
Fonofos	944-22-9	6.1E+00	nc	3.2E+01	nc	1.5E+03	nc	2.3E-01	nc
Formaldehyde	50-00-0	4.3E-01	ca	1.7E+01	ca	7.3E+02	ca	1.7E-03	ca

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Formic acid	64-18-6	1.6E-01	nc	7.3E+00	nc	1.2E+02	nc	6.3E-04	nc
Fosetyl-al	39148-24-8	1.3E+04	nc	4.0E+04	nc	1.0E+05	max	3.3E+03	nc
Furan	110-00-9	4.8E+00	nc	1.8E+01	nc	1.0E+03	nc	3.7E-02	nc
Furazolidone	67-45-8	2.0E-02	ca	1.4E-01	ca	5.6E+00	ca	7.8E-04	ca
Furfural	98-01-1	9.5E+00	nc	5.4E+01	nc	2.6E+03	nc	4.0E-02	nc
Furmecyclox	60568-05-0	1.1E+00	ca	1.8E+01	ca	7.1E+02	ca	2.4E-02	ca
Furothiazole (Furium)	531-82-8	5.1E-02	ca	3.6E-01	ca	1.4E+01	ca	1.4E-03	ca
Glufosinate-ammonium	77182-82-2	3.0E+01	nc	9.5E+01	nc	4.6E+03	nc	1.3E-01	nc
Glycidaldehyde	765-34-4	4.1E-01	nc	5.8E+00	nc	2.1E+02	nc	1.7E-03	nc
Glyphosate	1071-83-6	7.0E+02	mcl	1.6E+03	nc	7.6E+04	nc	6.2E+01	mcl
Haloxyfop-methyl	69806-40-2	1.9E-01	nc	7.9E-01	nc	3.8E+01	nc	4.2E-02	nc
Thifensulfuron-methyl (Harmony)	79277-27-3	2.1E+02	nc	6.8E+02	nc	3.3E+04	nc	1.3E+00	nc
Heptachlor	76-44-8	4.0E-01	mcl	1.3E-01	ca	6.3E+00	ca	6.6E-01	mcl
Heptachlor epoxide	1024-57-3	2.0E-01	mcl	7.0E-02	ca	3.3E+00	ca	8.2E-02	mcl
Hexabromobenzene	87-82-1	1.6E-01	s	3.9E+01	nc	2.3E+03	nc	1.2E+00	nc
Hexachlorobenzene	118-74-1	1.0E+00	mcl	2.1E-01	ca	9.6E+00	ca	2.5E-01	mcl
Hexachlorobutadiene	87-68-3	1.4E-01	ca	1.2E+00	ca	5.3E+01	ca	5.3E-03	ca
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	7.2E-03	ca	8.6E-02	ca	3.4E+00	ca	8.4E-04	ca
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	2.5E-02	ca	3.0E-01	ca	1.2E+01	ca	2.9E-03	ca
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	2.0E-01	mcl	5.7E-01	ca	2.4E+01	ca	2.3E-02	mcl
Hexachlorocyclohexane technical	608-73-1	2.5E-02	ca	3.0E-01	ca	1.2E+01	ca	2.9E-03	ca
Hexachlorocyclopentadiene	77-47-4	5.0E+01	mcl	4.4E-01	nc	7.5E+00	nc	3.1E+00	mcl
Hexachloroethane	67-72-1	3.3E-01	ca	1.8E+00	ca	8.0E+01	ca	4.0E-03	ca
Hexachlorophene	70-30-4	1.5E+00	nc	4.7E+00	nc	2.3E+02	nc	4.0E+01	nc
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	7.0E-01	ca	6.1E+00	ca	2.8E+02	ca	5.3E-03	ca
1,6-Hexamethylene diisocyanate	822-06-0	5.2E-03	nc	7.8E-01	nc	1.3E+01	nc	1.0E-03	nc
n-Hexane	110-54-3	3.7E+02	nc	1.5E+02	nc	2.5E+03	nc	5.1E+01	nc
Hexazinone	51235-04-2	1.6E+02	nc	5.2E+02	nc	2.5E+04	nc	1.5E+00	nc
Hexythiazox (Savey)	78587-05-0	2.8E+01	nc	4.0E+02	nc	1.9E+04	nc	2.5E+00	nc
Hydramethylnon (Amdro)	67485-29-4	6.0E+00	s	2.7E+02	nc	1.3E+04	nc	1.0E+05	max
Hydrazine, hydrazine sulfate	302-01-2	1.1E-03	ca	2.3E-01	ca	1.1E+01	ca	--	
Hydrazine, dimethyl	57-14-7	1.0E-03	nc	1.4E-02	nc	2.4E-01	nc	4.7E-06	nc
Hydrogen chloride	7647-01-0	1.0E+01	nc	1.0E+05	max	1.0E+05	max	--	
Hydrogen sulfide	7783-06-4	1.0E+00	nc	1.0E+05	max	1.0E+05	max	--	
p-Hydroquinone	123-31-9	1.3E+00	ca	9.0E+00	ca	3.5E+02	ca	1.7E-02	ca
Imazaquin	81335-37-7	1.2E+03	nc	4.0E+03	nc	1.0E+05	max	1.2E+02	nc
Imazethapyr (Pursuit)	81335-77-5	1.2E+04	nc	4.0E+04	nc	1.0E+05	max	2.1E+02	nc

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Iprodione	36734-19-7	1.8E+02	nc	6.3E+02	nc	3.0E+04	nc	1.1E+00	nc
Iron	7439-89-6	3.0E+02	mcl	1.4E+04	nc	1.0E+05	max	1.5E+02	mcl
Isobutanol (Isobutyl alcohol)	78-83-1	1.5E+03	nc	5.9E+03	nc	1.0E+05	max	6.1E+00	nc
Isophorone	78-59-1	7.8E+01	ca	5.7E+02	ca	2.2E+04	ca	5.2E-01	ca
Isopropalin	33820-53-0	1.0E+01	nc	2.9E+02	nc	1.8E+04	nc	4.6E+00	nc
Isopropyl methyl phosphonic acid	1832-54-8	5.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.1E+00	nc
Isoxaben	82558-50-7	1.8E+02	nc	7.9E+02	nc	3.8E+04	nc	1.0E+01	nc
Lactofen	77501-63-4	2.5E+01	nc	1.3E+02	nc	6.1E+03	nc	2.3E+01	nc
Lead +++	7439-92-1	1.5E+01	mcl	4.0E+02	nc	8.0E+02	nc	2.7E+02	mcl
Lead (tetraethyl)	78-00-2	3.3E-04	nc	2.0E-03	nc	1.2E-01	nc	2.3E-05	nc
Linuron	330-55-2	3.2E+01	nc	1.2E+02	nc	5.8E+03	nc	5.6E-01	nc
Lithium	7439-93-2	1.0E+01	nc	4.0E+02	nc	2.3E+03	nc	6.0E+01	nc
Malathion	121-75-5	9.7E+01	nc	3.2E+02	nc	1.5E+04	nc	5.1E-01	nc
Maleic anhydride	108-31-6	4.8E+02	nc	1.6E+03	nc	7.5E+04	nc	1.9E+00	nc
Maleic hydrazide	123-33-1	2.5E+03	nc	7.9E+03	nc	1.0E+05	max	1.0E+01	nc
Malononitrile	109-77-3	5.0E-01	nc	1.6E+00	nc	7.6E+01	nc	2.1E-03	nc
Mancozeb	8018-01-7	1.3E+02	nc	4.7E+02	nc	2.3E+04	nc	3.8E+00	nc
Maneb	12427-38-2	2.4E+01	nc	7.9E+01	nc	3.8E+03	nc	6.9E-01	nc
Manganese (non-food) +++	7439-96-5	5.0E+01	mcl	2.5E+03	nc	1.0E+05	max	6.5E+01	mcl
Mephosfolan	950-10-7	4.5E-01	nc	1.4E+00	nc	6.8E+01	nc	1.3E-02	nc
Mepiquat chloride (Mepiquat)	24307-26-4	1.5E+02	nc	4.7E+02	nc	2.3E+04	nc	1.0E+00	nc
Mercury and compounds	7487-94-7	2.0E+00	mcl	5.9E+00	nc	3.5E+02	nc	--	
Mercury (elemental)	7439-97-6	2.0E+00	mcl	2.7E+00	nc	4.6E+01	nc	2.1E+00	mcl
Mercury (methyl)	22967-92-6	4.9E-01	nc	2.0E+00	nc	1.2E+02	nc	--	
Merphos	150-50-5	1.5E-01	nc	5.9E-01	nc	3.5E+01	nc	3.0E-01	nc
Merphos oxide	78-48-8	7.1E-02	nc	1.6E+00	nc	7.6E+01	nc	7.0E-03	nc
Metalaxyl	57837-19-1	3.0E+02	nc	9.5E+02	nc	4.6E+04	nc	1.6E+00	nc
Methacrylonitrile	126-98-7	4.8E-01	nc	1.9E+00	nc	1.0E+02	nc	2.2E-03	nc
Methamidophos	10265-92-6	2.5E-01	nc	7.9E-01	nc	3.8E+01	nc	1.1E-03	nc
Methanol	67-56-1	5.1E+03	nc	3.1E+04	nc	1.0E+05	max	2.1E+01	nc
Methidathion	950-37-8	7.3E+00	nc	2.4E+01	nc	1.1E+03	nc	3.5E-02	nc
Methomyl	16752-77-5	1.2E+02	nc	4.0E+02	nc	1.9E+04	nc	5.5E-01	nc
Methoxychlor	72-43-5	4.0E+01	mcl	7.9E+01	nc	3.8E+03	nc	4.3E+01	mcl
2-Methoxyethanol	109-86-4	7.4E+00	nc	8.2E+01	nc	3.5E+03	nc	3.0E-02	nc
2-Methoxyethanol acetate	110-49-6	5.1E-01	nc	2.7E+01	nc	5.1E+02	nc	2.1E-03	nc
2-Methoxy-5-nitroaniline	99-59-2	1.5E+00	ca	1.1E+01	ca	4.3E+02	ca	1.1E-02	ca
Methyl acetate	79-20-9	5.0E+03	nc	2.0E+04	nc	1.0E+05	max	2.1E+01	nc

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Methyl acrylate	96-33-3	1.0E+01	nc	3.6E+01	nc	6.1E+02	nc	4.4E-02	nc
2-Methylaniline hydrochloride	636-21-5	6.0E-01	ca	4.2E+00	ca	1.6E+02	ca	5.2E-03	ca
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	2.4E+02	nc	7.9E+02	nc	3.8E+04	nc	4.2E+00	nc
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	1.9E+00	nc	7.9E+00	nc	3.8E+02	nc	9.8E-03	nc
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	1.6E+01	nc	7.0E+01	nc	3.3E+03	nc	1.3E-01	nc
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	3.9E+00	nc	1.6E+01	nc	7.6E+02	nc	2.3E-02	nc
4,4'-Methylenebisbenzeneamine	101-77-9	4.7E-02	ca	3.4E-01	ca	1.3E+01	ca	4.2E-03	ca
4,4'-Methylene bis(2-chloroaniline)	101-14-4	1.6E-01	ca	1.2E+00	ca	2.1E+02	ca	3.7E-02	ca
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	4.8E-01	ca	1.2E+01	ca	4.6E+02	ca	5.3E-02	ca
Methylene bromide	74-95-3	2.1E+00	nc	5.9E+00	nc	9.9E+01	nc	1.0E-02	nc
Methylene chloride	75-09-2	5.0E+00	mcl	5.7E+01	ca	3.2E+03	nc	2.6E-02	mcl
4,4'-Methylenediphenyl isocyanate	101-68-8	--		1.0E+05	max	1.0E+05	max	--	
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	2.0E+01	nc	6.3E+01	nc	3.0E+03	nc	1.3E-01	nc
Methyl ethyl ketone (2-Butanone)	78-93-3	1.4E+03	nc	6.8E+03	nc	1.0E+05	max	5.8E+00	nc
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	1.6E+03	nc	8.3E+03	nc	1.0E+05	max	7.1E+00	nc
Methyl methacrylate	80-62-6	3.5E+02	nc	1.1E+03	nc	1.9E+04	nc	1.5E+00	nc
2-Methyl-5-nitroaniline	99-55-8	8.2E+00	ca	6.0E+01	ca	2.4E+03	ca	9.1E-02	ca
Methyl parathion	298-00-0	1.1E+00	nc	4.0E+00	nc	1.9E+02	nc	3.7E-02	nc
2-Methylphenol	95-48-7	2.3E+02	nc	7.9E+02	nc	3.8E+04	nc	3.8E+00	nc
3-Methylphenol	108-39-4	2.3E+02	nc	7.9E+02	nc	3.8E+04	nc	3.7E+00	nc
4-Methylphenol	106-44-5	4.6E+02	nc	1.6E+03	nc	7.6E+04	nc	7.4E+00	nc
Methyl phosphonic acid	993-13-5	3.0E+02	nc	9.5E+02	nc	4.6E+04	nc	1.2E+00	nc
Methyl styrene (mixture)	25013-15-4	5.7E+00	nc	8.0E+01	nc	2.6E+03	nc	1.9E-01	nc
Methyl styrene (alpha)	98-83-9	1.9E+02	nc	1.4E+03	nc	8.2E+04	nc	6.2E+00	nc
Methyl tertbutyl ether (MTBE)	1634-04-4	1.4E+01	ca	4.7E+01	ca	2.1E+03	ca	6.4E-02	ca
Metolaclor (Dual)	51218-45-2	6.8E+02	nc	2.4E+03	nc	1.0E+05	max	1.6E+01	nc
Metribuzin	21087-64-9	1.2E+02	nc	4.0E+02	nc	1.9E+04	nc	7.5E-01	nc
Metsulfuron-methyl (Ally)	74223-64-6	1.2E+03	nc	4.0E+03	nc	1.0E+05	max	9.5E+00	nc
Mirex	2385-85-5	8.8E-04	ca	3.6E-02	ca	1.7E+00	ca	1.3E-02	ca
Molinate	2212-67-1	7.5E+00	nc	3.2E+01	nc	1.5E+03	nc	8.4E-02	nc
Molybdenum	7439-98-7	2.5E+01	nc	9.8E+01	nc	5.8E+03	nc	1.0E+01	nc
Monochloramine	10599-90-3	4.0E+03	mcl	2.0E+03	nc	1.0E+05	max	--	
Myclobutanil (Systhane)	88671-89-0	1.1E+02	nc	4.0E+02	nc	1.9E+04	nc	2.8E+01	nc
Naled	300-76-5	1.0E+01	nc	3.9E+01	nc	2.3E+03	nc	9.0E-02	nc
Napropamide	15299-99-7	4.9E+02	nc	1.9E+03	nc	9.1E+04	nc	6.5E+01	nc
Nickel and compounds	7440-02-0	9.8E+01	nc	3.9E+02	nc	2.3E+04	nc	1.3E+02	nc
Nickel refinery dust	7440-02-0-NRD	5.4E+01	nc	2.1E+02	nc	1.2E+04	nc	1.6E+02	nc

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		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Nickel subsulfide	12035-72-2	4.5E-02	ca	4.1E-01	ca	1.9E+01	ca	--	
Nitrate	14797-55-8	1.0E+04	mcl	3.1E+04	nc	1.0E+05	max	--	
Nitrite	14797-65-0	1.0E+03	mcl	2.0E+03	nc	1.0E+05	max	--	
2-Nitroaniline	88-74-4	4.7E+01	nc	1.6E+02	nc	7.5E+03	nc	4.0E-01	nc
Nitrobenzene	98-95-3	1.4E-01	ca	5.1E+00	ca	2.2E+02	ca	1.8E-03	ca
Nitrofurantoin	67-20-9	3.5E+02	nc	1.1E+03	nc	5.3E+04	nc	3.0E+00	nc
Nitrofurazone	59-87-0	6.0E-02	ca	4.2E-01	ca	1.6E+01	ca	1.1E-03	ca
Nitroglycerin	55-63-0	4.9E-01	nc	1.6E+00	nc	7.6E+01	nc	4.2E-03	nc
Nitroguanidine	556-88-7	5.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.4E+00	nc
2-Nitropropane	79-46-9	2.1E-03	ca	1.4E-02	ca	6.0E-01	ca	1.1E-05	ca
N-Nitrosodi-n-butylamine	924-16-3	2.7E-03	ca	9.9E-02	ca	4.6E+00	ca	1.1E-04	ca
N-Nitrosodiethanolamine	1116-54-7	2.8E-02	ca	1.9E-01	ca	7.6E+00	ca	1.1E-04	ca
N-Nitrosodiethylamine	55-18-5	1.7E-04	ca	8.1E-04	ca	1.4E-01	ca	1.2E-06	ca
N-Nitrosodimethylamine	62-75-9	1.1E-04	ca	2.0E-03	ca	3.4E-01	ca	5.5E-07	ca
N-Nitrosodiphenylamine	86-30-6	1.2E+01	ca	1.1E+02	ca	4.3E+03	ca	1.3E+00	ca
N-Nitroso di-n-propylamine	621-64-7	1.1E-02	ca	7.8E-02	ca	3.0E+00	ca	1.6E-04	ca
N-Nitroso-N-methylethylamine	10595-95-6	7.1E-04	ca	2.0E-02	ca	9.1E-01	ca	4.1E-06	ca
N-Nitrosopyrrolidine	930-55-2	3.7E-02	ca	2.6E-01	ca	1.0E+01	ca	2.8E-04	ca
m-Nitrotoluene	99-08-1	4.4E-01	nc	1.6E+00	nc	7.6E+01	nc	8.1E-03	nc
o-Nitrotoluene	88-72-2	3.1E-01	ca	3.2E+00	ca	1.5E+02	ca	5.9E-03	ca
p-Nitrotoluene	99-99-0	4.3E+00	ca	3.4E+01	ca	1.3E+03	ca	7.9E-02	ca
Norflurazon	27314-13-2	7.2E+01	nc	2.4E+02	nc	1.1E+04	nc	9.3E+00	nc
Octabromodiphenyl ether	32536-52-0	1.1E-05	s	4.7E+01	nc	2.3E+03	nc	6.0E+01	nc
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	2.5E+02	nc	9.6E+02	nc	5.7E+04	nc	6.3E+00	nc
Octamethylpyrophosphoramide	152-16-9	1.0E+01	nc	3.2E+01	nc	1.5E+03	nc	4.8E-02	nc
Oryzalin	19044-88-3	7.9E+00	ca	7.0E+01	ca	2.7E+03	ca	2.9E-01	ca
Oxadiazon	19666-30-9	1.2E+01	nc	7.9E+01	nc	3.8E+03	nc	2.4E+00	nc
Oxamyl	23135-22-0	2.0E+02	mcl	4.0E+02	nc	1.9E+04	nc	8.8E-01	mcl
Oxyfluorfen	42874-03-3	5.4E-01	ca	7.4E+00	ca	2.9E+02	ca	8.6E-01	ca
Paclobutrazol	76738-62-0	5.7E+01	nc	2.1E+02	nc	9.9E+03	nc	2.3E+00	nc
Paraquat	4685-14-7	2.3E+01	nc	7.1E+01	nc	3.4E+03	nc	7.0E+00	nc
Parathion	56-38-2	2.1E+01	nc	9.5E+01	nc	4.6E+03	nc	2.2E+00	nc
Pebulate	1114-71-2	1.4E+02	nc	9.8E+02	nc	5.8E+04	nc	2.2E+00	nc
Pendimethalin	40487-42-1	3.4E+01	nc	4.7E+02	nc	2.3E+04	nc	7.8E+00	nc
Pentabromo-6-chloro cyclohexane	87-84-3	2.8E+00	ca	2.7E+01	ca	1.1E+03	ca	3.2E-01	ca
Pentabromodiphenyl ether	32534-81-9	2.4E+00	s	3.9E+01	nc	2.3E+03	nc	8.7E+00	nc
Pentachlorobenzene	608-93-5	7.9E-01	nc	1.6E+01	nc	9.3E+02	nc	1.2E-01	nc

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-1: GROUNDWATER AND SOIL REMEDIATION GOALS

CONTAMINANT	CAS No.	Direct Contact Exposure Pathways						Protection of Groundwater	
		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Pentachloronitrobenzene	82-68-8	1.2E-01	ca	2.7E+00	ca	1.3E+02	ca	3.0E-02	ca
Pentachlorophenol	87-86-5	1.0E+00	mcl	1.0E+00	ca	3.5E+01	ca	2.8E-02	mcl
Perchlorate	14797-73-0	1.5E+01	nc	1.4E+01	nc	8.2E+02	nc	--	
Perfluoroalkyl Compounds									
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	7.0E-02	hal	3.2E+00	nc	1.5E+02	nc	7.8E-04	mcl
Perfluorooctanoic acid (PFOA)^^	335-67-1	7.0E-02	hal	3.2E-01	nc	1.5E+01	nc	6.0E-04	mcl
Permethrin	52645-53-1	6.0E+00	s	7.9E+02	nc	3.8E+04	nc	1.2E+03	nc
Phenmedipham	13684-63-4	9.5E+02	nc	3.8E+03	nc	1.0E+05	max	1.0E+02	nc
Phenol	108-95-2	1.4E+03	nc	4.7E+03	nc	1.0E+05	max	1.7E+01	nc
m-Phenylenediamine	108-45-2	3.0E+01	nc	9.5E+01	nc	4.6E+03	nc	1.6E-01	nc
p-Phenylenediamine	106-50-3	5.0E+00	nc	1.6E+01	nc	7.6E+02	nc	2.7E-02	nc
Phenylmercuric acetate	62-38-4	4.0E-01	nc	1.3E+00	nc	6.1E+01	nc	2.5E-03	nc
2-Phenylphenol	90-43-7	3.1E+01	ca	2.9E+02	ca	1.1E+04	ca	8.3E+00	ca
Phorate	298-02-2	7.6E-01	nc	3.2E+00	nc	1.5E+02	nc	1.7E-02	nc
Phosmet	732-11-6	9.3E+01	nc	3.2E+02	nc	1.5E+04	nc	4.1E-01	nc
Phosphine	7803-51-2	1.4E-01	nc	5.9E+00	nc	3.5E+02	nc	--	
Phosphoric acid	7664-38-2	2.4E+05	nc	1.0E+05	max	1.0E+05	max	--	
Phosphorus (white)	7723-14-0	1.0E-01	nc	3.9E-01	nc	2.3E+01	nc	7.4E-03	nc
p-Phthalic acid	100-21-0	4.7E+03	nc	1.6E+04	nc	1.0E+05	max	3.4E+01	nc
Phthalic anhydride	85-44-9	9.7E+03	nc	3.2E+04	nc	1.0E+05	max	4.3E+01	nc
Picloram	1918-02-1	5.0E+02	mcl	1.1E+03	nc	5.3E+04	nc	2.8E+00	mcl
Pirimiphos-methyl	29232-93-7	2.1E-01	nc	1.1E+00	nc	5.3E+01	nc	4.0E-03	nc
Polybrominated biphenyls (PBBs)	59536-65-1	2.6E-03	ca	1.8E-02	ca	7.1E-01	ca	--	

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Polychlorinated biphenyls (PCBs)	1336-36-3	5.0E-01	mcl	2.3E-01	ca	8.6E+00	ca	1.6E+00	mcl
Aroclor 1016	12674-11-2	3.5E-01	nc	1.4E+00	nc	8.2E+01	nc	--	
Aroclor 1221	11104-28-2	4.7E-03	ca	2.0E-01	ca	7.7E+00	ca	1.6E-03	ca
Aroclor 1232	11141-16-5	4.7E-03	ca	1.7E-01	ca	6.7E+00	ca	1.6E-03	ca
Aroclor 1242	53469-21-9	7.9E-03	ca	2.3E-01	ca	8.7E+00	ca	2.5E-02	ca
Aroclor 1248	12672-29-6	7.9E-03	ca	2.3E-01	ca	8.7E+00	ca	2.4E-02	ca
Aroclor 1254	11097-69-1	7.9E-03	ca	2.4E-01	ca	8.9E+00	ca	4.1E-02	ca
Aroclor 1260	11096-82-5	7.9E-03	ca	2.4E-01	ca	9.0E+00	ca	1.1E-01	ca
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9	1.3E+02	nc	9.0E+02	nc	4.1E+04	nc	2.7E+01	nc
Anthracene	120-12-7	4.3E+01	s	4.5E+03	nc	1.0E+05	max	2.9E+02	nc
Benz[a]anthracene	56-55-3	3.0E-02	ca	1.1E+00	ca	1.9E+02	ca	2.1E-01	ca
Benzo[a]pyrene	50-32-8	2.0E-01	mcl	1.1E-01	ca	1.9E+01	ca	4.7E+00	mcl
Benzo[b]fluoranthene	205-99-2	2.5E-01	ca	1.1E+00	ca	1.9E+02	ca	6.0E+00	ca
Benzo[k]fluoranthene	207-08-9	8.0E-01	s	1.1E+01	ca	1.9E+03	ca	5.9E+01	ca
Chrysene	218-01-9	2.0E+00	s	1.1E+02	ca	1.9E+04	ca	1.8E+02	ca
Dibenz[ah]anthracene	53-70-3	2.5E-02	ca	1.1E-01	ca	1.9E+01	ca	1.9E+00	ca
Fluoranthene	206-44-0	2.0E+02	nc	6.0E+02	nc	2.7E+04	nc	4.5E+02	nc
Fluorene	86-73-7	7.4E+01	nc	6.0E+02	nc	2.7E+04	nc	2.7E+01	nc
Indeno[1,2,3-cd]pyrene	193-39-5	1.9E-01	s	1.1E+00	ca	1.9E+02	ca	2.0E+01	ca
Naphthalene	91-20-3	1.7E-01	ca	3.8E+00	ca	1.7E+02	ca	1.1E-02	ca
Pyrene	129-00-0	3.0E+01	nc	4.5E+02	nc	2.1E+04	nc	6.6E+01	nc
Prochloraz	67747-09-5	3.8E-01	ca	3.6E+00	ca	1.4E+02	ca	3.8E-02	ca
Profluralin	26399-36-0	6.5E+00	nc	1.2E+02	nc	7.0E+03	nc	8.0E+00	nc
Prometon	1610-18-0	6.3E+01	nc	2.4E+02	nc	1.1E+04	nc	6.0E-01	nc
Prometryn	7287-19-6	1.5E+02	nc	6.3E+02	nc	3.0E+04	nc	4.5E+00	nc
Propyzamide (Pronamide)	23950-58-5	2.9E+02	nc	1.2E+03	nc	5.7E+04	nc	6.0E+00	nc
Propachlor	1918-16-7	6.1E+01	nc	2.1E+02	nc	9.9E+03	nc	7.5E-01	nc
Propanil	709-98-8	2.0E+01	nc	7.9E+01	nc	3.8E+03	nc	2.3E-01	nc
Propargite	2312-35-8	1.6E-01	ca	2.9E+00	ca	1.1E+02	ca	2.3E-01	ca
Propargyl alcohol	107-19-7	1.0E+01	nc	3.9E+01	nc	2.3E+03	nc	4.1E-02	nc
Propazine	139-40-2	8.6E+01	nc	3.2E+02	nc	1.5E+04	nc	1.5E+00	nc
Propham	122-42-9	8.8E+01	nc	3.2E+02	nc	1.5E+04	nc	1.1E+00	nc
Propiconazole	60207-90-1	4.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.7E+01	nc
n-Propylbenzene	103-65-1	1.6E+02	nc	9.4E+02	nc	2.4E+04	nc	6.1E+00	nc
Propylene glycol	57-55-6	1.0E+05	nc	1.0E+05	max	1.0E+05	max	4.0E+02	nc
Propylene glycol, monoethyl ether	52125-53-8	8.0E+02	nc	1.0E+04	nc	1.0E+05	max	3.2E+01	nc

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		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Propylene glycol, monomethyl ether	107-98-2	8.0E+02	nc	1.0E+04	nc	1.0E+05	max	3.2E+00	nc
Propylene oxide	75-56-9	2.7E-01	ca	2.8E+00	ca	1.3E+02	ca	1.1E-02	ca
Pyridine	110-86-1	4.9E+00	nc	2.0E+01	nc	1.2E+03	nc	3.4E-02	nc
Quinalphos	13593-03-8	1.3E+00	nc	7.9E+00	nc	3.8E+02	nc	2.2E-01	nc
Quinoline	91-22-5	2.4E-02	ca	1.8E-01	ca	7.1E+00	ca	1.6E-03	ca
Resmethrin	10453-86-8	1.7E+01	nc	4.7E+02	nc	2.3E+04	nc	2.1E+02	nc
Ronnel	299-84-3	1.0E+02	nc	9.8E+02	nc	5.8E+04	nc	1.9E+01	nc
Rotenone	83-79-4	1.5E+01	nc	6.3E+01	nc	3.0E+03	nc	1.6E+02	nc
Selenious Acid	7783-00-8	2.5E+01	nc	9.8E+01	nc	5.8E+03	nc	--	
Selenium	7782-49-2	5.0E+01	mcl	9.8E+01	nc	5.8E+03	nc	5.2E+00	mcl
Sethoxydim	74051-80-2	4.0E+02	nc	2.2E+03	nc	1.0E+05	max	7.2E+01	nc
Silver and compounds	7440-22-4	1.0E+02	mcl	9.8E+01	nc	5.8E+03	nc	1.7E+01	mcl
Simazine	122-34-9	4.0E+00	mcl	4.5E+00	ca	1.8E+02	ca	3.9E-02	mcl
Sodium azide	26628-22-8	2.0E+01	nc	7.8E+01	nc	4.7E+03	nc	--	
Sodium diethyldithiocarbamate	148-18-5	2.9E-01	ca	2.0E+00	ca	7.9E+01	ca	3.5E-03	ca
Sodium fluoroacetate	62-74-8	1.0E-01	nc	3.2E-01	nc	1.5E+01	nc	4.1E-04	nc
Sodium metavanadate	13718-26-8	5.0E+00	nc	2.0E+01	nc	1.2E+03	nc	--	
Strontium, stable	7440-24-6	3.0E+03	nc	1.2E+04	nc	1.0E+05	max	2.1E+03	nc
Strychnine	57-24-9	1.5E+00	nc	4.7E+00	nc	2.3E+02	nc	3.3E-01	nc
Styrene	100-42-5	1.0E+02	mcl	1.5E+03	nc	3.5E+04	nc	2.2E+00	mcl
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	2.7E+00	nc	1.3E+01	nc	6.1E+02	nc	3.2E-01	nc
Tebuthiuron	34014-18-1	3.4E+02	nc	1.1E+03	nc	5.3E+04	nc	1.9E+00	nc
Temephos	3383-96-8	1.0E+02	nc	3.2E+02	nc	1.5E+04	nc	3.8E+02	nc
Terbacil	5902-51-2	6.3E+01	nc	2.1E+02	nc	9.9E+03	nc	3.8E-01	nc
Terbufos	13071-79-9	5.9E-02	nc	4.9E-01	nc	2.9E+01	nc	2.6E-03	nc
Terbutryn	886-50-0	3.4E+00	nc	1.6E+01	nc	7.6E+02	nc	9.5E-02	nc
1,2,4,5-Tetrachlorobenzene	95-94-3	4.3E-01	nc	5.9E+00	nc	3.5E+02	nc	4.0E-02	nc
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	3.0E-05	mcl	4.8E-06	ca	2.1E-04	ca	3.0E-04	mcl
1,1,1,2-Tetrachloroethane	630-20-6	5.7E-01	ca	2.0E+00	ca	8.8E+01	ca	4.4E-03	ca
1,1,2,2-Tetrachloroethane	79-34-5	7.6E-02	ca	6.0E-01	ca	2.7E+01	ca	5.9E-04	ca
Tetrachloroethylene (PCE)	127-18-4	5.0E+00	mcl	2.0E+01	nc	3.9E+02	nc	4.5E-02	mcl
2,3,4,6-Tetrachlorophenol	58-90-2	5.9E+01	nc	4.7E+02	nc	2.3E+04	nc	9.0E-01	nc
p,a,a,a-Tetrachlorotoluene	5216-25-1	1.3E-03	ca	3.5E-02	ca	1.6E+00	ca	9.1E-05	ca
Tetrachlorovinphos (Stirofos)	961-11-5	2.8E+00	ca	2.3E+01	ca	8.9E+02	ca	1.6E-01	ca
Tetraethyldithiopyrophosphate	3689-24-5	1.8E+00	nc	7.9E+00	nc	3.8E+02	nc	2.6E-02	nc
Thallium and compounds	7440-28-0	2.0E+00	mcl	2.0E-01	nc	1.2E+01	nc	2.8E+00	mcl
Thiobencarb	28249-77-6	4.0E+01	nc	1.6E+02	nc	7.6E+03	nc	2.8E+00	nc

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Thiofanox	39196-18-4	1.3E+00	nc	4.7E+00	nc	2.3E+02	nc	9.1E-03	nc
Thiophanate-methyl	23564-05-8	6.4E+00	ca	4.5E+01	ca	1.8E+03	ca	1.1E-01	ca
Thiram	137-26-8	7.3E+01	nc	2.4E+02	nc	1.1E+04	nc	2.1E+00	nc
Tin and compounds	7440-31-5	3.0E+03	nc	1.2E+04	nc	1.0E+05	max	1.5E+04	nc
Toluene	108-88-3	1.0E+03	mcl	1.2E+03	nc	4.7E+04	nc	1.4E+01	mcl
p-Toluidine	106-49-0	2.5E+00	ca	1.8E+01	ca	7.1E+02	ca	2.1E-02	ca
Tralomethrin	66841-25-6	3.8E+01	nc	1.2E+02	nc	5.7E+03	nc	2.9E+02	nc
Triadimefon (Bayleton)	43121-43-3	1.6E+02	nc	5.4E+02	nc	2.6E+04	nc	2.5E+00	nc
Triallate	2303-17-5	4.7E-01	ca	9.7E+00	ca	4.5E+02	ca	2.1E-02	ca
Triasulfuron	82097-50-5	5.0E+01	nc	1.6E+02	nc	7.6E+03	nc	1.1E+00	nc
Tribenuron-methyl (Express)	101200-48-0	3.9E+01	nc	1.3E+02	nc	6.1E+03	nc	3.0E-01	nc
1,2,4-Tribromobenzene	615-54-3	1.1E+01	nc	9.8E+01	nc	5.8E+03	nc	3.2E-01	nc
Tributyltin oxide (TBTO)	56-35-9	1.4E+00	nc	4.7E+00	nc	2.3E+02	nc	1.5E+03	nc
2,4,6-Trichloroaniline	634-93-5	9.9E-02	nc	4.7E-01	nc	2.3E+01	nc	1.8E-02	nc
2,4,6-Trichloroaniline hydrochloride	33663-50-2	2.7E+00	ca	1.9E+01	ca	7.3E+02	ca	1.5E-01	ca
1,2,4-Trichlorobenzene	120-82-1	7.0E+01	mcl	1.4E+01	nc	2.6E+02	nc	4.1E+00	mcl
1,1,1-Trichloroethane	71-55-6	2.0E+02	mcl	2.0E+03	nc	3.6E+04	nc	1.4E+00	mcl
1,1,2-Trichloroethane	79-00-5	5.0E+00	mcl	3.7E-01	nc	6.3E+00	nc	3.2E-02	mcl
Trichloroethylene (TCE) Long-term +++	79-01-6	5.0E+00	mcl	4.7E-01	ca	1.9E+01	nc	3.6E-02	mcl
Trichlorofluoromethane	75-69-4	1.3E+03	nc	5.9E+03	nc	1.0E+05	max	1.7E+01	nc
2,4,5-Trichlorophenol	95-95-4	3.0E+02	nc	1.6E+03	nc	7.6E+04	nc	2.0E+01	nc
2,4,6-Trichlorophenol	88-06-2	3.0E+00	nc	1.6E+01	nc	7.6E+02	nc	5.8E-02	nc
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	4.1E+01	nc	1.6E+02	nc	7.6E+03	nc	3.4E-01	nc
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	5.0E+01	mcl	1.3E+02	nc	6.1E+03	nc	5.5E-01	mcl
1,1,2-Trichloropropane	598-77-6	2.2E+01	nc	9.8E+01	nc	5.8E+03	nc	1.7E-01	nc
1,2,3-Trichloropropane	96-18-4	7.5E-04	ca	5.1E-03	ca	1.1E+00	ca	6.5E-06	ca
1,2,3-Trichloropropene	96-19-5	1.5E-01	nc	1.8E-01	nc	3.1E+00	nc	1.5E-03	nc
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	2.5E+03	nc	1.7E+03	nc	2.8E+04	nc	1.3E+02	nc
Tridiphane	58138-08-2	4.5E+00	nc	4.7E+01	nc	2.3E+03	nc	6.4E-01	nc
Triethylamine	121-44-8	3.7E+00	nc	2.9E+01	nc	4.8E+02	nc	2.2E-02	nc
Trifluralin	1582-09-8	2.6E+00	ca	9.0E+01	ca	4.2E+03	ca	1.7E+00	ca
1,2,4-Trimethylbenzene	95-63-6	1.4E+01	nc	7.6E+01	nc	1.8E+03	nc	4.0E-01	nc
1,3,5-Trimethylbenzene	108-67-8	1.5E+01	nc	6.8E+01	nc	1.5E+03	nc	4.3E-01	nc
Trimethyl phosphate	512-56-1	3.9E+00	ca	2.7E+01	ca	1.1E+03	ca	1.7E-02	ca
1,3,5-Trinitrobenzene	99-35-4	1.5E+02	nc	5.6E+02	nc	3.2E+04	nc	1.1E+01	nc
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	9.9E+00	nc	3.9E+01	nc	2.3E+03	nc	1.9E+00	nc
2,4,6-Trinitrotoluene (TNT)	118-96-7	2.5E+00	nc	9.1E+00	nc	5.0E+02	nc	2.9E-01	nc

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		Groundwater		Soil				Soil (DAF = 20)	
		Residential TCR=1E-06/ THQ=0.25 (µg/l)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)		Industrial TCR=1E-05/ THQ=1 (mg/kg)		Residential TCR=1E-06/ THQ=0.25 (mg/kg)	
Triphenylphosphine oxide	791-28-6	9.1E+01	nc	3.2E+02	nc	1.5E+04	nc	7.5E+00	nc
Tris(2-chloroethyl) phosphate	115-96-8	3.8E+00	ca	2.7E+01	ca	1.1E+03	ca	7.5E-02	ca
Uranium (chemical toxicity only)	7440-61-0	3.0E+01	mcl	3.9E+00	nc	2.3E+02	nc	2.7E+02	mcl
Vanadium and compounds +++	7440-62-2	2.1E+01	nc	9.8E+01	nc	5.8E+03	nc	4.3E+02	nc
Vernolate (Vernam)	1929-77-7	2.8E+00	nc	2.0E+01	nc	1.2E+03	nc	4.4E-02	nc
Vinclozolin	50471-44-8	5.3E+00	nc	1.9E+01	nc	9.1E+02	nc	8.1E-02	nc
Vinyl acetate	108-05-4	1.0E+02	nc	2.3E+02	nc	3.8E+03	nc	4.4E-01	nc
Vinyl bromide	593-60-2	1.8E-01	ca	1.2E-01	ca	5.2E+00	ca	1.0E-03	ca
Vinyl chloride +++	75-01-4	2.0E+00	mcl	1.1E-01	ca	1.7E+01	ca	1.4E-02	mcl
Warfarin	81-81-2	1.4E+00	nc	4.7E+00	nc	2.3E+02	nc	3.0E-02	nc
Xylenes	1330-20-7	1.0E+04	mcl	1.4E+02	nc	2.5E+03	nc	2.0E+02	mcl
Zinc	7440-66-6	5.0E+03	mcl	5.9E+03	nc	1.0E+05	max	6.2E+03	mcl
Zinc phosphide	1314-84-7	1.5E+00	nc	5.9E+00	nc	3.5E+02	nc	--	
Zineb	12122-67-7	2.5E+02	nc	7.9E+02	nc	3.8E+04	nc	1.4E+01	nc

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both chromium III and chromium VI analyses.

^^ If both PFOS and PFOA are present, the sum of the concentrations for these contaminants should not exceed 0.07 µg/L.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

-- = Not available/not applicable
µg/L = Micrograms per liter
ca = cancer
CAS No. = Chemical Abstract Service Number
DAF = Dilution attenuation factor
hal = health advisory limit
max = maximum (saturation value)
mcl = Maximum Contaminant Level
nc = noncancer
NDEE = Nebraska Department of Enviroment and Energy policy value

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

Version Date: March 2021

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Acephate	30560-19-1	--		--		--	--	--	--
Acetaldehyde	75-07-0	1.3E+00	ca	3.9E+01	nc	7.9E+02	2.4E+04	4.3E+01	1.3E+03
Acetochlor	34256-82-1	--		--		--	--	--	--
Acetone	67-64-1	8.1E+03	nc	1.4E+05	nc	1.1E+07	1.8E+08	2.7E+05	4.5E+06
Acetone cyanohydrin	75-86-5	5.2E-01	nc	8.8E+00	nc	--	--	--	--
Acetonitrile	75-05-8	1.6E+01	nc	2.6E+02	nc	2.1E+04	3.5E+05	5.2E+02	8.8E+03
Acrolein	107-02-8	5.2E-03	nc	8.8E-02	nc	1.9E+00	3.2E+01	1.7E-01	2.9E+00
Acrylamide	79-06-1	1.0E-02	ca	1.2E+00	ca	--	--	--	--
Acrylic acid	79-10-7	2.6E-01	nc	4.4E+00	nc	5.2E+04	8.8E+05	8.7E+00	1.5E+02
Acrylonitrile	107-13-1	4.1E-02	ca	1.8E+00	ca	1.5E+01	6.7E+02	1.4E+00	6.0E+01
Alachlor	15972-60-8	--		--		--	--	--	--
Aldicarb	116-06-3	--		--		--	--	--	--
Aldicarb sulfone	1646-88-4	--		--		--	--	--	--
Aldrin	309-00-2	5.7E-04	ca	2.5E-02	ca	1.4E+00	NVT	1.9E-02	8.3E-01
Allyl alcohol	107-18-6	2.6E-02	nc	4.4E-01	nc	3.3E+02	5.5E+03	8.7E-01	1.5E+01
Allyl chloride	107-05-1	2.6E-01	nc	4.4E+00	nc	1.1E+00	1.8E+01	8.7E+00	1.5E+02
Aluminum	7429-90-5	1.3E+00	nc	2.2E+01	nc	--	--	--	--
Aluminum phosphide	20859-73-8	--		--		--	--	--	--
Ametryn	834-12-8	--		--		--	--	--	--
m-Aminophenol	591-27-5	--		--		--	--	--	--
Amitraz	33089-61-1	--		--		--	--	--	--
Ammonia +++	7664-41-7	1.3E+02	nc	2.2E+03	nc	3.0E+05	5.1E+06	4.3E+03	7.3E+04
Ammonium sulfamate	7773-06-0	--		--		--	--	--	--
Aniline	62-53-3	2.6E-01	nc	4.4E+00	nc	--	--	--	--
Antimony and compounds	7440-36-0	--		--		--	--	--	--
Antimony pentoxide	1314-60-9	--		--		--	--	--	--
Antimony potassium tartrate	28300-74-5	--		--		--	--	--	--
Antimony tetroxide	1332-81-6	--		--		--	--	--	--
Antimony trioxide	1309-64-4	5.2E-02	nc	8.8E-01	nc	--	--	--	--
Arsenic (inorganic) +++	7440-38-2	--		--		--	--	--	--
Arsine	7784-42-1	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Assure	76578-14-8	--		--		--	--	--	--
Asulam	3337-71-1	--		--		--	--	--	--
Atrazine	1912-24-9	--		--		--	--	--	--
Avermectin B1	65195-55-3	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Azobenzene	103-33-3	9.1E-02	ca	4.0E+00	ca	1.6E+02	NVT	3.0E+00	1.3E+02
Barium and compounds	7440-39-3	1.3E-01	nc	2.2E+00	nc	--	--	--	--
Benfluralin (Benefin)	1861-40-1	--		--		--	--	--	--
Bensulfuron-methyl (Londax)	83055-99-6	--		--		--	--	--	--
Bentazone (Bentazon)	25057-89-0	--		--		--	--	--	--
Benzaldehyde	100-52-7	--		--		--	NVT	--	--
Benzene	71-43-2	3.6E-01	ca	1.6E+01	ca	3.1E+00	1.4E+02	1.2E+01	5.2E+02
Benzidine	92-87-5	1.5E-05	ca	1.8E-03	ca	--	--	--	--
Benzoic acid	65-85-0	--		--		--	--	--	--
Benzotrichloride	98-07-7	--		--		--	--	--	--
Benzyl alcohol	100-51-6	--		--		--	--	--	--
Benzyl chloride	100-44-7	5.7E-02	ca	2.5E+00	ca	8.3E+00	3.6E+02	1.9E+00	8.3E+01
Beryllium and compounds	7440-41-7	1.2E-03	ca	5.1E-02	ca	--	--	--	--
Biphenthrin (Talstar)	82657-04-3	--		--		--	--	--	--
1,1-Biphenyl	92-52-4	1.0E-01	nc	1.8E+00	nc	2.7E+01	4.5E+02	3.5E+00	5.8E+01
Bis(2-chloroethyl)ether	111-44-4	8.5E-03	ca	3.7E-01	ca	3.8E+01	1.7E+03	2.8E-01	1.2E+01
Bis(chloromethyl)ether	542-88-1	4.5E-05	ca	2.0E-03	ca	2.5E-04	1.1E-02	1.5E-03	6.6E-02
Bis(2-chloro-1-methylethyl)ether	108-60-1	--		--		--	--	--	--
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	1.2E+00	ca	5.1E+01	ca	--	--	--	--
Bisphenol A	80-05-7	--		--		--	--	--	--
Boron	7440-42-8	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Boron trifluoride	7637-07-2	3.4E+00	nc	5.7E+01	nc	No HLC	No HLC	1.1E+02	1.9E+03
Bromate	15541-45-4	--		--		--	--	--	--
Bromobenzene	108-86-1	1.6E+01	nc	2.6E+02	nc	4.4E+02	7.4E+03	5.2E+02	8.8E+03
Bromodichloromethane	75-27-4	7.6E-02	ca	3.3E+00	ca	1.8E+00	7.9E+01	2.5E+00	1.1E+02
Bromoform (Tribromomethane)	75-25-2	2.6E+00	ca	1.1E+02	ca	3.0E+02	1.3E+04	8.5E+01	3.7E+03
Bromomethane	74-83-9	1.3E+00	nc	2.2E+01	nc	6.9E+00	1.2E+02	4.3E+01	7.3E+02
Bromophos	2104-96-3	--		--		--	--	--	--
Bromoxynil	1689-84-5	--		--		--	--	--	--
Bromoxynil octanoate	1689-99-2	--		--		--	--	--	--
1,3-Butadiene	106-99-0	9.4E-02	ca	4.1E+00	ca	--	--	3.1E+00	1.4E+02
1-Butanol	71-36-3	--		--		--	--	--	--
Butylate	2008-41-5	--		--		--	--	--	--
Butyl benzyl phthalate	85-68-7	--		--		--	--	--	--
Butylphthalyl butylglycolate	85-70-1	--		--		--	--	--	--
Cacodylic acid	75-60-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Cadmium and compounds +++	7440-43-9	1.6E-03	ca	4.4E-02	nc	--	--	--	--
Camphechlor (Toxaphene)	8001-35-2	8.8E-03	ca	3.8E-01	ca	--	--	--	--
Caprolactam	105-60-2	5.7E-01	nc	9.6E+00	nc	--	--	--	--
Captafol	2425-06-1	6.5E-02	ca	2.9E+00	ca	--	--	--	--
Captan	133-06-2	4.3E+00	ca	1.9E+02	ca	--	--	--	--
Carbaryl	63-25-2	--		--		--	--	--	--
Carbofuran	1563-66-2	--		--		--	--	--	--
Carbon disulfide	75-15-0	1.8E+02	nc	3.1E+03	nc	5.4E+02	9.1E+03	6.1E+03	1.0E+05
Carbon tetrachloride	56-23-5	4.7E-01	ca	2.0E+01	ca	8.0E-01	3.5E+01	1.6E+01	6.8E+02
Carbosulfan	55285-14-8	--		--		--	--	--	--
Carboxin	5234-68-4	--		--		--	--	--	--
Chloramben	133-90-4	--		--		--	--	--	--
Chloranil	118-75-2	--		--		--	--	--	--
Chlordane	12789-03-6	2.8E-02	ca	1.2E+00	ca	NVT	NVT	9.4E-01	4.1E+01
Chlordecone (Kepone)	143-50-0	6.1E-04	ca	2.7E-02	ca	--	--	--	--
Chlorimuron-ethyl	90982-32-4	--		--		--	--	--	--
Chlorine	7782-50-5	3.9E-02	nc	6.6E-01	nc	1.5E+01	2.5E+02	1.3E+00	2.2E+01
Chlorine dioxide	10049-04-4	5.2E-02	nc	8.8E-01	nc	No S	No S	1.7E+00	2.9E+01
Chloroacetic acid	79-11-8	--		--		--	--	--	--
2-Chloroacetophenone	532-27-4	7.8E-03	nc	1.3E-01	nc	--	--	--	--
4-Chloroaniline	106-47-8	--		--		--	--	--	--
Chlorobenzene	108-90-7	1.3E+01	nc	2.2E+02	nc	NVT	NVT	4.3E+02	7.3E+03
Chlorobenzilate	510-15-6	9.1E-02	ca	4.0E+00	ca	--	--	--	--
p-Chlorobenzoic acid	74-11-3	--		--		--	--	--	--
4-Chlorobenzotrifluoride	98-56-6	7.8E+01	nc	1.3E+03	nc	--	--	2.6E+03	4.4E+04
2-Chloro-1,3-butadiene	126-99-8	9.4E-03	ca	4.1E-01	ca	8.4E-03	3.7E-01	3.1E-01	1.4E+01
1-Chlorobutane	109-69-3	--		--		--	--	--	--
1-Chloro-1,1-difluoroethane	75-68-3	1.3E+04	nc	2.2E+05	nc	3.6E+05	NVT	4.3E+05	7.3E+06
Chlorodifluoromethane	75-45-6	1.3E+04	nc	2.2E+05	nc	1.1E+04	1.9E+05	4.3E+05	7.3E+06
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	4.0E-01	ca	1.7E+01	ca	--	--	--	--
Chloroform	67-66-3	1.2E-01	ca	5.3E+00	ca	1.5E+00	6.7E+01	4.1E+00	1.8E+02
Chloromethane	74-87-3	2.3E+01	nc	3.9E+02	nc	9.7E+01	1.6E+03	7.8E+02	1.3E+04
4-Chloro-2-methylaniline hydrochloride	3165-93-3	--		--		--	--	--	--
beta-Chloronaphthalene	91-58-7	--		--		--	--	--	--
o-Chloronitrobenzene	88-73-3	2.6E-03	nc	4.4E-02	nc	--	NVT	--	--
p-Chloronitrobenzene	100-00-5	5.2E-01	nc	8.8E+00	nc	--	--	--	--

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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
2-Chlorophenol	95-57-8	--		--		--	--	--	--
Chlorothalonil	1897-45-6	3.2E+00	ca	1.4E+02	ca	--	--	--	--
o-Chlorotoluene	95-49-8	--		--		--	--	--	--
Chlorpropham	101-21-3	--		--		--	--	--	--
Chlorpyrifos	2921-88-2	--		--		--	--	--	--
Chlorpyrifos-methyl	5598-13-0	--		--		--	--	--	--
Chlorsulfuron	64902-72-3	--		--		--	--	--	--
Chlorthiophos	60238-56-4	--		--		--	--	--	--
Chromium, Total	7440-47-3	--		--		--	--	--	--
Chromium III *	16065-83-1	--		--		--	--	--	--
Chromium VI +++	18540-29-9	1.2E-05	ca	1.5E-03	ca	--	--	--	--
Clofentezine (Apollo)	74115-24-5	--		--		--	--	--	--
Cobalt	7440-48-4	3.1E-04	ca	1.4E-02	ca	--	--	--	--
Coke Oven Emissions	7440-47-3	--		--		--	--	--	--
Copper and compounds	7440-50-8	--		--		--	--	--	--
Crotonaldehyde	123-73-9	--		--		--	--	--	--
Cumene (Isopropylbenzene)	98-82-8	1.0E+02	nc	1.8E+03	nc	6.3E+02	1.1E+04	3.5E+03	5.8E+04
Cyanazine	21725-46-2	--		--		--	--	--	--
Cyanide (free)	57-12-5	2.1E-01	nc	3.5E+00	nc	5.0E+01	8.4E+02	7.0E+00	1.2E+02
Cyanide (hydrogen)	74-90-8	2.1E-01	nc	3.5E+00	nc	--	--	--	--
Cyanogen	460-19-5	--		--		--	--	--	--
Cyanogen bromide	506-68-3	--		--		--	--	--	--
Cyanogen chloride	506-77-4	--		--		--	--	--	--
Cyclohexane	110-82-7	1.6E+03	nc	2.6E+04	nc	4.9E+02	8.3E+03	5.2E+04	8.8E+05
Cyclohexanone	108-94-1	1.8E+02	nc	3.1E+03	nc	1.5E+06	NVT	6.1E+03	1.0E+05
Cyclohexylamine	108-91-8	--		--		--	--	--	--
Cyfluthrin (Baythroid)	68359-37-5	--		--		--	--	--	--
Cyhalothrin (Karate)	68085-85-8	--		--		--	--	--	--
Cyromazine	66215-27-8	--		--		--	--	--	--
Dacthal	1861-32-1	--		--		--	NVT	--	--
Dalapon	75-99-0	--		--		--	--	--	--
Daminozide (Alar)	1596-84-5	5.5E-01	ca	2.4E+01	ca	--	--	--	--
Demeton	8065-48-3	--		--		--	--	--	--
Diallate	2303-16-4	--		--		--	--	--	--
Diazinon	333-41-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Dibenzofuran	132-64-9	--		--		--	--	--	--
1,4-Dibromobenzene	106-37-6	--		--		--	--	--	--
Dibromochloromethane	124-48-1	--		--		--	--	--	--
1,2-Dibromo-3-chloropropane	96-12-8	1.7E-04	ca	2.0E-02	ca	7.9E-02	9.6E+00	5.6E-03	6.8E-01
1,2-Dibromoethane	106-93-4	4.7E-03	ca	2.0E-01	ca	4.1E-01	1.8E+01	1.6E-01	6.8E+00
Dibutyl phthalate	84-74-2	--		--		NVT	NVT	--	--
Dicamba	1918-00-9	--		--		--	--	--	--
1,2-Dichlorobenzene	95-50-1	5.2E+01	nc	8.8E+02	nc	1.8E+03	2.9E+04	1.7E+03	2.9E+04
1,4-Dichlorobenzene	106-46-7	2.6E-01	ca	1.1E+01	ca	6.6E+00	2.9E+02	8.5E+00	3.7E+02
3,3-Dichlorobenzidine	91-94-1	8.3E-03	ca	3.6E-01	ca	--	--	--	--
4,4'-Dichlorobenzophenone	90-98-2	--		--		--	--	--	--
1,4-Dichloro-2-butene	764-41-0	6.7E-04	ca	2.9E-02	ca	1.9E-03	8.4E-02	2.2E-02	9.7E-01
Dichlorodifluoromethane	75-71-8	2.6E+01	nc	4.4E+02	nc	3.7E+00	6.3E+01	8.7E+02	1.5E+04
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	4.1E-02	ca	1.8E+00	ca	--	--	--	--
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	2.9E-02	ca	1.3E+00	ca	NVT	NVT	9.6E-01	4.2E+01
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.9E-02	ca	1.3E+00	ca	--	--	--	--
1,1-Dichloroethane	75-34-3	1.8E+00	ca	7.7E+01	ca	1.4E+01	6.2E+02	5.8E+01	2.6E+03
1,2-Dichloroethane	107-06-2	1.1E-01	ca	4.7E+00	ca	4.5E+00	2.0E+02	3.6E+00	1.6E+02
1,1-Dichloroethylene	75-35-4	5.2E+01	nc	8.8E+02	nc	8.3E+01	1.4E+03	1.7E+03	2.9E+04
1,2-Dichloroethylene (cis)	156-59-2	--		--		--	--	--	--
1,2-Dichloroethylene (trans)	156-60-5	--		--		--	--	--	--
2,4-Dichlorophenol	120-83-2	--		--		--	--	--	--
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	--		--		--	--	--	--
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	--		--		--	--	--	--
Decabromodiphenyl ether (BDE-209)	1163-19-5	--		--		--	--	--	--
1,2-Dichloropropane	78-87-5	7.5E-01	ca	1.8E+01	nc	1.3E+01	3.1E+02	2.5E+01	5.8E+02
2,3-Dichloropropanol	616-23-9	--		--		--	--	--	--
1,3-Dichloropropene	542-75-6	7.0E-01	ca	3.1E+01	ca	1.0E+01	4.5E+02	2.3E+01	1.0E+03
Dichlorvos	62-73-7	3.4E-02	ca	1.5E+00	ca	--	--	--	--
Dicrotophos (Bidrin)	141-66-2	--		--		--	--	--	--
Dicyclopentadiene	77-73-6	7.8E-02	nc	1.3E+00	nc	3.8E-02	6.4E-01	2.6E+00	4.4E+01
Dieldrin	60-57-1	6.1E-04	ca	2.7E-02	ca	--	--	--	--
Diethylene glycol, monobutyl ether	112-34-5	2.6E-02	nc	4.4E-01	nc	--	--	--	--
Diethylene glycol, monoethyl ether	111-90-0	7.8E-02	nc	1.3E+00	nc	--	--	--	--
Diethylformamide	617-84-5	--		--		--	--	--	--
Di(2-ethylhexyl)adipate	103-23-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Diethyl phthalate	84-66-2	--		--		--	--	--	--
Diethylstilbestrol	56-53-1	2.8E-05	ca	1.2E-03	ca	--	--	--	--
Difenzoquat (Avenge)	43222-48-6	--		--		--	--	--	--
Diflubenzuron	35367-38-5	--		--		--	--	--	--
1,1-Difluoroethane	75-37-6	1.0E+04	nc	1.8E+05	nc	1.8E+04	3.1E+05	3.5E+05	5.8E+06
Diisopropyl methylphosphonate (DIMP)	1445-75-6	--		--		--	--	--	--
Dimethipin	55290-64-7	--		--		--	--	--	--
Dimethoate	60-51-5	--		--		--	--	--	--
3,3'-Dimethoxybenzidine	119-90-4	--		--		--	--	--	--
N-N-Dimethylaniline	121-69-7	--		--		--	--	--	--
2,4-Dimethylaniline	95-68-1	--		--		--	--	--	--
2,4-Dimethylaniline hydrochloride	21436-96-4	--		--		--	--	--	--
3,3'-Dimethylbenzidine	119-93-7	--		--		--	--	--	--
N,N-Dimethylformamide	68-12-2	7.8E+00	nc	1.3E+02	nc	8.1E+06	1.4E+08	2.6E+02	4.4E+03
2,4-Dimethylphenol	105-67-9	--		--		--	--	--	--
2,6-Dimethylphenol	576-26-1	--		--		--	--	--	--
3,4-Dimethylphenol	95-65-8	--		--		--	--	--	--
Dimethyl terephthalate	120-61-6	--		--		--	--	--	--
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	--		--		--	--	--	--
1,2-Dinitrobenzene	528-29-0	--		--		--	--	--	--
1,3-Dinitrobenzene	99-65-0	--		--		--	--	--	--
1,4-Dinitrobenzene	100-25-4	--		--		--	--	--	--
2,4-Dinitrophenol	51-28-5	--		--		--	--	--	--
Dinitrotoluene mixture	25321-14-6	--		--		--	--	--	--
2,4-Dinitrotoluene	121-14-2	3.2E-02	ca	1.4E+00	ca	--	--	--	--
2,6-Dinitrotoluene	606-20-2	--		--		--	--	--	--
Dinoseb	88-85-7	--		--		--	--	--	--
1,4-Dioxane	123-91-1	5.6E-01	ca	2.5E+01	ca	6.5E+03	2.8E+05	1.9E+01	8.2E+02
Diphenamid	957-51-7	--		--		--	--	--	--
Diphenylamine	122-39-4	--		--		--	--	--	--
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	--		--		--	--	--	--
1,2-Diphenylhydrazine	122-66-7	1.3E-02	ca	5.6E-01	ca	--	--	--	--
Diphenyl sulfone	127-63-9	--		--		--	--	--	--
Diquat dibromide (Diquat)	85-00-7	--		--		--	--	--	--
Direct black 38	1937-37-7	2.0E-05	ca	8.8E-04	ca	--	--	--	--
Direct blue 6	2602-46-2	2.0E-05	ca	8.8E-04	ca	--	--	--	--

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TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Direct brown 95	16071-86-6	2.0E-05	ca	8.8E-04	ca	--	--	--	--
Disulfoton	298-04-4	--		--		--	--	--	--
1,4-Dithiane	505-29-3	--		--		--	--	--	--
Diuron	330-54-1	--		--		--	--	--	--
Dodine	2439-10-3	--		--		--	--	--	--
Endosulfan	115-29-7	--		--		--	--	--	--
Endothall	145-73-3	--		--		--	--	--	--
Endrin	72-20-8	--		--		--	--	--	--
Enilconazole (Imazalil)	35554-44-0	--		--		--	--	--	--
Epichlorohydrin	106-89-8	2.6E-01	nc	4.4E+00	nc	2.1E+02	3.5E+03	8.7E+00	1.5E+02
1,2-Epoxybutane	106-88-7	5.2E+00	nc	8.8E+01	nc	1.4E+03	2.3E+04	1.7E+02	2.9E+03
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	--		--		--	--	--	--
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	--		--		--	--	--	--
Ethion	563-12-2	--		--		--	--	--	--
2-Ethoxyethanol	110-80-5	5.2E+01	nc	8.8E+02	nc	7.1E+06	1.2E+08	1.7E+03	2.9E+04
2-Ethoxyethanol acetate	111-15-9	1.6E+01	nc	2.6E+02	nc	3.4E+05	5.7E+06	5.2E+02	8.8E+03
Ethyl acetate	141-78-6	1.8E+01	nc	3.1E+02	nc	6.8E+03	1.1E+05	6.1E+02	1.0E+04
Ethyl acrylate	140-88-5	2.1E+00	nc	3.5E+01	nc	3.7E+02	6.2E+03	7.0E+01	1.2E+03
Ethylbenzene	100-41-4	1.1E+00	ca	4.9E+01	ca	8.1E+00	3.5E+02	3.7E+01	1.6E+03
Ethyl chloride (Chloroethane)	75-00-3	2.6E+03	nc	4.4E+04	nc	9.4E+03	1.6E+05	8.7E+04	1.5E+06
Ethylene cyanohydrin	109-78-4	--		--		--	--	--	--
Ethylene diamine	107-15-3	--		--		--	--	--	--
Ethylene glycol	107-21-1	1.0E+02	nc	1.8E+03	nc	--	--	--	--
Ethylene glycol, monobutyl ether	111-76-2	4.2E+02	nc	7.0E+03	nc	--	--	--	--
Ethylene oxide	75-21-8	3.4E-04	ca	4.1E-02	ca	9.3E-02	1.1E+01	1.1E-02	1.4E+00
Ethylene thiourea (ETU)	96-45-7	2.2E-01	ca	9.4E+00	ca	--	--	--	--
Ethyl ether	60-29-7	--		--		--	--	--	--
Ethyl methacrylate	97-63-2	7.8E+01	nc	1.3E+03	nc	9.9E+03	1.7E+05	2.6E+03	4.4E+04
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	--		--		--	--	--	--
Ethylphthalyl ethyl glycolate	84-72-0	--		--		--	--	--	--
Fenamiphos	22224-92-6	--		--		--	--	--	--
Fenpropathrin (Danitol)	39515-41-8	--		--		--	--	--	--
Fenvalerate (Pydrin)	51630-58-1	--		--		--	--	--	--
Fluometuron	2164-17-2	--		--		--	--	--	--
Fluoride	16984-48-8	3.4E+00	nc	5.7E+01	nc	--	--	--	--
Fluoridone	59756-60-4	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Flurprimidol	56425-91-3	--		--		--	--	--	--
Flusilazole (NuStar)	85509-19-9	--		--		--	--	--	--
Flutolanil	66332-96-5	--		--		--	--	--	--
Fluvalinate	69409-94-5	--		--		--	--	--	--
Folpet	133-07-3	--		--		--	--	--	--
Fomesafen	72178-02-0	--		--		--	--	--	--
Fonofos	944-22-9	--		--		--	--	--	--
Formaldehyde	50-00-0	2.2E-01	ca	9.4E+00	ca	2.5E+04	1.1E+06	7.2E+00	3.1E+02
Formic acid	64-18-6	7.8E-02	nc	1.3E+00	nc	1.8E+04	3.0E+05	2.6E+00	4.4E+01
Fosetyl-al	39148-24-8	--		--		--	--	--	--
Furan	110-00-9	--		--		--	--	--	--
Furazolidone	67-45-8	--		--		--	--	--	--
Furfural	98-01-1	1.3E+01	nc	2.2E+02	nc	2.1E+05	3.6E+06	4.3E+02	7.3E+03
Furmecyclox	60568-05-0	3.3E-01	ca	1.4E+01	ca	--	--	--	--
Furothiazole (Furium)	531-82-8	6.5E-03	ca	2.9E-01	ca	--	--	--	--
Glufosinate-ammonium	77182-82-2	--		--		--	--	--	--
Glycidaldehyde	765-34-4	2.6E-01	nc	4.4E+00	nc	1.2E+04	2.1E+05	8.7E+00	1.5E+02
Glyphosate	1071-83-6	--		--		--	--	--	--
Haloxyfop-methyl	69806-40-2	--		--		--	--	--	--
Thifensulfuron-methyl (Harmony)	79277-27-3	--		--		--	--	--	--
Heptachlor	76-44-8	2.2E-03	ca	9.4E-02	ca	7.4E-01	3.2E+01	7.2E-02	3.1E+00
Heptachlor epoxide	1024-57-3	1.1E-03	ca	4.7E-02	ca	7.3E+00	NVT	3.6E-02	1.6E+00
Hexabromobenzene	87-82-1	--		--		--	--	--	--
Hexachlorobenzene	118-74-1	6.1E-03	ca	2.7E-01	ca	3.2E-01	NVT	2.0E-01	8.9E+00
Hexachlorobutadiene	87-68-3	1.3E-01	ca	5.6E+00	ca	8.8E-01	NVT	4.3E+00	1.9E+02
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	1.6E-03	ca	6.8E-02	ca	--	--	--	--
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	5.3E-03	ca	2.3E-01	ca	--	NVT	--	--
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	9.1E-03	ca	4.0E-01	ca	--	--	--	--
Hexachlorocyclohexane technical	608-73-1	5.5E-03	ca	2.4E-01	ca	--	--	--	--
Hexachlorocyclopentadiene	77-47-4	5.2E-02	nc	8.8E-01	nc	4.5E+00	7.5E+01	1.7E+00	2.9E+01
Hexachloroethane	67-72-1	2.6E-01	ca	1.1E+01	ca	5.2E+00	2.3E+02	8.5E+00	3.7E+02
Hexachlorophene	70-30-4	--		--		--	--	--	--
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	--		--		--	--	--	--
1,6-Hexamethylene diisocyanate	822-06-0	2.6E-03	nc	4.4E-02	nc	1.3E+00	2.2E+01	8.7E-02	1.5E+00
n-Hexane	110-54-3	1.8E+02	nc	3.1E+03	nc	4.7E+00	7.9E+01	6.1E+03	1.0E+05
Hexazinone	51235-04-2	--		--		--	--	--	--

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		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Hexythiazox (Savey)	78587-05-0	--		--		--	--	--	--
Hydramethylnon (Amdro)	67485-29-4	--		--		--	--	--	--
Hydrazine, hydrazine sulfate	302-01-2	5.7E-04	ca	2.5E-02	ca	6.2E+01	2.7E+03	1.9E-02	8.3E-01
Hydrazine, dimethyl	57-14-7	5.2E-04	nc	8.8E-03	nc	2.0E+00	3.4E+01	1.7E-02	2.9E-01
Hydrogen chloride	7647-01-0	5.2E+00	nc	8.8E+01	nc	7.8E-08	1.3E-06	1.7E+02	2.9E+03
Hydrogen sulfide	7783-06-4	5.2E-01	nc	8.8E+00	nc	2.0E+00	3.4E+01	1.7E+01	2.9E+02
p-Hydroquinone	123-31-9	--		--		--	--	--	--
Imazaquin	81335-37-7	--		--		--	--	--	--
Imazethapyr (Pursuit)	81335-77-5	--		--		--	--	--	--
Iprodione	36734-19-7	--		--		--	--	--	--
Iron	7439-89-6	--		--		--	--	--	--
Isobutanol (Isobutyl alcohol)	78-83-1	--		--		--	--	--	--
Isophorone	78-59-1	5.2E+02	nc	8.8E+03	nc	--	--	--	--
Isopropalin	33820-53-0	--		--		--	--	--	--
Isopropyl methyl phosphonic acid	1832-54-8	--		--		--	--	--	--
Isoxaben	82558-50-7	--		--		--	--	--	--
Lactofen	77501-63-4	--		--		--	--	--	--
Lead +++	7439-92-1	--		--		--	--	--	--
Lead (tetraethyl)	78-00-2	--		--		--	--	--	--
Linuron	330-55-2	--		--		--	--	--	--
Lithium	7439-93-2	--		--		--	--	--	--
Malathion	121-75-5	--		--		--	--	--	--
Maleic anhydride	108-31-6	1.8E-01	nc	3.1E+00	nc	--	--	--	--
Maleic hydrazide	123-33-1	--		--		--	--	--	--
Malononitrile	109-77-3	--		--		--	--	--	--
Mancozeb	8018-01-7	--		--		--	--	--	--
Maneb	12427-38-2	--		--		--	--	--	--
Manganese (non-food) +++	7439-96-5	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Mephosfolan	950-10-7	--		--		--	--	--	--
Mepiquat chloride (Mepiquat)	24307-26-4	--		--		--	--	--	--
Mercury and compounds	7487-94-7	7.8E-02	nc	1.3E+00	nc	--	--	--	--
Mercury (elemental)	7439-97-6	7.8E-02	nc	1.3E+00	nc	7.3E-01	1.2E+01	2.6E+00	4.4E+01
Mercury (methyl)	22967-92-6	--		--		--	--	--	--
Merphos	150-50-5	--		--		--	--	--	--
Merphos oxide	78-48-8	--		--		--	--	--	--
Metalaxyl	57837-19-1	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Methacrylonitrile	126-98-7	7.8E+00	nc	1.3E+02	nc	1.6E+03	2.7E+04	2.6E+02	4.4E+03
Methamidophos	10265-92-6	--		--		--	--	--	--
Methanol	67-56-1	5.2E+03	nc	8.8E+04	nc	6.4E+07	NVT	1.7E+05	2.9E+06
Methidathion	950-37-8	--		--		--	--	--	--
Methomyl	16752-77-5	--		--		--	--	--	--
Methoxychlor	72-43-5	--		--		--	--	--	--
2-Methoxyethanol	109-86-4	5.2E+00	nc	8.8E+01	nc	9.3E+05	NVT	1.7E+02	2.9E+03
2-Methoxyethanol acetate	110-49-6	2.6E-01	nc	4.4E+00	nc	5.9E+04	9.9E+05	8.7E+00	1.5E+02
2-Methoxy-5-nitroaniline	99-59-2	2.0E-01	ca	8.8E+00	ca	--	--	--	--
Methyl acetate	79-20-9	--		--		--	--	--	--
Methyl acrylate	96-33-3	5.2E+00	nc	8.8E+01	nc	1.3E+03	2.2E+04	1.7E+02	2.9E+03
2-Methylaniline hydrochloride	636-21-5	7.6E-02	ca	3.3E+00	ca	--	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	--		--		--	--	--	--
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	--		--		--	--	--	--
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	--		--		--	--	--	--
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	--		--		--	--	--	--
4,4'-Methylenebisbenzeneamine	101-77-9	6.1E-03	ca	2.7E-01	ca	--	--	--	--
4,4'-Methylene bis(2-chloroaniline)	101-14-4	2.4E-03	ca	2.9E-01	ca	--	--	--	--
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	2.2E-01	ca	9.4E+00	ca	--	--	--	--
Methylene bromide	74-95-3	1.0E+00	nc	1.8E+01	nc	6.5E+01	1.1E+03	3.5E+01	5.8E+02
Methylene chloride	75-09-2	1.0E+02	ca	2.6E+03	nc	1.4E+03	3.5E+04	3.4E+03	8.8E+04
4,4'-Methylenediphenyl isocyanate	101-68-8	1.6E-01	nc	2.6E+00	nc	--	--	--	--
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	--		--		--	--	--	--
Methyl ethyl ketone (2-Butanone)	78-93-3	1.3E+03	nc	2.2E+04	nc	1.1E+06	1.9E+07	4.3E+04	7.3E+05
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	7.8E+02	nc	1.3E+04	nc	3.1E+05	5.3E+06	2.6E+04	4.4E+05
Methyl methacrylate	80-62-6	1.8E+02	nc	3.1E+03	nc	3.3E+04	5.6E+05	6.1E+03	1.0E+05
2-Methyl-5-nitroaniline	99-55-8	--		--		--	--	--	--
Methyl parathion	298-00-0	--		--		--	--	--	--
2-Methylphenol	95-48-7	1.6E+02	nc	2.6E+03	nc	--	--	--	--
3-Methylphenol	108-39-4	1.6E+02	nc	2.6E+03	nc	--	--	--	--
4-Methylphenol	106-44-5	1.6E+02	nc	2.6E+03	nc	--	--	--	--
Methyl phosphonic acid	993-13-5	--		--		--	--	--	--
Methyl styrene (mixture)	25013-15-4	1.0E+01	nc	1.8E+02	nc	3.3E+02	5.6E+03	3.5E+02	5.8E+03
Methyl styrene (alpha)	98-83-9	--		--		--	--	--	--
Methyl tertbutyl ether (MTBE)	1634-04-4	1.1E+01	ca	4.7E+02	ca	8.2E+02	3.6E+04	3.6E+02	1.6E+04
Metolaclor (Dual)	51218-45-2	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Metribuzin	21087-64-9	--		--		--	--	--	--
Metsulfuron-methyl (Ally)	74223-64-6	--		--		--	--	--	--
Mirex	2385-85-5	5.5E-04	ca	2.4E-02	ca	1.7E-02	7.3E-01	1.8E-02	8.0E-01
Molinate	2212-67-1	--		--		--	--	--	--
Molybdenum	7439-98-7	--		--		--	--	--	--
Monochloramine	10599-90-3	--		--		--	--	--	--
Myclobutanil (Systhane)	88671-89-0	--		--		--	--	--	--
Naled	300-76-5	--		--		--	--	--	--
Napropamide	15299-99-7	--		--		--	--	--	--
Nickel and compounds	7440-02-0	1.1E-02	ca	3.9E-01	nc	--	--	--	--
Nickel refinery dust	7440-02-0-NRD	3.7E-03	nc	6.1E-02	nc	--	--	--	--
Nickel subsulfide	12035-72-2	3.7E-03	nc	6.1E-02	nc	--	--	--	--
Nitrate	14797-55-8	--		--		--	--	--	--
Nitrite	14797-65-0	--		--		--	--	--	--
2-Nitroaniline	88-74-4	1.3E-02	nc	2.2E-01	nc	--	--	--	--
Nitrobenzene	98-95-3	7.0E-02	ca	3.1E+00	ca	2.2E+02	9.5E+03	2.3E+00	1.0E+02
Nitrofurantoin	67-20-9	--		--		--	--	--	--
Nitrofurazone	59-87-0	7.6E-03	ca	3.3E-01	ca	--	--	--	--
Nitroglycerin	55-63-0	--		--		--	--	--	--
Nitroguanidine	556-88-7	--		--		--	--	--	--
2-Nitropropane	79-46-9	1.0E-03	ca	4.5E-02	ca	4.9E-01	2.1E+01	3.5E-02	1.5E+00
N-Nitrosodi-n-butylamine	924-16-3	1.8E-03	ca	7.7E-02	ca	3.3E+00	1.4E+02	5.8E-02	2.6E+00
N-Nitrosodiethanolamine	1116-54-7	3.5E-03	ca	1.5E-01	ca	--	--	--	--
N-Nitrosodiethylamine	55-18-5	2.4E-05	ca	2.9E-03	ca	--	--	--	--
N-Nitrosodimethylamine	62-75-9	7.2E-05	ca	8.8E-03	ca	9.7E-01	1.2E+02	2.4E-03	2.9E-01
N-Nitrosodiphenylamine	86-30-6	1.1E+00	ca	4.7E+01	ca	--	--	--	--
N-Nitroso di-n-propylamine	621-64-7	1.4E-03	ca	6.1E-02	ca	--	--	--	--
N-Nitroso-N-methylethylamine	10595-95-6	4.5E-04	ca	1.9E-02	ca	7.6E+00	3.3E+02	1.5E-02	6.5E-01
N-Nitrosopyrrolidine	930-55-2	4.6E-03	ca	2.0E-01	ca	--	--	--	--
m-Nitrotoluene	99-08-1	--		--		--	--	--	--
o-Nitrotoluene	88-72-2	--		--		--	--	--	--
p-Nitrotoluene	99-99-0	--		--		--	--	--	--
Norflurazon	27314-13-2	--		--		--	--	--	--
Octabromodiphenyl ether	32536-52-0	--		--		--	--	--	--
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--		--		--	--	--	--
Octamethylpyrophosphoramide	152-16-9	--		--		--	--	--	--

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Oryzalin	19044-88-3	--		--		--	--	--	--
Oxadiazon	19666-30-9	--		--		--	--	--	--
Oxamyl	23135-22-0	--		--		--	--	--	--
Oxyfluorfen	42874-03-3	--		--		--	--	--	--
Paclobutrazol	76738-62-0	--		--		--	--	--	--
Paraquat	4685-14-7	--		--		--	--	--	--
Parathion	56-38-2	--		--		--	--	--	--
Pebulate	1114-71-2	--		--		--	--	--	--
Pendimethalin	40487-42-1	--		--		--	--	--	--
Pentabromo-6-chloro cyclohexane	87-84-3	--		--		--	--	--	--
Pentabromodiphenyl ether	32534-81-9	--		--		--	--	--	--
Pentachlorobenzene	608-93-5	--		--		--	--	--	--
Pentachloronitrobenzene	82-68-8	--		--		--	--	--	--
Pentachlorophenol	87-86-5	5.5E-01	ca	2.4E+01	ca	--	--	--	--
Perchlorate	14797-73-0	--		--		--	--	--	--
Perfluoroalkyl Compounds									
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	--		--		--	--	--	--
Perfluorooctanoic acid (PFOA)^^	335-67-1	--		--		--	--	--	--
Permethrin	52645-53-1	--		--		--	--	--	--
Phenmedipham	13684-63-4	--		--		--	--	--	--
Phenol	108-95-2	5.2E+01	nc	8.8E+02	nc	--	--	--	--
m-Phenylenediamine	108-45-2	--		--		--	--	--	--
p-Phenylenediamine	106-50-3	--		--		--	--	--	--
Phenylmercuric acetate	62-38-4	--		--		--	--	--	--
2-Phenylphenol	90-43-7	--		--		--	--	--	--
Phorate	298-02-2	--		--		--	--	--	--
Phosmet	732-11-6	--		--		--	--	--	--
Phosphine	7803-51-2	7.8E-02	nc	1.3E+00	nc	7.8E-02	1.3E+00	2.6E+00	4.4E+01
Phosphoric acid	7664-38-2	2.6E+00	nc	4.4E+01	nc	--	--	--	--
Phosphorus (white)	7723-14-0	--		--		--	--	--	--
p-Phthalic acid	100-21-0	--		--		--	--	--	--
Phthalic anhydride	85-44-9	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Picloram	1918-02-1	--		--		--	--	--	--
Pirimiphos-methyl	29232-93-7	--		--		--	--	--	--
Polybrominated biphenyls (PBBs)	59536-65-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Polychlorinated biphenyls (PCBs)	1336-36-3	--		--		--	--	--	--
Aroclor 1016	12674-11-2	--		--		--	--	--	--
Aroclor 1221	11104-28-2	--		--		1.6E-01	7.2E+00	1.6E-01	7.2E+00
Aroclor 1232	11141-16-5	4.9E-03	ca	2.2E-01	ca	1.6E-01	NVT	1.6E-01	7.2E+00
Aroclor 1242	53469-21-9	4.9E-03	ca	2.2E-01	ca	3.5E-01	1.5E+01	1.6E-01	7.2E+00
Aroclor 1248	12672-29-6	4.9E-03	ca	2.2E-01	ca	2.7E-01	1.2E+01	1.6E-01	7.2E+00
Aroclor 1254	11097-69-1	4.9E-03	ca	2.2E-01	ca	4.3E-01	1.9E+01	1.6E-01	7.2E+00
Aroclor 1260	11096-82-5	4.9E-03	ca	2.2E-01	ca	3.6E-01	NVT	1.6E-01	7.2E+00
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9	--		--		--	--	--	--
Anthracene	120-12-7	--		--		--	--	--	--
Benz[a]anthracene	56-55-3	1.7E-02	ca	2.0E+00	ca	NVT	NVT	5.6E-01	NVT
Benzo[a]pyrene	50-32-8	5.2E-04	nc	8.8E-03	nc	--	--	--	--
Benzo[b]fluoranthene	205-99-2	1.7E-02	ca	2.0E+00	ca	NVT	NVT	--	NVT
Benzo[k]fluoranthene	207-08-9	1.7E-01	ca	2.0E+01	ca	--	--	--	--
Chrysene	218-01-9	1.7E+00	ca	2.0E+02	ca	--	--	--	--
Dibenz[ah]anthracene	53-70-3	1.7E-03	ca	2.0E-01	ca	--	--	--	--
Fluoranthene	206-44-0	--		--		--	--	--	--
Fluorene	86-73-7	--		--		--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	1.7E-02	ca	2.0E+00	ca	--	--	--	--
Naphthalene	91-20-3	8.3E-02	ca	3.6E+00	ca	1.3E+01	5.9E+02	2.8E+00	1.2E+02
Pyrene	129-00-0	--		--		--	--	--	--
Prochloraz	67747-09-5	--		--		--	--	--	--
Profluralin	26399-36-0	--		--		--	--	--	--
Prometon	1610-18-0	--		--		--	--	--	--
Prometryn	7287-19-6	--		--		--	--	--	--
Propyzamide (Pronamide)	23950-58-5	--		--		--	--	--	--
Propachlor	1918-16-7	--		--		--	--	--	--
Propanil	709-98-8	--		--		--	--	--	--
Propargite	2312-35-8	--		--		--	--	--	--
Propargyl alcohol	107-19-7	--		--		--	--	--	--
Propazine	139-40-2	--		--		--	--	--	--
Propham	122-42-9	--		--		--	--	--	--
Propiconazole	60207-90-1	--		--		--	--	--	--
n-Propylbenzene	103-65-1	2.6E+02	nc	4.4E+03	nc	1.6E+03	2.6E+04	8.7E+03	1.5E+05
Propylene glycol	57-55-6	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)		Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)		Residential TCR=1E-06/ THQ=0.25 ($\mu g/l$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/l$)	Residential TCR=1E-06/ THQ=0.25 ($\mu g/m^3$)	Industrial TCR=1E-05/ THQ=1 ($\mu g/m^3$)
Propylene glycol, monoethyl ether	52125-53-8	5.2E+02	nc	8.8E+03	nc	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Propylene glycol, monomethyl ether	107-98-2	5.2E+02	nc	8.8E+03	nc	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Propylene oxide	75-56-9	7.6E-01	ca	3.3E+01	ca	3.0E+07	5.0E+08	1.7E+04	2.9E+05
Pyridine	110-86-1	--		--		--	--	--	--
Quinalphos	13593-03-8	--		--		--	--	--	--
Quinoline	91-22-5	--		--		--	--	--	--
Resmethrin	10453-86-8	--		--		--	--	--	--
Ronnel	299-84-3	--		--		--	--	--	--
Rotenone	83-79-4	--		--		--	--	--	--
Selenious Acid	7783-00-8	--		--		--	--	--	--
Selenium	7782-49-2	5.2E+00	nc	8.8E+01	nc	--	--	--	--
Sethoxydim	74051-80-2	--		--		--	--	--	--
Silver and compounds	7440-22-4	--		--		--	--	--	--
Simazine	122-34-9	--		--		--	--	--	--
Sodium azide	26628-22-8	--		--		--	--	--	--
Sodium diethyldithiocarbamate	148-18-5	--		--		--	--	--	--
Sodium fluoroacetate	62-74-8	--		--		--	--	--	--
Sodium metavanadate	13718-26-8	--		--		--	--	--	--
Strontium, stable	7440-24-6	--		--		--	--	--	--
Strychnine	57-24-9	--		--		--	--	--	--
Styrene	100-42-5	2.6E+02	nc	4.4E+03	nc	5.5E+03	9.3E+04	8.7E+03	1.5E+05
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	--		--		--	--	--	--
Tebuthiuron	34014-18-1	--		--		--	--	--	--
Temephos	3383-96-8	--		--		--	--	--	--
Terbacil	5902-51-2	--		--		--	--	--	--
Terbufos	13071-79-9	--		--		--	--	--	--
Terbutryn	886-50-0	--		--		--	--	--	--
1,2,4,5-Tetrachlorobenzene	95-94-3	--		--		--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	7.4E-08	ca	3.2E-06	ca	3.6E-05	1.6E-03	2.5E-06	1.1E-04
1,1,1,2-Tetrachloroethane	630-20-6	3.8E-01	ca	1.7E+01	ca	9.6E+00	4.2E+02	1.3E+01	5.5E+02
1,1,2,2-Tetrachloroethane	79-34-5	4.8E-02	ca	2.1E+00	ca	7.8E+00	3.4E+02	1.6E+00	7.0E+01
Tetrachloroethylene (PCE)	127-18-4	1.0E+01	nc	1.8E+02	nc	3.2E+01	5.4E+02	3.5E+02	5.8E+03
2,3,4,6-Tetrachlorophenol	58-90-2	--		--		--	--	--	--
p,a,a,a-Tetrachlorotoluene	5216-25-1	--		--		--	--	--	--
Tetrachlorovinphos (Stirofos)	961-11-5	--		--		--	--	--	--
Tetraethyldithiopyrophosphate	3689-24-5	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
Thallium and compounds	7440-28-0	--		--		--	--	--	--
Thiobencarb	28249-77-6	--		--		--	--	--	--
Thiofanox	39196-18-4	--		--		--	--	--	--
Thiophanate-methyl	23564-05-8	--		--		--	--	--	--
Thiram	137-26-8	--		--		--	--	--	--
Tin and compounds	7440-31-5	--		--		--	--	--	--
Toluene	108-88-3	1.3E+03	nc	2.2E+04	nc	1.0E+04	1.7E+05	4.3E+04	7.3E+05
p-Toluidine	106-49-0	--		--		--	--	--	--
Tralomethrin	66841-25-6	--		--		--	--	--	--
Triadimefon (Bayleton)	43121-43-3	--		--		--	--	--	--
Triallate	2303-17-5	--		--		--	--	--	--
Triasulfuron	82097-50-5	--		--		--	--	--	--
Tribenuron-methyl (Express)	101200-48-0	--		--		--	--	--	--
1,2,4-Tribromobenzene	615-54-3	--		--		--	--	--	--
Tributyltin oxide (TBTO)	56-35-9	--		--		--	--	--	--
2,4,6-Trichloroaniline	634-93-5	--		--		--	--	--	--
2,4,6-Trichloroaniline hydrochloride	33663-50-2	--		--		--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	5.2E-01	nc	8.8E+00	nc	2.7E+01	4.5E+02	1.7E+01	2.9E+02
1,1,1-Trichloroethane	71-55-6	1.3E+03	nc	2.2E+04	nc	3.6E+03	6.0E+04	4.3E+04	7.3E+05
1,1,2-Trichloroethane	79-00-5	5.2E-02	nc	8.8E-01	nc	3.4E+00	5.8E+01	1.7E+00	2.9E+01
Trichloroethylene (TCE) Long-term +++	79-01-6	4.8E-01	ca	8.8E+00	nc	2.4E+00	4.4E+01	1.6E+01	2.9E+02
Trichloroethylene (TCE) Short-term ‡	79-01-6	2.0E+00	nc	6.0E+00	nc	1.0E+01	3.0E+01	6.7E+01	2.0E+02
Trichlorofluoromethane	75-69-4	--		--		--	--	--	--
2,4,5-Trichlorophenol	95-95-4	--		--		--	--	--	--
2,4,6-Trichlorophenol	88-06-2	2.0E+00	nc	6.0E+00	ca				
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	--		--		--	--	--	--
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	--		--		--	--	--	--
1,1,2-Trichloropropane	598-77-6	--		--		--	--	--	--
1,2,3-Trichloropropane	96-18-4	7.8E-02	nc	1.3E+00	nc	1.4E+01	2.4E+02	2.6E+00	4.4E+01
1,2,3-Trichloropropene	96-19-5	7.8E-02	nc	1.3E+00	nc	1.1E-01	1.8E+00	2.6E+00	4.4E+01
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	1.3E+03	nc	2.2E+04	nc	1.1E+02	1.8E+03	4.3E+04	7.3E+05
Tridiphane	58138-08-2	--		--		--	--	--	--
Triethylamine	121-44-8	1.8E+00	nc	3.1E+01	nc	6.5E+02	1.1E+04	6.1E+01	1.0E+03
Trifluralin	1582-09-8	--		--		--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	1.6E+01	nc	2.6E+02	nc	1.6E+02	2.8E+03	5.2E+02	8.8E+03
1,3,5-Trimethylbenzene	108-67-8	1.6E+01	nc	2.6E+02	nc	--	--	--	--
Trimethyl phosphate	512-56-1	--		--		--	--	--	--

Nebraska Department of Environment and Energy Voluntary Cleanup Program Remedial Goals
TABLE A-2: INDOOR AIR, SOIL GAS, and GROUNDWATER VAPOR INTRUSION REMEDIATION GOALS

CONTAMINANT	CAS No.	Indoor Air				Vapor Intrusion Inhalation Pathway			
						Groundwater		Subslab and Exterior Soil Gas	
		Residential TCR=1E-06/ THQ=0.25 (µg/m^3)		Industrial TCR=1E-05/ THQ=1 (µg/m^3)		Residential TCR=1E-06/ THQ=0.25 (µg/l)	Industrial TCR=1E-05/ THQ=1 (µg/l)	Residential TCR=1E-06/ THQ=0.25 (µg/m^3)	Industrial TCR=1E-05/ THQ=1 (µg/m^3)
1,3,5-Trinitrobenzene	99-35-4	--		--		--	--	--	--
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	--		--		--	--	--	--
2,4,6-Trinitrotoluene (TNT)	118-96-7	--		--		--	--	--	--
Triphenylphosphine oxide	791-28-6	--		--		--	--	--	--
Tris(2-chloroethyl) phosphate	115-96-8	--		--		--	--	--	--
Uranium (chemical toxicity only)	7440-61-0	1.0E-02	nc	1.8E-01	nc	--	--	--	--
Vanadium and compounds +++	7440-62-2	2.6E-02	nc	4.4E-01	nc	--	--	--	--
Vernolate (Vernam)	1929-77-7	--		--		--	--	--	--
Vinclozolin	50471-44-8	--		--		--	--	--	--
Vinyl acetate	108-05-4	5.2E+01	nc	8.8E+02	nc	5.2E+03	8.7E+04	1.7E+03	2.9E+04
Vinyl bromide	593-60-2	8.8E-02	ca	3.8E+00	ca	2.7E-01	1.2E+01	2.9E+00	1.3E+02
Vinyl chloride +++	75-01-4	1.7E-01	ca	2.8E+01	ca	2.2E-01	3.7E+01	5.6E+00	9.3E+02
Warfarin	81-81-2	--		--		--	--	--	--
Xylenes	1330-20-7	2.6E+01	nc	4.4E+02	nc	2.3E+02	3.8E+03	8.7E+02	1.5E+04
Zinc	7440-66-6	--		--		No VP	No VP	No VP	No VP
Zinc phosphide	1314-84-7	--		--		No VP	No VP	No VP	No VP
Zineb	12122-67-7	--		--		--	--	--	--

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both Chromium III and Chromium VI analyses.

‡ Short-term exposures to TCE during pregnancy are associated with many forms of developmental toxicity, with the critical develpoment endpoint being cardiac malformations. The type and severity of the resulting cardiac malformation depends on the timing and level of exposure to TCE approximately four to seven weeks after conception. Therefore, the EPA standard default exposure parameters for chronic exposures are invalid for estimating hazard quotients for potential cardiac defects and deriving screening levels protective of developmental endpoints. The EPA Region 7 Action Levels for TCE in air were used for short-term indoor air exposure to TCE and these values were used to calculcate the concentrations via the vapor intrusion pathway.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

-- = Not available/not applicable
µg/L = Micrograms per liter
µg/m^3 = Micrograms per cubic meter
ca = cancer
CAS No. = Chemical Abstract Service Number
nc = noncancer
NVT = Not sufficiently volatile or toxic (in selected exposure scenario)

ATTACHMENT B

SUPPORTING TABLES FOR CALCULATING THE VCP REMEDIATION GOALS

Table B-1: Toxicity Values

Table B-2: Chemical-Specific Parameters

Table B-3: Groundwater Remediation Goals

Table B-4: Soil Remediation Goals

Table B-5: Subslab and Exterior Soil Gas and Groundwater to Indoor Remediation Goals

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Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Version Date: September 2018

Source of toxicity values: EPA RSLs May 2018, except as noted

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Acephate	30560-19-1			1.2E-03	O				
Acetaldehyde	75-07-0					2.2E-06	I	9.0E-03	I
Acetochlor	34256-82-1			2.0E-02	I				
Acetone	67-64-1			9.0E-01	I			3.1E+01	A
Acetone cyanohydrin	75-86-5							2.0E-03	X
Acetonitrile	75-05-8							6.0E-02	I
Acrolein	107-02-8			5.0E-04	I			2.0E-05	I
Acrylamide	79-06-1	5.0E-01	I	2.0E-03	I	1.0E-04	I	6.0E-03	I
Acrylic acid	79-10-7			5.0E-01	I			1.0E-03	I
Acrylonitrile	107-13-1	5.4E-01	I	4.0E-02	A	6.8E-05	I	2.0E-03	I
Alachlor	15972-60-8	5.6E-02	C	1.0E-02	I				
Aldicarb	116-06-3			1.0E-03	I				
Aldicarb sulfone	1646-88-4			1.0E-03	I				
Aldrin	309-00-2	1.7E+01	I	3.0E-05	I	4.9E-03	I		
Allyl alcohol	107-18-6			5.0E-03	I			1.0E-04	X
Allyl chloride	107-05-1	2.1E-02	C			6.0E-06	C	1.0E-03	I
Aluminum	7429-90-5			1.0E+00	P			5.0E-03	P
Aluminum phosphide	20859-73-8			4.0E-04	I				
Ametryn	834-12-8			9.0E-03	I				
m-Aminophenol	591-27-5			8.0E-02	P				
Amitraz	33089-61-1			2.5E-03	I				
Ammonia +++	7664-41-7							5.0E-01	I
Ammonium sulfamate	7773-06-0			2.0E-01	I				
Aniline	62-53-3	5.7E-03	I	7.0E-03	P	1.6E-06	C	1.0E-03	I
Antimony and compounds	7440-36-0			4.0E-04	I				
Antimony pentoxide	1314-60-9			5.0E-04	H				
Antimony potassium tartrate [1]	28300-74-5			9.0E-04	H				
Antimony tetroxide	1332-81-6			4.0E-04	H				
Antimony trioxide	1309-64-4							2.0E-04	I
Arsenic (inorganic) +++	7440-38-2	1.5E+00	I	3.0E-04	I	4.3E-03	I	1.5E-05	C
Arsine	7784-42-1			3.5E-06	C			5.0E-05	I
Assure	76578-14-8			9.0E-03	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Asulam	3337-71-1			3.6E-02	O				
Atrazine	1912-24-9	2.3E-01	C	3.5E-02	I				
Avermectin B1	65195-55-3			4.0E-04	I				
Azobenzene	103-33-3	1.1E-01	I			3.1E-05	I		
Barium and compounds	7440-39-3			2.0E-01	I			5.0E-04	H
Benfluralin (Benefin)	1861-40-1			5.0E-03	O				
Bensulfuron-methyl (Londax)	83055-99-6			2.0E-01	I				
Bentazone (Bentazon)	25057-89-0			3.0E-02	I				
Benzaldehyde	100-52-7	4.0E-03	P	1.0E-01	I				
Benzene	71-43-2	5.5E-02	I	4.0E-03	I	7.8E-06	I	3.0E-02	I
Benzidine	92-87-5	2.3E+02	I	3.0E-03	I	6.7E-02	I		
Benzoic acid	65-85-0			4.0E+00	I				
Benzotrichloride	98-07-7	1.3E+01	I						
Benzyl alcohol	100-51-6			1.0E-01	P				
Benzyl chloride	100-44-7	1.7E-01	I	2.0E-03	P	4.9E-05	C	1.0E-03	P
Beryllium and compounds	7440-41-7			2.0E-03	I	2.4E-03	I	2.0E-05	I
Biphenthrin (Talstar)	82657-04-3			1.5E-02	I				
1,1-Biphenyl	92-52-4	8.0E-03	I	5.0E-01	I			4.0E-04	X
Bis(2-chloroethyl)ether	111-44-4	1.1E+00	I			3.3E-04	I		
Bis(chloromethyl)ether	542-88-1	2.2E+02	I			6.2E-02	I		
Bis(2-chloro-1-methylethyl)ether	108-60-1			4.0E-02	I				
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	1.4E-02	I	2.0E-02	I	2.4E-06	C		
Bisphenol A	80-05-7			5.0E-02	I				
Boron	7440-42-8			2.0E-01	I			2.0E-02	H
Boron trifluoride	7637-07-2			4.0E-02	C			1.3E-02	C
Bromate	15541-45-4	7.0E-01	I	4.0E-03	I				
Bromobenzene	108-86-1			8.0E-03	I			6.0E-02	I
Bromodichloromethane	75-27-4	6.2E-02	I	2.0E-02	I	3.7E-05	C		
Bromoform (Tribromomethane)	75-25-2	7.9E-03	I	2.0E-02	I	1.1E-06	I		
Bromomethane	74-83-9			1.4E-03	I			5.0E-03	I
Bromophos	2104-96-3			5.0E-03	H				
Bromoxynil	1689-84-5	1.0E-01	O	1.5E-02	O				
Bromoxynil octanoate	1689-99-2	1.0E-01	O	1.5E-02	O				
1,3-Butadiene	106-99-0	3.4E+00	C			3.0E-05	I	2.0E-03	I

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
1-Butanol	71-36-3			1.0E-01	I				
Butylate	2008-41-5			5.0E-02	I				
Butyl benzyl phthalate	85-68-7	1.9E-03	P	2.0E-01	I				
Butylphthalyl butylglycolate	85-70-1			1.0E+00	I				
Cacodylic acid	75-60-5			2.0E-02	A				
Cadmium and compounds +++	7440-43-9			1.0E-03	I	1.8E-03	I	1.0E-05	A
Camphechlor (Toxaphene)	8001-35-2	1.1E+00	I			3.2E-04	I		
Caprolactam	105-60-2			5.0E-01	I			2.2E-03	C
Captafol	2425-06-1	1.5E-01	C	2.0E-03	I	4.3E-05	C		
Captan	133-06-2	2.3E-03	C	1.3E-01	I	6.6E-07	C		
Carbaryl	63-25-2			1.0E-01	I				
Carbofuran	1563-66-2			5.0E-03	I				
Carbon disulfide	75-15-0			1.0E-01	I			7.0E-01	I
Carbon tetrachloride	56-23-5	7.0E-02	I	4.0E-03	I	6.0E-06	I	1.0E-01	I
Carbosulfan	55285-14-8			1.0E-02	I				
Carboxin	5234-68-4			1.0E-01	I				
Chloramben	133-90-4			1.5E-02	I				
Chloranil	118-75-2	4.0E-01	H						
Chlordane	12789-03-6	3.5E-01	I	5.0E-04	I	1.0E-04	I	7.0E-04	I
Chlordecone (Kepone)	143-50-0	1.0E+01	I	3.0E-04	I	4.6E-03	C		
Chlorimuron-ethyl	90982-32-4			9.0E-02	O				
Chlorine	7782-50-5			1.0E-01	I			1.5E-04	A
Chlorine dioxide	10049-04-4			3.0E-02	I			2.0E-04	I
Chloroacetic acid	79-11-8								
2-Chloroacetophenone	532-27-4							3.0E-05	I
4-Chloroaniline	106-47-8	2.0E-01	P	4.0E-03	I				
Chlorobenzene	108-90-7			2.0E-02	I			5.0E-02	P
Chlorobenzilate	510-15-6	1.1E-01	C	2.0E-02	I	3.1E-05	C		
p-Chlorobenzoic acid	74-11-3			3.0E-02	X				
4-Chlorobenzotrifluoride	98-56-6			3.0E-03	P			3.0E-01	P
2-Chloro-1,3-butadiene	126-99-8			2.0E-02	H	3.0E-04	I	2.0E-02	I
1-Chlorobutane	109-69-3			4.0E-02	P				
1-Chloro-1,1-difluoroethane	75-68-3							5.0E+01	I
Chlorodifluoromethane	75-45-6							5.0E+01	I

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	2.5E-02	I	5.0E-02	H	7.1E-06	I		
Chloroform	67-66-3	3.1E-02	C	1.0E-02	I	2.3E-05	I	9.8E-02	A
Chloromethane	74-87-3							9.0E-02	I
4-Chloro-2-methylaniline hydrochloride	3165-93-3	4.6E-01	H						
beta-Chloronaphthalene	91-58-7			8.0E-02	I				
o-Chloronitrobenzene	88-73-3	3.0E-01	P	3.0E-03	P			1.0E-05	X
p-Chloronitrobenzene	100-00-5	6.0E-02	P	7.0E-04	P			2.0E-03	P
2-Chlorophenol	95-57-8			5.0E-03	I				
Chlorothalonil	1897-45-6	3.1E-03	C	1.5E-02	I	8.9E-07	C		
o-Chlorotoluene	95-49-8			2.0E-02	I				
Chlorpropham	101-21-3			5.0E-02	O				
Chlorpyrifos	2921-88-2			1.0E-03	A				
Chlorpyrifos-methyl	5598-13-0			1.0E-02	H				
Chlorsulfuron	64902-72-3			5.0E-02	O				
Chlorthiophos	60238-56-4			8.0E-04	H				
Chromium, Total	7440-47-3								
Chromium III *	16065-83-1			1.5E+00	I				
Chromium VI +++	18540-29-9	5.0E-01	C	3.0E-03	I	8.4E-02	S	1.0E-04	I
Clofentezine (Apollo)	74115-24-5			1.3E-02	I				
Cobalt	7440-48-4			3.0E-04	P	9.0E-03	P	6.0E-06	P
Coke Oven Emissions	8007-45-2					6.2E-04	I		
Copper and compounds	7440-50-8			4.0E-02	H				
Crotonaldehyde	123-73-9	1.9E+00	H	1.0E-03	P				
Cumene (Isopropylbenzene)	98-82-8			1.0E-01	I			4.0E-01	I
Cyanazine	21725-46-2	8.4E-01	H	2.0E-03	H				
Cyanide (free)	57-12-5			6.0E-04	I			8.0E-04	S
Cyanide (hydrogen)	74-90-8			6.0E-04	I			8.0E-04	I
Cyanogen	460-19-5			1.0E-03	I				
Cyanogen bromide	506-68-3			9.0E-02	I				
Cyanogen chloride	506-77-4			5.0E-02	I				
Cyclohexane	110-82-7							6.0E+00	I
Cyclohexanone	108-94-1			5.0E+00	I			7.0E-01	P
Cyclohexylamine	108-91-8			2.0E-01	I				
Cyfluthrin (Baythroid)	68359-37-5			2.5E-02	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Cyhalothrin (Karate)	68085-85-8			1.0E-03	O				
Cyromazine	66215-27-8			5.0E-01	O				
Dacthal	1861-32-1			1.0E-02	I				
Dalapon	75-99-0			3.0E-02	I				
Daminozide (Alar)	1596-84-5	1.8E-02	C	1.5E-01	I	5.1E-06	C		
Demeton	8065-48-3			4.0E-05	I				
Diallate	2303-16-4	6.1E-02	H						
Diazinon	333-41-5			7.0E-04	A				
Dibenzofuran	132-64-9			1.0E-03	X				
1,4-Dibromobenzene	106-37-6			1.0E-02	I				
Dibromochloromethane	124-48-1	8.4E-02	I	2.0E-02	I				
1,2-Dibromo-3-chloropropane	96-12-8	8.0E-01	P	2.0E-04	P	6.0E-03	P	2.0E-04	I
1,2-Dibromoethane	106-93-4	2.0E+00	I	9.0E-03	I	6.0E-04	I	9.0E-03	I
Dibutyl phthalate	84-74-2			1.0E-01	I				
Dicamba	1918-00-9			3.0E-02	I				
1,2-Dichlorobenzene	95-50-1			9.0E-02	I			2.0E-01	H
1,4-Dichlorobenzene	106-46-7	5.4E-03	C	7.0E-02	A	1.1E-05	C	8.0E-01	I
3,3-Dichlorobenzidine	91-94-1	4.5E-01	I			3.4E-04	C		
4,4'-Dichlorobenzophenone	90-98-2			9.0E-03	X				
1,4-Dichloro-2-butene	764-41-0					4.2E-03	P		
Dichlorodifluoromethane	75-71-8			2.0E-01	I			1.0E-01	X
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	2.4E-01	I	3.0E-05	X	6.9E-05	C		
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	3.4E-01	I	3.0E-04	X	9.7E-05	C		
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	3.4E-01	I	5.0E-04	I	9.7E-05	I		
1,1-Dichloroethane	75-34-3	5.7E-03	C	2.0E-01	P	1.6E-06	C		
1,2-Dichloroethane	107-06-2	9.1E-02	I	6.0E-03	X	2.6E-05	I	7.0E-03	P
1,1-Dichloroethylene	75-35-4			5.0E-02	I			2.0E-01	I
1,2-Dichloroethylene (cis)	156-59-2			2.0E-03	I				
1,2-Dichloroethylene (trans)	156-60-5			2.0E-02	I				
2,4-Dichlorophenol	120-83-2			3.0E-03	I				
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7			1.0E-02	I				
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6			3.0E-02	O				
Decabromodiphenyl ether (BDE-209)	1163-19-5	7.0E-04	I	7.0E-03	I				
1,2-Dichloropropane	78-87-5	3.7E-02	P	4.0E-02	P	3.7E-06	P	4.0E-03	I

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
2,3-Dichloropropanol	616-23-9			3.0E-03	I				
1,3-Dichloropropene	542-75-6	1.0E-01	I	3.0E-02	I	4.0E-06	I	2.0E-02	I
Dichlorvos	62-73-7	2.9E-01	I	5.0E-04	I	8.3E-05	C	5.0E-04	I
Dicrotophos (Bidrin)	141-66-2			3.0E-05	O				
Dicyclopentadiene	77-73-6			8.0E-02	P			3.0E-04	X
Dieldrin	60-57-1	1.6E+01	I	5.0E-05	I	4.6E-03	I		
Diethylene glycol, monobutyl ether	112-34-5			3.0E-02	P			1.0E-04	P
Diethylene glycol, monoethyl ether	111-90-0			6.0E-02	P			3.0E-04	P
Diethylformamide	617-84-5			1.0E-03	P				
Di(2-ethylhexyl)adipate	103-23-1	1.2E-03	I	6.0E-01	I				
Diethyl phthalate	84-66-2			8.0E-01	I				
Diethylstilbestrol	56-53-1	3.5E+02	C			1.0E-01	C		
Difenzoquat (Avenge)	43222-48-6			8.3E-02	O				
Diflubenzuron	35367-38-5			2.0E-02	I				
1,1-Difluoroethane	75-37-6							4.0E+01	I
Diisopropyl methylphosphonate (DIMP)	1445-75-6			8.0E-02	I				
Dimethipin	55290-64-7			2.2E-02	O				
Dimethoate	60-51-5			2.2E-03	O				
3,3'-Dimethoxybenzidine	119-90-4	1.6E+00	P						
N-N-Dimethylaniline	121-69-7	2.7E-02	P	2.0E-03	I				
2,4-Dimethylaniline	95-68-1	2.0E-01	P	2.0E-03	X				
2,4-Dimethylaniline hydrochloride	21436-96-4	5.8E-01	H						
3,3'-Dimethylbenzidine	119-93-7	1.1E+01	P						
N,N-Dimethylformamide	68-12-2			1.0E-01	P			3.0E-02	I
2,4-Dimethylphenol	105-67-9			2.0E-02	I				
2,6-Dimethylphenol	576-26-1			6.0E-04	I				
3,4-Dimethylphenol	95-65-8			1.0E-03	I				
Dimethyl terephthalate	120-61-6			1.0E-01	I				
4,6-Dinitro-o-cyclohexyl phenol	131-89-5			2.0E-03	I				
1,2-Dinitrobenzene	528-29-0			1.0E-04	P				
1,3-Dinitrobenzene	99-65-0			1.0E-04	I				
1,4-Dinitrobenzene	100-25-4			1.0E-04	P				
2,4-Dinitrophenol	51-28-5			2.0E-03	I				
Dinitrotoluene mixture	25321-14-6	4.5E-01	X	9.0E-04	X				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
2,4-Dinitrotoluene	121-14-2	3.1E-01	C	2.0E-03	I	8.9E-05	C		
2,6-Dinitrotoluene	606-20-2	1.5E+00	P	3.0E-04	X				
Dinoseb	88-85-7			1.0E-03	I				
1,4-Dioxane	123-91-1	1.0E-01	I	3.0E-02	I	5.0E-06	I	3.0E-02	I
Diphenamid	957-51-7			3.0E-02	I				
Diphenylamine	122-39-4			1.0E-01	O				
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7			3.0E-04	X				
1,2-Diphenylhydrazine	122-66-7	8.0E-01	I			2.2E-04	I		
Diphenyl sulfone	127-63-9			8.0E-04	X				
Diquat dibromide (Diquat)	85-00-7			2.2E-03	I				
Direct black 38	1937-37-7	7.1E+00	C			1.4E-01	C		
Direct blue 6	2602-46-2	7.4E+00	C			1.4E-01	C		
Direct brown 95	16071-86-6	6.7E+00	C			1.4E-01	C		
Disulfoton	298-04-4			4.0E-05	I				
1,4-Dithiane	505-29-3			1.0E-02	I				
Diuron	330-54-1			2.0E-03	I				
Dodine	2439-10-3			2.0E-02	O				
Endosulfan	115-29-7			6.0E-03	I				
Endothall	145-73-3			2.0E-02	I				
Endrin	72-20-8			3.0E-04	I				
Enilconazole (Imazalil)	35554-44-0	6.1E-02	O	2.5E-03	O				
Epichlorohydrin	106-89-8	9.9E-03	I	6.0E-03	P	1.2E-06	I	1.0E-03	I
1,2-Epoxybutane	106-88-7							2.0E-02	I
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4			5.0E-02	O				
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0			5.0E-03	I				
Ethion	563-12-2			5.0E-04	I				
2-Ethoxyethanol	110-80-5			9.0E-02	P			2.0E-01	I
2-Ethoxyethanol acetate	111-15-9			1.0E-01	P			6.0E-02	P
Ethyl acetate	141-78-6			9.0E-01	I			7.0E-02	P
Ethyl acrylate	140-88-5			5.0E-03	P			8.0E-03	P
Ethylbenzene	100-41-4	1.1E-02	C	1.0E-01	I	2.5E-06	C	1.0E+00	I
Ethyl chloride (Chloroethane)	75-00-3							1.0E+01	I
Ethylene cyanohydrin	109-78-4			7.0E-02	P				
Ethylene diamine	107-15-3			9.0E-02	P				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Ethylene glycol	107-21-1			2.0E+00	I			4.0E-01	C
Ethylene glycol, monobutyl ether	111-76-2			1.0E-01	I			1.6E+00	I
Ethylene oxide	75-21-8	3.1E-01	C			3.0E-03	I	3.0E-02	C
Ethylene thiourea (ETU)	96-45-7	4.5E-02	C	8.0E-05	I	1.3E-05	C		
Ethyl ether	60-29-7			2.0E-01	I				
Ethyl methacrylate	97-63-2							3.0E-01	P
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5			1.0E-05	I				
Ethylphthalyl ethyl glycolate	84-72-0			3.0E+00	I				
Fenamiphos	22224-92-6			2.5E-04	I				
Fenpropathrin (Danitol)	39515-41-8			2.5E-02	I				
Fenvalerate (Pydrin)	51630-58-1			2.5E-02	I				
Fluometuron	2164-17-2			1.3E-02	I				
Fluoride	16984-48-8			4.0E-02	C			1.3E-02	C
Fluoridone	59756-60-4			8.0E-02	I				
Flurprimidol	56425-91-3			4.0E-02	O				
Flusilazole (NuStar)	85509-19-9			2.0E-03	O				
Flutolanil	66332-96-5			5.0E-01	O				
Fluvalinate	69409-94-5			1.0E-02	I				
Folpet	133-07-3			9.0E-02	O				
Fomesafen	72178-02-0			2.5E-03	O				
Fonofos	944-22-9			2.0E-03	I				
Formaldehyde	50-00-0			2.0E-01	I	1.3E-05	I	9.8E-03	A
Formic acid	64-18-6			9.0E-01	P			3.0E-04	X
Fosetyl-al	39148-24-8			2.5E+00	O				
Furan	110-00-9			1.0E-03	I				
Furazolidone	67-45-8	3.8E+00	H						
Furfural	98-01-1			3.0E-03	I			5.0E-02	H
Furmecyclox	60568-05-0	3.0E-02	I			8.6E-06	C		
Furothiazole (Furium)	531-82-8	1.5E+00	C			4.3E-04	C		
Glufosinate-ammonium	77182-82-2			6.0E-03	O				
Glycidaldehyde	765-34-4			4.0E-04	I			1.0E-03	H
Glyphosate	1071-83-6			1.0E-01	I				
Haloxyfop-methyl	69806-40-2			5.0E-05	I				
Thifensulfuron-methyl (Harmony)	79277-27-3			4.3E-02	O				

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Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Heptachlor	76-44-8	4.5E+00	I	5.0E-04	I	1.3E-03	I		
Heptachlor epoxide	1024-57-3	9.1E+00	I	1.3E-05	I	2.6E-03	I		
Hexabromobenzene	87-82-1			2.0E-03	I				
Hexachlorobenzene	118-74-1	1.6E+00	I	8.0E-04	I	4.6E-04	I		
Hexachlorobutadiene	87-68-3	7.8E-02	I	1.0E-03	P	2.2E-05	I		
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	6.3E+00	I	8.0E-03	A	1.8E-03	I		
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	1.8E+00	I			5.3E-04	I		
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	1.1E+00	C	3.0E-04	I	3.1E-04	C		
Hexachlorocyclohexane technical	608-73-1	1.8E+00	I			5.1E-04	I		
Hexachlorocyclopentadiene	77-47-4			6.0E-03	I			2.0E-04	I
Hexachloroethane	67-72-1	4.0E-02	I	7.0E-04	I	1.1E-05	C	3.0E-02	I
Hexachlorophene	70-30-4			3.0E-04	I				
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	1.1E-01	I	3.0E-03	I				
1,6-Hexamethylene diisocyanate	822-06-0							1.0E-05	I
n-Hexane	110-54-3							7.0E-01	I
Hexazinone	51235-04-2			3.3E-02	I				
Hexythiazox (Savey)	78587-05-0			2.5E-02	I				
Hydramethylnon (Amdro)	67485-29-4			1.7E-02	O				
Hydrazine, hydrazine sulfate	302-01-2	3.0E+00	I			4.9E-03	I	3.0E-05	P
Hydrazine, dimethyl	57-14-7			1.0E-04	X			2.0E-06	X
Hydrogen chloride	7647-01-0							2.0E-02	I
Hydrogen sulfide	7783-06-4							2.0E-03	I
p-Hydroquinone	123-31-9	6.0E-02	P	4.0E-02	P				
Imazaquin	81335-37-7			2.5E-01	I				
Imazethapyr (Pursuit)	81335-77-5			2.5E+00	O				
Iprodione	36734-19-7			4.0E-02	I				
Iron	7439-89-6			7.0E-01	P				
Isobutanol (Isobutyl alcohol)	78-83-1			3.0E-01	I				
Isophorone	78-59-1	9.5E-04	I	2.0E-01	I			2.0E+00	C
Isopropalin	33820-53-0			1.5E-02	I				
Isopropyl methyl phosphonic acid	1832-54-8			1.0E-01	I				
Isoxaben	82558-50-7			5.0E-02	I				
Lactofen	77501-63-4			8.0E-03	O				
Lead +++	7439-92-1								

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		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Lead (tetraethyl)	78-00-2			1.0E-07	I				
Linuron	330-55-2			7.7E-03	O				
Lithium	7439-93-2			2.0E-03	P				
Malathion	121-75-5			2.0E-02	I				
Maleic anhydride	108-31-6			1.0E-01	I			7.0E-04	C
Maleic hydrazide	123-33-1			5.0E-01	I				
Malononitrile	109-77-3			1.0E-04	P				
Mancozeb	8018-01-7			3.0E-02	H				
Maneb	12427-38-2			5.0E-03	I				
Manganese (non-food) +++	7439-96-5			1.4E-01	I			5.0E-05	I
Mephosfolan	950-10-7			9.0E-05	H				
Mepiquat chloride (Mepiquat)	24307-26-4			3.0E-02	I				
Mercury and compounds	7487-94-7			3.0E-04	I			3.0E-04	S
Mercury (elemental)	7439-97-6							3.0E-04	I
Mercury (methyl)	22967-92-6			1.0E-04	I				
Merphos	150-50-5			3.0E-05	I				
Merphos oxide	78-48-8			1.0E-04	O				
Metalaxyl	57837-19-1			6.0E-02	I				
Methacrylonitrile	126-98-7			1.0E-04	I			3.0E-02	P
Methamidophos	10265-92-6			5.0E-05	I				
Methanol	67-56-1			2.0E+00	I			2.0E+01	I
Methidathion	950-37-8			1.5E-03	O				
Methomyl	16752-77-5			2.5E-02	I				
Methoxychlor	72-43-5			5.0E-03	I				
2-Methoxyethanol	109-86-4			5.0E-03	P			2.0E-02	I
2-Methoxyethanol acetate	110-49-6			8.0E-03	P			1.0E-03	P
2-Methoxy-5-nitroaniline	99-59-2	4.9E-02	C			1.4E-05	C		
Methyl acetate	79-20-9			1.0E+00	X				
Methyl acrylate	96-33-3							2.0E-02	P
2-Methylaniline hydrochloride	636-21-5	1.3E-01	C			3.7E-05	C		
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2			5.0E-02	I				
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6			5.0E-04	I				
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5			4.4E-03	O				
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2			1.0E-03	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
4,4'-Methylenebisbenzeneamine	101-77-9	1.6E+00	C			4.6E-04	C	2.0E-02	C
4,4'-Methylene bis(2-chloroaniline)	101-14-4	1.0E-01	P	2.0E-03	P	4.3E-04	C		
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	4.6E-02	I			1.3E-05	C		
Methylene bromide	74-95-3							4.0E-03	X
Methylene chloride	75-09-2	2.0E-03	I	6.0E-03	I	1.0E-08	I	6.0E-01	I
4,4'-Methylenediphenyl isocyanate	101-68-8							6.0E-04	I
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1			4.0E-03	I				
Methyl ethyl ketone (2-Butanone)	78-93-3			6.0E-01	I			5.0E+00	I
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1							3.0E+00	I
Methyl methacrylate	80-62-6			1.4E+00	I			7.0E-01	I
2-Methyl-5-nitroaniline	99-55-8	9.0E-03	P	2.0E-02	X				
Methyl parathion	298-00-0			2.5E-04	I				
2-Methylphenol	95-48-7			5.0E-02	I			6.0E-01	C
3-Methylphenol	108-39-4			5.0E-02	I			6.0E-01	C
4-Methylphenol	106-44-5			1.0E-01	A			6.0E-01	C
Methyl phosphonic acid	993-13-5			6.0E-02	X				
Methyl styrene (mixture)	25013-15-4			6.0E-03	H			4.0E-02	H
Methyl styrene (alpha)	98-83-9			7.0E-02	H				
Methyl tertbutyl ether (MTBE)	1634-04-4	1.8E-03	C			2.6E-07	C	3.0E+00	I
Metolaclor (Dual)	51218-45-2			1.5E-01	I				
Metribuzin	21087-64-9			2.5E-02	I				
Metsulfuron-methyl (Ally)	74223-64-6			2.5E-01	I				
Mirex	2385-85-5	1.8E+01	C	2.0E-04	I	5.1E-03	C		
Molinate	2212-67-1			2.0E-03	I				
Molybdenum	7439-98-7			5.0E-03	I				
Monochloramine	10599-90-3			1.0E-01	I				
Myclobutanil (Systhane)	88671-89-0			2.5E-02	I				
Naled	300-76-5			2.0E-03	I				
Napropamide	15299-99-7			1.2E-01	O				
Nickel and compounds	7440-02-0			2.0E-02	I	2.6E-04	C	9.0E-05	A
Nickel refinery dust	7440-02-0-NRD			1.1E-02	C	2.4E-04	I	1.4E-05	C
Nickel subsulfide	12035-72-2	1.7E+00	C	1.1E-02	C	4.8E-04	I	1.4E-05	C
Nitrate	14797-55-8			1.6E+00	I				
Nitrite	14797-65-0			1.0E-01	I				

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2-Nitroaniline	88-74-4			1.0E-02	X			5.0E-05	X
Nitrobenzene	98-95-3			2.0E-03	I	4.0E-05	I	9.0E-03	I
Nitrofurantoin	67-20-9			7.0E-02	H				
Nitrofurazone	59-87-0	1.3E+00	C			3.7E-04	C		
Nitroglycerin	55-63-0	1.7E-02	P	1.0E-04	P				
Nitroguanidine	556-88-7			1.0E-01	I				
2-Nitropropane	79-46-9					2.7E-03	H	2.0E-02	I
N-Nitrosodi-n-butylamine	924-16-3	5.4E+00	I			1.6E-03	I		
N-Nitrosodiethanolamine	1116-54-7	2.8E+00	I			8.0E-04	C		
N-Nitrosodiethylamine	55-18-5	1.5E+02	I			4.3E-02	I		
N-Nitrosodimethylamine	62-75-9	5.1E+01	I	8.0E-06	P	1.4E-02	I	4.0E-05	X
N-Nitrosodiphenylamine	86-30-6	4.9E-03	I			2.6E-06	C		
N-Nitroso di-n-propylamine	621-64-7	7.0E+00	I			2.0E-03	C		
N-Nitroso-N-methylethylamine	10595-95-6	2.2E+01	I			6.3E-03	C		
N-Nitrosopyrrolidine	930-55-2	2.1E+00	I			6.1E-04	I		
m-Nitrotoluene	99-08-1			1.0E-04	X				
o-Nitrotoluene	88-72-2	2.2E-01	P	9.0E-04	P				
p-Nitrotoluene	99-99-0	1.6E-02	P	4.0E-03	P				
Norflurazon	27314-13-2			1.5E-02	O				
Octabromodiphenyl ether	32536-52-0			3.0E-03	I				
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0			5.0E-02	I				
Octamethylpyrophosphoramide	152-16-9			2.0E-03	H				
Oryzalin	19044-88-3	7.8E-03	O	1.4E-01	O				
Oxadiazon	19666-30-9			5.0E-03	I				
Oxamyl	23135-22-0			2.5E-02	I				
Oxyfluorfen	42874-03-3	7.3E-02	O	3.0E-02	O				
Paclobutrazol	76738-62-0			1.3E-02	I				
Paraquat [2]	4685-14-7			4.5E-03	I				
Parathion	56-38-2			6.0E-03	H				
Pebulate	1114-71-2			5.0E-02	H				
Pendimethalin	40487-42-1			3.0E-02	O				
Pentabromo-6-chloro cyclohexane	87-84-3	2.0E-02	X	2.0E-02	X				
Pentabromodiphenyl ether	32534-81-9			2.0E-03	I				
Pentachlorobenzene	608-93-5			8.0E-04	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Pentachloronitrobenzene	82-68-8	2.6E-01	H	3.0E-03	I				
Pentachlorophenol	87-86-5	4.0E-01	I	5.0E-03	I	5.1E-06	C		
Perchlorate	14797-73-0			7.0E-04	I				
Perfluoroalkyl Compounds									
Perfluoro-octanesulfonate (PFOS)^^ [3]	1763-23-1			2.0E-04	O				
Perfluorooctanoic acid (PFOA)^^ [4]	335-67-1	7.0E-02	O	2.0E-05	O				
Permethrin	52645-53-1			5.0E-02	I				
Phenmedipham	13684-63-4			2.4E-01	O				
Phenol	108-95-2			3.0E-01	I			2.0E-01	C
m-Phenylenediamine	108-45-2			6.0E-03	I				
p-Phenylenediamine	106-50-3			1.0E-03	X				
Phenylmercuric acetate	62-38-4			8.0E-05	I				
2-Phenylphenol	90-43-7	1.9E-03	H						
Phorate	298-02-2			2.0E-04	H				
Phosmet	732-11-6			2.0E-02	I				
Phosphine	7803-51-2			3.0E-04	I			3.0E-04	I
Phosphoric acid	7664-38-2			4.9E+01	P			1.0E-02	I
Phosphorus (white)	7723-14-0			2.0E-05	I				
p-Phthalic acid	100-21-0			1.0E+00	H				
Phthalic anhydride	85-44-9			2.0E+00	I			2.0E-02	C
Picloram	1918-02-1			7.0E-02	I				
Pirimiphos-methyl	29232-93-7			7.0E-05	O				
Polybrominated biphenyls (PBBs) [5]	59536-65-1	3.0E+01	C	7.0E-06	H	8.6E-03	C		
Polychlorinated biphenyls (PCBs)	1336-36-3	2.0E+00	I			5.7E-04	I		
Aroclor 1016	12674-11-2	7.0E-02	S	7.0E-05	I	2.0E-05	S		
Aroclor 1221	11104-28-2	2.0E+00	S			5.7E-04	S		
Aroclor 1232	11141-16-5	2.0E+00	S			5.7E-04	S		
Aroclor 1242	53469-21-9	2.0E+00	S			5.7E-04	S		
Aroclor 1248	12672-29-6	2.0E+00	S			5.7E-04	S		
Aroclor 1254	11097-69-1	2.0E+00	S	2.0E-05	I	5.7E-04	S		
Aroclor 1260	11096-82-5	2.0E+00	S			5.7E-04	S		
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9			6.0E-02	I				
Anthracene	120-12-7			3.0E-01	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Benz[a]anthracene	56-55-3	1.0E-01	E			6.0E-05	E		
Benzo[a]pyrene	50-32-8	1.0E+00	I	3.0E-04	I	6.0E-04	I	2.0E-06	I
Benzo[b]fluoranthene	205-99-2	1.0E-01	E			6.0E-05	E		
Benzo[k]fluoranthene	207-08-9	1.0E-02	E			6.0E-06	E		
Chrysene	218-01-9	1.0E-03	E			6.0E-07	E		
Dibenz[ah]anthracene	53-70-3	1.0E+00	E			6.0E-04	E		
Fluoranthene	206-44-0			4.0E-02	I				
Fluorene	86-73-7			4.0E-02	I				
Indeno[1,2,3-cd]pyrene	193-39-5	1.0E-01	E			6.0E-05	E		
Naphthalene	91-20-3			2.0E-02	I	3.4E-05	C	3.0E-03	I
Pyrene	129-00-0			3.0E-02	I				
Prochloraz	67747-09-5	1.5E-01	I	9.0E-03	I				
Profluralin	26399-36-0			6.0E-03	H				
Prometon	1610-18-0			1.5E-02	I				
Prometryn	7287-19-6			4.0E-02	O				
Propyzamide (Pronamide)	23950-58-5			7.5E-02	I				
Propachlor	1918-16-7			1.3E-02	I				
Propanil	709-98-8			5.0E-03	I				
Propargite	2312-35-8	1.9E-01	O	4.0E-02	O				
Propargyl alcohol	107-19-7			2.0E-03	I				
Propazine	139-40-2			2.0E-02	I				
Propham	122-42-9			2.0E-02	I				
Propiconazole	60207-90-1			1.0E-01	O				
n-Propylbenzene	103-65-1			1.0E-01	X			1.0E+00	X
Propylene glycol	57-55-6			2.0E+01	P				
Propylene glycol, monoethyl ether [6]	52125-53-8			7.0E-01	H			2.0E+00	I
Propylene glycol, monomethyl ether	107-98-2			7.0E-01	H			2.0E+00	I
Propylene oxide	75-56-9	2.4E-01	I			3.7E-06	I	3.0E-02	I
Pyridine	110-86-1			1.0E-03	I				
Quinalphos	13593-03-8			5.0E-04	I				
Quinoline	91-22-5	3.0E+00	I						
Resmethrin	10453-86-8			3.0E-02	I				
Ronnel	299-84-3			5.0E-02	H				
Rotenone	83-79-4			4.0E-03	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Selenious Acid	7783-00-8			5.0E-03	I				
Selenium	7782-49-2			5.0E-03	I			2.0E-02	C
Sethoxydim	74051-80-2			1.4E-01	O				
Silver and compounds	7440-22-4			5.0E-03	I				
Simazine	122-34-9	1.2E-01	H	5.0E-03	I				
Sodium azide	26628-22-8			4.0E-03	I				
Sodium diethyldithiocarbamate	148-18-5	2.7E-01	H	3.0E-02	I				
Sodium fluoroacetate	62-74-8			2.0E-05	I				
Sodium metavanadate	13718-26-8			1.0E-03	H				
Strontium, stable	7440-24-6			6.0E-01	I				
Strychnine	57-24-9			3.0E-04	I				
Styrene	100-42-5			2.0E-01	I			1.0E+00	I
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9			8.0E-04	P				
Tebuthiuron	34014-18-1			7.0E-02	I				
Temephos	3383-96-8			2.0E-02	H				
Terbacil	5902-51-2			1.3E-02	I				
Terbufos	13071-79-9			2.5E-05	H				
Terbutryn	886-50-0			1.0E-03	I				
1,2,4,5-Tetrachlorobenzene	95-94-3			3.0E-04	I				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin) [7]	1746-01-6	1.3E+05	C	7.0E-10	I	3.8E+01	C	4.0E-08	C
1,1,1,2-Tetrachloroethane	630-20-6	2.6E-02	I	3.0E-02	I	7.4E-06	I		
1,1,2,2-Tetrachloroethane	79-34-5	2.0E-01	I	2.0E-02	I	5.8E-05	C		
Tetrachloroethylene (PCE)	127-18-4	2.1E-03	I	6.0E-03	I	2.6E-07	I	4.0E-02	I
2,3,4,6-Tetrachlorophenol	58-90-2			3.0E-02	I				
p,a,a,a-Tetrachlorotoluene	5216-25-1	2.0E+01	H						
Tetrachlorovinphos (Stirofos)	961-11-5	2.4E-02	H	3.0E-02	I				
Tetraethyldithiopyrophosphate	3689-24-5			5.0E-04	I				
Thallium and compounds	7440-28-0			1.0E-05	X				
Thiobencarb	28249-77-6			1.0E-02	I				
Thiofanox	39196-18-4			3.0E-04	H				
Thiophanate-methyl	23564-05-8	1.2E-02	O	2.7E-02	O				
Thiram	137-26-8			1.5E-02	O				
Tin and compounds	7440-31-5			6.0E-01	H				
Toluene	108-88-3			8.0E-02	I			5.0E+00	I

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
p-Toluidine	106-49-0	3.0E-02	P	4.0E-03	X				
Tralomethrin	66841-25-6			7.5E-03	I				
Triadimefon (Bayleton)	43121-43-3			3.4E-02	O				
Triallate	2303-17-5	7.2E-02	O	2.5E-02	O				
Triasulfuron	82097-50-5			1.0E-02	I				
Tribenuron-methyl (Express)	101200-48-0			8.0E-03	I				
1,2,4-Tribromobenzene	615-54-3			5.0E-03	I				
Tributyltin oxide (TBTO)	56-35-9			3.0E-04	I				
2,4,6-Trichloroaniline	634-93-5	7.0E-03	X	3.0E-05	X				
2,4,6-Trichloroaniline hydrochloride	33663-50-2	2.9E-02	H						
1,2,4-Trichlorobenzene	120-82-1	2.9E-02	P	1.0E-02	I			2.0E-03	P
1,1,1-Trichloroethane	71-55-6			2.0E+00	I			5.0E+00	I
1,1,2-Trichloroethane	79-00-5	5.7E-02	I	4.0E-03	I	1.6E-05	I	2.0E-04	X
Trichloroethylene (TCE) Long-term +++	79-01-6	4.6E-02	I	5.0E-04	I	4.1E-06	I	2.0E-03	I
Trichlorofluoromethane	75-69-4			3.0E-01	I				
2,4,5-Trichlorophenol	95-95-4			1.0E-01	I				
2,4,6-Trichlorophenol	88-06-2	1.1E-02	I	1.0E-03	P	3.1E-06	I		
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5			1.0E-02	I				
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1			8.0E-03	I				
1,1,2-Trichloropropane	598-77-6			5.0E-03	I				
1,2,3-Trichloropropane	96-18-4	3.0E+01	I	4.0E-03	I			3.0E-04	I
1,2,3-Trichloropropene	96-19-5			3.0E-03	X			3.0E-04	P
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1			3.0E+01	I			5.0E+00	P
Tridiphane	58138-08-2			3.0E-03	I				
Triethylamine	121-44-8							7.0E-03	I
Trifluralin	1582-09-8	7.7E-03	I	7.5E-03	I				
1,2,4-Trimethylbenzene	95-63-6			1.0E-02	I			6.0E-02	I
1,3,5-Trimethylbenzene	108-67-8			1.0E-02	I			6.0E-02	I
Trimethyl phosphate	512-56-1	2.0E-02	P	1.0E-02	P				
1,3,5-Trinitrobenzene	99-35-4			3.0E-02	I				
Trinitrophenylmethylnitramine (Tetryl)	479-45-8			2.0E-03	P				
2,4,6-Trinitrotoluene (TNT)	118-96-7	3.0E-02	I	5.0E-04	I				
Triphenylphosphine oxide	791-28-6			2.0E-02	P				
Tris(2-chloroethyl) phosphate	115-96-8	2.0E-02	P	7.0E-03	P				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Contaminant	CAS	SFo		RfDo		IUR		RfCi	
		$(mg/kg\text{-}d)^{-1}$	Ref	(mg/kg-d)	Ref	$1/(\mu g/m^3)$	Ref	(mg/m^3)	Ref
Uranium (chemical toxicity only)	7440-61-0			2.0E-04	A			4.0E-05	A
Vanadium and compounds +++	7440-62-2			5.0E-03	S			1.0E-04	A
Vernolate (Vernam)	1929-77-7			1.0E-03	I				
Vinclozolin	50471-44-8			1.2E-03	O				
Vinyl acetate	108-05-4			1.0E+00	H			2.0E-01	I
Vinyl bromide	593-60-2					3.2E-05	H	3.0E-03	I
Vinyl chloride +++	75-01-4	7.2E-01	I	3.0E-03	I	4.4E-06	I	1.0E-01	I
Warfarin	81-81-2			3.0E-04	I				
Xylenes	1330-20-7			2.0E-01	I			1.0E-01	I
Zinc	7440-66-6			3.0E-01	I				
Zinc phosphide	1314-84-7			3.0E-04	I				
Zineb	12122-67-7			5.0E-02	I				

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-1: TOXICITY VALUES

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both Chromium III and Chromium VI analyses.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

[1] Toxicity values for antimony potassium tartrate are not included in the RSL tables (EPA 2018a). HEAST (EPA 2011) value used.

[2] Toxicity values for Paraquat are not included in the RSL tables (EPA 2018a). The RfD for Paraquat dichloride was used as a surrogate value.

[3] The toxicity values for perfluorooctane sulfonate are based on values produced by the EPA Office of Water (EPA 2016a).

[4] The toxicity values for perfluorooctane acid are based on values produced by the EPA Office of Water (EPA 2016b).

[5] The toxicity values for polybrominated biphenyls are not included in RSL tables (EPA 2018a). Source of values as noted.

[6] Toxicity values for propylene glycol, monoethyl ether are not included in the RSL tables (EPA 2018a). The RfD for propylene glycol, monomethyl ether was used as a surrogate value.

[7] See RSL User's Guide (EPA 2018b) Section 2.3.5 for more information on the toxicity of dioxins.

Reference Key:

A = ATSDR
C = Cal EPA
H = HEAST
I = IRIS
O = USEPA Office of Water
P = PPRTV
X = PPRTV Appendix

CAS = Chemical abstract service number
IUR = Inhalation unit risk
µg/m^3 = micrograms per cubic meter
mg/kg-d = milligrams per kilogram body weight per day
mg/m^3 = milligrams per cubic meter
RfC_i = Reference concentration inhalation
RfDo = Reference dose oral
SFo = Slope factor oral

Sources:

U.S. Environmental Protection Agency (EPA). 2011. Health Effects Assessment Summary Tables for Superfund (HEAST). December.
EPA. 2016a. Health Effects Support Document for Perfluorooctane Sulfonate (PFOS), Office of Water. EPA 822-R-16-002. May
EPA. 2016b. Health Effects Support Document for Perfluorooctanoic Acid (PFOA). Office of Water. EPA 822-R-16-003. May.
EPA. 2017a. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.
EPA. 2017b. Regional Screening Levels (RSLs) -- User's Guide. November.

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-2: CHEMICAL-SPECIFIC PARAMETERS

Version Date: September 2018
Source of chemical and physical parameters: EPA RSLs May 2018, except as noted

Contaminant	CAS	MW (g/mol)	Organic/ Inorganic	Henry's Law Constant H_units (atm-m^3/mol)	Henry's Law Constant H' (H_unitless) (unitless)	VP>1?	VOL	D_i (cm^2/s)	D_w (cm^2/s)	K_{oc} (organics) (cm^3/g)	K_d (inorganics) (cm^3/g)	$K_{d\ VF}$ (cm^3/g)	K_d_s_to_gw (cm^3/g)	S (mg/L-water)	S (µg/L-water)	D_A (cm^2/s)	VF (m^3/kg)	SAT (mg/kg)	soil-to-gw factor (kg/L)	ABS_d	ABS_{GI}	Title 118 MCL (µg/L)	EPA Fed MCL MCL (µg/L)	Kp.org (cm/hr)	Kp.inorg (cm/hr)	t_star (hr)	FA (unitless)	tau_event (hr)	B (unitless)	RBA (unitless)	Mutagen	In EPD?
Acephate	30560-19-1	1.8E+02	O	5.0E-13	2.0E-11	No	0	3.7E-02	8.0E-06	1.0E+01		2.0E-02	2.0E-02	8.2E+05	8.2E+08			9.8E+04	2.2E-01	0.1	1			4.0E-05		2.7E+00	1.0E+00	1.1E+00	2.1E-04	1		Yes
Acetaldehyde	75-07-0	4.4E+01	O	6.7E-05	2.7E-03	Yes	1	1.3E-01	1.4E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.8E-04	8.7E+03	1.0E+05	2.0E-01		1			5.3E-04		4.5E-01	1.0E+00	1.9E-01	1.3E-03	1		Yes
Acetochlor	34256-82-1	2.7E+02	O	2.2E-08	9.1E-07	No	0	2.2E-02	5.6E-06	3.0E+02		6.0E-01	6.0E-01	2.2E+02	2.2E+05			1.6E+02	8.0E-01	0.1	1			5.0E-03		8.2E+00	9.0E-01	3.4E+00	3.1E-02	1		Yes
Acetone	67-64-1	5.8E+01	O	3.5E-05	1.4E-03	Yes	1	1.1E-01	1.2E-05	2.4E+00		4.7E-03	4.7E-03	1.0E+06	1.0E+09	7.8E-05	1.4E+04	1.0E+05	2.0E-01		1			5.1E-04		5.3E-01	1.0E+00	2.2E-01	1.5E-03	1		Yes
Acetone cyanohydrin	75-86-5	8.5E+01	O	2.0E-09	8.1E-08	No	0	8.6E-02	1.0E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			5.0E-04		7.6E-01	1.0E+00	3.2E-01	1.8E-03	1		Yes
Acetonitrile	75-05-8	4.1E+01	O	3.5E-05	1.4E-03	Yes	1	1.3E-01	1.4E-05	4.7E+00		9.3E-03	9.3E-03	1.0E+06	1.0E+09	9.3E-05	1.3E+04	1.1E+05	2.1E-01		1			5.5E-04		4.3E-01	1.0E+00	1.8E-01	1.4E-03	1		Yes
Acrolein	107-02-8	5.6E+01	O	1.2E-04	5.0E-03	Yes	1	1.1E-01	1.2E-05	1.0E+00		2.0E-03	2.0E-03	2.1E+05	2.1E+08	2.9E-04	6.9E+03	2.2E+04	2.0E-01		1			7.5E-04		5.2E-01	1.0E+00	2.2E-01	2.2E-03	1		Yes
Acrylamide	79-06-1	7.1E+01	O	1.7E-09	7.0E-08	No	0	1.1E-01	1.3E-05	5.7E+00		1.1E-02	1.1E-02	3.9E+05	3.9E+08			4.3E+04	2.1E-01	0.1	1			2.2E-04		6.3E-01	1.0E+00	2.6E-01	7.3E-04	1	M	Yes
Acrylic acid	79-10-7	7.2E+01	O	3.7E-07	1.5E-05	Yes	1	1.0E-01	1.2E-05	1.4E+00		2.9E-03	2.9E-03	1.0E+06	1.0E+09	1.5E-06	9.5E+04	1.0E+05	2.0E-01		1			1.1E-03		6.4E-01	1.0E+00	2.7E-01	3.4E-03	1		Yes
Acrylonitrile	107-13-1	5.3E+01	O	1.4E-04	5.6E-03	Yes	1	1.1E-01	1.2E-05	8.5E+00		1.7E-02	1.7E-02	7.5E+04	7.5E+07	2.9E-04	7.7E+03	8.8E+03	2.2E-01		1			1.2E-03		5.0E-01	1.0E+00	2.1E-01	3.3E-03	1		Yes
Alachlor	15972-60-8	2.7E+02	O	8.3E-09	3.4E-07	No	0	2.3E-02	5.7E-06	3.1E+02		6.2E-01	6.2E-01	2.4E+02	2.4E+05			1.7E+02	8.2E-01	0.1	1	2	2	1.1E-02		8.2E+00	9.0E-01	3.4E+00	6.6E-02	1		Yes
Aldicarb	116-06-3	1.9E+02	O	1.4E-09	5.9E-08	No	0	3.2E-02	7.2E-06	2.5E+01		4.9E-02	4.9E-02	6.0E+03	6.0E+06			9.0E+02	2.5E-01	0.1	1		3	7.6E-04		2.9E+00	1.0E+00	1.2E+00	4.0E-03	1		Yes
Aldicarb sulfone	1646-88-4	2.2E+02	O	3.4E-09	1.4E-07	No	0	5.2E-02	6.1E-06	1.0E+01		2.0E-02	2.0E-02	1.0E+04	1.0E+07			1.2E+03	2.2E-01	0.1	1		2	3.7E-05		4.4E+00	1.0E+00	1.8E+00	2.1E-04	1		Yes
Aldrin	309-00-2	3.6E+02	O	4.4E-05	1.8E-03	No	1	2.3E-02	5.8E-06	8.2E+04		1.6E+02	1.6E+02	1.7E-02	1.7E+01	1.4E-08	1.7E+06	2.8E+00	1.6E+02		1			2.9E-01		4.8E+01	1.0E+00	1.2E+01	2.2E+00	1		No
Allyl alcohol	107-18-6	5.8E+01	O	5.0E-06	2.0E-04	Yes	1	1.1E-01	1.2E-05	1.9E+00		3.8E-03	3.8E-03	1.0E+06	1.0E+09	1.2E-05	3.4E+04	1.0E+05	2.0E-01		1			9.6E-04		5.3E-01	1.0E+00	2.2E-01	2.8E-03	1		Yes
Allyl chloride	107-05-1	7.7E+01	O	1.1E-02	4.5E-01	Yes	1	9.4E-02	1.1E-05	4.0E+01		7.9E-02	7.9E-02	3.4E+03	3.4E+06	8.5E-03	1.6E+03	8.9E+02	3.2E-01		1			1.1E-02		6.8E-01	1.0E+00	2.8E-01	3.8E-02	1		Yes
Aluminum	7429-90-5	2.7E+01	I			No	0				1.5E+03	1.5E+03	1.5E+03						1.5E+03		1	50			1.0E-03	3.6E-01	1.0E+00	1.5E-01	2.0E-03	1		Yes
Aluminum phosphide	20859-73-8	5.8E+01	I			No	0														1				1.0E-03	5.3E-01	1.0E+00	2.2E-01	2.9E-03	1		Yes
Ametryn	834-12-8	2.3E+02	O	2.4E-09	9.9E-08	No	0	5.1E-02	6.0E-06	4.3E+02		8.6E-01	8.6E-01	2.1E+02	2.1E+05			2.0E+02	1.1E+00	0.1	1			7.9E-03		4.7E+00	1.0E+00	2.0E+00	4.6E-02	1		Yes
m-Aminophenol	591-27-5	1.1E+02	O	2.0E-10	8.1E-09	No	0	8.3E-02	9.7E-06	9.0E+01		1.8E-01	1.8E-01	2.7E+04	2.7E+07			7.6E+03	3.8E-01	0.1	1			5.3E-04		1.0E+00	1.0E+00	4.3E-01	2.1E-03	1		Yes
Amitraz	33089-61-1	2.9E+02	O	9.9E-06	4.0E-04	No	0	2.2E-02	5.4E-06	2.6E+05		5.1E+02	5.1E+02	1.0E+00	1.0E+03			5.1E+02	5.1E+02	0.1	1			1.6E-01		1.8E+01	9.0E-01	4.6E+00	1.1E+00	1		Yes
Ammonia +++	7664-41-7	1.7E+01	I	1.6E-05	6.6E-04	Yes	1	2.3E-01	2.2E-05					4.8E+05	4.8E+08						1				1.0E-03	3.1E-01	1.0E+00	1.3E-01	1.6E-03	1		
Ammonium sulfamate	7773-06-0	1.1E+02	I			No	0							1.3E+06	1.3E+09						1				1.0E-03	1.1E+00	1.0E+00	4.6E-01	4.1E-03	1		Yes
Aniline	62-53-3	9.3E+01	O	2.0E-06	8.3E-05	No	0	8.3E-02	1.0E-05	7.0E+01		1.4E-01	1.4E-01	3.6E+04	3.6E+07			8.7E+03	3.4E-01	0.1	1			1.9E-03		8.4E-01	1.0E+00	3.5E-01	6.9E-03	1		Yes
Antimony and compounds	7440-36-0	1.2E+02	I			No	0				4.5E+01	4.5E+01	4.5E+01						4.5E+01		0.15	6	6		1.0E-03	1.2E+00	1.0E+00	5.1E-01	4.2E-03	1		Yes
Antimony pentoxide	1314-60-9	3.2E+02	I			No	0							3.0E+03	3.0E+06						0.15				1.0E-03	1.6E+01	1.0E+00	6.8E+00	6.9E-03	1		Yes
Antimony potassium tartrate	28300-74-5	6.7E+02	I			No	0							5.3E+04	5.3E+07						0.15	6			1.0E-03					1		Yes
Antimony tetroxide	1332-81-6	3.1E+02	I			No	0														0.15				1.0E-03	1.3E+01	1.0E+00	5.5E+00	6.7E-03	1		Yes
Antimony trioxide	1309-64-4	2.9E+02	I			No	0														0.15				1.0E-03	1.1E+01	1.0E+00	4.5E+00	6.6E-03	1		Yes
Arsenic (inorganic) +++	7440-38-2	6.7E+01	I			No	0							5.3E+04	5.3E+07						0.15	10	10		1.0E-03					1		Yes
Arsine	7784-42-1	7.8E+01	O			No	0							2.0E+05	2.0E+08						1			1.0E-03		6.9E-01	1.0E+00	2.9E-01	3.4E-03	1		Yes
Assure	76578-14-8	3.7E+02	O	1.1E-08	4.3E-07	No	0	3.7E-02	4.3E-06	7.7E+03		1.5E+01	1.5E+01	3.0E-01	3.0E+02			4.7E+00	1.6E+01	0.1	1			8.9E-03		3.1E+01	9.0E-01	1.3E+01	6.6E-02	1		Yes
Asulam	3337-71-1	2.3E+02	O	1.7E-12	7.0E-11	No	0	5.1E-02	5.9E-06	2.8E+01		5.6E-02	5.6E-02	5.0E+03	5.0E+06			7.8E+02	2.6E-01	0.1	1			5.3E-05		4.9E+00	1.0E+00	2.0E+00	3.1E-04	1		Yes
Atrazine	1912-24-9	2.2E+02	O	2.4E-09	9.6E-08	No	0	2.6E-02	6.8E-06	2.2E+02		4.5E-01	4.5E-01	3.5E+01	3.5E+04			1.9E+01	6.5E-01	0.1	1	3	3	5.2E-03		4.1E+00	1.0E+00	1.7E+00	3.0E-02	1		Yes
Avermectin B1	65195-55-3	8.8E+02	O	1.3E-27	5.4E-26	No	0	2.1E-02	2.4E-06	8.8E+05		1.8E+03	1.8E+03	3.5E-04	3.5E-01			6.1E-01	1.8E+03	0.1	1			1.8E-05		2.0E+04	1.0E+00	8.4E+03	2.1E-04	1		No
Azobenzene	103-33-3	1.8E+02	O	1.4E-05	5.5E-04	No	1	3.6E-02	7.5E-06	3.8E+03		7.5E+00	7.5E+00	6.4E+00	6.4E+03	1.4E-07	5.2E+05	4.9E+01	7.7E+00		1			5.1E-02		2.6E+00	1.0E+00	1.1E+00	2.7E-01	1		Yes
Barium and compounds	7440-39-3	1.4E+02	I			No	0				4.1E+01	4.1E+01	4.1E+01						4.1E+01		0.07	2000	2000		1.0E-03	1.5E+00	1.0E+00	6.2E-01	4.5E-03	1		Yes
Benfluralin (Benefin)	1861-40-1	3.4E+02	O	2.9E-04	1.2E-02	No	1	2.2E-02	5.5E-06	1.6E+04		3.3E+01	3.3E+01	1.0E-01	1.0E+02	4.2E-07	3.1E+05	3.3E+00	3.3E+01		1			6.8E-02		1.9E+01	8.0E-01	7.9E+00	4.8E-01	1		Yes
Bensulfuron-methyl (Londax)	83055-99-6	4.1E+02	O	3.8E-15	1.5E-13	No	0	3.4E-02	4.0E-06	2.8E+01		5.6E-02	5.6E-02	1.2E+02	1.2E+05			1.9E+01	2.6E-01	0.1	1			2.2E-04		5.0E+01	1.0E+00	2.1E+01	1.7E-03	1		Yes
Bentazone (Bentazon)	25057-89-0	2.4E+02	O	2.2E-09	8.9E-08	No	0	4.9E-02	5.7E-06	1.0E+01		2.0E-02	2.0E-02	5.0E+02	5.0E+05			6.0E+01	2.2E-01	0.1	1			2.5E-03		5.6E+00	1.0E+00	2.3E+00	1.5E-02	1		Yes
Benzaldehyde	100-52-7	1.1E+02	O	2.7E-05	1.1E-03	Yes	1	7.4E-02	9.5E-06	1.1E+01		2.2E-02	2.2E-02	7.0E+03	7.0E+06	3.6E-05	2.2E+04	8.5E+02	2.2E-01		1			3.8E-03		9.9E-01	1.0E+00	4.1E-01	1.5E-02	1		Yes
Benzene	71-43-2	7.8E+01	O	5.6E-03	2.3E-01	Yes	1	9.0E-02	1.0E-05	1.5E+02		2.9E-01	2.9E-01	1.8E+03	1.8E+06	2.5E-03	3.5E+03	7.8E+02	5.1E-01		1	5	5	1.5E-02		6.9E-01	1.0E+00	2.9E-01	5.1E-02	1		Yes
Benzidine	92-87-5	1.8E+02	O	5.2E-11	2.1E-09	No	0	3.5E-02	7.5E-06	1.2E+03		2.4E+00	2.4E+00	3.2E+02	3.2E+05			8.0E+02	2.6E+00	0.1	1			1.1E-03		2.7E+00	1.0E+00	1.1E+00	5.9E-03	1	M	Yes
Benzoic acid	65-85-0	1.2E+02	O	3.8E-08	1.6E-06	No	0	7.0E-02	9.8E-06	6.0E-01		1.2E-03	1.2E-03	3.4E+03	3.4E+06			3.4E+02	2.0E-01	0.1	1			5.7E-03		1.2E+00	1.0E+00	5.1E-01	2.4E-02	1		Yes
Benzotrichloride	98-07-7	2.0E+02	O	2.6E-04	1.1E-02	No	1	3.1E-02	7.7E-06	1.0E+03		2.0E+00	2.0E+00	5.3E+01	5.3E+04	8.4E-06	6.8E+04	1.1E+02	2.2E+00		1			4.9E-02		3.1E+00	1.0E+00	1.3E+00	2.6E-01	1		Yes
Benzyl alcohol	100-51-6	1.1E+02	O	3.4E-07	1.4E-05	No	0	7.3E-02	9.4E-06	2.1E+01		4.3E-02	4.3E-02	4.3E+04	4.3E+07			6.1E+03	2.4E-01	0.1	1			2.1E-03		1.0E+00	1.0E+00	4.2E-01	8.4E-03	1		Yes
Benzyl chloride	100-44-7	1.3E+02	O	4.1E-04	1.7E-02	Yes	1	6.3E-02	8.8E-06	4.5E+02		8.9E-01	8.9E-01	5.3E+02	5.3E+05	5.7E-05	2.5E+04	5.2E+02	1.1E+00		1			1.0E-02		1.3E+00	1.0E+00	5.4E-01	4.5E-02	1		Yes
Beryllium and compounds	7440-41-7	9.0E+00	I			No	0				7.9E+02	7.9E+02	7.9E+02						7.9E+02		0.007	4	4		1.0E-03	2.8E-01	1.0E+00	1.2E-01	1.2E-03	1		Yes
Biphenthrin (Talstar)	82657-04-3	4.2E+02	O	1.0E-06	4.1E-05	No	0	1.8E-02	4.5E-06	2.3E+06		4.5E+03	4.5E+03	1.0E-03	1.0E+00			4.5E+00	4.5E+03	0.1	1			1.7E+00		1.1E+02	0.0E+00	2.5E+01	1.4E+01	1		Yes
1,1-Biphenyl	92-52-4	1.5E+02	O	3.1E-04	1.3E-02	No	1	4.7E-02	7.6E-06	5.1E+03		1.0E+01	1.0E+01	7.5E+00	7.5E+03	3.1E-06	1.1E+05	7.7E+01	1.0E+01		1			9.4E-02		1.8E+00	1.0E+00	7.7E-01	4.5E-01	1		Yes
Bis(2-chloroethyl)ether	111-44-4	1.4E+02	O	1.7E-05	7.0E-04	Yes	1	5.7E-02	8.7E-06	3.2E+01		6.4E-02	6.4E-02	1.7E+04	1.7E+07	1.3E-05	4.3E+04	2.8E+03	2.6E-01		1			1.8E-03		1.6E+00	1.0E+00	6.6E-01	8.2E-03	1		Yes
Bis(chloromethyl)ether	542-88-1	1.1E+02	O	4.4E-03	1.8E-01	Yes	1	7.6E-02	1.0E-05	9.7E+00		1.9E-02	1.9E-02	2.2E+04	2.2E+07	4.7E-03	1.9E+03	3.4E+03	2.4E-01		1			8.6E-04		1.1E+00	1.0E+00	4.6E-01	3.5E-03	1		Yes
Bis(2-chloro-1-methylethyl)ether	108-60-1	1.7E+02	O	7.4E-05	3.0E-03	No	1	4.0E-02	7.4E-06	8.3E+01		1.7E-01	1.7E-01	1.7E+03	1.7E+06	2.4E-05	3.5E+04	4.5E+02	3.7E-01		1			7.6E-03		2.3E+00	1.0E+00	9.5E-01	3.8E-02	1		Yes
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3.9E+02	O	2.7E-07	1.1E-05	No	0	1.7E-02	4.2E-06	1.2E+05		2.4E+02	2.4E+02	2.7E-01	2.7E+02			6.5E+01	2.4E+02	0.1	1	6	6	1.1E+00		7.3E+01	8.0E-01	1.6E+01	8.6E+00	1		No
Bisphenol A	80-05-7	2.3E+02	O	1.0E-11	4.1E-10	No	0	2.5E-02	6.5E-06	3.8E+04		7.5E+01	7.5E+01	1.2E+02	1.2E+05			9.1E+03	7.6E+01	0.1	1			1.3E-02		4.8E+00	1.0E+00	2.0E+00	7.7E-02	1		Yes
Boron	7440-42-8	1.4E+01	I			No	0				3.0E+00	3.0E+00	3.0E+00						3.2E+00		1				1.0E-03	3.0E-01	1.0E+00	1.3E-01	1.4E-03	1		Yes
Boron trifluoride	7637-07-2	6.8E+01	I			Yes	1	1.6E-01	2.2E-05					3.3E+06	3.3E+09						1				1.0E-03	6.1E-01	1.0E+00	2.5E-01	3.2E-03	1		Yes
Bromate	15541-45-4	8.0E+01	I			No	0				7.5E+00	7.5E+00	7.5E+00						7.7E+00		1		10		1.0E-03	7.1E-01	1.0E+00	2.9E-01	3.4E-03	1		Yes
Bromobenzene	108-86-1	1.6E+02	O	2.5E-03	1.0E-01	Yes	1	5.4E-02	9.3E-06	2.3E+02		4.7E-01	4.7E-01	4.5E+02	4.5E+05	4.9E-04	8.4E+03	2.6E+02	6.8E-01		1			2.0E-02		1.9E+00	1.0E+00	8.0E-01	9.6E-02	1		Yes
Bromodichloromethane	75-27-4	1.6E+02	O	2.1E-03	8.7E-02	Yes	1	5.6E-02	1.1E-05	3.2E+01		6.4E-02	6.4E-02	3.0E+03	3.0E+06	1.4E-03	4.0E+03	5.5E+02	2.7E-01		1	100	80	4.0E-03		2.1E+00	1.0E+00	8.7E-01	2.0E-02	1		Yes
Bromoform (Tribromomethane)	75-25-2	2.5E+02	O	5.4E-04	2.2E-02	Yes	1	3.6E-02	1.0E-05	3.2E+01		6.4E-02	6.4E-02	3.1E+03	3.1E+06	2.5E-04	9.7E+03	5.2E+02	2.7E-01		1	100	80	2.4E-03		6.6E+00	1.0E+00	2.7E+00	1.4E-02	1		Yes
Bromomethane	74-83-9	9.5E+01	O	7.3E-03	3.0E-01	Yes	1	1.0E-01	1.4E-05	1.3E+01		2.6E-02	2.6E-02	1.5E+04	1.5E+07	8.8E-03	1.4E+03	2.8E+03	2.5E-01		1			2.8E-03		8.6E-01	1.0E+00	3.6E-01	1.1E-02	1		Yes
Bromophos	2104-96-3	3.7E+02	O	2.1E-04	8.4E-03	No	1	2.3E-02	6.1E-06	2.0E+03		4.0E+00	4.0E+00	3.0E-01	3.0E+02	2.5E-06	1.2E+05	1.2E+00	4.2E+00		1			4.0E-02		2.8E+01	8.0E-01	1.2E+01	3.0E-01	1		Yes
Bromoxynil	1689-84-5	2.8E+02	O	1.3E-10	5.4E-09	No	0	4.5E-02	5.2E-06	3.3E+02		6.6E-01	6.6E-01	1.3E+02	1.3E+05			9.9E+01	8.6E-01	0.1	1			7.8E-03		9.0E+00	9.0E-01	3.7E+00	5.0E-02	1		Yes
Bromoxynil octanoate	1689-99-2	4.0E+02	O	3.2E-05	1.3E-03	No	1	2.1E-02	5.4E-06	4.3E+03		8.5E+00	8.5E+00	8.0E-02	8.0E+01	1.8E-07	4.7E+05	6.9E-01	8.7E+00		1			3.3E-02		4.6E+01	8.0E-01	1.9E+01	2.6E-01	1		Yes
1,3-Butadiene	106-99-0	5.4E+01	O	7.4E-02	3.0E+00	Yes	1	1.0E-01	1.0E-05	4.0E+01		7.9E-02	7.9E-02	7.4E+02	7.4E+05	2.1E-02	8.7E+02	5.5E+02	5.5E-01		1			1.6E-02		5.1E-01	1.0E+00	2.1E-01	4.6E-02	1		Yes
1-Butanol	71-36-3	7.4E+01	O	8.8E-06	3.6E-04	Yes	1	9.0E-02	1.0E-05	3.5E+00		6.9E-03	6.9E-03	6.3E+04	6.3E+07	1.7E-05	3.0E+04	6.8E+03	2.1E-01		1			2.3E-03		6.6E-01	1.0E+00	2.7E-01	7.6E-03	1		Yes
Butylate	2008-41-5	2.2E+02	O	8.5E-05	3.5E-03	No	1	2.3E-02	5.8E-06	3.9E+02		7.7E-01	7.7E-01	4.5E+01	4.5E+04	4.9E-06	8.6E+04	3.9E+01	9.7E-01		1			5.4E-02		4.2E+00	1.0E+00	1.7E+00	3.1E-01	1		Yes
Butyl benzyl phthalate	85-68-7	3.1E+02	O	1.3E-06	5.2E-05	No	0	2.1E-02	5.2E-06	7.2E+03		1.4E+01	1.4E+01	2.7E+00	2.7E+03			3.9E+01	1.5E+01	0.1	1			3.9E-02		1.4E+01	9.0E-01	5.9E+00	2.6E-01	1		Yes
Butylphthalyl butylglycolate	85-70-1	3.4E+02	O	2.1E-08	8.4E-07	No	0	2.0E-02	4.9E-06	1.1E+04		2.2E+01	2.2E+01	8.8E+00	8.8E+03			2.0E+02	2.3E+01	0.1	1			1.2E-02		1.9E+01	9.0E-01	8.0E+00	8.2E-02	1		Yes
Cacodylic acid	75-60-5	1.4E+02	O	1.8E-14	7.4E-13	No	0	7.1E-02	8.3E-06	4.4E+01		8.8E-02	8.8E-02	2.0E+06	2.0E+09			3.8E+05	2.9E-01	0.1	1			4.6E-04		1.5E+00	1.0E+00	6.2E-01	2.1E-03	1		Yes
Cadmium and compounds +++	7440-43-9	1.1E+02	I			No	0				7.5E+01	7.5E+01	7.5E+01						7.5E+01	0.001	0.025	5	5		1.0E-03	1.1E+00	1.0E+00	4.5E-01	4.1E-03	1		
Camphechlor (Toxaphene)	8001-35-2	4.5E+02	O	6.0E-06	2.5E-04	No	0	3.2E-02	3.8E-06	7.7E+04		1.5E+02	1.5E+02	5.5E-01	5.5E+02			8.5E+01	1.5E+02	0.1	1	3	3	5.2E-02		8.2E+01	8.0E-01	3.4E+01	4.2E-01	1		No
Caprolactam	105-60-2	1.1E+02	O	2.5E-08	1.0E-06	No	0	6.9E-02	9.0E-06	2.5E+01		4.9E-02	4.9E-02	7.7E+05	7.7E+08			1.2E+05	2.5E-01	0.1	1			1.0E-03		1.1E+00	1.0E+00	4.5E-01	4.1E-03	1		Yes
Captafol	2425-06-1	3.5E+02	O	4.9E-09	2.0E-07	No	0	3.8E-02	4.5E-06	7.8E+02		1.6E+00	1.6E+00	1.4E+00	1.4E+03			2.3E+00	1.8E+00	0.1	1			5.8E-03		2.3E+01	9.0E-01	9.5E+00	4.1E-02	1		Yes
Captan	133-06-2	3.0E+02	O	7.0E-09	2.9E-07	No	0	2.6E-02	6.9E-06	2.5E+02		5.0E-01	5.0E-01	5.1E+00	5.1E+03			3.1E+00	7.0E-01	0.1	1			2.3E-03		1.2E+01	1.0E+00	5.1E+00	1.6E-02	1		Yes
Carbaryl	63-25-2	2.0E+02	O	3.3E-09	1.3E-07	No	0	2.7E-02	7.1E-06	3.5E+02		7.1E-01	7.1E-01	1.1E+02	1.1E+05			8.9E+01	9.1E-01	0.1	1			4.3E-03		3.4E+00	1.0E+00	1.4E+00	2.4E-02	1		Yes
Carbofuran	1563-66-2	2.2E+02	O	3.1E-09	1.3E-07	No	0	2.6E-02	6.6E-06	9.5E+01		1.9E-01	1.9E-01	3.2E+02	3.2E+05			9.3E+01	3.9E-01	0.1	1	40	40	3.1E-03		4.4E+00	1.0E+00	1.8E+00	1.8E-02	1		Yes
Carbon disulfide	75-15-0	7.6E+01	O	1.4E-02	5.9E-01	Yes	1	1.1E-01	1.3E-05	2.2E+01		4.3E-02	4.3E-02	2.2E+03	2.2E+06	1.3E-02	1.2E+03	5.5E+02	3.0E-01		1			1.1E-02		6.7E-01	1.0E+00	2.8E-01	3.8E-02	1		Yes
Carbon tetrachloride	56-23-5	1.5E+02	O	2.8E-02	1.1E+00	Yes	1	5.7E-02	9.8E-06	4.4E+01		8.8E-02	8.8E-02	7.9E+02	7.9E+05	8.6E-03	1.5E+03	3.2E+02	3.9E-01		1	5	5	1.6E-02		1.8E+00	1.0E+00	7.6E-01	7.8E-02	1		Yes
Carbosulfan	55285-14-8	3.8E+02	O	5.1E-07	2.1E-05	No	0	1.8E-02	4.4E-06	1.2E+04		2.4E+01	2.4E+01	3.0E-01	3.0E+02			7.2E+00	2.4E+01	0.1	1			5.8E-02		3.4E+01	8.0E-01	1.4E+01	4.3E-01	1		Yes
Carboxin	5234-68-4	2.4E+02	O	3.2E-10	1.3E-08	No	0	5.0E-02	5.8E-06	1.7E+02		3.4E-01	3.4E-01	1.5E+02	1.5E+05			6.5E+01	5.4E-01	0.1	1			2.0E-03		5.2E+00	1.0E+00	2.2E+00	1.2E-02	1		Yes
Chloramben	133-90-4	2.1E+02	O	3.9E-11	1.6E-09	No	0	5.4E-02	6.4E-06	2.1E+01		4.3E-02	4.3E-02	7.0E+02	7.0E+05			1.0E+02	2.4E-01	0.1	1			2.0E-03		3.6E+00	1.0E+00	1.5E+00	1.1E-02	1		Yes
Chloranil	118-75-2	2.5E+02	O	3.3E-10	1.3E-08	No	0	4.8E-02	5.7E-06	3.1E+02		6.2E-01	6.2E-01	2.5E+02	2.5E+05			1.8E+02	8.2E-01	0.1	1			1.9E-03		6.0E+00	1.0E+00	2.5E+00	1.2E-02	1		Yes
Chlordane	12789-03-6	4.1E+02	O	4.9E-05	2.0E-03	No	1	2.1E-02	5.4E-06	6.8E+04		1.4E+02	1.4E+02	5.6E-02	5.6E+01	1.7E-08	1.5E+06	7.6E+00	1.4E+02	0.04	1	2	2	1.1E-01		8.0E+01	7.0E-01	2.1E+01	8.3E-01	1		Yes
Chlordecone (Kepone)	143-50-0	4.9E+02	O	5.4E-08	2.2E-06	No	0	2.0E-02	4.9E-06	1.8E+04		3.5E+01	3.5E+01	2.7E+00	2.7E+03			9.5E+01	3.5E+01	0.1	1			1.1E-02		1.4E+02	8.0E-01	5.9E+01	9.3E-02	1		Yes
Chlorimuron-ethyl	90982-32-4	4.1E+02	O	1.8E-15	7.4E-14	No	0	3.4E-02	4.0E-06	7.2E+01		1.4E-01	1.4E-01	1.2E+03	1.2E+06			2.9E+02	3.4E-01	0.1	1			3.4E-04		5.3E+01	1.0E+00	2.2E+01	2.6E-03	1		Yes
Chlorine	7782-50-5	7.1E+01	I	1.2E-02	4.8E-01	Yes	1	1.5E-01	2.2E-05		2.5E-01	2.5E-01	2.5E-01	6.3E+03	6.3E+06	8.9E-03	1.2E+03	2.8E+03	4.9E-01		1				1.0E-03	6.3E-01	1.0E+00	2.6E-01	3.2E-03	1		Yes
Chlorine dioxide	10049-04-4	6.7E+01	I	4.0E-02	1.6E+00	Yes	1	1.6E-01	2.2E-05												1				1.0E-03	6.0E-01	1.0E+00	2.5E-01	3.2E-03	1		Yes
Chloroacetic acid	79-11-8	9.4E+01	O	9.3E-09	3.8E-07	No	0	9.4E-02	1.2E-05	1.4E+00		2.9E-03	2.9E-03	8.6E+05	8.6E+08			8.8E+04	2.0E-01	0.1	1		60	6.5E-04		8.5E-01	1.0E+00	3.6E-01	2.4E-03	1		Yes
2-Chloroacetophenone	532-27-4	1.5E+02	O	3.5E-06	1.4E-04	No	0	5.2E-02	8.7E-06	9.9E+01		2.0E-01	2.0E-01	1.1E+03	1.1E+06			3.3E+02	4.0E-01	0.1	1			4.1E-03		1.9E+00	1.0E+00	7.7E-01	1.9E-02	1		Yes
4-Chloroaniline	106-47-8	1.3E+02	O	1.2E-06	4.7E-05	No	0	7.0E-02	1.0E-05	1.1E+02		2.3E-01	2.3E-01	3.9E+03	3.9E+06			1.3E+03	4.3E-01	0.1	1			5.0E-03		1.3E+00	1.0E+00	5.4E-01	2.2E-02	1		Yes
Chlorobenzene	108-90-7	1.1E+02	O	3.1E-03	1.3E-01	Yes	1	7.2E-02	9.5E-06	2.3E+02		4.7E-01	4.7E-01	5.0E+02	5.0E+05	8.3E-04	6.4E+03	2.9E+02	6.8E-01		1	100	100	2.8E-02		1.1E+00	1.0E+00	4.5E-01	1.2E-01	1		Yes
Chlorobenzilate	510-15-6	3.3E+02	O	7.2E-08	3.0E-06	No	0	2.2E-02	5.5E-06	1.5E+03		3.1E+00	3.1E+00	1.3E+01	1.3E+04			4.1E+01	3.3E+00	0.1	1			3.3E-02		1.7E+01	8.0E-01	7.0E+00	2.3E-01	1		Yes
p-Chlorobenzoic acid	74-11-3	1.6E+02	O	8.0E-08	3.3E-06	No	0	5.5E-02	9.5E-06	2.7E+01		5.3E-02	5.3E-02	7.2E+01	7.2E+04			1.1E+01	2.5E-01	0.1	1			1.2E-02		1.9E+00	1.0E+00	7.9E-01	5.8E-02	1		Yes
4-Chlorobenzotrifluoride	98-56-6	1.8E+02	O	3.5E-02	1.4E+00	Yes	1	3.8E-02	8.0E-06	1.6E+03		3.2E+00	3.2E+00	2.9E+01	2.9E+04	8.1E-04	6.8E+03	1.0E+02	3.5E+00		1			3.8E-02		2.6E+00	1.0E+00	1.1E+00	1.9E-01	1		Yes
2-Chloro-1,3-butadiene	126-99-8	8.9E+01	O	5.6E-02	2.3E+00	Yes	1	8.4E-02	1.0E-05	6.1E+01		1.2E-01	1.2E-01	8.7E+02	8.7E+05	1.6E-02	1.1E+03	5.7E+02	5.3E-01		1			2.4E-02		7.9E-01	1.0E+00	3.3E-01	8.6E-02	1		Yes
1-Chlorobutane	109-69-3	9.3E+01	O	1.7E-02	6.8E-01	Yes	1	7.8E-02	9.3E-06	7.2E+01		1.4E-01	1.4E-01	1.1E+03	1.1E+06	7.6E-03	1.8E+03	4.1E+02	4.1E-01		1			2.7E-02		8.3E-01	1.0E+00	3.5E-01	1.0E-01	1		Yes
1-Chloro-1,1-difluoroethane	75-68-3	1.0E+02	O	5.9E-02	2.4E+00	Yes	1	8.0E-02	1.0E-05	4.4E+01		8.8E-02	8.8E-02	1.4E+03	1.4E+06	1.6E-02	1.0E+03	9.0E+02	5.0E-01		1			9.9E-03		9.2E-01	1.0E+00	3.8E-01	3.8E-02	1		Yes
Chlorodifluoromethane	75-45-6	8.6E+01	O	4.1E-02	1.7E+00	Yes	1	1.0E-01	1.3E-05	3.2E+01		6.4E-02	6.4E-02	2.8E+03	2.8E+06	1.9E-02	9.4E+02	1.3E+03	4.1E-01		1			2.7E-03		7.7E-01	1.0E+00	3.2E-01	9.6E-03	1		Yes
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	3.3E+02	O	1.9E-07	7.8E-06	No	0	2.0E-02	5.0E-06	5.6E+03		1.1E+01	1.1E+01	5.9E-01	5.9E+02			6.6E+00	1.1E+01	0.1	1			3.3E-02		1.9E+01	8.0E-01	7.9E+00	2.3E-01	1		Yes
Chloroform	67-66-3	1.2E+02	O	3.7E-03	1.5E-01	Yes	1	7.7E-02	1.1E-05	3.2E+01		6.4E-02	6.4E-02	8.0E+03	8.0E+06	3.2E-03	2.6E+03	1.5E+03	2.8E-01		1	100	80	6.8E-03		1.2E+00	1.0E+00	4.9E-01	2.9E-02	1		Yes
Chloromethane	74-87-3	5.0E+01	O	8.8E-03	3.6E-01	Yes	1	1.2E-01	1.4E-05	1.3E+01		2.6E-02	2.6E-02	5.3E+03	5.3E+06	1.2E-02	1.2E+03	1.0E+03	2.6E-01		1			3.3E-03		4.8E-01	1.0E+00	2.0E-01	9.0E-03	1		Yes
4-Chloro-2-methylaniline hydrochloride	3165-93-3	1.8E+02	O	1.6E-06	6.4E-05	No	0	6.0E-02	7.0E-06	3.5E+02		7.0E-01	7.0E-01	9.5E+02	9.5E+05			7.7E+02	9.0E-01	0.1	1			1.8E-05		2.5E+00	1.0E+00	1.0E+00	9.2E-05	1		Yes
beta-Chloronaphthalene	91-58-7	1.6E+02	O	3.2E-04	1.3E-02	No	1	4.5E-02	7.7E-06	2.5E+03		5.0E+00	5.0E+00	1.2E+01	1.2E+04	6.2E-06	8.0E+04	5.9E+01	5.2E+00	0.13	1			7.5E-02		2.1E+00	1.0E+00	8.6E-01	3.7E-01	1		Yes
o-Chloronitrobenzene	88-73-3	1.6E+02	O	9.3E-06	3.8E-04	No	0	5.1E-02	8.8E-06	3.7E+02		7.4E-01	7.4E-01	4.4E+02	4.4E+05			3.7E+02	9.4E-01	0.1	1			6.3E-03		1.9E+00	1.0E+00	8.0E-01	3.0E-02	1		Yes
p-Chloronitrobenzene	100-00-5	1.6E+02	O	4.9E-06	2.0E-04	No	0	5.0E-02	8.5E-06	3.6E+02		7.3E-01	7.3E-01	2.3E+02	2.3E+05			1.9E+02	9.3E-01	0.1	1			7.9E-03		1.9E+00	1.0E+00	8.0E-01	3.8E-02	1		Yes
2-Chlorophenol	95-57-8	1.3E+02	O	1.1E-05	4.6E-04	Yes	1	6.6E-02	9.5E-06	3.9E+02		7.8E-01	7.8E-01	1.1E+04	1.1E+07	1.9E-06	1.4E+05	9.9E+03	9.8E-01		1			8.0E-03		1.3E+00	1.0E+00	5.5E-01	3.5E-02	1		Yes
Chlorothalonil	1897-45-6	2.7E+02	O	2.0E-06	8.2E-05	No	0	2.8E-02	7.3E-06	1.0E+03		2.1E+00	2.1E+00	8.1E-01	8.1E+02			1.8E+00	2.3E+00	0.1	1			5.4E-03		7.8E+00	9.0E-01	3.2E+00	3.4E-02	1		Yes
o-Chlorotoluene	95-49-8	1.3E+02	O	3.6E-03	1.5E-01	Yes	1	6.3E-02	8.7E-06	3.8E+02		7.7E-01	7.7E-01	3.7E+02	3.7E+05	5.5E-04	8.1E+03	3.3E+02	9.8E-01		1			5.7E-02		1.3E+00	1.0E+00	5.4E-01	2.5E-01	1		Yes
Chlorpropham	101-21-3	2.1E+02	O	5.7E-07	2.3E-05	No	0	2.6E-02	6.7E-06	3.5E+02		7.0E-01	7.0E-01	8.9E+01	8.9E+04			7.1E+01	9.0E-01	0.1	1			2.1E-02		4.0E+00	9.0E-01	1.7E+00	1.2E-01	1		Yes
Chlorpyrifos	2921-88-2	3.5E+02	O	2.9E-06	1.2E-04	No	0	3.8E-02	4.5E-06	7.3E+03		1.5E+01	1.5E+01	1.1E+00	1.1E+03			1.6E+01	1.5E+01	0.1	1			3.3E-02		2.3E+01	8.0E-01	9.7E+00	2.4E-01	1		Yes
Chlorpyrifos-methyl	5598-13-0	3.2E+02	O	3.8E-06	1.5E-04	No	0	4.0E-02	4.7E-06	2.2E+03		4.4E+00	4.4E+00	4.8E+00	4.8E+03			2.1E+01	4.6E+00	0.1	1			1.8E-02		1.6E+01	9.0E-01	6.7E+00	1.2E-01	1		Yes
Chlorsulfuron	64902-72-3	3.6E+02	O	3.4E-16	1.4E-14	No	0	3.8E-02	4.4E-06	3.2E+02		6.4E-01	6.4E-01	3.1E+04	3.1E+07			2.3E+04	8.4E-01	0.1	1			3.3E-04		2.5E+01	1.0E+00	1.1E+01	2.4E-03	1		Yes
Chlorthiophos	60238-56-4	3.6E+02	O	1.2E-06	4.9E-05	No	0	3.7E-02	4.4E-06	1.3E+04		2.6E+01	2.6E+01	3.0E-01	3.0E+02			7.7E+00	2.6E+01	0.1	1			1.1E-01		4.3E+01	8.0E-01	1.1E+01	7.7E-01	1		Yes
Chromium, Total	7440-47-3	5.2E+01	I			No	0				1.8E+06	1.8E+06	1.8E+06						1.8E+06		0.013	100	100		1.0E-03	4.9E-01	1.0E+00	2.1E-01	2.8E-03	1		Yes
Chromium III *	16065-83-1	5.2E+01	I			No	0				1.8E+06	1.8E+06	1.8E+06						1.8E+06		0.013				1.0E-03	4.9E-01	1.0E+00	2.1E-01	2.8E-03	1		Yes
Chromium VI +++	18540-29-9	5.2E+01	I			No	0				1.9E+01	1.9E+01	1.9E+01	1.7E+06	1.7E+09				1.9E+01		0.025				2.0E-03	4.9E-01	1.0E+00	2.1E-01	5.5E-03	1	M	Yes
Clofentezine (Apollo)	74115-24-5	3.0E+02	O	3.9E-10	1.6E-08	No	0	4.2E-02	4.9E-06	3.0E+04		6.0E+01	6.0E+01	1.0E+00	1.0E+03			6.1E+01	6.1E+01	0.1	1			3.6E-03		1.3E+01	9.0E-01	5.2E+00	2.4E-02	1		Yes
Cobalt	7440-48-4	5.9E+01	I			No	0				4.5E+01	4.5E+01	4.5E+01						4.5E+01		1				4.0E-04	5.4E-01	1.0E+00	2.2E-01	1.2E-03	1		Yes
Coke Oven Emissions	8007-45-2		O	1.1E-02	4.5E-01	Yes	1	1.0E-01	1.2E-05	1.6E+04		3.2E+01	3.2E+01			7.7E-05			3.2E+01		1						0.0E+00			1	M	
Copper and compounds	7440-50-8	6.4E+01	I			No	0				3.5E+01	3.5E+01	3.5E+01						3.5E+01		1	1300	1300		1.0E-03	5.7E-01	1.0E+00	2.4E-01	3.1E-03	1		Yes
Crotonaldehyde	123-73-9	7.0E+01	O	1.9E-05	7.9E-04	Yes	1	9.6E-02	1.1E-05	1.8E+00		3.6E-03	3.6E-03	1.5E+05	1.5E+08	4.0E-05	1.9E+04	1.6E+04	2.0E-01		1			1.6E-03		6.2E-01	1.0E+00	2.6E-01	5.1E-03	1		Yes
Cumene (Isopropylbenzene)	98-82-8	1.2E+02	O	1.2E-02	4.7E-01	Yes	1	6.0E-02	7.9E-06	7.0E+02		1.4E+00	1.4E+00	6.1E+01	6.1E+04	9.5E-04	6.2E+03	9.7E+01	1.6E+00		1			9.0E-02		1.2E+00	1.0E+00	5.0E-01	3.8E-01	1		Yes
Cyanazine	21725-46-2	2.4E+02	O	2.6E-12	1.1E-10	No	0	4.9E-02	5.7E-06	1.3E+02		2.7E-01	2.7E-01	1.7E+02	1.7E+05			6.3E+01	4.7E-01	0.1	1			2.1E-03		5.6E+00	1.0E+00	2.3E+00	1.2E-02	1		Yes
Cyanide (free)	57-12-5	2.6E+01	I	1.0E-04	4.2E-03	Yes	1	2.1E-01	2.5E-05		9.9E+00	9.9E+00	9.9E+00	9.5E+04	9.5E+07	4.7E-06	5.3E+04	9.5E+05	1.0E+01		1	200	200		1.0E-03	3.5E-01	1.0E+00	1.5E-01	2.0E-03	1		Yes
Cyanide (hydrogen)	74-90-8	2.7E+01	I	1.3E-04	5.4E-03	Yes	1	1.7E-01	1.7E-05		9.9E+00	9.9E+00	9.9E+00	1.0E+06	1.0E+09	4.9E-06	5.2E+04	1.0E+07	1.0E+01		1				1.0E-03	3.6E-01	1.0E+00	1.5E-01	2.0E-03	1		Yes
Cyanogen	460-19-5	5.2E+01	I	5.4E-03	2.2E-01	Yes	1	1.2E-01	1.4E-05					8.0E+03	8.0E+06						1				8.9E-04	4.9E-01	1.0E+00	2.1E-01	2.5E-03	1		Yes

Contaminant	CAS	MW (g/mol)	Organic/ Inorganic	Henry's Law Constant H_units ($atm\text{-}m^3/mol$)	Henry's Law Constant H' (H_unitless) (unitless)	VP>1?	VOL	D_i (cm^2/s)	D_w (cm^2/s)	K_{oc} (organics) (cm^3/g)	K_d (inorganics) (cm^3/g)	$K_{d\ VF}$ (cm^3/g)	K_d_s_to_gw (cm^3/g)	S (mg/L-water)	S (µg/L-water)	D_A (cm^2/s)	VF (m^3/kg)	SAT (mg/kg)	soil-to-gw factor (kg/L)	ABS_d	ABS_{GI}	Title 118 MCL (µg/L)	EPA Fed MCL MCL (µg/L)	Kp.org (cm/hr)	Kp.inorg (cm/hr)	t_star (hr)	FA (unitless)	tau_event (hr)	B (unitless)	RBA (unitless)	Mutagen	In EPD?
Cyanogen bromide	506-68-3	1.1E+02	I	2.5E-02	1.0E+00	Yes	1	9.8E-02	1.4E-05												1				2.6E-04	9.9E-01	1.0E+00	4.1E-01	1.0E-03	1		Yes
Cyanogen chloride	506-77-4	6.1E+01	I	1.9E-03	7.9E-02	Yes	1	1.2E-01	1.4E-05					6.0E+04	6.0E+07						1				3.9E-04	5.6E-01	1.0E+00	2.3E-01	1.2E-03	1		Yes
Cyclohexane	110-82-7	8.4E+01	O	1.5E-01	6.1E+00	Yes	1	8.0E-02	9.1E-06	1.5E+02		2.9E-01	2.9E-01	5.5E+01	5.5E+04	1.7E-02	1.0E+03	8.5E+01	1.0E+00		1			1.0E-01		7.5E-01	1.0E+00	3.1E-01	3.6E-01	1		Yes
Cyclohexanone	108-94-1	9.8E+01	O	9.0E-06	3.7E-04	Yes	1	7.7E-02	9.4E-06	1.7E+01		3.5E-02	3.5E-02	2.5E+04	2.5E+07	1.2E-05	4.2E+04	3.4E+03	2.3E-01		1			1.5E-03		8.9E-01	1.0E+00	3.7E-01	5.8E-03	1		Yes
Cyclohexylamine	108-91-8	9.9E+01	O	4.2E-06	1.7E-04	Yes	1	7.1E-02	8.5E-06	3.2E+01		6.4E-02	6.4E-02	1.0E+06	1.0E+09	4.3E-06	7.5E+04	1.6E+05	2.6E-01		1			4.3E-03		9.1E-01	1.0E+00	3.8E-01	1.6E-02	1		Yes
Cyfluthrin (Baythroid)	68359-37-5	4.3E+02	O	2.9E-08	1.2E-06	No	0	3.3E-02	3.9E-06	1.3E+05		2.6E+02	2.6E+02	3.0E-03	3.0E+00			7.8E-01	2.6E+02	0.1	1			5.2E-02		6.8E+01	7.0E-01	2.8E+01	4.1E-01	1		Yes
Cyhalothrin (Karate)	68085-85-8	4.5E+02	O	1.5E-06	6.1E-05	No	0	3.2E-02	3.8E-06	3.4E+05		6.8E+02	6.8E+02	5.0E-03	5.0E+00			3.4E+00	6.8E+02	0.1	1			2.1E-01		1.4E+02	5.0E-01	3.5E+01	1.7E+00	1		No
Cyromazine	66215-27-8	1.7E+02	O	5.7E-14	2.3E-12	No	0	6.3E-02	7.3E-06	2.9E+01		5.7E-02	5.7E-02	1.3E+04	1.3E+07			2.0E+03	2.6E-01	0.1	1			8.0E-04		2.2E+00	1.0E+00	9.0E-01	4.0E-03	1		Yes
Dacthal	1861-32-1	3.3E+02	O	2.2E-06	8.9E-05	No	0	4.0E-02	4.6E-06	5.1E+02		1.0E+00	1.0E+00	5.0E-01	5.0E+02			5.6E-01	1.2E+00	0.1	1			1.5E-02		1.8E+01	9.0E-01	7.6E+00	1.1E-01	1		Yes
Dalapon	75-99-0	1.4E+02	O	5.7E-08	2.3E-06	No	0	6.0E-02	9.4E-06	3.2E+00		6.5E-03	6.5E-03	5.0E+05	5.0E+08			5.3E+04	2.1E-01	0.1	1	200	200	8.2E-04		1.6E+00	1.0E+00	6.6E-01	3.7E-03	1		Yes
Daminozide (Alar)	1596-84-5	1.6E+02	O	4.2E-10	1.7E-08	No	0	6.4E-02	7.5E-06	1.0E+01		2.0E-02	2.0E-02	1.0E+05	1.0E+08			1.2E+04	2.2E-01	0.1	1			2.0E-05		2.0E+00	1.0E+00	8.3E-01	9.7E-05	1		Yes
Demeton	8065-48-3	5.2E+02	O	3.8E-06	1.6E-04	No	0	1.6E-02	3.8E-06					6.7E+02	6.7E+05					0.1	1			7.6E-03		2.0E+02	8.0E-01	8.2E+01	6.6E-02	1		Yes
Diallate	2303-16-4	2.7E+02	O	3.8E-06	1.6E-04	No	0	4.5E-02	5.3E-06	6.4E+02		1.3E+00	1.3E+00	1.4E+01	1.4E+04			1.9E+01	1.5E+00	0.1	1			4.6E-02		8.2E+00	9.0E-01	3.4E+00	2.9E-01	1		Yes
Diazinon	333-41-5	3.0E+02	O	1.1E-07	4.6E-06	No	0	2.1E-02	5.2E-06	3.0E+03		6.1E+00	6.1E+00	4.0E+01	4.0E+04			2.5E+02	6.3E+00	0.1	1			1.0E-02		1.3E+01	9.0E-01	5.3E+00	7.0E-02	1		Yes
Dibenzofuran	132-64-9	1.7E+02	O	2.1E-04	8.7E-03	No	1	6.5E-02	7.4E-06	9.2E+03		1.8E+01	1.8E+01	3.1E+00	3.1E+03	1.6E-06	1.6E+05	5.7E+01	1.9E+01	0.03	1			9.8E-02		2.2E+00	1.0E+00	9.2E-01	4.9E-01	1		Yes
1,4-Dibromobenzene	106-37-6	2.4E+02	O	8.9E-04	3.7E-02	No	1	3.3E-02	9.3E-06	3.8E+02		7.5E-01	7.5E-01	2.0E+01	2.0E+04	7.6E-05	2.2E+04	1.7E+01	9.5E-01		1			2.5E-02		5.3E+00	9.0E-01	2.2E+00	1.4E-01	1		Yes
Dibromochloromethane	124-48-1	2.1E+02	O	7.8E-04	3.2E-02	Yes	1	3.7E-02	1.1E-05	3.2E+01		6.4E-02	6.4E-02	2.7E+03	2.7E+06	3.7E-04	7.9E+03	4.6E+02	2.7E-01		1	100	80	2.9E-03		3.7E+00	1.0E+00	1.5E+00	1.6E-02	1		Yes
1,2-Dibromo-3-chloropropane	96-12-8	2.4E+02	O	1.5E-04	6.0E-03	No	1	3.2E-02	8.9E-06	1.2E+02		2.3E-01	2.3E-01	1.2E+03	1.2E+06	3.1E-05	3.2E+04	4.1E+02	4.3E-01		1	0.2	0.2	6.9E-03		5.3E+00	1.0E+00	2.2E+00	4.1E-02	1	M	Yes
1,2-Dibromoethane	106-93-4	1.9E+02	O	6.5E-04	2.7E-02	Yes	1	4.3E-02	1.0E-05	4.0E+01		7.9E-02	7.9E-02	3.9E+03	3.9E+06	3.3E-04	8.6E+03	7.2E+02	2.8E-01		1	0.05	0.05	2.8E-03		2.8E+00	1.0E+00	1.2E+00	1.5E-02	1		Yes
Dibutyl phthalate	84-74-2	2.8E+02	O	1.8E-06	7.4E-05	No	0	2.1E-02	5.3E-06	1.2E+03		2.3E+00	2.3E+00	1.1E+01	1.1E+04			2.7E+01	2.5E+00	0.1	1			4.2E-02		9.1E+00	9.0E-01	3.8E+00	2.7E-01	1		Yes
Dicamba	1918-00-9	2.2E+02	O	2.2E-09	8.9E-08	No	0	2.9E-02	7.8E-06	2.9E+01		5.8E-02	5.8E-02	8.3E+03	8.3E+06			1.3E+03	2.6E-01	0.1	1			2.7E-03		4.4E+00	1.0E+00	1.8E+00	1.5E-02	1		Yes
1,2-Dichlorobenzene	95-50-1	1.5E+02	O	1.9E-03	7.8E-02	Yes	1	5.6E-02	8.9E-06	3.8E+02		7.7E-01	7.7E-01	1.6E+02	1.6E+05	2.7E-04	1.2E+04	1.4E+02	9.7E-01		1	600	600	4.5E-02		1.7E+00	1.0E+00	7.0E-01	2.1E-01	1		Yes
1,4-Dichlorobenzene	106-46-7	1.5E+02	O	2.4E-03	9.9E-02	Yes	1	5.5E-02	8.7E-06	3.8E+02		7.5E-01	7.5E-01	8.1E+01	8.1E+04	3.3E-04	1.0E+04	7.1E+01	9.6E-01		1	75	75	4.5E-02		1.7E+00	1.0E+00	7.0E-01	2.1E-01	1		Yes
3,3-Dichlorobenzidine	91-94-1	2.5E+02	O	2.8E-11	1.2E-09	No	0	4.7E-02	5.5E-06	3.2E+03		6.4E+00	6.4E+00	3.1E+00	3.1E+03			2.0E+01	6.6E+00	0.1	1			1.3E-02		6.6E+00	1.0E+00	2.8E+00	7.8E-02	1		Yes
4,4'-Dichlorobenzophenone	90-98-2	2.5E+02	O	1.1E-06	4.4E-05	No	0	2.6E-02	6.9E-06	2.9E+03		5.9E+00	5.9E+00	8.3E-01	8.3E+02			4.9E+00	6.1E+00	0.1	1			5.4E-02		6.4E+00	9.0E-01	2.7E+00	3.3E-01	1		Yes
1,4-Dichloro-2-butene	764-41-0	1.3E+02	O	8.5E-03	3.5E-01	Yes	1	6.7E-02	9.3E-06	1.3E+02		2.6E-01	2.6E-01	5.8E+02	5.8E+05	2.9E-03	3.2E+03	2.5E+02	4.9E-01		1			1.7E-02		1.3E+00	1.0E+00	5.3E-01	7.1E-02	1		Yes
Dichlorodifluoromethane	75-71-8	1.2E+02	O	3.4E-01	1.4E+01	Yes	1	7.6E-02	1.1E-05	4.4E+01		8.8E-02	8.8E-02	2.8E+02	2.8E+05	2.0E-02	8.4E+02	8.0E+02	1.5E+00		1			9.0E-03		1.2E+00	1.0E+00	5.0E-01	3.8E-02	1		Yes
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	3.2E+02	O	6.6E-06	2.7E-04	No	0	4.1E-02	4.7E-06	1.2E+05		2.4E+02	2.4E+02	9.0E-02	9.0E+01			2.1E+01	2.4E+02	0.1	1			2.5E-01		2.6E+01	8.0E-01	6.5E+00	1.7E+00	1		Yes
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	3.2E+02	O	4.2E-05	1.7E-03	No	1	2.3E-02	5.9E-06	1.2E+05		2.4E+02	2.4E+02	4.0E-02	4.0E+01	9.0E-09	2.1E+06	9.4E+00	2.4E+02		1			5.5E-01		2.7E+01	8.0E-01	6.4E+00	3.7E+00	1		No
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	3.5E+02	O	8.3E-06	3.4E-04	No	0	3.8E-02	4.4E-06	1.7E+05		3.4E+02	3.4E+02	5.5E-03	5.5E+00			1.9E+00	3.4E+02	0.03	1			6.3E-01		4.4E+01	7.0E-01	1.0E+01	4.5E+00	1		No
1,1-Dichloroethane	75-34-3	9.9E+01	O	5.6E-03	2.3E-01	Yes	1	8.4E-02	1.1E-05	3.2E+01		6.4E-02	6.4E-02	5.0E+03	5.0E+06	4.9E-03	2.1E+03	1.0E+03	2.8E-01		1			6.8E-03		9.0E-01	1.0E+00	3.8E-01	2.6E-02	1		Yes
1,2-Dichloroethane	107-06-2	9.9E+01	O	1.2E-03	4.8E-02	Yes	1	8.6E-02	1.1E-05	4.0E+01		7.9E-02	7.9E-02	8.6E+03	8.6E+06	1.2E-03	4.6E+03	1.6E+03	2.8E-01		1	5	5	4.2E-03		9.0E-01	1.0E+00	3.8E-01	1.6E-02	1		Yes
1,1-Dichloroethylene	75-35-4	9.7E+01	O	2.6E-02	1.1E+00	Yes	1	8.6E-02	1.1E-05	3.2E+01		6.4E-02	6.4E-02	2.4E+03	2.4E+06	1.3E-02	1.2E+03	8.8E+02	3.6E-01		1	7	7	1.2E-02		8.8E-01	1.0E+00	3.7E-01	4.4E-02	1		Yes
1,2-Dichloroethylene (cis)	156-59-2	9.7E+01	O	4.1E-03	1.7E-01	Yes	1	8.8E-02	1.1E-05	4.0E+01		7.9E-02	7.9E-02	6.4E+03	6.4E+06	3.7E-03	2.5E+03	1.4E+03	2.9E-01		1	70	70	1.1E-02		8.8E-01	1.0E+00	3.7E-01	4.2E-02	1		Yes
1,2-Dichloroethylene (trans)	156-60-5	9.7E+01	O	9.4E-03	3.8E-01	Yes	1	8.8E-02	1.1E-05	4.0E+01		7.9E-02	7.9E-02	4.5E+03	4.5E+06	7.1E-03	1.7E+03	1.1E+03	3.1E-01		1	100	100	1.1E-02		8.8E-01	1.0E+00	3.7E-01	4.2E-02	1		Yes
2,4-Dichlorophenol	120-83-2	1.6E+02	O	4.3E-06	1.8E-04	No	0	4.9E-02	8.7E-06	1.5E+02		2.9E-01	2.9E-01	5.6E+03	5.6E+06			2.2E+03	4.9E-01	0.1	1			2.1E-02		2.1E+00	1.0E+00	8.6E-01	1.0E-01	1		Yes
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	2.2E+02	O	3.5E-08	1.4E-06	No	0	2.8E-02	7.3E-06	3.0E+01		5.9E-02	5.9E-02	6.8E+02	6.8E+05			1.1E+02	2.6E-01	0.05	1	70	70	6.6E-03		4.4E+00	1.0E+00	1.8E+00	3.8E-02	1		Yes
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	2.5E+02	O	2.3E-09	9.4E-08	No	0	2.6E-02	6.7E-06	3.7E+02		7.4E-01	7.4E-01	4.6E+01	4.6E+04			3.9E+01	9.4E-01	0.1	1			1.4E-02		6.3E+00	9.0E-01	2.6E+00	8.4E-02	1		Yes
Decabromodiphenyl ether (BDE-209)	1163-19-5	9.6E+02	O	1.2E-08	4.9E-07	No	0	1.9E-02	4.8E-06	2.8E+05		5.5E+02	5.5E+02	1.0E-04	1.0E-01			5.5E-02	5.5E+02	0.1	1			7.3E-01		1.1E+05	0.0E+00	2.5E+04	8.6E+00	1		No
1,2-Dichloropropane	78-87-5	1.1E+02	O	2.8E-03	1.2E-01	Yes	1	7.3E-02	9.7E-06	6.1E+01		1.2E-01	1.2E-01	2.8E+03	2.8E+06	1.9E-03	3.8E+03	6.8E+02	3.3E-01		1	5	5	7.5E-03		1.1E+00	1.0E+00	4.5E-01	3.1E-02	1		Yes
2,3-Dichloropropanol	616-23-9	1.3E+02	O	3.6E-09	1.5E-07	No	0	6.8E-02	9.9E-06	5.6E+00		1.1E-02	1.1E-02	6.4E+04	6.4E+07			7.1E+03	2.1E-01	0.1	1			9.8E-04		1.3E+00	1.0E+00	5.5E-01	4.3E-03	1		Yes
1,3-Dichloropropene	542-75-6	1.1E+02	O	3.6E-03	1.5E-01	Yes	1	7.6E-02	1.0E-05	7.2E+01		1.4E-01	1.4E-01	2.8E+03	2.8E+06	2.2E-03	3.6E+03	7.6E+02	3.6E-01		1			8.3E-03		1.1E+00	1.0E+00	4.4E-01	3.4E-02	1		Yes
Dichlorvos	62-73-7	2.2E+02	O	5.7E-07	2.4E-05	No	0	2.8E-02	7.3E-06	5.4E+01		1.1E-01	1.1E-01	8.0E+03	8.0E+06			1.7E+03	3.1E-01	0.1	1			8.0E-04		4.4E+00	1.0E+00	1.8E+00	4.6E-03	1		Yes
Dicrotophos (Bidrin)	141-66-2	2.4E+02	O	5.0E-11	2.1E-09	No	0	2.5E-02	6.4E-06	1.7E+01		3.3E-02	3.3E-02	1.0E+06	1.0E+09			1.3E+05	2.3E-01	0.1	1			7.3E-05		5.4E+00	1.0E+00	2.2E+00	4.3E-04	1		Yes
Dicyclopentadiene	77-73-6	1.3E+02	O	6.3E-02	2.6E+00	Yes	1	5.6E-02	7.8E-06	1.5E+03		3.0E+00	3.0E+00	2.6E+01	2.6E+04	2.1E-03	4.1E+03	9.6E+01	3.5E+00		1			3.6E-02		1.4E+00	1.0E+00	5.8E-01	1.6E-01	1		Yes
Dieldrin	60-57-1	3.8E+02	O	1.0E-05	4.1E-04	No	0	2.3E-02	6.0E-06	2.0E+04		4.0E+01	4.0E+01	2.0E-01	2.0E+02			7.9E+00	4.0E+01	0.1	1			3.3E-02		3.4E+01	8.0E-01	1.4E+01	2.4E-01	1		Yes
Diethylene glycol, monobutyl ether	112-34-5	1.6E+02	O	7.2E-09	2.9E-07	No	0	4.1E-02	7.0E-06	1.0E+01		2.0E-02	2.0E-02	1.0E+06	1.0E+09			1.2E+05	2.2E-01	0.1	1			4.5E-04		2.0E+00	1.0E+00	8.5E-01	2.2E-03	1		Yes
Diethylene glycol, monoethyl ether	111-90-0	1.3E+02	O	2.2E-08	9.1E-07	No	0	5.6E-02	8.0E-06	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			1.2E-04		1.4E+00	1.0E+00	5.9E-01	5.4E-04	1		Yes
Diethylformamide	617-84-5	1.0E+02	O	1.3E-07	5.3E-06	Yes	1	7.3E-02	9.0E-06	2.1E+00		4.1E-03	4.1E-03	1.0E+06	1.0E+09	7.5E-07	1.4E+05	1.0E+05	2.0E-01		1			4.6E-04		9.3E-01	1.0E+00	3.9E-01	1.8E-03	1		Yes
Di(2-ethylhexyl)adipate	103-23-1	3.7E+02	O	4.3E-07	1.8E-05	No	0	1.7E-02	4.2E-06	3.6E+04		7.2E+01	7.2E+01	7.8E-01	7.8E+02			5.6E+01	7.2E+01	0.1	1	400	400	3.2E+00		5.8E+01	0.0E+00	1.3E+01	2.4E+01	1		Yes
Diethyl phthalate	84-66-2	2.2E+02	O	6.1E-07	2.5E-05	No	0	2.6E-02	6.7E-06	1.0E+02		2.1E-01	2.1E-01	1.1E+03	1.1E+06			3.3E+02	4.1E-01	0.1	1			3.6E-03		4.4E+00	1.0E+00	1.8E+00	2.1E-02	1		Yes
Diethylstilbestrol	56-53-1	2.7E+02	O	5.8E-12	2.4E-10	No	0	4.6E-02	5.3E-06	2.7E+05		5.5E+02	5.5E+02	1.2E+01	1.2E+04			6.6E+03	5.5E+02	0.1	1			1.1E-01		1.3E+01	9.0E-01	3.3E+00	7.2E-01	1		Yes
Difenzoquat (Avenge)	43222-48-6	3.6E+02	O			No	0	3.8E-02	4.4E-06	7.8E+04		1.6E+02	1.6E+02	8.2E+05	8.2E+08				1.6E+02	0.1	1			4.0E-05		2.6E+01	1.0E+00	1.1E+01	2.9E-04	1		Yes
Diflubenzuron	35367-38-5	3.1E+02	O	4.6E-09	1.9E-07	No	0	4.1E-02	4.8E-06	4.6E+02		9.3E-01	9.3E-01	8.0E-02	8.0E+01			8.2E-02	1.1E+00	0.1	1			1.1E-02		1.4E+01	9.0E-01	5.8E+00	7.3E-02	1		Yes
1,1-Difluoroethane	75-37-6	6.6E+01	O	2.0E-02	8.3E-01	Yes	1	1.0E-01	1.2E-05	3.2E+01		6.4E-02	6.4E-02	3.2E+03	3.2E+06	1.4E-02	1.1E+03	1.0E+03	3.4E-01		1			2.1E-03		5.9E-01	1.0E+00	2.5E-01	6.6E-03	1		Yes
Diisopropyl methylphosphonate (DIMP)	1445-75-6	1.8E+02	O	4.4E-05	1.8E-03	No	1	3.4E-02	6.6E-06	4.2E+01		8.4E-02	8.4E-02	1.5E+03	1.5E+06	1.8E-05	3.8E+04	2.8E+02	2.8E-01		1			7.4E-04		2.6E+00	1.0E+00	1.1E+00	3.8E-03	1		Yes
Dimethipin	55290-64-7	2.1E+02	O	2.3E-11	9.4E-10	No	0	5.4E-02	6.3E-06	1.0E+01		2.0E-02	2.0E-02	4.6E+03	4.6E+06			5.5E+02	2.2E-01	0.1	1			8.0E-05		3.8E+00	1.0E+00	1.6E+00	4.5E-04	1		Yes
Dimethoate	60-51-5	2.3E+02	O	2.4E-10	9.9E-09	No	0	2.6E-02	6.7E-06	1.3E+01		2.6E-02	2.6E-02	2.3E+04	2.3E+07			2.9E+03	2.3E-01	0.1	1			2.7E-04		4.9E+00	1.0E+00	2.0E+00	1.6E-03	1		Yes
3,3'-Dimethoxybenzidine	119-90-4	2.4E+02	O	4.7E-11	1.9E-09	No	0	4.9E-02	5.7E-06	5.1E+02		1.0E+00	1.0E+00	6.0E+01	6.0E+04			6.7E+01	1.2E+00	0.1	1			1.1E-03		5.9E+00	1.0E+00	2.5E+00	6.4E-03	1		Yes
N-N-Dimethylaniline	121-69-7	1.2E+02	O	5.7E-05	2.3E-03	No	1	6.3E-02	8.3E-06	7.9E+01		1.6E-01	1.6E-01	1.5E+03	1.5E+06	3.0E-05	3.1E+04	3.7E+02	3.6E-01		1			1.1E-02		1.2E+00	1.0E+00	5.0E-01	4.7E-02	1		Yes
2,4-Dimethylaniline	95-68-1	1.2E+02	O	2.5E-06	1.0E-04	No	0	6.3E-02	8.4E-06	1.8E+02		3.7E-01	3.7E-01	6.1E+03	6.1E+06			2.8E+03	5.7E-01	0.1	1			4.3E-03		1.2E+00	1.0E+00	5.0E-01	1.8E-02	1		Yes
2,4-Dimethylaniline hydrochloride	21436-96-4	1.2E+02	O	2.3E-06	9.5E-05	No	0	7.8E-02	9.1E-06	3.5E+02		7.0E-01	7.0E-01	3.7E+03	3.7E+06			2.9E+03	9.0E-01	0.1	1			2.0E-05		1.2E+00	1.0E+00	5.0E-01	8.6E-05	1		Yes
3,3'-Dimethylbenzidine	119-93-7	2.1E+02	O	6.3E-11	2.6E-09	No	0	5.3E-02	6.2E-06	3.2E+03		6.4E+00	6.4E+00	1.3E+03	1.3E+06			8.4E+03	6.6E+00	0.1	1			3.6E-03		3.9E+00	1.0E+00	1.6E+00	2.0E-02	1		Yes
N,N-Dimethylformamide	68-12-2	7.3E+01	O	7.4E-08	3.0E-06	Yes	1	9.7E-02	1.1E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	8.5E-07	1.3E+05	1.0E+05	2.0E-01		1			1.3E-04		6.5E-01	1.0E+00	2.7E-01	4.3E-04	1		Yes
2,4-Dimethylphenol	105-67-9	1.2E+02	O	9.5E-07	3.9E-05	No	0	6.2E-02	8.3E-06	4.9E+02		9.8E-01	9.8E-01	7.9E+03	7.9E+06			8.5E+03	1.2E+00	0.1	1			1.1E-02		1.2E+00	1.0E+00	5.1E-01	4.6E-02	1		Yes
2,6-Dimethylphenol	576-26-1	1.2E+02	O	6.7E-06	2.7E-04	No	0	7.7E-02	9.0E-06	5.0E+02		1.0E+00	1.0E+00	6.1E+03	6.1E+06			6.7E+03	1.2E+00	0.1	1			1.2E-02		1.2E+00	1.0E+00	5.1E-01	5.1E-02	1		Yes
3,4-Dimethylphenol	95-65-8	1.2E+02	O	4.2E-07	1.7E-05	No	0	6.3E-02	8.4E-06	4.9E+02		9.8E-01	9.8E-01	4.8E+03	4.8E+06			5.2E+03	1.2E+00	0.1	1			9.8E-03		1.2E+00	1.0E+00	5.1E-01	4.2E-02	1		Yes
Dimethyl terephthalate	120-61-6	1.9E+02	O	1.3E-04	5.5E-03	No	1	2.9E-02	6.7E-06	3.1E+01		6.2E-02	6.2E-02	1.9E+01	1.9E+04	5.1E-05	2.1E+04	3.1E+00	2.6E-01		1			4.0E-03		3.1E+00	1.0E+00	1.3E+00	2.1E-02	1		Yes
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	2.7E+02	O	5.5E-08	2.3E-06	No	0	4.6E-02	5.4E-06	1.7E+04		3.3E+01	3.3E+01	1.5E+01	1.5E+04			5.0E+02	3.3E+01	0.1	1			2.8E-02		7.8E+00	9.0E-01	3.3E+00	1.7E-01	1		Yes
1,2-Dinitrobenzene	528-29-0	1.7E+02	O	5.3E-08	2.2E-06	No	0	4.5E-02	8.3E-06	3.6E+02		7.2E-01	7.2E-01	1.3E+02	1.3E+05			1.1E+02	9.2E-01	0.1	1			2.4E-03		2.2E+00	1.0E+00	9.2E-01	1.2E-02	1		Yes
1,3-Dinitrobenzene	99-65-0	1.7E+02	O	4.9E-08	2.0E-06	No	0	4.8E-02	9.2E-06	3.5E+02		7.0E-01	7.0E-01	5.3E+02	5.3E+05			4.3E+02	9.0E-01	0.1	1			1.7E-03		2.2E+00	1.0E+00	9.2E-01	8.7E-03	1		Yes
1,4-Dinitrobenzene	100-25-4	1.7E+02	O	8.4E-08	3.4E-06	No	0	4.9E-02	9.4E-06	3.5E+02		7.0E-01	7.0E-01	6.9E+01	6.9E+04			5.5E+01	9.0E-01	0.1	1			1.7E-03		2.2E+00	1.0E+00	9.2E-01	8.3E-03	1		Yes
2,4-Dinitrophenol	51-28-5	1.8E+02	O	8.6E-08	3.5E-06	No	0	4.1E-02	9.1E-06	4.6E+02		9.2E-01	9.2E-01	2.8E+03	2.8E+06			2.9E+03	1.1E+00	0.1	1			1.9E-03		2.7E+00	1.0E+00	1.1E+00	9.8E-03	1		Yes
Dinitrotoluene mixture	25321-14-6	5.5E+02	O	9.3E-08	3.8E-06	No	0	2.8E-02	3.3E-06	5.9E+02		1.2E+00	1.2E+00	2.7E+02	2.7E+05			3.4E+02	1.4E+00	0.1	1			4.2E-03		2.9E+02	8.0E-01	1.2E+02	3.7E-02	1		Yes
2,4-Dinitrotoluene	121-14-2	1.8E+02	O	5.4E-08	2.2E-06	No	0	3.8E-02	7.9E-06	5.8E+02		1.2E+00	1.2E+00	2.0E+02	2.0E+05			2.5E+02	1.4E+00	0.102	1			3.1E-03		2.6E+00	1.0E+00	1.1E+00	1.6E-02	1		Yes
2,6-Dinitrotoluene	606-20-2	1.8E+02	O	7.5E-07	3.1E-05	No	0	3.7E-02	7.8E-06	5.9E+02		1.2E+00	1.2E+00	1.8E+02	1.8E+05			2.3E+02	1.4E+00	0.099	1			3.7E-03		2.6E+00	1.0E+00	1.1E+00	1.9E-02	1		Yes
Dinoseb	88-85-7	2.4E+02	O	4.6E-07	1.9E-05	No	0	2.5E-02	6.5E-06	4.3E+03		8.6E+00	8.6E+00	5.2E+01	5.2E+04			4.5E+02	8.8E+00	0.1	1	7	7	1.6E-02		5.6E+00	9.0E-01	2.3E+00	9.7E-02	1		Yes
1,4-Dioxane	123-91-1	8.8E+01	O	4.8E-06	2.0E-04	Yes	1	8.7E-02	1.1E-05	2.6E+00		5.3E-03	5.3E-03	1.0E+06	1.0E+09	9.3E-06	4.0E+04	1.1E+05	2.1E-01		1			3.3E-04		7.9E-01	1.0E+00	3.3E-01	1.2E-03	1		Yes
Diphenamid	957-51-7	2.4E+02	O	3.6E-11	1.5E-09	No	0	2.4E-02	6.2E-06	4.8E+03		9.6E+00	9.6E+00	2.6E+02	2.6E+05			2.5E+03	9.8E+00	0.1	1			5.6E-03		5.5E+00	1.0E+00	2.3E+00	3.3E-02	1		Yes
Diphenylamine	122-39-4	1.7E+02	O	2.7E-06	1.1E-04	No	0	4.2E-02	7.6E-06	8.3E+02		1.7E+00	1.7E+00	5.3E+01	5.3E+04			9.3E+01	1.9E+00	0.1	1			3.7E-02		2.2E+00	1.0E+00	9.3E-01	1.9E-01	1		Yes
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	2.6E+02	O	2.1E-10	8.4E-09	No	0	4.7E-02	5.4E-06	5.2E+04		1.0E+02	1.0E+02	7.4E+00	7.4E+03			7.6E+02	1.0E+02	0.1	1			2.6E-02		7.2E+00	9.0E-01	3.0E+00	1.6E-01	1		Yes
1,2-Diphenylhydrazine	122-66-7	1.8E+02	O	4.8E-07	2.0E-05	No	0	3.4E-02	7.2E-06	1.5E+03		3.0E+00	3.0E+00	2.2E+02	2.2E+05			6.9E+02	3.2E+00	0.1	1			1.3E-02		2.7E+00	1.0E+00	1.1E+00	6.8E-02	1		Yes
Diphenyl sulfone	127-63-9	2.2E+02	O	2.5E-07	1.0E-05	No	0	2.7E-02	6.9E-06	1.1E+03		2.2E+00	2.2E+00	3.1E+02	3.1E+05			7.3E+02	2.4E+00	0.1	1			3.7E-03		4.2E+00	1.0E+00	1.8E+00	2.1E-02	1		Yes
Diquat dibromide (Diquat)	85-00-7	3.4E+02	O	1.4E-13	5.8E-12	No	0	2.1E-02	5.2E-06	9.3E+03		1.9E+01	1.9E+01	7.1E+05	7.1E+08			1.3E+07	1.9E+01	0.1	1	20	20	2.4E-07		2.1E+01	1.0E+00	8.9E+00	1.7E-06	1		No
Direct black 38	1937-37-7	7.8E+02	O	8.2E-40	3.4E-38	No	0	2.2E-02	2.6E-06	2.4E+08		4.8E+05	4.8E+05	3.0E+03	3.0E+06			1.5E+09	4.8E+05	0.1	1			2.1E-04		5.9E+03	1.0E+00	2.4E+03	2.2E-03	1		No
Direct blue 6	2602-46-2	9.3E+02	O	9.1E-44	3.7E-42	No	0	2.0E-02	2.3E-06	7.9E+08		1.6E+06	1.6E+06	1.4E-04	1.4E-01			2.2E+02	1.6E+06	0.1	1			1.7E-09		4.2E+04	1.0E+00	1.8E+04	2.0E-08	1		No
Direct brown 95	16071-86-6	7.6E+02	O			No	0	2.3E-02	2.7E-06	7.0E+06		1.4E+04	1.4E+04	1.0E+06	1.0E+09				1.4E+04	0.1	1			3.9E-12		4.6E+03	1.0E+00	1.9E+03	4.1E-11	1		No
Disulfoton	298-04-4	2.7E+02	O	2.2E-06	8.8E-05	No	0	2.3E-02	5.7E-06	8.4E+02		1.7E+00	1.7E+00	1.6E+01	1.6E+04			2.9E+01	1.9E+00	0.1	1			2.1E-02		8.7E+00	9.0E-01	3.6E+00	1.4E-01	1		Yes
1,4-Dithiane	505-29-3	1.2E+02	O	4.2E-05	1.7E-03	No	1	6.8E-02	9.3E-06	1.5E+02		2.9E-01	2.9E-01	3.0E+03	3.0E+06	1.6E-05	4.5E+04	1.2E+03	4.9E-01		1			1.1E-03		1.2E+00	1.0E+00	5.0E-01	4.6E-03	1		Yes
Diuron	330-54-1	2.3E+02	O	5.0E-10	2.1E-08	No	0	5.0E-02	5.9E-06	1.1E+02		2.2E-01	2.2E-01	4.2E+01	4.2E+04			1.3E+01	4.2E-01	0.1	1			4.7E-03		5.1E+00	1.0E+00	2.1E+00	2.7E-02	1		Yes
Dodine	2439-10-3	2.9E+02	O	9.0E-11	3.7E-09	No	0	4.4E-02	5.1E-06	2.5E+03		5.0E+00	5.0E+00	6.3E+02	6.3E+05			3.2E+03	5.2E+00	0.1	1			2.2E-04		1.0E+01	1.0E+00	4.3E+00	1.4E-03	1		Yes
Endosulfan	115-29-7	4.1E+02	O	6.5E-05	2.7E-03	No	1	2.2E-02	5.8E-06	6.8E+03		1.4E+01	1.4E+01	3.3E-01	3.3E+02	2.4E-07	4.1E+05	4.4E+00	1.4E+01		1			2.9E-03		4.8E+01	9.0E-01	2.0E+01	2.2E-02	1		Yes
Endothall	145-73-3	1.9E+02	O	3.9E-16	1.6E-14	No	0	3.7E-02	8.2E-06	1.9E+01		3.9E-02	3.9E-02	1.0E+05	1.0E+08			1.4E+04	2.4E-01	0.1	1	100	100	2.6E-03		2.8E+00	1.0E+00	1.2E+00	1.4E-02	1		Yes
Endrin	72-20-8	3.8E+02	O	6.4E-06	2.6E-04	No	0	3.6E-02	4.2E-06	2.0E+04		4.0E+01	4.0E+01	2.5E-01	2.5E+02			1.0E+01	4.0E+01	0.1	1	2	2	3.3E-02		3.4E+01	8.0E-01	1.4E+01	2.4E-01	1		Yes
Enilconazole (Imazalil)	35554-44-0	3.0E+02	O	2.6E-09	1.1E-07	No	0	2.2E-02	5.7E-06	8.5E+03		1.7E+01	1.7E+01	1.8E+02	1.8E+05			3.1E+03	1.7E+01	0.1	1			1.2E-02		1.2E+01	9.0E-01	4.9E+00	7.7E-02	1		Yes
Epichlorohydrin	106-89-8	9.3E+01	O	3.0E-05	1.2E-03	Yes	1	8.9E-02	1.1E-05	9.9E+00		2.0E-02	2.0E-02	6.6E+04	6.6E+07	5.0E-05	1.9E+04	7.9E+03	2.2E-01		1			9.4E-04		8.3E-01	1.0E+00	3.5E-01	3.5E-03	1		Yes
1,2-Epoxybutane	106-88-7	7.2E+01	O	1.8E-04	7.4E-03	Yes	1	9.3E-02	1.0E-05	9.9E+00		2.0E-02	2.0E-02	9.5E+04	9.5E+07	3.0E-04	7.7E+03	1.2E+04	2.2E-01		1			2.3E-03		6.4E-01	1.0E+00	2.7E-01	7.5E-03	1		Yes
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	1.9E+02	O	1.6E-05	6.5E-04	No	1	2.9E-02	6.4E-06	1.6E+02		3.3E-01	3.3E-01	3.8E+02	3.8E+05	2.4E-06	1.2E+05	1.6E+02	5.3E-01		1			1.8E-02		2.9E+00	1.0E+00	1.2E+00	9.7E-02	1		Yes
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	1.4E+02	O	5.7E-12	2.3E-10	No	0	5.5E-02	8.6E-06	5.0E+00		1.0E-02	1.0E-02	1.0E+06	1.0E+09			1.1E+05	2.1E-01	0.1	1			1.7E-04		1.6E+00	1.0E+00	6.8E-01	8.0E-04	1		Yes
Ethion	563-12-2	3.8E+02	O	3.8E-07	1.6E-05	No	0	1.9E-02	4.8E-06	8.8E+02		1.8E+00	1.8E+00	2.0E+00	2.0E+03			3.7E+00	2.0E+00	0.1	1			2.6E-02		3.6E+01	8.0E-01	1.5E+01	1.9E-01	1		Yes
2-Ethoxyethanol	110-80-5	9.0E+01	O	4.7E-07	1.9E-05	Yes	1	8.2E-02	9.7E-06	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.4E-06	9.8E+04	1.0E+05	2.0E-01		1			3.0E-04		8.1E-01	1.0E+00	3.4E-01	1.1E-03	1		Yes
2-Ethoxyethanol acetate	111-15-9	1.3E+02	O	3.2E-06	1.3E-04	Yes	1	5.7E-02	8.0E-06	4.5E+00		9.1E-03	9.1E-03	1.9E+05	1.9E+08	4.1E-06	6.1E+04	2.0E+04	2.1E-01		1			7.0E-04		1.4E+00	1.0E+00	5.8E-01	3.1E-03	1		Yes
Ethyl acetate	141-78-6	8.8E+01	O	1.3E-04	5.5E-03	Yes	1	8.2E-02	9.7E-06	5.6E+00		1.1E-02	1.1E-02	8.0E+04	8.0E+07	2.1E-04	8.6E+03	9.0E+03	2.1E-01		1			1.5E-03		7.9E-01	1.0E+00	3.3E-01	5.5E-03	1		Yes
Ethyl acrylate	140-88-5	1.0E+02	O	3.4E-04	1.4E-02	Yes	1	7.5E-02	9.1E-06	1.1E+01		2.1E-02	2.1E-02	1.5E+04	1.5E+07	4.4E-04	6.3E+03	1.9E+03	2.2E-01		1			3.2E-03		9.2E-01	1.0E+00	3.8E-01	1.2E-02	1		Yes
Ethylbenzene	100-41-4	1.1E+02	O	7.9E-03	3.2E-01	Yes	1	6.8E-02	8.5E-06	4.5E+02		8.9E-01	8.9E-01	1.7E+02	1.7E+05	1.1E-03	5.7E+03	1.8E+02	1.1E+00		1	700	700	4.9E-02		9.9E-01	1.0E+00	4.1E-01	2.0E-01	1		Yes
Ethyl chloride (Chloroethane)	75-00-3	6.5E+01	O	1.1E-02	4.5E-01	Yes	1	1.0E-01	1.2E-05	2.2E+01		4.3E-02	4.3E-02	6.7E+03	6.7E+06	1.1E-02	1.3E+03	1.5E+03	2.8E-01		1			6.1E-03		5.8E-01	1.0E+00	2.4E-01	1.9E-02	1		Yes
Ethylene cyanohydrin	109-78-4	7.1E+01	O	7.5E-09	3.1E-07	No	0	1.0E-01	1.2E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			1.5E-04		6.3E-01	1.0E+00	2.6E-01	4.8E-04	1		Yes
Ethylene diamine	107-15-3	6.0E+01	O	1.7E-09	7.1E-08	Yes	1	1.1E-01	1.2E-05	1.5E+01		3.0E-02	3.0E-02	1.0E+06	1.0E+09	6.0E-07	1.8E+05	1.3E+05	2.3E-01		1			3.2E-05		5.5E-01	1.0E+00	2.3E-01	9.5E-05	1		No
Ethylene glycol	107-21-1	6.2E+01	O	6.0E-08	2.5E-06	No	0	1.2E-01	1.4E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			8.8E-05		5.6E-01	1.0E+00	2.3E-01	2.7E-04	1		Yes
Ethylene glycol, monobutyl ether	111-76-2	1.2E+02	O	1.6E-06	6.5E-05	No	0	6.3E-02	8.1E-06	2.8E+00		5.6E-03	5.6E-03	1.0E+06	1.0E+09			1.1E+05	2.1E-01	0.1	1			1.2E-03		1.2E+00	1.0E+00	4.8E-01	5.1E-03	1		Yes
Ethylene oxide	75-21-8	4.4E+01	O	1.5E-04	6.1E-03	Yes	1	1.3E-01	1.5E-05	3.2E+00		6.5E-03	6.5E-03	1.0E+06	1.0E+09	4.0E-04	6.1E+03	1.1E+05	2.1E-01		1			5.6E-04		4.5E-01	1.0E+00	1.9E-01	1.4E-03	1	M	Yes
Ethylene thiourea (ETU)	96-45-7	1.0E+02	O	1.4E-11	5.6E-10	No	0	8.7E-02	1.0E-05	1.3E+01		2.6E-02	2.6E-02	2.0E+04	2.0E+07			2.5E+03	2.3E-01	0.1	1			1.5E-04		9.4E-01	1.0E+00	3.9E-01	5.9E-04	1		Yes
Ethyl ether	60-29-7	7.4E+01	O	1.2E-03	5.0E-02	Yes	1	8.5E-02	9.4E-06	9.7E+00		1.9E-02	1.9E-02	6.0E+04	6.0E+07	1.8E-03	3.1E+03	7.8E+03	2.2E-01		1			2.4E-03		6.6E-01	1.0E+00	2.7E-01	7.8E-03	1		Yes
Ethyl methacrylate	97-63-2	1.1E+02	O	5.7E-04	2.3E-02	Yes	1	6.5E-02	8.4E-06	1.7E+01		3.3E-02	3.3E-02	5.4E+03	5.4E+06	5.9E-04	5.8E+03	7.4E+02	2.4E-01		1			7.0E-03		1.1E+00	1.0E+00	4.6E-01	2.9E-02	1		Yes
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	3.2E+02	O	4.4E-07	1.8E-05	No	0	2.2E-02	5.5E-06	1.5E+04		3.1E+01	3.1E+01	3.1E+00	3.1E+03			9.7E+01	3.1E+01	0.1	1			3.6E-02		1.6E+01	8.0E-01	6.8E+00	2.5E-01	1		Yes
Ethylphthalyl ethyl glycolate	84-72-0	2.8E+02	O	6.6E-09	2.7E-07	No	0	4.4E-02	5.2E-06	1.0E+03		2.0E+00	2.0E+00	2.2E+02	2.2E+05			4.6E+02	2.2E+00	0.1	1			1.2E-03		9.4E+00	1.0E+00	3.9E+00	7.7E-03	1		Yes
Fenamiphos	22224-92-6	3.0E+02	O	1.2E-09	4.9E-08	No	0	2.1E-02	5.4E-06	4.0E+02		8.0E-01	8.0E-01	3.3E+02	3.3E+05			2.9E+02	1.0E+00	0.1	1			4.4E-03		1.3E+01	9.0E-01	5.3E+00	2.9E-02	1		Yes
Fenpropathrin (Danitol)	39515-41-8	3.5E+02	O	7.6E-06	3.1E-04	No	0	3.8E-02	4.5E-06	2.2E+04		4.5E+01	4.5E+01	3.3E-01	3.3E+02			1.5E+01	4.5E+01	0.1	1			1.7E-01		3.7E+01	8.0E-01	9.5E+00	1.2E+00	1		Yes
Fenvalerate (Pydrin)	51630-58-1	4.2E+02	O	3.5E-08	1.4E-06	No	0	1.8E-02	4.4E-06	3.2E+05		6.3E+02	6.3E+02	2.4E-02	2.4E+01			1.5E+01	6.3E+02	0.1	1			9.4E-02		9.1E+01	7.0E-01	2.4E+01	7.4E-01	1		No
Fluometuron	2164-17-2	2.3E+02	O	2.6E-09	1.1E-07	No	0	5.0E-02	5.9E-06	2.9E+02		5.7E-01	5.7E-01	1.1E+02	1.1E+05			7.4E+01	7.7E-01	0.1	1			3.2E-03		5.0E+00	1.0E+00	2.1E+00	1.9E-02	1		Yes
Fluoride	16984-48-8	3.8E+01	I			No	0				1.5E+02	1.5E+02	1.5E+02	1.7E+00	1.7E+03				1.5E+02		1	4000	4000		1.0E-03	4.1E-01	1.0E+00	1.7E-01	2.4E-03	1		Yes
Fluoridone	59756-60-4	3.3E+02	O	8.1E-09	3.3E-07	No	0	4.0E-02	4.7E-06	5.7E+04		1.1E+02	1.1E+02	1.2E+01	1.2E+04			1.4E+03	1.1E+02	0.1	1			2.8E-03		1.8E+01	9.0E-01	7.3E+00	2.0E-02	1		Yes
Flurprimidol	56425-91-3	3.1E+02	O	1.3E-09	5.4E-08	No	0	4.1E-02	4.8E-06	2.2E+03		4.4E+00	4.4E+00	1.1E+02	1.1E+05			5.1E+02	4.6E+00	0.1	1			4.6E-03		1.4E+01	9.0E-01	5.9E+00	3.1E-02	1		Yes
Flusilazole (NuStar)	85509-19-9	3.2E+02	O	2.3E-09	9.2E-08	No	0	4.1E-02	4.8E-06	8.1E+04		1.6E+02	1.6E+02	5.4E+01	5.4E+04			8.8E+03	1.6E+02		1			7.7E-03		1.5E+01	9.0E-01	6.1E+00	5.2E-02	1		Yes
Flutolanil	66332-96-5	3.2E+02	O	3.2E-09	1.3E-07	No	0	4.0E-02	4.7E-06	2.6E+03		5.1E+00	5.1E+00	6.5E+00	6.5E+03			3.4E+01	5.3E+00	0.1	1			6.9E-03		1.6E+01	9.0E-01	6.8E+00	4.8E-02	1		Yes
Fluvalinate	69409-94-5	5.0E+02	O	1.5E-08	5.9E-07	No	0	3.0E-02	3.5E-06	7.3E+05		1.5E+03	1.5E+03	5.0E-03	5.0E+00			7.3E+00	1.5E+03	0.1	1			7.9E-02		2.7E+02	6.0E-01	6.9E+01	6.8E-01	1		No
Folpet	133-07-3	3.0E+02	O	7.7E-08	3.1E-06	No	0	4.3E-02	5.0E-06	1.8E+01		3.5E-02	3.5E-02	8.0E-01	8.0E+02			1.1E-01	2.4E-01	0.1	1			2.7E-03		1.2E+01	1.0E+00	4.8E+00	1.8E-02	1		Yes
Fomesafen	72178-02-0	4.4E+02	O	7.5E-13	3.1E-11	No	0	1.9E-02	4.6E-06	1.5E+03		3.1E+00	3.1E+00	5.0E+01	5.0E+04			1.6E+02	3.3E+00	0.1	1			4.6E-04		7.2E+01	1.0E+00	3.0E+01	3.7E-03	1		Yes
Fonofos	944-22-9	2.5E+02	O	7.0E-06	2.9E-04	No	0	2.4E-02	6.1E-06	8.6E+02		1.7E+00	1.7E+00	1.6E+01	1.6E+04			2.8E+01	1.9E+00	0.1	1			2.7E-02		6.0E+00	9.0E-01	2.5E+00	1.6E-01	1		Yes
Formaldehyde	50-00-0	3.0E+01	O	3.4E-07	1.4E-05	Yes	1	1.7E-01	1.7E-05	1.0E+00		2.0E-03	2.0E-03	4.0E+05	4.0E+08	2.3E-06	7.8E+04	4.1E+04	2.0E-01		1			1.8E-03		3.7E-01	1.0E+00	1.5E-01	3.8E-03	1		Yes
Formic acid	64-18-6	4.6E+01	O	1.7E-07	6.8E-06	Yes	1	1.5E-01	1.7E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.6E-06	9.3E+04	1.0E+05	2.0E-01		1			3.8E-04		4.6E-01	1.0E+00	1.9E-01	9.9E-04	1		Yes

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-2: CHEMICAL-SPECIFIC PARAMETERS

Contaminant	CAS	MW (g/mol)	Organic/ Inorganic	Henry's Law Constant H_units (atm-m^3/mol)	H' (H_unitless) (unitless)	VP>1?	VOL	D_i (cm^2/s)	D_w (cm^2/s)	K_{oc} (organics) (cm^3/g)	K_d (inorganics) (cm^3/g)	$K_{d\ VF}$ (cm^3/g)	K_d_s_to_gw (cm^3/g)	S (mg/L-water)	S (µg/L-water)	D_A (cm^2/s)	VF (m^3/kg)	SAT (mg/kg)	soil-to-gw factor (kg/L)	ABS_d	ABS_{GI}	Title 118 MCL (µg/L)	EPA Fed MCL (µg/L)	Kp.org (cm/hr)	Kp.inorg (cm/hr)	t_star (hr)	FA (unitless)	tau_event (hr)	B (unitless)	RBA (unitless)	Mutagen	In EPD?
Fosetyl-al	39148-24-8	3.5E+02	O	3.2E-14	1.3E-12	No	0	3.8E-02	4.4E-06	6.5E+03		1.3E+01	1.3E+01	1.1E+05	1.1E+08			1.5E+06	1.3E+01	0.1	1			4.1E-07		2.4E+01	1.0E+00	1.0E+01	3.0E-06	1		No
Furan	110-00-9	6.8E+01	O	5.4E-03	2.2E-01	Yes	1	1.0E-01	1.2E-05	8.0E+01		1.6E-01	1.6E-01	1.0E+04	1.0E+07	4.0E-03	2.6E+03	3.0E+03	3.8E-01	0.03	1			5.1E-03		6.1E-01	1.0E+00	2.5E-01	1.6E-02	1		Yes
Furazolidone	67-45-8	2.3E+02	O	3.3E-11	1.3E-09	No	0	5.1E-02	6.0E-06	8.6E+02		1.7E+00	1.7E+00	4.0E+01	4.0E+04			7.3E+01	1.9E+00	0.1	1			8.0E-05		4.6E+00	1.0E+00	1.9E+00	4.6E-04	1		Yes
Furfural	98-01-1	9.6E+01	O	3.8E-06	1.5E-04	Yes	1	8.5E-02	1.1E-05	6.1E+00		1.2E-02	1.2E-02	7.4E+04	7.4E+07	6.8E-06	4.9E+04	8.3E+03	2.1E-01		1			8.5E-04		8.7E-01	1.0E+00	3.6E-01	3.2E-03	1		Yes
Furmecyclox	60568-05-0	2.5E+02	O	6.9E-09	2.8E-07	No	0	4.8E-02	5.6E-06	4.3E+02		8.6E-01	8.6E-01	3.0E-01	3.0E+02			2.9E-01	1.1E+00	0.1	1			5.0E-02		6.4E+00	9.0E-01	2.7E+00	3.0E-01	1		Yes
Furothiazole (Furium)	531-82-8	2.5E+02	O	1.3E-15	5.4E-14	No	0	4.7E-02	5.5E-06	5.8E+02		1.2E+00	1.2E+00	4.2E+03	4.2E+06			5.3E+03	1.4E+00	0.1	1			9.4E-04		6.6E+00	1.0E+00	2.8E+00	5.7E-03	1		Yes
Glufosinate-ammonium	77182-82-2	2.0E+02	O	4.4E-14	1.8E-12	No	0	5.6E-02	6.5E-06	1.0E+01		2.0E-02	2.0E-02	1.4E+06	1.4E+09			1.6E+05	2.2E-01	0.1	1			3.4E-08		3.2E+00	1.0E+00	1.4E+00	1.9E-07	1		No
Glycidaldehyde	765-34-4	7.2E+01	O	5.1E-07	2.1E-05	Yes	1	1.1E-01	1.3E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.9E-06	8.4E+04	1.0E+05	2.0E-01		1			5.2E-04		6.4E-01	1.0E+00	2.7E-01	1.7E-03	1		Yes
Glyphosate	1071-83-6	1.7E+02	O	2.1E-12	8.6E-11	No	0	6.2E-02	7.3E-06	2.1E+03		4.2E+00	4.2E+00	1.1E+04	1.1E+07			4.5E+04	4.4E+00	0.1	1	700	700	4.5E-08		2.2E+00	1.0E+00	9.3E-01	2.3E-07	1		No
Haloxyfop-methyl	69806-40-2	3.8E+02	O	3.2E-07	1.3E-05	No	0	3.6E-02	4.3E-06	5.5E+03		1.1E+01	1.1E+01	9.3E+00	9.3E+03			1.0E+02	1.1E+01	0.1	1			6.0E-03		3.2E+01	9.0E-01	1.3E+01	4.5E-02	1		Yes
Thifensulfuron-methyl (Harmony)	79277-27-3	3.9E+02	O	4.1E-14	1.7E-12	No	0	3.6E-02	4.2E-06	5.1E+01		1.0E-01	1.0E-01	2.2E+03	2.2E+06			4.5E+02	3.0E-01	0.1	1			1.1E-04		3.7E+01	1.0E+00	1.6E+01	8.6E-04	1		Yes
Heptachlor	76-44-8	3.7E+02	O	2.9E-04	1.2E-02	No	1	2.2E-02	5.7E-06	4.1E+04		8.3E+01	8.3E+01	1.8E-01	1.8E+02	1.7E-07	4.8E+05	1.5E+01	8.3E+01		1	0.4	0.4	1.4E-01		5.0E+01	8.0E-01	1.3E+01	1.1E+00	1		Yes
Heptachlor epoxide	1024-57-3	3.9E+02	O	2.1E-05	8.6E-04	No	1	2.4E-02	6.2E-06	1.0E+04		2.0E+01	2.0E+01	2.0E-01	2.0E+02	5.6E-08	8.4E+05	4.1E+00	2.0E+01		1	0.2	0.2	2.1E-02		3.8E+01	8.0E-01	1.6E+01	1.6E-01	1		Yes
Hexabromobenzene	87-82-1	5.5E+02	O	2.8E-05	1.1E-03	No	1	2.5E-02	6.6E-06	2.8E+03		5.6E+00	5.6E+00	1.6E-04	1.6E-01	2.7E-07	3.8E+05	9.1E-04	5.8E+00		1			1.4E-02		3.1E+02	7.0E-01	1.3E+02	1.2E-01	1		No
Hexachlorobenzene	118-74-1	2.8E+02	O	1.7E-03	7.0E-02	No	1	2.9E-02	7.8E-06	6.2E+03		1.2E+01	1.2E+01	6.2E-03	6.2E+00	8.6E-06	6.8E+04	7.8E-02	1.3E+01		1	1	1	2.5E-01		1.7E+01	9.0E-01	4.1E+00	1.6E+00	1		No
Hexachlorobutadiene	87-68-3	2.6E+02	O	1.0E-02	4.2E-01	No	1	2.7E-02	7.0E-06	8.5E+02		1.7E+00	1.7E+00	3.2E+00	3.2E+03	3.2E-04	1.1E+04	6.0E+00	1.9E+00		1			8.1E-02		7.3E+00	9.0E-01	3.0E+00	5.0E-01	1		Yes
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	2.9E+02	O	6.7E-06	2.7E-04	No	0	4.3E-02	5.1E-06	2.8E+03		5.6E+00	5.6E+00	2.0E+00	2.0E+03			1.1E+01	5.8E+00	0.1	1			2.1E-02		1.1E+01	9.0E-01	4.5E+00	1.4E-01	1		Yes
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	2.9E+02	O	4.4E-07	1.8E-05	No	0	2.8E-02	7.4E-06	2.8E+03		5.6E+00	5.6E+00	2.4E-01	2.4E+02			1.4E+00	5.8E+00	0.1	1			2.1E-02		1.1E+01	9.0E-01	4.5E+00	1.4E-01	1		Yes
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	2.9E+02	O	5.1E-06	2.1E-04	No	0	4.3E-02	5.1E-06	2.8E+03		5.6E+00	5.6E+00	7.3E+00	7.3E+03			4.2E+01	5.8E+00	0.04	1	0.2	0.2	2.1E-02		1.1E+01	9.0E-01	4.5E+00	1.4E-01	1		Yes
Hexachlorocyclohexane technical	608-73-1	2.9E+02	O	5.1E-06	2.1E-04	No	0	4.3E-02	5.1E-06	2.8E+03		5.6E+00	5.6E+00	8.0E+00	8.0E+03			4.6E+01	5.8E+00	0.1	1			2.1E-02		1.1E+01	9.0E-01	4.5E+00	1.4E-01	1		Yes
Hexachlorocyclopentadiene	77-47-4	2.7E+02	O	2.7E-02	1.1E+00	No	1	2.7E-02	7.2E-06	1.4E+03		2.8E+00	2.8E+00	1.8E+00	1.8E+03	5.1E-04	8.5E+03	5.6E+00	3.1E+00		1	50	50	1.0E-01		1.4E+01	9.0E-01	3.5E+00	6.5E-01	1		Yes
Hexachloroethane	67-72-1	2.4E+02	O	3.9E-03	1.6E-01	No	1	3.2E-02	8.9E-06	2.0E+02		3.9E-01	3.9E-01	5.0E+01	5.0E+04	5.2E-04	8.0E+03	2.6E+01	6.1E-01		1			4.2E-02		5.3E+00	1.0E+00	2.2E+00	2.5E-01	1		Yes
Hexachlorophene	70-30-4	4.1E+02	O	5.5E-13	2.2E-11	No	0	3.5E-02	4.0E-06	6.7E+05		1.3E+03	1.3E+03	1.4E+02	1.4E+05			1.9E+05	1.3E+03	0.1	1			8.4E-01		8.9E+01	0.0E+00	2.0E+01	6.5E+00	1		No
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	2.2E+02	O	2.0E-11	8.2E-10	No	0	3.1E-02	8.5E-06	8.9E+01		1.8E-01	1.8E-01	6.0E+01	6.0E+04			1.7E+01	3.8E-01	0.015	1			3.4E-04		4.4E+00	1.0E+00	1.8E+00	1.9E-03	1		Yes
1,6-Hexamethylene diisocyanate	822-06-0	1.7E+02	O	4.8E-05	2.0E-03	No	1	4.0E-02	7.2E-06	4.8E+03		9.6E+00	9.6E+00	1.2E+02	1.2E+05	4.4E-07	3.0E+05	1.1E+03	9.8E+00		1			2.4E-02		2.2E+00	1.0E+00	9.2E-01	1.2E-01	1		Yes
n-Hexane	110-54-3	8.6E+01	O	1.8E+00	7.4E+01	Yes	1	7.3E-02	8.2E-06	1.3E+02		2.6E-01	2.6E-01	9.5E+00	9.5E+03	2.0E-02	8.3E+02	1.4E+02	7.0E+00		1			2.0E-01		1.2E+00	1.0E+00	3.2E-01	7.2E-01	1		Yes
Hexazinone	51235-04-2	2.5E+02	O	2.3E-12	9.2E-11	No	0	2.5E-02	6.3E-06	1.3E+02		2.6E-01	2.6E-01	3.3E+04	3.3E+07			1.2E+04	4.6E-01	0.1	1			1.0E-03		6.5E+00	1.0E+00	2.7E+00	6.2E-03	1		Yes
Hexythiazox (Savey)	78587-05-0	3.5E+02	O	2.4E-08	9.7E-07	No	0	3.8E-02	4.4E-06	2.1E+03		4.2E+00	4.2E+00	5.0E-01	5.0E+02			2.2E+00	4.4E+00	0.1	1			8.3E-02		2.4E+01	8.0E-01	1.0E+01	6.0E-01	1		Yes
Hydramethylnon (Amdro)	67485-29-4	4.9E+02	O	2.2E-06	9.0E-05	No	0	3.0E-02	3.6E-06	1.8E+08		3.6E+05	3.6E+05	6.0E-03	6.0E+00			2.2E+03	3.6E+05	0.1	1			9.0E-05		1.5E+02	1.0E+00	6.2E+01	7.7E-04	1		Yes
Hydrazine, hydrazine sulfate	302-01-2	3.2E+01	O	6.1E-07	2.5E-05	Yes	1	1.7E-01	1.9E-05					1.0E+06	1.0E+09						1			4.4E-05		3.8E-01	1.0E+00	1.6E-01	9.5E-05	1		Yes
Hydrazine, dimethyl	57-14-7	6.0E+01	O	1.3E-05	5.3E-04	Yes	1	1.0E-01	1.1E-05	1.2E+01		2.4E-02	2.4E-02	1.0E+06	1.0E+09	2.4E-05	2.8E+04	1.2E+05	2.2E-01		1			7.3E-05		5.5E-01	1.0E+00	2.3E-01	2.2E-04	1		Yes
Hydrogen chloride	7647-01-0	3.5E+01	O	2.0E+06	8.3E+07	Yes	1	1.9E-01	2.3E-05					6.7E+05	6.7E+08						1			1.0E-03		4.0E-01	1.0E+00	1.7E-01	2.3E-03	1		Yes
Hydrogen sulfide	7783-06-4	3.4E+01	O	8.6E-03	3.5E-01	Yes	1	1.9E-01	2.2E-05					3.7E+03	3.7E+06						1			1.0E-03		3.9E-01	1.0E+00	1.6E-01	2.2E-03	1		Yes
p-Hydroquinone	123-31-9	1.1E+02	O	4.7E-11	1.9E-09	No	0	8.0E-02	1.1E-05	2.4E+02		4.8E-01	4.8E-01	7.2E+04	7.2E+07			4.2E+04	6.8E-01	0.1	1			9.3E-04		1.0E+00	1.0E+00	4.3E-01	3.8E-03	1		Yes
Imazaquin	81335-37-7	3.1E+02	O	6.9E-18	2.8E-16	No	0	4.1E-02	4.8E-06	2.4E+03		4.8E+00	4.8E+00	9.0E+01	9.0E+04			4.4E+02	5.0E+00	0.1	1			4.8E-04		1.4E+01	1.0E+00	5.8E+00	3.3E-03	1		Yes
Imazethapyr (Pursuit)	81335-77-5	2.9E+02	O	1.0E-16	4.3E-15	No	0	4.3E-02	5.1E-06	3.4E+02		6.8E-01	6.8E-01	1.4E+03	1.4E+06			1.1E+03	8.8E-01	0.1	1			2.0E-03		1.1E+01	1.0E+00	4.4E+00	1.3E-02	1		Yes
Iprodione	36734-19-7	3.3E+02	O	3.1E-09	1.3E-07	No	0	4.0E-02	4.6E-06	5.3E+01		1.1E-01	1.1E-01	1.4E+01	1.4E+04			2.9E+00	3.1E-01	0.1	1			2.2E-03		1.8E+01	9.0E-01	7.4E+00	1.5E-02	1		Yes
Iron	7439-89-6	5.6E+01	I			No	0				2.5E+01	2.5E+01	2.5E+01						2.5E+01		1	300			1.0E-03	5.2E-01	1.0E+00	2.2E-01	2.9E-03	1		Yes
Isobutanol (Isobutyl alcohol)	78-83-1	7.4E+01	O	9.8E-06	4.0E-04	Yes	1	9.0E-02	1.0E-05	2.9E+00		5.8E-03	5.8E-03	8.5E+04	8.5E+07	1.9E-05	2.8E+04	9.0E+03	2.1E-01		1			1.9E-03		6.6E-01	1.0E+00	2.7E-01	6.4E-03	1		Yes
Isophorone	78-59-1	1.4E+02	O	6.6E-06	2.7E-04	No	0	5.3E-02	7.5E-06	6.5E+01		1.3E-01	1.3E-01	1.2E+04	1.2E+07			2.8E+03	3.3E-01	0.1	1			3.5E-03		1.5E+00	1.0E+00	6.2E-01	1.6E-02	1		Yes
Isopropalin	33820-53-0	3.1E+02	O	1.1E-04	4.5E-03	No	1	2.1E-02	5.3E-06	1.1E+04		2.3E+01	2.3E+01	1.1E-01	1.1E+02	2.3E-07	4.2E+05	2.5E+00	2.3E+01		1			2.1E-01		2.2E+01	8.0E-01	5.7E+00	1.4E+00	1		Yes
Isopropyl methyl phosphonic acid	1832-54-8	1.4E+02	O	6.9E-09	2.8E-07	No	0	7.1E-02	8.3E-06	7.7E+00		1.5E-02	1.5E-02	5.0E+04	5.0E+07			5.8E+03	2.2E-01	0.1	1			4.0E-04		1.5E+00	1.0E+00	6.2E-01	1.8E-03	1		Yes
Isoxaben	82558-50-7	3.3E+02	O	1.3E-09	5.2E-08	No	0	4.0E-02	4.6E-06	1.3E+03		2.5E+00	2.5E+00	1.4E+00	1.4E+03			3.7E+00	2.7E+00	0.1	1			8.9E-03		1.8E+01	9.0E-01	7.6E+00	6.2E-02	1		Yes
Lactofen	77501-63-4	4.6E+02	O	4.7E-07	1.9E-05	No	0	3.2E-02	3.7E-06	2.3E+04		4.6E+01	4.6E+01	1.0E-01	1.0E+02			4.6E+00	4.6E+01	0.1	1			6.3E-03		9.7E+01	9.0E-01	4.1E+01	5.2E-02	1		Yes
Lead +++	7439-92-1	2.1E+02	I			No	0				9.0E+02	9.0E+02	9.0E+02						9.0E+02		1	15	15		1.0E-04	3.7E+00	1.0E+00	1.5E+00	5.5E-04	1		Yes
Lead (tetraethyl)	78-00-2	3.2E+02	O	5.7E-01	2.3E+01	No	1	2.5E-02	6.4E-06	6.5E+02		1.3E+00	1.3E+00	2.9E-01	2.9E+02	5.3E-03	1.9E+03	1.7E+00	3.6E+00		1			1.4E-02		1.6E+01	9.0E-01	6.8E+00	9.5E-02	1		Yes
Linuron	330-55-2	2.5E+02	O	6.3E-09	2.6E-07	No	0	4.8E-02	5.6E-06	3.4E+02		6.8E-01	6.8E-01	7.5E+01	7.5E+04			5.8E+01	8.8E-01	0.1	1			8.4E-03		6.3E+00	9.0E-01	2.6E+00	5.1E-02	1		Yes
Lithium	7439-93-2	6.9E+00	I			No	0				3.0E+02	3.0E+02	3.0E+02						3.0E+02		1				1.0E-03	2.8E-01	1.0E+00	1.2E-01	1.0E-03	1		Yes
Malathion	121-75-5	3.3E+02	O	4.9E-09	2.0E-07	No	0	2.1E-02	5.2E-06	3.1E+01		6.3E-02	6.3E-02	1.4E+02	1.4E+05			2.3E+01	2.6E-01	0.1	1			8.1E-04		1.8E+01	1.0E+00	7.4E+00	5.7E-03	1		Yes
Maleic anhydride	108-31-6	9.8E+01	O	3.9E-06	1.6E-04	No	0	8.8E-02	1.1E-05	1.0E+00		2.0E-03	2.0E-03	1.6E+05	1.6E+08			1.7E+04	2.0E-01	0.1	1			5.3E-03		8.9E-01	1.0E+00	3.7E-01	2.0E-02	1		Yes
Maleic hydrazide	123-33-1	1.1E+02	O	2.7E-11	1.1E-09	No	0	8.2E-02	9.5E-06	3.3E+00		6.6E-03	6.6E-03	4.5E+03	4.5E+06			4.8E+02	2.1E-01	0.1	1			1.0E-04		1.1E+00	1.0E+00	4.5E-01	4.2E-04	1		Yes
Malononitrile	109-77-3	6.6E+01	O	1.3E-07	5.4E-06	No	0	1.2E-01	1.4E-05	3.3E+00		6.7E-03	6.7E-03	1.3E+05	1.3E+08			1.4E+04	2.1E-01	0.1	1			2.7E-04		5.9E-01	1.0E+00	2.5E-01	8.3E-04	1		Yes
Mancozeb	8018-01-7	5.4E+02	O	1.5E-11	6.2E-10	No	0	2.0E-02	5.1E-06	6.1E+02		1.2E+00	1.2E+00	6.2E+00	6.2E+03			8.2E+00	1.4E+00	0.1	1			7.7E-04		2.7E+02	9.0E-01	1.1E+02	6.9E-03	1		Yes
Maneb	12427-38-2	3.0E+02	O	4.9E-09	2.0E-07	No	0	4.3E-02	5.0E-06	6.1E+02		1.2E+00	1.2E+00	6.0E+00	6.0E+03			7.9E+00	1.4E+00	0.1	1			7.7E-04		1.1E+01	1.0E+00	4.7E+00	5.1E-03	1		Yes
Manganese (non-food) +++	7439-96-5	5.5E+01	I			No	0				6.5E+01	6.5E+01	6.5E+01						6.5E+01		1	50			1.0E-03	5.1E-01	1.0E+00	2.1E-01	2.9E-03	1		
Mephosfolan	950-10-7	2.7E+02	O	1.2E-10	4.9E-09	No	0	4.6E-02	5.3E-06	6.4E+02		1.3E+00	1.3E+00	5.7E+01	5.7E+04			7.8E+01	1.5E+00	0.1	1			2.4E-04		8.1E+00	1.0E+00	3.4E+00	1.5E-03	1		Yes
Mepiquat chloride (Mepiquat)	24307-26-4	1.5E+02	O	4.3E-12	1.8E-10	No	0	6.7E-02	7.9E-06	6.6E+01		1.3E-01	1.3E-01	5.0E+05	5.0E+08			1.2E+05	3.3E-01	0.1	1			3.0E-06		1.7E+00	1.0E+00	7.2E-01	1.4E-05	1		No
Mercury and compounds	7487-94-7	2.7E+02	I			No	0							6.9E+04	6.9E+07						0.07	2	2		1.0E-03	8.4E+00	1.0E+00	3.5E+00	6.3E-03	1		Yes
Mercury (elemental)	7439-97-6	2.0E+02	I	8.6E-03	3.5E-01	No	1	3.1E-02	6.3E-06		5.2E+01	5.2E+01	5.2E+01	6.0E-02	6.0E+01	1.1E-05	3.5E+04	3.1E+00	5.2E+01		1	2	2		1.0E-03	3.4E+00	1.0E+00	1.4E+00	5.4E-03	1		Yes
Mercury (methyl)	22967-92-6	2.2E+02	O			No	0														1			1.0E-03		4.1E+00	1.0E+00	1.7E+00	5.7E-03	1		Yes
Merphos	150-50-5	3.0E+02	O	2.3E-05	9.3E-04	No	1	2.0E-02	5.0E-06	4.9E+04		9.8E+01	9.8E+01	3.5E-03	3.5E+00	1.1E-08	1.9E+06	3.4E-01	9.8E+01		1			4.2E+00		2.3E+01	3.0E-01	4.9E+00	2.8E+01	1		No
Merphos oxide	78-48-8	3.1E+02	O	2.9E-07	1.2E-05	No	0	2.0E-02	5.0E-06	2.4E+03		4.7E+00	4.7E+00	2.3E+00	2.3E+03			1.1E+01	4.9E+00	0.1	1			1.7E-01		2.4E+01	9.0E-01	6.1E+00	1.1E+00	1		Yes
Metalaxyl	57837-19-1	2.8E+02	O	3.0E-09	1.2E-07	No	0	4.4E-02	5.2E-06	3.9E+01		7.7E-02	7.7E-02	8.4E+03	8.4E+06			1.5E+03	2.8E-01	0.1	1			5.8E-04		9.3E+00	1.0E+00	3.9E+00	3.7E-03	1		Yes
Methacrylonitrile	126-98-7	6.7E+01	O	2.5E-04	1.0E-02	Yes	1	9.6E-02	1.1E-05	1.3E+01		2.6E-02	2.6E-02	2.5E+04	2.5E+07	4.1E-04	6.8E+03	3.3E+03	2.3E-01		1			1.9E-03		6.0E-01	1.0E+00	2.5E-01	5.9E-03	1		Yes
Methamidophos	10265-92-6	1.4E+02	O	8.7E-10	3.5E-08	No	0	6.0E-02	9.2E-06	5.4E+00		1.1E-02	1.1E-02	1.0E+06	1.0E+09			1.1E+05	2.1E-01	0.1	1			7.4E-05		1.6E+00	1.0E+00	6.5E-01	3.4E-04	1		Yes
Methanol	67-56-1	3.2E+01	O	4.6E-06	1.9E-04	Yes	1	1.6E-01	1.7E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.6E-05	2.9E+04	1.0E+05	2.0E-01		1			3.2E-04		3.8E-01	1.0E+00	1.6E-01	6.9E-04	1		Yes
Methidathion	950-37-8	3.0E+02	O	7.2E-09	2.9E-07	No	0	4.2E-02	4.9E-06	2.1E+01		4.2E-02	4.2E-02	1.9E+02	1.9E+05			2.7E+01	2.4E-01	0.1	1			9.1E-04		1.2E+01	1.0E+00	5.2E+00	6.1E-03	1		Yes
Methomyl	16752-77-5	1.6E+02	O	2.0E-11	8.1E-10	No	0	4.8E-02	8.4E-06	1.0E+01		2.0E-02	2.0E-02	5.8E+04	5.8E+07			7.0E+03	2.2E-01	0.1	1			4.8E-04		2.0E+00	1.0E+00	8.5E-01	2.4E-03	1		Yes
Methoxychlor	72-43-5	3.5E+02	O	2.0E-07	8.3E-06	No	0	2.2E-02	5.6E-06	2.7E+04		5.4E+01	5.4E+01	1.0E-01	1.0E+02			5.4E+00	5.4E+01	0.1	1	40	40	4.3E-02		2.2E+01	8.0E-01	9.1E+00	3.1E-01	1		Yes
2-Methoxyethanol	109-86-4	7.6E+01	O	3.3E-07	1.4E-05	Yes	1	9.5E-02	1.1E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	1.4E-06	1.0E+05	1.0E+05	2.0E-01		1			1.8E-04		6.7E-01	1.0E+00	2.8E-01	6.0E-04	1		Yes
2-Methoxyethanol acetate	110-49-6	1.2E+02	O	3.1E-07	1.3E-05	Yes	1	6.6E-02	8.7E-06	2.5E+00		5.0E-03	5.0E-03	1.0E+06	1.0E+09	9.5E-07	1.2E+05	1.0E+05	2.0E-01		1			4.0E-04		1.2E+00	1.0E+00	4.8E-01	1.7E-03	1		Yes
2-Methoxy-5-nitroaniline	99-59-2	1.7E+02	O	1.3E-08	5.1E-07	No	0	4.3E-02	7.8E-06	7.1E+01		1.4E-01	1.4E-01	1.2E+02	1.2E+05			2.8E+01	3.4E-01	0.1	1			1.7E-03		2.2E+00	1.0E+00	9.2E-01	8.4E-03	1		Yes
Methyl acetate	79-20-9	7.4E+01	O	1.2E-04	4.7E-03	Yes	1	9.6E-02	1.1E-05	3.1E+00		6.1E-03	6.1E-03	2.4E+05	2.4E+08	2.2E-04	8.1E+03	2.6E+04	2.1E-01		1			7.9E-04		6.6E-01	1.0E+00	2.7E-01	2.6E-03	1		Yes
Methyl acrylate	96-33-3	8.6E+01	O	2.0E-04	8.1E-03	Yes	1	8.6E-02	1.0E-05	5.8E+00		1.2E-02	1.2E-02	4.9E+04	4.9E+07	3.3E-04	7.0E+03	5.6E+03	2.1E-01		1			1.8E-03		7.7E-01	1.0E+00	3.2E-01	6.2E-03	1		Yes
2-Methylaniline hydrochloride	636-21-5	1.4E+02	O	2.1E-06	8.6E-05	No	0	6.9E-02	8.1E-06	1.2E+02		2.3E-01	2.3E-01	8.3E+03	8.3E+06			2.7E+03	4.3E-01	0.1	1			1.1E-05		1.6E+00	1.0E+00	6.7E-01	4.8E-05	1		Yes
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	2.9E+02	O	4.9E-12	2.0E-10	No	0	4.3E-02	5.1E-06	3.4E+02		6.7E-01	6.7E-01	3.8E+00	3.8E+03			2.9E+00	8.7E-01	0.1	1			9.4E-04		1.1E+01	1.0E+00	4.4E+00	6.2E-03	1		Yes
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	2.0E+02	O	1.3E-09	5.4E-08	No	0	3.1E-02	8.2E-06	3.0E+01		5.9E-02	5.9E-02	6.3E+02	6.3E+05			1.0E+02	2.6E-01	0.1	1			1.7E-02		3.4E+00	1.0E+00	1.4E+00	9.2E-02	1		Yes
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	2.3E+02	O	2.7E-09	1.1E-07	No	0	5.1E-02	5.9E-06	9.8E+01		2.0E-01	2.0E-01	4.8E+01	4.8E+04			1.4E+01	4.0E-01	0.1	1			1.7E-02		4.8E+00	9.0E-01	2.0E+00	1.0E-01	1		Yes
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	2.1E+02	O	1.8E-08	7.4E-07	No	0	2.7E-02	7.0E-06	4.9E+01		9.7E-02	9.7E-02	6.2E+02	6.2E+05			1.2E+02	3.0E-01	0.1	1			1.3E-02		4.0E+00	1.0E+00	1.7E+00	7.4E-02	1		Yes
4,4'-Methylenebisbenzeneamine	101-77-9	2.0E+02	O	5.3E-11	2.2E-09	No	0	5.6E-02	6.5E-06	2.1E+03		4.3E+00	4.3E+00	1.0E+03	1.0E+06			4.4E+03	4.5E+00	0.1	1			1.4E-03		3.3E+00	1.0E+00	1.4E+00	7.5E-03	1		Yes
4,4'-Methylene bis(2-chloroaniline)	101-14-4	2.7E+02	O	4.1E-11	1.7E-09	No	0	4.6E-02	5.4E-06	5.7E+03		1.1E+01	1.1E+01	1.4E+01	1.4E+04			1.6E+02	1.2E+01	0.1	1			2.0E-02		7.9E+00	9.0E-01	3.3E+00	1.2E-01	1	M	Yes
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	2.5E+02	O	1.1E-09	4.4E-08	No	0	4.7E-02	5.5E-06	2.7E+03		5.3E+00	5.3E+00	4.1E+00	4.1E+03			2.2E+01	5.5E+00	0.1	1			8.4E-02		6.7E+00	1.0E+00	2.8E+00	5.2E-01	1		Yes
Methylene bromide	74-95-3	1.7E+02	O	8.2E-04	3.4E-02	Yes	1	5.5E-02	1.2E-05	2.2E+01		4.3E-02	4.3E-02	1.2E+04	1.2E+07	6.6E-04	5.6E+03	1.8E+03	2.5E-01		1			2.2E-03		2.4E+00	1.0E+00	9.9E-01	1.1E-02	1		Yes
Methylene chloride	75-09-2	8.5E+01	O	3.3E-03	1.3E-01	Yes	1	1.0E-01	1.3E-05	2.2E+01		4.3E-02	4.3E-02	1.3E+04	1.3E+07	4.2E-03	2.2E+03	2.2E+03	2.6E-01		1	5	5	3.5E-03		7.5E-01	1.0E+00	3.1E-01	1.3E-02	1	M	Yes
4,4'-Methylenediphenyl isocyanate	101-68-8	2.5E+02	O	9.0E-07	3.7E-05	No	0	2.4E-02	6.2E-06	2.8E+05		5.7E+02	5.7E+02	8.3E-01	8.3E+02			4.7E+02	5.7E+02	0.1	1			1.8E-01		1.0E+01	9.0E-01	2.7E+00	1.1E+00	1		Yes
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	2.1E+02	O	1.4E-09	5.8E-08	No	0	2.6E-02	6.6E-06	6.0E+01		1.2E-01	1.2E-01	1.9E+03	1.9E+06			4.1E+02	3.2E-01	0.1	1			1.1E-03		3.7E+00	1.0E+00	1.6E+00	6.0E-03	1		Yes
Methyl ethyl ketone (2-Butanone)	78-93-3	7.2E+01	O	5.7E-05	2.3E-03	Yes	1	9.1E-02	1.0E-05	4.5E+00		9.0E-03	9.0E-03	2.2E+05	2.2E+08	1.0E-04	1.2E+04	2.4E+04	2.1E-01		1			9.6E-04		6.4E-01	1.0E+00	2.7E-01	3.1E-03	1		Yes
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	1.0E+02	O	1.4E-04	5.6E-03	Yes	1	7.0E-02	8.3E-06	1.3E+01		2.5E-02	2.5E-02	1.9E+04	1.9E+07	1.7E-04	1.1E+04	2.4E+03	2.3E-01		1			3.2E-03		9.2E-01	1.0E+00	3.8E-01	1.2E-02	1		Yes
Methyl methacrylate	80-62-6	1.0E+02	O	3.2E-04	1.3E-02	Yes	1	7.5E-02	9.2E-06	9.1E+00		1.8E-02	1.8E-02	1.5E+04	1.5E+07	4.3E-04	6.3E+03	1.8E+03	2.2E-01		1			3.6E-03		9.2E-01	1.0E+00	3.8E-01	1.4E-02	1		Yes
2-Methyl-5-nitroaniline	99-55-8	1.5E+02	O	8.3E-09	3.4E-07	No	0	6.7E-02	7.8E-06	1.8E+02		3.6E-01	3.6E-01	1.0E+04	1.0E+07			4.6E+03	5.6E-01	0.1	1			3.8E-03		1.8E+00	1.0E+00	7.5E-01	1.8E-02	1		Yes
Methyl parathion	298-00-0	2.6E+02	O	1.0E-07	4.1E-06	No	0	2.5E-02	6.4E-06	7.3E+02		1.5E+00	1.5E+00	3.8E+01	3.8E+04			5.9E+01	1.7E+00	0.1	1			4.2E-03		7.5E+00	1.0E+00	3.1E+00	2.6E-02	1		Yes
2-Methylphenol	95-48-7	1.1E+02	O	1.2E-06	4.9E-05	No	0	7.3E-02	9.3E-06	3.1E+02		6.1E-01	6.1E-01	2.6E+04	2.6E+07			1.8E+04	8.1E-01	0.1	1			7.7E-03		1.0E+00	1.0E+00	4.2E-01	3.1E-02	1		Yes
3-Methylphenol	108-39-4	1.1E+02	O	8.6E-07	3.5E-05	No	0	7.3E-02	9.3E-06	3.0E+02		6.0E-01	6.0E-01	2.3E+04	2.3E+07			1.6E+04	8.0E-01	0.1	1			7.8E-03		1.0E+00	1.0E+00	4.2E-01	3.1E-02	1		Yes
4-Methylphenol	106-44-5	1.1E+02	O	1.0E-06	4.1E-05	No	0	7.2E-02	9.2E-06	3.0E+02		6.0E-01	6.0E-01	2.2E+04	2.2E+07			1.5E+04	8.0E-01	0.1	1			7.5E-03		1.0E+00	1.0E+00	4.2E-01	3.0E-02	1		Yes
Methyl phosphonic acid	993-13-5	9.6E+01	O	1.2E-11	5.0E-10	No	0	9.1E-02	1.1E-05	1.4E+00		2.8E-03	2.8E-03	2.0E+04	2.0E+07			2.1E+03	2.0E-01	0.1	1			9.8E-05		8.7E-01	1.0E+00	3.6E-01	3.7E-04	1		Yes
Methyl styrene (mixture)	25013-15-4	3.5E+02	O	2.6E-03	1.1E-01	Yes	1	1.7E-02	4.2E-06	7.2E+02		1.4E+00	1.4E+00	8.9E+01	8.9E+04	6.4E-05	2.4E+04	1.4E+02	1.6E+00		1			6.6E-02		2.4E+01	8.0E-01	1.0E+01	4.8E-01	1		Yes
Methyl styrene (alpha)	98-83-9	1.2E+02	O	2.6E-03	1.0E-01	Yes	1	6.3E-02	8.2E-06	7.0E+02		1.4E+00	1.4E+00	1.2E+02	1.2E+05	2.3E-04	1.3E+04	1.8E+02	1.6E+00		1			7.0E-02		1.2E+00	1.0E+00	4.8E-01	2.9E-01	1		Yes
Methyl tertbutyl ether (MTBE)	1634-04-4	8.8E+01	O	5.9E-04	2.4E-02	Yes	1	7.5E-02	8.6E-06	1.2E+01		2.3E-02	2.3E-02	5.1E+04	5.1E+07	7.5E-04	4.9E+03	6.5E+03	2.3E-01		1			2.1E-03		7.9E-01	1.0E+00	3.3E-01	7.6E-03	1		Yes
Metolaclor (Dual)	51218-45-2	2.8E+02	O	9.0E-09	3.7E-07	No	0	2.2E-02	5.5E-06	4.9E+02		9.8E-01	9.8E-01	5.3E+02	5.3E+05			5.7E+02	1.2E+00	0.1	1			3.4E-03		9.8E+00	1.0E+00	4.1E+00	2.2E-02	1		Yes
Metribuzin	21087-64-9	2.1E+02	O	1.2E-10	4.8E-09	No	0	2.7E-02	7.1E-06	5.3E+01		1.1E-01	1.1E-01	1.1E+03	1.1E+06			2.2E+02	3.1E-01	0.1	1			1.3E-03		4.0E+00	1.0E+00	1.7E+00	7.4E-03	1		Yes
Metsulfuron-methyl (Ally)	74223-64-6	3.8E+02	O	1.3E-16	5.4E-15	No	0	3.6E-02	4.2E-06	9.3E+01		1.9E-01	1.9E-01	9.5E+03	9.5E+06			2.7E+03	3.9E-01	0.1	1			3.3E-04		3.4E+01	1.0E+00	1.4E+01	2.5E-03	1		Yes
Mirex	2385-85-5	5.5E+02	O	8.1E-04	3.3E-02	No	1	2.2E-02	5.6E-06	3.6E+05		7.1E+02	7.1E+02	8.5E-02	8.5E+01	5.4E-08	8.6E+05	6.1E+01	7.1E+02		1			5.2E-02		2.9E+02	5.0E-01	1.2E+02	4.6E-01	1		No
Molinate	2212-67-1	1.9E+02	O	4.1E-06	1.7E-04	No	0	3.2E-02	6.8E-06	1.8E+02		3.6E-01	3.6E-01	9.7E+02	9.7E+05			4.5E+02	5.6E-01	0.1	1			1.9E-02		2.8E+00	1.0E+00	1.2E+00	9.9E-02	1		Yes
Molybdenum	7439-98-7	9.6E+01	O			No	0				2.0E+01	2.0E+01	2.0E+01						2.0E+01		1			1.0E-03		8.7E-01	1.0E+00	3.6E-01	3.8E-03	1		Yes
Monochloramine	10599-90-3	5.1E+01	O			No	0														1		4000	1.0E-03		4.9E-01	1.0E+00	2.0E-01	2.8E-03	1		Yes
Myclobutanil (Systhane)	88671-89-0	2.7E+02	O	4.3E-09	1.7E-07	No	0	4.5E-02	5.3E-06	6.1E+03		1.2E+01	1.2E+01	1.4E+02	1.4E+05			1.7E+03	1.2E+01	0.1	1			3.4E-03		8.7E+00	1.0E+00	3.6E+00	2.1E-02	1		Yes
Naled	300-76-5	3.8E+02	O	6.5E-05	2.7E-03	No	1	2.5E-02	6.4E-06	1.3E+02		2.5E-01	2.5E-01	1.5E+00	1.5E+03	1.0E-05	5.7E+04	5.3E-01	4.5E-01		1			9.4E-05		3.4E+01	1.0E+00	1.4E+01	7.1E-04	1		Yes
Napropamide	15299-99-7	2.7E+02	O	8.4E-10	3.4E-08	No	0	4.5E-02	5.3E-06	3.2E+03		6.4E+00	6.4E+00	7.3E+01	7.3E+04			4.8E+02	6.6E+00	0.1	1			8.0E-03		8.3E+00	9.0E-01	3.5E+00	5.1E-02	1		Yes
Nickel and compounds	7440-02-0	5.9E+01	I			No	0				6.5E+01	6.5E+01	6.5E+01						6.5E+01		0.04				2.0E-04	5.4E-01	1.0E+00	2.2E-01	5.9E-04	1		Yes
Nickel refinery dust	7440-02-0-NRD		I			No	0				1.5E+02	1.5E+02	1.5E+02						1.5E+02		0.04				2.0E-04		0.0E+00			1		Yes
Nickel subsulfide	12035-72-2	2.4E+02	I			No	0														0.04				2.0E-04	5.6E+00	1.0E+00	2.3E+00	1.2E-03	1		Yes
Nitrate	14797-55-8	6.2E+01	I			No	0														1	10000	10000		1.0E-03	5.6E-01	1.0E+00	2.3E-01	3.0E-03	1		Yes
Nitrite	14797-65-0	4.7E+01	I			No	0														1	1000	1000		1.0E-03	4.6E-01	1.0E+00	1.9E-01	2.6E-03	1		Yes
2-Nitroaniline	88-74-4	1.4E+02	O	5.9E-08	2.4E-06	No	0	5.2E-02	7.4E-06	1.1E+02		2.2E-01	2.2E-01	1.5E+03	1.5E+06			4.7E+02	4.2E-01	0.1	1			4.5E-03		1.5E+00	1.0E+00	6.2E-01	2.0E-02	1		Yes
Nitrobenzene	98-95-3	1.2E+02	O	2.4E-05	9.8E-04	No	1	6.8E-02	9.4E-06	2.3E+02		4.5E-01	4.5E-01	2.1E+03	2.1E+06	6.5E-06	7.3E+04	1.2E+03	6.5E-01		1			5.4E-03		1.2E+00	1.0E+00	5.1E-01	2.3E-02	1		Yes
Nitrofurantoin	67-20-9	2.4E+02	O	1.3E-12	5.4E-11	No	0	4.9E-02	5.8E-06	1.2E+02		2.3E-01	2.3E-01	8.0E+01	8.0E+04			2.7E+01	4.3E-01	0.1	1			3.5E-05		5.4E+00	1.0E+00	2.3E+00	2.1E-04	1		Yes
Nitrofurazone	59-87-0	2.0E+02	O	3.1E-13	1.3E-11	No	0	5.6E-02	6.5E-06	3.5E+02		7.0E-01	7.0E-01	2.1E+02	2.1E+05			1.7E+02	9.0E-01	0.1	1			1.7E-04		3.2E+00	1.0E+00	1.4E+00	9.3E-04	1		Yes
Nitroglycerin	55-63-0	2.3E+02	O	8.7E-08	3.5E-06	No	0	2.9E-02	7.7E-06	1.2E+02		2.3E-01	2.3E-01	1.4E+03	1.4E+06			4.6E+02	4.3E-01	0.1	1			9.9E-04		4.7E+00	1.0E+00	2.0E+00	5.8E-03	1		Yes
Nitroguanidine	556-88-7	1.0E+02	O	4.5E-16	1.8E-14	No	0	1.0E-01	1.4E-05	2.1E+01		4.1E-02	4.1E-02	4.4E+03	4.4E+06			6.2E+02	2.4E-01	0.1	1			1.1E-04		9.7E-01	1.0E+00	4.0E-01	4.1E-04	1		Yes
2-Nitropropane	79-46-9	8.9E+01	O	1.2E-04	4.9E-03	Yes	1	8.5E-02	1.0E-05	3.1E+01		6.2E-02	6.2E-02	1.7E+04	1.7E+07	1.4E-04	1.3E+04	2.8E+03	2.6E-01		1			2.1E-03		8.0E-01	1.0E+00	3.3E-01	7.5E-03	1		Yes
N-Nitrosodi-n-butylamine	924-16-3	1.6E+02	O	1.3E-05	5.4E-04	No	1	4.2E-02	6.8E-06	9.1E+02		1.8E+00	1.8E+00	1.3E+03	1.3E+06	6.5E-07	2.4E+05	2.5E+03	2.0E+00		1			1.1E-02		1.9E+00	1.0E+00	8.1E-01	5.5E-02	1		Yes
N-Nitrosodiethanolamine	1116-54-7	1.3E+02	O	4.9E-12	2.0E-10	No	0	7.3E-02	8.5E-06	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			2.5E-05		1.4E+00	1.0E+00	5.9E-01	1.1E-04	1		Yes
N-Nitrosodiethylamine	55-18-5	1.0E+02	O	3.6E-06	1.5E-04	No	0	7.4E-02	9.1E-06	8.3E+01		1.7E-01	1.7E-01	1.1E+05	1.1E+08			2.8E+04	3.7E-01	0.1	1			8.7E-04		9.4E-01	1.0E+00	3.9E-01	3.4E-03	1	M	Yes
N-Nitrosodimethylamine	62-75-9	7.4E+01	O	1.8E-06	7.4E-05	Yes	1	9.9E-02	1.2E-05	2.3E+01		4.6E-02	4.6E-02	1.0E+06	1.0E+09	3.2E-06	8.2E+04	1.5E+05	2.5E-01		1			2.5E-04		6.6E-01	1.0E+00	2.7E-01	8.3E-04	1	M	Yes
N-Nitrosodiphenylamine	86-30-6	2.0E+02	O	1.2E-06	5.0E-05	No	0	5.6E-02	6.5E-06	2.6E+03		5.3E+00	5.3E+00	3.5E+01	3.5E+04			1.9E+02	5.5E+00	0.1	1			1.5E-02		3.3E+00	1.0E+00	1.4E+00	7.9E-02	1		Yes
N-Nitroso di-n-propylamine	621-64-7	1.3E+02	O	5.4E-06	2.2E-04	No	0	5.6E-02	7.8E-06	2.8E+02		5.5E-01	5.5E-01	1.3E+04	1.3E+07			8.5E+03	7.5E-01	0.1	1			2.3E-03		1.4E+00	1.0E+00	5.6E-01	1.0E-02	1		Yes
N-Nitroso-N-methylethylamine	10595-95-6	8.8E+01	O	1.4E-06	5.9E-05	Yes	1	8.4E-02	1.0E-05	4.3E+01		8.7E-02	8.7E-02	3.0E+05	3.0E+08	1.8E-06	1.2E+05	5.6E+04	2.9E-01		1			5.3E-04		7.9E-01	1.0E+00	3.3E-01	1.9E-03	1		Yes
N-Nitrosopyrrolidine	930-55-2	1.0E+02	O	4.9E-08	2.0E-06	No	0	8.0E-02	1.0E-05	9.2E+01		1.8E-01	1.8E-01	1.0E+06	1.0E+09			2.8E+05	3.8E-01	0.1	1			3.2E-04		9.2E-01	1.0E+00	3.8E-01	1.2E-03	1		Yes
m-Nitrotoluene	99-08-1	1.4E+02	O	9.3E-06	3.8E-04	No	0	5.9E-02	8.7E-06	3.6E+02		7.3E-01	7.3E-01	5.0E+02	5.0E+05			4.1E+02	9.3E-01	0.1	1			1.1E-02		1.5E+00	1.0E+00	6.2E-01	5.1E-02	1		Yes
o-Nitrotoluene	88-72-2	1.4E+02	O	1.3E-05	5.1E-04	No	1	5.9E-02	8.7E-06	3.7E+02		7.4E-01	7.4E-01	6.5E+02	6.5E+05	2.0E-06	1.4E+05	5.5E+02	9.4E-01		1			9.0E-03		1.5E+00	1.0E+00	6.2E-01	4.0E-02	1		Yes
p-Nitrotoluene	99-99-0	1.4E+02	O	5.6E-06	2.3E-04	No	0	5.7E-02	8.4E-06	3.6E+02		7.3E-01	7.3E-01	4.4E+02	4.4E+05			3.7E+02	9.3E-01	0.1	1			1.0E-02		1.5E+00	1.0E+00	6.2E-01	4.5E-02	1		Yes

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-2: CHEMICAL-SPECIFIC PARAMETERS

Contaminant		CAS	MW (g/mol)	Organic/ Inorganic	Henry's Law Constant H_units (atm-m^3/mol)	Henry's Law Constant H' (H_unitless) (unitless)	VP>1?	VOL	D_i (cm^2/s)	D_w (cm^2/s)	K_{oc} (organics) (cm^3/g)	K_d (inorganics) (cm^3/g)	$K_{d\ VF}$ (cm^3/g)	K_{d}_s_to_gw (cm^3/g)	S (mg/L-water)	S (µg/L-water)	D_A (cm^2/s)	VF (m^3/kg)	SAT (mg/kg)	soil-to-gw factor (kg/L)	ABS_d	ABS_{GI}	Title 118 MCL (µg/L)	EPA Fed MCL MCL (µg/L)	Kp.org (cm/hr)	Kp.inorg (cm/hr)	t_star (hr)	FA (unitless)	tau_event (hr)	B (unitless)	RBA (unitless)	Mutagen	In EPD?
Norflurazon		27314-13-2	3.0E+02	O	3.4E-10	1.4E-08	No	0	4.2E-02	4.9E-06	3.1E+03		6.2E+00	6.2E+00	3.4E+01	3.4E+04			2.1E+02	6.4E+00	0.1	1			1.1E-03		1.3E+01	1.0E+00	5.3E+00	7.0E-03	1		Yes
Octabromodiphenyl ether		32536-52-0	8.0E+02	O	7.5E-08	3.1E-06	No	0	2.2E-02	2.6E-06	9.9E+04		2.0E+02	2.0E+02	1.1E-08	1.1E-05			2.2E-06	2.0E+02	0.1	1			3.1E-02		7.8E+03	3.0E-01	3.2E+03	3.3E-01	1		No
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		2691-41-0	3.0E+02	O	8.7E-10	3.5E-08	No	0	4.3E-02	5.0E-06	5.3E+02		1.1E+00	1.1E+00	5.0E+00	5.0E+03			5.8E+00	1.3E+00	0.006	1			4.4E-05		1.1E+01	1.0E+00	4.8E+00	2.9E-04	1		Yes
Octamethylpyrophosphoramide		152-16-9	2.9E+02	O	3.8E-10	1.5E-08	No	0	2.2E-02	5.4E-06	2.0E+01		4.0E-02	4.0E-02	1.0E+06	1.0E+09			1.4E+05	2.4E-01	0.1	1			8.3E-06		1.0E+01	1.0E+00	4.2E+00	5.4E-05	1		Yes
Oryzalin		19044-88-3	3.5E+02	O	1.9E-09	7.8E-08	No	0	3.9E-02	4.5E-06	8.3E+02		1.7E+00	1.7E+00	2.5E+00	2.5E+03			4.4E+00	1.9E+00	0.1	1			5.4E-03		2.2E+01	9.0E-01	9.2E+00	3.8E-02	1		Yes
Oxadiazon		19666-30-9	3.5E+02	O	7.3E-08	3.0E-06	No	0	3.9E-02	4.5E-06	5.0E+03		1.0E+01	1.0E+01	7.0E-01	7.0E+02			7.1E+00	1.0E+01	0.1	1			2.8E-02		2.2E+01	8.0E-01	9.0E+00	2.0E-01	1		Yes
Oxamyl		23135-22-0	2.2E+02	O	2.4E-10	9.7E-09	No	0	2.3E-02	5.9E-06	1.0E+01		2.0E-02	2.0E-02	2.8E+05	2.8E+08			3.4E+04	2.2E-01	0.1	1	200	200	4.5E-05		4.3E+00	1.0E+00	1.8E+00	2.6E-04	1		Yes
Oxyfluorfen		42874-03-3	3.6E+02	O	8.2E-07	3.4E-05	No	0	2.1E-02	5.3E-06	4.0E+04		8.0E+01	8.0E+01	1.2E-01	1.2E+02			9.3E+00	8.0E+01	0.1	1			2.0E-02		2.7E+01	8.0E-01	1.1E+01	1.5E-01	1		Yes
Paclobutrazol		76738-62-0	2.9E+02	O	8.3E-11	3.4E-09	No	0	2.2E-02	5.7E-06	9.2E+02		1.8E+00	1.8E+00	2.6E+01	2.6E+04			5.1E+01	2.0E+00	0.1	1			4.7E-03		1.1E+01	9.0E-01	4.6E+00	3.1E-02	1		Yes
Paraquat		4685-14-7	1.9E+02	O	1.0E-09	2.4E-11	No	0	4.7E-02	5.5E-06	6.8E+03		1.4E+01	1.4E+01	6.2E+05	6.2E+08			8.5E+06	1.6E+01	0.1	1			5.8E-08		7.0E+00	1.0E+00	2.9E+00	3.6E-07	1		No
Parathion		56-38-2	2.9E+02	O	3.0E-07	1.2E-05	No	0	2.3E-02	5.8E-06	2.4E+03		4.8E+00	4.8E+00	1.1E+01	1.1E+04			5.4E+01	5.0E+00	0.1	1			1.3E-02		1.1E+01	9.0E-01	4.5E+00	8.4E-02	1		Yes
Pebulate		1114-71-2	2.0E+02	O	2.4E-04	9.7E-03	No	1	2.4E-02	6.1E-06	3.0E+02		6.0E-01	6.0E-01	1.0E+02	1.0E+05	1.8E-05	4.5E+04	7.0E+01	8.0E-01		1			4.0E-02		3.5E+00	1.0E+00	1.4E+00	2.2E-01	1		Yes
Pendimethalin		40487-42-1	2.8E+02	O	8.6E-07	3.5E-05	No	0	2.3E-02	5.7E-06	5.6E+03		1.1E+01	1.1E+01	3.3E-01	3.3E+02			3.7E+00	1.1E+01	0.1	1			1.2E-01		1.5E+01	9.0E-01	4.0E+00	7.4E-01	1		Yes
Pentabromo-6-chloro cyclohexane		87-84-3	5.1E+02	O	9.6E-07	3.9E-05	No	0	3.0E-02	3.5E-06	2.8E+03		5.6E+00	5.6E+00	5.5E-02	5.5E+01			3.1E-01	5.8E+00	0.1	1			2.8E-03		1.9E+02	9.0E-01	7.9E+01	2.5E-02	1		Yes
Pentabromodiphenyl ether		32534-81-9	5.6E+02	O	1.1E-04	4.4E-03	No	1	2.8E-02	3.2E-06	2.2E+04		4.3E+01	4.3E+01	2.4E-03	2.4E+00	1.5E-07	5.1E+05	1.0E-01	4.4E+01		1			3.7E-02		3.7E+02	6.0E-01	1.5E+02	3.4E-01	1		No
Pentachlorobenzene		608-93-5	2.5E+02	O	7.0E-04	2.9E-02	No	1	2.9E-02	7.9E-06	3.7E+03		7.4E+00	7.4E+00	8.3E-01	8.3E+02	6.0E-06	8.1E+04	6.3E+00	7.6E+00		1			1.7E-01		1.0E+01	9.0E-01	2.7E+00	1.0E+00	1		Yes
Pentachloronitrobenzene		82-68-8	3.0E+02	O	4.4E-05	1.8E-03	No	1	2.6E-02	6.9E-06	6.0E+03		1.2E+01	1.2E+01	4.4E-01	4.4E+02	2.1E-07	4.3E+05	5.3E+00	1.2E+01		1			4.2E-02		1.1E+01	9.0E-01	4.7E+00	2.8E-01	1		Yes
Pentachlorophenol		87-86-5	2.7E+02	O	2.5E-08	1.0E-06	No	0	3.0E-02	8.0E-06	5.9E+02		1.2E+00	1.2E+00	1.4E+01	1.4E+04			1.8E+01	1.4E+00	0.25	1	1	1	1.3E-01		1.3E+01	9.0E-01	3.3E+00	8.0E-01	1		Yes
Perchlorate		14797-73-0	1.2E+02	I			No	0							2.5E+05	2.5E+08						1		15		1.0E-03	1.1E+00	1.0E+00	4.8E-01	4.2E-03	1		Yes
Perfluoroalkyl Compounds																																	
Perfluoro-octanesulfonate (PFOS)^^		1763-23-1	3.0E+02	O	1.4E-05	5.9E-04	No	0	2.7E-02	7.2E-06	1.8E+02		3.5E-01	3.5E-01	3.7E+02	3.7E+05			1.7E+02	5.5E-01	0.1	1	0.07		1.3E-03		1.2E+01	0.0E+00	5.0E+00	8.7E-03	1		Yes
Perfluorooctanoic acid (PFOA)^^	1	335-67-1	2.1E+02	O	2.0E-04	8.2E-03	No	0			1.1E+02			2.3E-01	9.5E+03	9.5E+06				4.3E-01	0.1	1	0.07		1.3E-03		1.2E+01	0.0E+00	5.0E+00	8.7E-03	1		Yes
Permethrin		52645-53-1	3.0E+02	O	1.9E-06	7.7E-05	No	0	1.9E-02	4.8E-06	1.2E+05		2.4E+02	2.4E+02	6.0E-03	6.0E+00			1.4E+00	2.4E+02	0.1	1			2.1E-01		6.5E+01	6.0E-01	1.6E+01	1.6E+00	1		No
Phenmedipham		13684-63-4	2.1E+02	O	8.4E-13	3.4E-11	No	0	4.2E-02	5.0E-06	2.6E+03		5.2E+00	5.2E+00	4.7E+00	4.7E+03			2.5E+01	5.4E+00	0.1	1			7.9E-03		1.2E+01	9.0E-01	5.1E+00	5.2E-02	1		Yes
Phenol		108-95-2	9.4E+01	O	3.3E-07	1.4E-05	No	0	8.3E-02	1.0E-05	1.9E+02		3.7E-01	3.7E-01	8.3E+04	8.3E+07			3.9E+04	5.7E-01	0.1	1			4.3E-03		8.5E-01	1.0E+00	3.5E-01	1.6E-02	1		Yes
m-Phenylenediamine		108-45-2	1.1E+02	O	1.3E-09	5.1E-08	No	0	7.2E-02	9.2E-06	3.4E+01		6.8E-02	6.8E-02	2.4E+05	2.4E+08			4.0E+04	2.7E-01	0.1	1			2.3E-04		1.0E+00	1.0E+00	4.2E-01	9.4E-04	1		Yes
p-Phenylenediamine		106-50-3	1.1E+02	O	6.7E-10	2.8E-08	No	0	8.4E-02	9.8E-06	3.4E+01		6.8E-02	6.8E-02	3.7E+04	3.7E+07			6.2E+03	2.7E-01	0.1	1			2.5E-04		1.0E+00	1.0E+00	4.2E-01	9.8E-04	1		Yes
Phenylmercuric acetate		62-38-4	3.4E+02	O	5.7E-10	2.3E-08	No	0	3.9E-02	4.6E-06	5.6E+01		1.1E-01	1.1E-01	4.4E+03	4.4E+06			9.3E+02	3.1E-01	0.1	1			6.0E-05		1.9E+01	1.0E+00	8.1E+00	4.2E-04	1		Yes
2-Phenylphenol		90-43-7	1.7E+02	O	1.1E-06	4.3E-05	No	0	4.2E-02	7.8E-06	6.7E+03		1.3E+01	1.3E+01	7.0E+02	7.0E+05			9.5E+03	1.4E+01	0.1	1			2.0E-02		2.3E+00	1.0E+00	9.4E-01	9.8E-02	1		Yes
Phorate		298-02-2	2.6E+02	O	4.4E-06	1.8E-04	No	0	2.3E-02	5.9E-06	4.6E+02		9.2E-01	9.2E-01	5.0E+01	5.0E+04			5.1E+01	1.1E+00	0.1	1			1.3E-02		7.2E+00	9.0E-01	3.0E+00	7.8E-02	1		Yes
Phosmet		732-11-6	3.2E+02	O	8.4E-09	3.4E-07	No	0	4.1E-02	4.8E-06	1.0E+01		2.0E-02	2.0E-02	2.4E+01	2.4E+04			2.9E+00	2.2E-01	0.1	1			1.8E-03		1.5E+01	1.0E+00	6.3E+00	1.3E-02	1		Yes
Phosphine		7803-51-2	3.4E+01	O	2.4E-02	1.0E+00	Yes	1	1.9E-01	2.2E-05					2.6E+05	2.6E+08						1			1.0E-03		3.9E-01	1.0E+00	1.6E-01	2.2E-03	1		Yes
Phosphoric acid		7664-38-2	9.8E+01	O			No	0							5.5E+06	5.5E+09						1			1.0E-03		8.9E-01	1.0E+00	3.7E-01	3.8E-03	1		Yes
Phosphorus (white)		7723-14-0	3.1E+01	O	2.1E-03	8.6E-02	No	1	2.2E-01	2.8E-05	1.1E+03	3.5E+00		3.5E+00	3.0E+00	3.0E+03		6.9E+03		3.7E+00		1			1.0E-03		3.8E-01	1.0E+00	1.6E-01	2.1E-03	1		Yes
p-Phthalic acid		100-21-0	1.7E+02	O	3.9E-13	1.6E-11	No	0	4.9E-02	9.0E-06	7.9E+01		1.6E-01	1.6E-01	1.5E+01	1.5E+04			3.9E+00	3.6E-01	0.1	1			3.9E-03		2.1E+00	1.0E+00	9.0E-01	1.9E-02	1		Yes
Phthalic anhydride		85-44-9	1.5E+02	O	1.6E-08	6.7E-07	No	0	5.9E-02	9.8E-06	1.0E+01		2.0E-02	2.0E-02	6.2E+03	6.2E+06			7.4E+02	2.2E-01	0.1	1			2.7E-03		1.7E+00	1.0E+00	7.1E-01	1.2E-02	1		Yes
Picloram		1918-02-1	2.4E+02	O	5.3E-14	2.2E-12	No	0	4.9E-02	5.7E-06	3.9E+01		7.8E-02	7.8E-02	4.3E+02	4.3E+05			7.6E+01	2.8E-01	0.1	1	500	500	1.3E-03		5.7E+00	1.0E+00	2.4E+00	7.6E-03	1		Yes
Pirimiphos-methyl		29232-93-7	3.1E+02	O	7.0E-07	2.9E-05	No	0	2.2E-02	5.4E-06	3.7E+02		7.5E-01	7.5E-01	8.6E+00	8.6E+03			7.3E+00	9.5E-01	0.1	1			1.9E-02		1.3E+01	9.0E-01	5.4E+00	1.3E-01	1		Yes
Polybrominated biphenyls (PBBs)		59536-65-1		O			No	0													0.1	1						0.0E+00			1		No
Polychlorinated biphenyls (PCBs)		1336-36-3	2.9E+02	O	4.2E-04	1.7E-02	No	1	2.4E-02	6.3E-06	7.8E+04		1.6E+02	1.6E+02	7.0E-01	7.0E+02	1.4E-07	5.3E+05	1.1E+02	1.6E+02	0.14	1	0.5	0.5	5.5E-01		1.9E+01	7.0E-01	4.5E+00	3.6E+00	1		
Aroclor 1016		12674-11-2	6.3E+02	O			No	0																							1		
Aroclor 1221		11104-28-2	1.9E+02	O	2.3E-04	9.3E-03	No	1	3.2E-02	7.2E-06	8.4E+03		1.7E+01	1.7E+01	1.5E+01	1.5E+04	9.6E-07	2.0E+05	2.5E+02	1.7E+01	0.14	1			1.7E-01		4.6E+00	1.0E+00	1.2E+00	8.9E-01	1		Yes
Aroclor 1232		11141-16-5	1.9E+02	O	7.4E-04	3.0E-02	No	1	3.3E-02	7.5E-06	8.4E+03		1.7E+01	1.7E+01	1.5E+00	1.5E+03	3.2E-06	1.1E+05	2.5E+01	1.7E+01	0.14	1			1.7E-01		4.6E+00	1.0E+00	1.2E+00	8.9E-01	1		Yes
Aroclor 1242		53469-21-9	2.9E+02	O	3.4E-04	1.4E-02	No	1	2.4E-02	6.1E-06	7.8E+04		1.6E+02	1.6E+02	2.8E-01	2.8E+02	1.1E-07	5.9E+05	4.3E+01	1.6E+02	0.14	1			5.5E-01		1.9E+01	7.0E-01	4.5E+00	3.6E+00	1		No
Aroclor 1248		12672-29-6	6.2E+02	O	4.4E-04	1.8E-02	No	1	1.6E-02	3.9E-06	7.7E+04		1.5E+02	1.5E+02	1.0E-01	1.0E+02	1.0E-07	6.3E+05	1.5E+01	1.5E+02	0.14	1			4.8E-01		1.3E+03	0.0E+00	3.1E+02	4.5E+00	1		No
Aroclor 1254		11097-69-1	3.3E+02	O	2.8E-04	1.2E-02	No	1	2.4E-02	6.1E-06	1.3E+05		2.6E+02	2.6E+02	4.3E-02	4.3E+01	5.6E-08	8.4E+05	1.1E+01	2.6E+02	0.14	1			7.5E-01		3.1E+01	5.0E-01	7.1E+00	5.2E+00	1		No
Aroclor 1260		11096-82-5	4.0E+02	O	3.4E-04	1.4E-02	No	1	2.2E-02	5.6E-06	3.5E+05		7.0E+02	7.0E+02	1.4E-02	1.4E+01	2.3E-08	1.3E+06	1.0E+01	7.0E+02	0.14	1			9.9E-01		7.7E+01	0.0E+00	1.7E+01	7.5E+00	1		No
Polynuclear aromatic hydrocarbons (PAHs)																																	
Acenaphthene		83-32-9	1.5E+02	O	1.8E-04	7.5E-03	No	1	5.1E-02	8.3E-06	5.0E+03		1.0E+01	1.0E+01	3.9E+00	3.9E+03	2.0E-06	1.4E+05	4.0E+01	1.0E+01	0.13	1			8.6E-02		1.8E+00	1.0E+00	7.7E-01	4.1E-01	1		Yes
Anthracene		120-12-7	1.8E+02	O	5.6E-05	2.3E-03	No	1	3.9E-02	7.9E-06	1.6E+04		3.3E+01	3.3E+01	4.3E-02	4.3E+01	1.5E-07	5.2E+05	1.4E+00	3.3E+01	0.13	1			1.4E-01		4.1E+00	1.0E+00	1.0E+00	7.3E-01	1		Yes
Benz[a]anthracene		56-55-3	2.3E+02	O	1.2E-05	4.9E-04	No	1	2.6E-02	6.7E-06	1.8E+05		3.5E+02	3.5E+02	9.4E-03	9.4E+00	2.0E-09	4.4E+06	3.3E+00	3.5E+02	0.13	1			5.5E-01		8.5E+00	1.0E+00	2.0E+00	3.2E+00	1	M	No
Benzo[a]pyrene		50-32-8	2.5E+02	O	4.6E-07	1.9E-05	No	0	4.8E-02	5.6E-06	5.9E+05		1.2E+03	1.2E+03	1.6E-03	1.6E+00			1.9E+00	1.2E+03	0.13	1	0.2	0.2	7.1E-01		1.2E+01	1.0E+00	2.7E+00	4.4E+00	1	M	No
Benzo[b]fluoranthene		205-99-2	2.5E+02	O	6.6E-07	2.7E-05	No	0	4.8E-02	5.6E-06	6.0E+05		1.2E+03	1.2E+03	1.5E-03	1.5E+00			1.8E+00	1.2E+03	0.13	1			4.2E-01		1.1E+01	1.0E+00	2.7E+00	2.5E+00	1	M	No
Benzo[k]fluoranthene		207-08-9	2.5E+02	O	5.8E-07	2.4E-05	No	0	4.8E-02	5.6E-06	5.9E+05		1.2E+03	1.2E+03	8.0E-04	8.0E-01			9.4E-01	1.2E+03	0.13	1			6.9E-01		1.2E+01	9.0E-01	2.7E+00	4.2E+00	1	M	No
Chrysene		218-01-9	2.3E+02	O	5.2E-06	2.1E-04	No	0	2.6E-02	6.7E-06	1.8E+05		3.6E+02	3.6E+02	2.0E-03	2.0E+00			7.2E-01	3.6E+02	0.13	1			6.0E-01		8.5E+00	1.0E+00	2.0E+00	3.5E+00	1	M	No
Dibenz[ah]anthracene		53-70-3	2.8E+02	O	1.4E-07	5.8E-06	No	0	4.5E-02	5.2E-06	1.9E+06		3.8E+03	3.8E+03	2.5E-03	2.5E+00			9.5E+00	3.8E+03	0.13	1			9.5E-01		1.7E+01	6.0E-01	3.8E+00	6.1E+00	1	M	No
Fluoranthene		206-44-0	2.0E+02	O	8.9E-06	3.6E-04	No	0	2.8E-02	7.2E-06	5.5E+04		1.1E+02	1.1E+02	2.6E-01	2.6E+02			2.9E+01	1.1E+02	0.13	1			3.1E-01		5.7E+00	1.0E+00	1.4E+00	1.7E+00	1		No
Fluorene		86-73-7	1.7E+02	O	9.6E-05	3.9E-03	No	1	4.4E-02	7.9E-06	9.2E+03		1.8E+01	1.8E+01	1.7E+00	1.7E+03	5.0E-07	2.8E+05	3.1E+01	1.9E+01	0.13	1			1.1E-01		2.2E+00	1.0E+00	9.0E-01	5.5E-01	1		Yes
Indeno[1,2,3-cd]pyrene		193-39-5	2.8E+02	O	3.5E-07	1.4E-05	No	0	4.5E-02	5.2E-06	2.0E+06		3.9E+03	3.9E+03	1.9E-04	1.9E-01			7.4E-01	3.9E+03	0.13	1			1.2E+00		1.7E+01	6.0E-01	3.7E+00	7.9E+00	1	M	No
Naphthalene		91-20-3	1.3E+02	O	4.4E-04	1.8E-02	No	1	6.0E-02	8.4E-06	1.5E+03		3.1E+00	3.1E+00	3.1E+01	3.1E+04	1.8E-05	4.6E+04	9.9E+01	3.3E+00	0.13	1			4.7E-02		1.3E+00	1.0E+00	5.5E-01	2.0E-01	1		Yes
Pyrene		129-00-0	2.0E+02	O	1.2E-05	4.9E-04	No	1	2.8E-02	7.2E-06	5.4E+04		1.1E+02	1.1E+02	1.4E-01	1.4E+02	7.0E-09	2.4E+06	1.5E+01	1.1E+02	0.13	1			2.0E-01		5.5E+00	1.0E+00	1.4E+00	1.1E+00	1		Yes
Prochloraz		67747-09-5	3.8E+02	O	1.6E-08	6.7E-07	No	0	3.6E-02	4.3E-06	2.4E+03		4.9E+00	4.9E+00	3.4E+01	3.4E+04			1.7E+02	5.1E+00	0.1	1			6.4E-03		3.2E+01	9.0E-01	1.4E+01	4.8E-02	1		Yes
Profluralin		26399-36-0	3.5E+02	O	2.9E-04	1.2E-02	No	1	2.2E-02	5.5E-06	3.1E+04		6.1E+01	6.1E+01	1.0E-01	1.0E+02	2.3E-07	4.2E+05	6.1E+00	6.1E+01		1			9.0E-02		3.7E+01	8.0E-01	9.3E+00	6.5E-01	1		Yes
Prometon		1610-18-0	2.3E+02	O	9.1E-10	3.7E-08	No	0	5.1E-02	6.0E-06	1.4E+02		2.7E-01	2.7E-01	7.5E+02	7.5E+05			2.8E+02	4.7E-01	0.1	1			8.3E-03		4.6E+00	1.0E+00	1.9E+00	4.8E-02	1		Yes
Prometryn		7287-19-6	2.4E+02	O	1.2E-08	4.9E-07	No	0	2.4E-02	6.2E-06	6.6E+02		1.3E+00	1.3E+00	3.3E+01	3.3E+04			4.7E+01	1.5E+00	0.1	1			1.5E-02		5.7E+00	9.0E-01	2.4E+00	8.9E-02	1		Yes
Propyzamide (Pronamide)		23950-58-5	2.6E+02	O	9.8E-09	4.0E-07	No	0	4.7E-02	5.5E-06	4.0E+02		8.1E-01	8.1E-01	1.5E+01	1.5E+04			1.4E+01	1.0E+00	0.1	1			1.1E-02		6.9E+00	9.0E-01	2.9E+00	6.7E-02	1		Yes
Propachlor		1918-16-7	2.1E+02	O	3.6E-07	1.5E-05	No	0	2.7E-02	7.0E-06	2.0E+02		4.1E-01	4.1E-01	5.8E+02	5.8E+05			3.0E+02	6.1E-01	0.1	1			2.9E-03		3.9E+00	1.0E+00	1.6E+00	1.6E-02	1		Yes
Propanil		709-98-8	2.2E+02	O	1.7E-09	7.0E-08	No	0	2.7E-02	6.9E-06	1.8E+02		3.5E-01	3.5E-01	1.5E+02	1.5E+05			6.9E+01	5.5E-01	0.1	1			1.0E-02		4.2E+00	1.0E+00	1.8E+00	5.9E-02	1		Yes
Propargite		2312-35-8	3.5E+02	O	6.4E-07	2.6E-05	No	0	1.9E-02	4.8E-06	3.7E+04		7.3E+01	7.3E+01	2.2E-01	2.2E+02			1.6E+01	7.4E+01	0.1	1			3.6E-02		2.3E+01	8.0E-01	9.7E+00	2.6E-01	1		Yes
Propargyl alcohol		107-19-7	5.6E+01	O	1.2E-06	4.7E-05	Yes	1	1.2E-01	1.3E-05	1.9E+00		3.8E-03	3.8E-03	1.0E+06	1.0E+09	3.6E-06	6.3E+04	1.0E+05	2.0E-01		1			4.2E-04		5.2E-01	1.0E+00	2.2E-01	1.2E-03	1		Yes
Propazine		139-40-2	2.3E+02	O	4.6E-09	1.9E-07	No	0	2.5E-02	6.4E-06	3.4E+02		6.9E-01	6.9E-01	8.6E+00	8.6E+03			6.8E+00	8.9E-01	0.1	1			7.1E-03		4.9E+00	1.0E+00	2.0E+00	4.2E-02	1		Yes
Propham		122-42-9	1.8E+02	O	1.8E-07	7.5E-06	No	0	3.6E-02	7.1E-06	2.2E+02		4.4E-01	4.4E-01	1.8E+02	1.8E+05			9.6E+01	6.4E-01	0.1	1			8.3E-03		2.5E+00	1.0E+00	1.1E+00	4.3E-02	1		Yes
Propiconazole		60207-90-1	3.4E+02	O	1.7E-09	7.0E-08	No	0	2.1E-02	5.3E-06	1.6E+03		3.1E+00	3.1E+00	1.1E+02	1.1E+05			3.5E+02	3.3E+00	0.1	1			5.6E-03		2.1E+01	9.0E-01	8.7E+00	4.0E-02	1		Yes
n-Propylbenzene		103-65-1	1.2E+02	O	1.1E-02	4.3E-01	Yes	1	6.0E-02	7.8E-06	8.1E+02		1.6E+00	1.6E+00	5.2E+01	5.2E+04	7.6E-04	7.0E+03	9.4E+01	1.9E+00		1			9.4E-02		1.2E+00	1.0E+00	5.0E-01	4.0E-01	1		Yes
Propylene glycol		57-55-6	7.6E+01	O	1.3E-08	5.3E-07	No	0	9.8E-02	1.2E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09			1.0E+05	2.0E-01	0.1	1			1.4E-04		6.7E-01	1.0E+00	2.8E-01	4.8E-04	1		Yes
Propylene glycol, monoethyl ether		52125-53-8	1.0E+02	O	7.4E-08	3.0E-06	Yes	1	8.3E-02	1.0E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09		7.8E+04		2.0E+00		1			3.7E-04		8.1E-01	1.0E+00	3.4E-01	1.4E-03	1		Yes
Propylene glycol, monomethyl ether		107-98-2	9.0E+01	O	9.2E-07	3.8E-05	Yes	1	8.3E-02	1.0E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09	2.3E-06	7.8E+04	1.0E+05	2.0E-01		1			3.7E-04		8.1E-01	1.0E+00	3.4E-01	1.4E-03	1		Yes
Propylene oxide		75-56-9	1.0E+02	O	7.4E-08	3.0E-06	Yes	1	8.3E-02	1.0E-05	1.0E+00		2.0E-03	2.0E-03	1.0E+06	1.0E+09		7.8E+04		2.0E+00		1			3.7E-04		8.1E-01	1.0E+00	3.4E-01	1.4E-03	1		Yes
Pyridine		110-86-1	7.9E+01	O	1.1E-05	4.5E-04	Yes	1	9.3E-02	1.1E-05	7.2E+01		1.4E-01	1.4E-01	1.0E+06	1.0E+09	9.4E-06	5.5E+04	2.4E+05	3.4E-01		1			1.5E-03		7.0E-01	1.0E+00	2.9E-01	5.2E-03	1		Yes
Quinalphos		13593-03-8	3.0E+02	O	4.6E-08	1.9E-06	No	0	4.3E-02	5.0E-06	4.2E+03		8.4E+00	8.4E+00	2.2E+01	2.2E+04			1.9E+02	8.6E+00	0.1	1			3.0E-02		1.2E+01	9.0E-01	4.9E+00	2.0E-01	1		Yes
Quinoline		91-22-5	1.3E+02	O	1.7E-06	6.8E-05	No	0	6.2E-02	8.7E-06	1.5E+03		3.1E+00	3.1E+00	6.1E+03	6.1E+06			1.9E+04	3.3E+00	0.1	1			6.6E-03		1.3E+00	1.0E+00	5.6E-01	2.9E-02	1		Yes
Resmethrin		10453-86-8	3.4E+02	O	1.3E-07	5.4E-06	No	0	3.9E-02	4.6E-06	3.1E+05		6.2E+02	6.2E+02	3.8E-02	3.8E+01			2.4E+01	6.2E+02	0.1	1			2.4E-01		3.3E+01	7.0E-01	8.3E+00	1.7E+00	1		Yes
Ronnel		299-84-3	3.2E+02	O	3.2E-05	1.3E-03	No	1	2.3E-02	5.9E-06	4.5E+03		8.9E+00	8.9E+00	1.0E+00	1.0E+03	1.8E-07	4.6E+05	9.0E+00	9.1E+00		1			4.3E-02		1.6E+01	8.0E-01	6.6E+00	3.0E-01	1		Yes
Rotenone		83-79-4	3.9E+02	O	1.1E-13	4.6E-12	No	0	3.5E-02	4.1E-06	2.6E+05		5.2E+02	5.2E+02	2.0E-01	2.0E+02			1.0E+02	5.2E+02	0.1	1			5.1E-03		4.1E+01	9.0E-01	1.7E+01	3.9E-02	1		Yes
Selenious Acid		7783-00-8	1.3E+02	I			No	0							9.0E+05	9.0E+08						1				1.0E-03	1.3E+00	1.0E+00	5.5E-01	4.4E-03	1		Yes
Selenium		7782-49-2	7.9E+01	I			No	0				5.0E+00	5.0E+00	5.0E+00						5.2E+00		1	50	50		1.0E-03	7.0E-01	1.0E+00	2.9E-01	3.4E-03	1		Yes
Sethoxydim		74051-80-2	3.3E+02	O	2.2E-11	8.8E-10	No	0	2.0E-02	4.8E-06	4.4E+03		8.7E+00	8.7E+00	2.5E+01	2.5E+04			2.2E+02	8.9E+00	0.1	1			1.9E-02		1.7E+01	9.0E-01	7.2E+00	1.3E-01	1		Yes
Silver and compounds		7440-22-4	1.1E+02	I			No	0				8.3E+00	8.3E+00	8.3E+00						8.5E+00		0.04	100			6.0E-04	1.0E+00	1.0E+00	4.2E-01	2.4E-03	1		Yes
Simazine		122-34-9	2.0E+02	O	9.4E-10	3.9E-08	No	0	2.8E-02	7.4E-06	1.5E+02		2.9E-01	2.9E-01	6.2E+00	6.2E+03			2.4E+00	4.9E-01	0.1	1	4	4	3.3E-03		3.4E+00	1.0E+00	1.4E+00	1.8E-02	1		Yes
Sodium azide		26628-22-8	6.5E+01	O			No	0							4.1E+05	4.1E+08						1			1.0E-03		5.8E-01	1.0E+00	2.4E-01	3.1E-03	1		Yes
Sodium diethyldithiocarbamate		148-18-5	1.7E+02	O			No	0	6.1E-02	7.2E-06	2.0E+02		4.1E-01	4.1E-01	3.6E+05	3.6E+08				6.1E-01	0.1	1			1.9E-05		2.3E+00	1.0E+00	9.7E-01	9.7E-05	1		Yes
Sodium fluoroacetate		62-74-8	1.0E+02	O	1.1E-06	4.5E-05	No	0	8.8E-02	1.0E-05	1.4E+00		2.9E-03	2.9E-03	1.1E+06	1.1E+09			1.1E+05	2.0E-01	0.1	1			1.3E-06		9.2E-01	1.0E+00	3.8E-01	5.1E-06	1		No
Sodium metavanadate		13718-26-8	1.2E+02	O			No	0							2.1E+05	2.1E+08						1			1.0E-03		1.2E+00	1.0E+00	5.1E-01	4.2E-03	1		Yes
Strontium, stable		7440-24-6	8.8E+01	I			No	0				3.5E+01	3.5E+01	3.5E+01						3.5E+01		1				1.0E-03	7.8E-01	1.0E+00	3.3E-01	3.6E-03	1		Yes
Strychnine		57-24-9	3.3E+02	O	7.6E-14	3.1E-12	No	0	2.2E-02	5.6E-06	5.4E+03		1.1E+01	1.1E+01	1.6E+02	1.6E+05			1.7E+03	1.1E+01	0.1	1			4.0E-04		1.9E+01	1.0E+00	7.8E+00	2.8E-03	1		Yes
Styrene		100-42-5	1.0E+02	O	2.8E-03	1.1E-01	Yes	1	7.1E-02	8.8E-06	4.5E+02		8.9E-01	8.9E-01	3.1E+02	3.1E+05	4.2E-04	9.3E+03	3.1E+02	1.1E+00		1	100	100	3.7E-02		9.7E-01	1.0E+00	4.0E-01	1.5E-01	1		Yes
1,1'-Sulfonylbis (4-Chlorobenzene)		80-07-9	2.9E+02	O	1.4E-07	5.6E-06	No	0	4.4E-02	5.1E-06	2.9E+03		5.7E+00	5.7E+00	2.4E+00	2.4E+03			1.4E+01	5.9E+00	0.1	1			1.5E-02		1.0E+01	9.0E-01	4.3E+00	9.7E-02	1		Yes
Tebuthiuron		34014-18-1	2.3E+02	O	1.2E-10	4.9E-09	No	0	5.1E-02	5.9E-06	4.2E+01		8.5E-02	8.5E-02	2.5E+03	2.5E+06			4.6E+02	2.8E-01	0.1	1			1.3E-03		4.8E+00	1.0E+00	2.0E+00	7.4E-03	1		Yes
Temephos		3383-96-8	4.7E+02	O	2.0E-09	8.0E-08	No	0	1.8E-02	4.5E-06	9.5E+04		1.9E+02	1.9E+02	2.7E-01	2.7E+02			5.1E+01	1.9E+02	0.1	1			3.5E-02		1.0E+02	7.0E-01	4.3E+01	2.9E-01	1		No
Terbacil		5902-51-2	2.2E+02	O	1.2E-10	4.9E-09	No	0	2.7E-02	7.2E-06	5.0E+01		1.0E-01	1.0E-01	7.1E+02	7.1E+05			1.4E+02	3.0E-01	0.1	1			1.7E-03		4.1E+00	1.0E+00	1.7E+00	9.7E-03	1		Yes
Terbufos		13071-79-9	2.9E+02	O	2.4E-05	9.8E-04	No	1	2.2E-02	5.4E-06	1.0E+03		2.0E+00	2.0E+00	5.1E+00	5.1E+03	5.5E-07	2.6E+05	1.1E+01	2.2E+00		1			3.6E-02		1.0E+01	9.0E-01	4.3E+00	2.3E-01	1		Yes
Terbutryn		886-50-0	2.4E+02	O	2.2E-08	8.8E-07	No	0	2.4E-02	6.0E-06	6.1E+02		1.2E+00	1.2E+00	2.5E+01	2.5E+04			3.3E+01	1.4E+00	0.1	1			2.1E-02		5.7E+00	9.0E-01	2.4E+00	1.3E-01	1		Yes
1,2,4,5-Tetrachlorobenzene		95-94-3	2.2E+02	O	1.0E-03	4.1E-02	No	1	3.2E-02	8.8E-06	2.2E+03		4.4E+00	4.4E+00	6.0E-01	6.0E+02	1.5E-05	5.1E+04	2.7E+00	4.6E+00		1			1.2E-01		6.7E+00	1.0E+00	1.7E+00	6.6E-01	1		Yes
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)		1746-01-6	3.2E+02	O	5.0E-05	2.0E-03	No	1	4.7E-02	6.8E-06	2.5E+05		5.0E+02	5.0E+02	2.0E-04	2.0E-01	1.0E-08	2.0E+06	1.0E-01	5.0E+02	0.03	1	0.00003	0.00003	8.1E-01		2.9E+01	5.0E-01	6.7E+00	5.6E+00	1		No
1,1,1,2-Tetrachloroethane		630-20-6	1.7E+02	O	2.5E-03	1.0E-01	Yes	1	4.8E-02	9.1E-06	8.6E+01		1.7E-01	1.7E-01	1.1E+03	1.1E+06	9.0E-04	5.7E+03	3.1E+02	3.8E-01		1			1.6E-02		2.2E+00	1.0E+00	9.2E-01	7.9E-02	1		Yes
1,1,2,2-Tetrachloroethane		79-34-5	1.7E+02	O	3.7E-04	1.5E-02	Yes	1	4.9E-02	9.3E-06	9.5E+01		1.9E-01	1.9E-01	2.8E+03	2.8E+06	1.3E-04	1.5E+04	8.3E+02	3.9E-01		1			6.9E-03		2.2E+00	1.0E+00	9.2E-01	3.5E-02	1		Yes
Tetrachloroethylene (PCE)		127-18-4	1.7E+02	O	1.8E-02	7.2E-01	Yes	1	5.0E-02	9.5E-06	9.5E+01		1.9E-01	1.9E-01	2.1E+02	2.1E+05	4.6E-03	2.3E+03	8.8E+01	4.5E-01		1	5	5	3.3E-02		2.1E+00	1.0E+00	8.9E-01	1.7E-01	1		Yes
2,3,4,6-Tetrachlorophenol		58-90-2	2.3E+02	O	8.8E-06	3.6E-04	No	0	5.0E-02	5.9E-06	2.8E+02		5.6E-01	5.6E-01	2.3E+01	2.3E+04			1.5E+01	7.6E-01	0.1	1			7.1E-02		5.0E+00	9.0E-01	2.1E+00	4.2E-01	1		Yes
p,a,a,a-Tetrachlorotoluene		5216-25-1	2.3E+02	O	1.9E-04	7.9E-03	No	1	2.8E-02	7.3E-06	1.6E+03		3.2E+00	3.2E+00	4.0E+00	4.0E+03	3.5E-06	1.1E+05	1.3E+01	3.4E+00		1			8.4E-02		4.9E+00	9.0E-01	2.0E+00	4.9E-01	1		Yes
Tetrachlorovinphos (Stirofos)		961-11-5	3.7E+02	O	1.8E-09	7.5E-08	No	0	3.7E-02	4.3E-06	1.4E+03		2.8E+00	2.8E+00	1.1E+01	1.1E+04			3.1E+01	3.0E+00	0.1	1			3.1E-03		2.8E+01	9.0E-01	1.2E+01	2.3E-02	1		Yes
Tetraethyldithiopyrophosphate		3689-24-5	3.2E+02	O	4.5E-06	1.8E-04	No	0	2.1E-02	5.3E-06	2.7E+02		5.3E-01	5.3E-01	3.0E+01	3.0E+04			1.9E+01	7.3E-01	0.1	1			1.1E-02		1.6E+01	9.0E-01	6.7E+00	7.5E-02	1		Yes
Thallium and compounds		7440-28-0	2.0E+02	I			No	0				7.1E+01	7.1E+01	7.1E+01						7.1E+01		1	2	2		1.0E-03	3.5E+00	1.0E+00	1.5E+00	5.5E-03	1		Yes
Thiobencarb		28249-77-6	2.6E+02	O	2.7E-07	1.1E-05	No	0	2.3E-02	5.9E-06	1.6E+03		3.3E+00	3.3E+00	2.8E+01	2.8E+04			9.4E+01	3.5E+00	0.1	1			1.0E-02		7.0E+00	9.0E-01	2.9E+00	6.3E-02	1		Yes
Thiofanox		39196-18-4	2.2E+02	O	9.4E-09	3.8E-07	No	0	5.2E-02	6.1E-06	7.2E+01		1.4E-01	1.4E-01	5.2E+03	5.2E+06			1.3E+03	3.4E-01	0.1	1			6.3E-03		4.2E+00	1.0E+00	1.8E+00	3.6E-02	1		Yes
Thiophanate-methyl		23564-05-8	3.4E+02	O	1.2E-09	4.9E-08	No	0	3.9E-02	4.5E-06	3.3E+02		6.5E-01	6.5E-01	2.7E+01	2.7E+04			2.0E+01	8.5E-01	0.1	1			1.6E-04		2.1E+01	1.0E+00	8.7E+00	1.1E-03	1		Yes
Thiram		137-26-8	2.4E+02	O	1.8E-07	7.4E-06	No	0	2.6E-02	6.6E-06	6.1E+02		1.2E+00	1.2E+00	3.0E+01	3.0E+04			4.0E+01	1.4E+00	0.1	1			9.9E-04		5.6E+00	1.0E+00	2.3E+00	5.9E-03	1		Yes
Tin and compounds		7440-31-5	1.2E+02	I			No	0				2.5E+02	2.5E+02	2.5E+02						2.5E+02		1				1.0E-03	1.2E+00	1.0E+00	4.9E-01	4.2E-03	1		Yes
Toluene		108-88-3	9.2E+01	O	6.6E-03	2.7E-01	Yes	1	7.8E-02	9.2E-06	2.3E+02		4.7E-01	4.7E-01	5.3E+02	5.3E+05	1.8E-03	4.3E+03	3.3E+02	6.9E-01		1	1000	1000	3.1E-02		8.3E-01	1.0E+00	3.5E-01	1.1E-01	1		Yes
p-Toluidine		106-49-0	1.1E+02	O	2.0E-06	8.3E-05	No	0	7.1E-02	9.0E-06	1.1E+02		2.3E-01	2.3E-01	6.5E+03	6.5E+06			2.1E+03	4.3E-01	0.1	1			3.3E-03		1.0E+00	1.0E+00	4.2E-01	1.3E-02	1		Yes
Tralomethrin		66841-25-6	6.7E+02	O	3.9E-10	1.6E-08	No	0	2.5E-02	2.9E-06	1.9E+05		3.8E+02	3.8E+02	8.0E-02	8.0E+01			3.1E+01	3.8E+02	0.1	1			3.1E-02		1.3E+03	5.0E-01	5.6E+02	3.0E-01	1		No
Triadimefon (Bayleton)		43121-43-3	2.9E+02	O	8.1E-11	3.3E-09	No	0	2.2E-02	5.7E-06	3.0E+02		6.0E-01	6.0E-01	7.2E+01	7.2E+04			5.0E+01	8.0E-01	0.1	1			2.4E-03		1.1E+01	1.0E+00	4.6E+00	1.6E-02	1		Yes
Triallate		2303-17-5	3.0E+02	O	1.2E-05	4.9E-04	No	1	2.2E-02	5.7E-06	1.0E+03		2.0E+00	2.0E+00	4.0E+00	4.0E+03	2.9E-07	3.6E+05	8.5E+00	2.2E+00		1			3.5E-02		1.3E+01	9.0E-01	5.3E+00	2.3E-01	1		Yes
Triasulfuron		82097-50-5	4.0E+02	O	3.2E-13	1.3E-11	No	0	3.5E-02	4.1E-06	4.3E+02		8.5E-01	8.5E-01	3.2E+01	3.2E+04			3.1E+01	1.1E+00	0.1	1			4.7E-05		4.5E+01	1.0E+00	1.9E+01	3.6E-04	1		Yes
Tribenuron-methyl (Express)		101200-48-0	4.0E+02	O	1.0E-13	4.2E-12	No	0	3.5E-02	4.1E-06	9.5E+01		1.9E-01	1.9E-01	5.0E+01	5.0E+04			1.4E+01	3.9E-01	0.1	1			4.7E-04		4.1E+01	1.0E+00	1.7E+01	3.6E-03	1		Yes
1,2,4-Tribromobenzene		615-54-3	3.1E+02	O	3.4E-04	1.4E-02	No	1	2.9E-02	7.9E-06	6.1E+02		1.2E+00	1.2E+00	4.9E+00	4.9E+03	1.6E-05	4.8E+04	6.5E+00	1.4E+00		1			3.4E-02		1.5E+01	9.0E-01	6.1E+00	2.3E-01	1		Yes
Tributyltin oxide (TBTO)		56-35-9	6.0E+02	O	3.0E-07	1.2E-05	No	0	1.5E-02	3.6E-06	2.6E+07		5.2E+04	5.2E+04	2.0E+01	2.0E+04			1.0E+06	5.2E+04	0.1	1			2.5E-04		5.5E+02	1.0E+00	2.3E+02	2.4E-03	1		Yes
2,4,6-Trichloroaniline		634-93-5	2.0E+02	O	1.3E-06	5.5E-05	No	0	5.6E-02	6.6E-06	4.4E+03		8.9E+00	8.9E+00	4.0E+01	4.0E+04			3.6E+02	9.1E+00	0.1	1			2.7E-02		3.2E+00	1.0E+00	1.3E+00	1.5E-01	1		Yes
2,4,6-Trichloroaniline hydrochloride		33663-50-2	2.3E+02	O	7.2E-14	2.9E-12	No	0	5.0E-02	5.9E-06	1.3E+03		2.5E+00	2.5E+00	2.1E+01	2.1E+04			5.5E+01	2.7E+00	0.1	1			2.8E-05		5.1E+00	1.0E+00	2.1E+00	1.6E-04	1		Yes
1,2,4-Trichlorobenzene		120-82-1	1.8E+02	O	1.4E-03	5.8E-02	No	1	4.0E-02	8.4E-06	1.4E+03		2.7E+00	2.7E+00	4.9E+01	4.9E+04	4.3E-05	3.0E+04	1.4E+02	2.9E+00		1	70	70	7.1E-02		2.6E+00	1.0E+00	1.1E+00	3.7E-01	1		Yes
1,1,1-Trichloroethane		71-55-6	1.3E+02	O	1.7E-02	7.0E-01	Yes	1	6.5E-02	9.6E-06	4.4E+01		8.8E-02	8.8E-02	1.3E+03	1.3E+06	7.6E-03	1.6E+03	4.1E+02	3.5E-01		1	200	200	1.3E-02		1.4E+00	1.0E+00	5.9E-01	5.6E-02	1		Yes
1,1,2-Trichloroethane		79-00-5	1.3E+02	O	8.2E-04	3.4E-02	Yes	1	6.7E-02	1.0E-05	6.1E+01		1.2E-01	1.2E-01	4.6E+03	4.6E+06	5.3E-04	7.2E+03	1.0E+03	3.2E-01		1	5	5	5.0E-03		1.4E+00	1.0E+00	5.9E-01	2.2E-02	1		Yes

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-2: CHEMICAL-SPECIFIC PARAMETERS

Contaminant	CAS	MW (g/mol)	Organic/ Inorganic	Henry's Law Constant H_units (atm-m³/mol)	H' (H_unitless) (unitless)	VP>1?	VOL	D_i (cm^2/s)	D_w (cm^2/s)	K_{oc} (organics) (cm^3/g)	K_d (inorganics) (cm^3/g)	K_{d_VF} (cm^3/g)	$K_{d\_S\_to\_gw}$ (cm^3/g)	S (mg/L-water)	S (µg/L-water)	D_A (cm^2/s)	VF (m^3/kg)	SAT (mg/kg)	soil-to-gw factor (kg/L)	ABS_d	ABS_{GI}	Title 18 MCL (µg/L)	EPA Fed MCL MCL (µg/L)	Kp.org (cm/hr)	Kp.inorg (cm/hr)	t_star (hr)	FA (unitless)	tau_event (hr)	B (unitless)	RBA (unitless)	Mutagen	In EPD?
Trichloroethylene (TCE) Long-term +++	79-01-6	1.3E+02	O	9.9E-03	4.0E-01	Yes	1	6.9E-02	1.0E-05	6.1E+01		1.2E-01	1.2E-01	1.3E+03	1.3E+06	4.9E-03	2.2E+03	3.8E+02	3.6E-01		1	5	5	1.2E-02		1.4E+00	1.0E+00	5.7E-01	5.1E-02	1	M	Yes
Trichlorofluoromethane	75-69-4	1.4E+02	O	9.7E-02	4.0E+00	Yes	1	6.5E-02	1.0E-05	4.4E+01		8.8E-02	8.8E-02	1.1E+03	1.1E+06	1.5E-02	1.0E+03	1.0E+03	6.4E-01		1			1.3E-02		1.5E+00	1.0E+00	6.2E-01	5.7E-02	1		Yes
2,4,5-Trichlorophenol	95-95-4	2.0E+02	O	1.6E-06	6.6E-05	No	0	3.1E-02	8.1E-06	1.6E+03		3.2E+00	3.2E+00	1.2E+03	1.2E+06			4.0E+03	3.4E+00	0.1	1			3.6E-02		3.2E+00	1.0E+00	1.3E+00	2.0E-01	1		Yes
2,4,6-Trichlorophenol	88-06-2	2.0E+02	O	2.6E-06	1.1E-04	No	0	3.1E-02	8.1E-06	3.8E+02		7.6E-01	7.6E-01	8.0E+02	8.0E+05			6.9E+02	9.6E-01	0.1	1			3.5E-02		3.2E+00	1.0E+00	1.3E+00	1.9E-01	1		Yes
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	2.6E+02	O	8.7E-09	3.5E-07	No	0	2.9E-02	7.8E-06	1.1E+02		2.1E-01	2.1E-01	2.8E+02	2.8E+05			8.7E+01	4.1E-01	0.1	1			9.1E-03		6.8E+00	9.0E-01	2.8E+00	5.6E-02	1		Yes
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	2.7E+02	O	9.1E-09	3.7E-07	No	0	2.3E-02	5.9E-06	1.8E+02		3.5E-01	3.5E-01	7.1E+01	7.1E+04			3.2E+01	5.5E-01	0.1	1	50	50	1.6E-02		8.2E+00	9.0E-01	3.4E+00	1.0E-01	1	TCE	Yes
1,1,2-Trichloropropane	598-77-6	1.5E+02	O	3.2E-04	1.3E-02	Yes	1	5.7E-02	9.2E-06	9.5E+01		1.9E-01	1.9E-01	1.9E+03	1.9E+06	1.4E-04	1.5E+04	5.6E+02	3.9E-01		1			9.6E-03		1.7E+00	1.0E+00	7.0E-01	4.5E-02	1		Yes
1,2,3-Trichloropropane	96-18-4	1.5E+02	O	3.4E-04	1.4E-02	Yes	1	5.7E-02	9.2E-06	1.2E+02		2.3E-01	2.3E-01	1.8E+03	1.8E+06	1.3E-04	1.6E+04	5.8E+02	4.3E-01		1			7.5E-03		1.7E+00	1.0E+00	7.0E-01	3.5E-02	1	M	Yes
1,2,3-Trichloropropene	96-19-5	1.5E+02	O	1.8E-02	7.2E-01	Yes	1	5.9E-02	9.4E-06	1.2E+02		2.3E-01	2.3E-01	3.3E+02	3.3E+05	4.8E-03	2.3E+03	1.6E+02	5.0E-01		1			1.7E-02		1.6E+00	1.0E+00	6.9E-01	7.8E-02	1		Yes
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	1.9E+02	O	5.3E-01	2.2E+01	Yes	1	3.8E-02	8.6E-06	2.0E+02		3.9E-01	3.9E-01	1.7E+02	1.7E+05	9.4E-03	1.3E+03	7.8E+02	2.5E+00		1			1.8E-02		2.8E+00	1.0E+00	1.2E+00	9.2E-02	1		Yes
Tridiphane	58138-08-2	3.2E+02	O	4.1E-07	1.7E-05	No	0	4.1E-02	4.7E-06	3.4E+03		6.9E+00	6.9E+00	1.1E+00	1.1E+03			8.0E+00	7.1E+00	0.1	1			6.9E-02		1.6E+01	8.0E-01	6.6E+00	4.7E-01	1		Yes
Triethylamine	121-44-8	1.0E+02	O	1.5E-04	6.1E-03	Yes	1	6.6E-02	7.9E-06	5.1E+01		1.0E-01	1.0E-01	6.9E+04	6.9E+07	1.1E-04	1.6E+04	1.4E+04	3.0E-01		1			3.9E-03		9.3E-01	1.0E+00	3.9E-01	1.5E-02	1		Yes
Trifluralin	1582-09-8	3.4E+02	O	1.0E-04	4.2E-03	No	1	2.2E-02	5.6E-06	1.6E+04		3.3E+01	3.3E+01	1.8E-01	1.8E+02	1.5E-07	5.1E+05	6.1E+00	3.3E+01		1			7.3E-02		1.9E+01	8.0E-01	7.9E+00	5.1E-01	1		Yes
1,2,4-Trimethylbenzene	95-63-6	1.2E+02	O	6.2E-03	2.5E-01	Yes	1	6.1E-02	7.9E-06	6.1E+02		1.2E+00	1.2E+00	5.7E+01	5.7E+04	5.9E-04	7.9E+03	7.8E+01	1.5E+00		1			8.6E-02		1.2E+00	1.0E+00	5.0E-01	3.6E-01	1		Yes
1,3,5-Trimethylbenzene	108-67-8	1.2E+02	O	8.8E-03	3.6E-01	Yes	1	6.0E-02	7.8E-06	6.0E+02		1.2E+00	1.2E+00	4.8E+01	4.8E+04	8.4E-04	6.6E+03	6.6E+01	1.4E+00		1			6.2E-02		1.2E+00	1.0E+00	5.0E-01	2.6E-01	1		Yes
Trimethyl phosphate	512-56-1	1.4E+02	O	7.2E-09	2.9E-07	No	0	5.8E-02	8.8E-06	1.1E+01		2.1E-02	2.1E-02	5.0E+05	5.0E+08			6.1E+04	2.2E-01	0.1	1			9.5E-05		1.5E+00	1.0E+00	6.4E-01	4.3E-04	1		Yes
1,3,5-Trinitrobenzene	99-35-4	2.1E+02	O	6.5E-09	2.7E-07	No	0	2.9E-02	7.7E-06	1.7E+03		3.4E+00	3.4E+00	2.8E+02	2.8E+05			9.6E+02	3.6E+00	0.019	1			6.1E-04		3.9E+00	1.0E+00	1.6E+00	3.4E-03	1		Yes
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	2.9E+02	O	2.7E-09	1.1E-07	No	0	2.6E-02	6.7E-06	4.6E+03		9.2E+00	9.2E+00	7.4E+01	7.4E+04			6.9E+02	9.4E+00	0.00065	1			4.7E-04		1.0E+01	1.0E+00	4.3E+00	3.1E-03	1		Yes
2,4,6-Trinitrotoluene (TNT)	118-96-7	2.3E+02	O	2.1E-08	8.5E-07	No	0	3.0E-02	7.9E-06	2.8E+03		5.6E+00	5.6E+00	1.2E+02	1.2E+05			6.6E+02	5.8E+00	0.032	1			9.6E-04		4.7E+00	1.0E+00	2.0E+00	5.6E-03	1		Yes
Triphenylphosphine oxide	791-28-6	2.8E+02	O	5.3E-10	2.2E-08	No	0	2.3E-02	5.8E-06	2.0E+03		3.9E+00	3.9E+00	6.3E+01	6.3E+04			2.5E+02	4.1E+00	0.1	1			3.3E-03		9.1E+00	1.0E+00	3.8E+00	2.1E-02	1		Yes
Tris(2-chloroethyl) phosphate	115-96-8	2.9E+02	O	3.3E-06	1.3E-04	No	0	2.4E-02	6.2E-06	3.9E+02		7.8E-01	7.8E-01	7.0E+03	7.0E+06			6.1E+03	9.8E-01	0.1	1			3.6E-04		1.0E+01	1.0E+00	4.2E+00	2.3E-03	1		Yes
Uranium (chemical toxicity only)	7440-61-0	2.4E+02	O			No	0				4.5E+02	4.5E+02	4.5E+02						4.5E+02		1	30	30	1.0E-03		5.4E+00	1.0E+00	2.3E+00	5.9E-03	1		Yes
Vanadium and compounds +++	7440-62-2	5.1E+01	I			No	0				1.0E+03	1.0E+03	1.0E+03						1.0E+03		0.026				1.0E-03	4.9E-01	1.0E+00	2.0E-01	2.7E-03	1		Yes
Vernolate (Vernam)	1929-77-7	2.0E+02	O	3.1E-05	1.3E-03	No	1	2.4E-02	6.1E-06	3.0E+02		6.0E-01	6.0E-01	9.0E+01	9.0E+04	2.4E-06	1.2E+05	6.3E+01	8.0E-01		1			4.0E-02		3.5E+00	1.0E+00	1.4E+00	2.2E-01	1		Yes
Vinclozolin	50471-44-8	2.9E+02	O	1.7E-08	7.1E-07	No	0	2.5E-02	6.5E-06	2.8E+02		5.7E-01	5.7E-01	2.6E+00	2.6E+03			1.7E+00	7.7E-01	0.1	1			4.5E-03		1.0E+01	9.0E-01	4.2E+00	2.9E-02	1		Yes
Vinyl acetate	108-05-4	8.6E+01	O	5.1E-04	2.1E-02	Yes	1	8.5E-02	1.0E-05	5.6E+00		1.1E-02	1.1E-02	2.0E+04	2.0E+07	8.2E-04	4.4E+03	2.3E+03	2.1E-01		1			1.6E-03		7.7E-01	1.0E+00	3.2E-01	5.6E-03	1		Yes
Vinyl bromide	593-60-2	1.1E+02	O	1.2E-02	5.0E-01	Yes	1	8.6E-02	1.2E-05	2.2E+01		4.3E-02	4.3E-02	7.6E+03	7.6E+06	9.7E-03	1.4E+03	1.8E+03	2.9E-01		1			4.4E-03		1.0E+00	1.0E+00	4.2E-01	1.7E-02	1		Yes
Vinyl chloride +++	75-01-4	6.2E+01	O	2.8E-02	1.1E+00	Yes	1	1.1E-01	1.2E-05	2.2E+01		4.3E-02	4.3E-02	8.8E+03	8.8E+06	1.8E-02	9.6E+02	3.2E+03	3.4E-01		1	2	2	8.4E-03		5.7E-01	1.0E+00	2.4E-01	2.5E-02	1	M	Yes
Warfarin	81-81-2	3.1E+02	O	2.8E-09	1.1E-07	No	0	4.2E-02	4.9E-06	4.3E+02		8.5E-01	8.5E-01	1.7E-01	1.7E+04			1.6E+01	1.1E+00	0.1	1			1.8E-03		1.3E+01	1.0E+00	5.6E+00	1.2E-02	1		Yes
Xylenes	1330-20-7	1.1E+02	O	6.6E-03	2.7E-01	Yes	1	6.9E-02	8.5E-06	3.8E+02		7.7E-01	7.7E-01	1.1E+02	1.1E+05	1.1E-03	5.7E+03	9.7E+01	9.9E-01		1	10000	10000	5.0E-02		9.9E-01	1.0E+00	4.1E-01	2.0E-01	1		Yes
Zinc	7440-66-6	6.5E+01	I			No	0				6.2E+01	6.2E+01							6.2E+01		1	5000			6.0E-04	5.9E-01	1.0E+00	2.4E-01	1.9E-03	1		Yes
Zinc phosphide	1314-84-7	2.6E+02	I			No	0														1				6.0E-04	7.0E+00	1.0E+00	2.9E+00	3.7E-03	1	VC	Yes
Zineb	12122-67-7	2.8E+02	O	2.7E-09	1.1E-07	No	0	4.5E-02	5.2E-06	1.3E+03		2.7E+00	2.7E+00	1.0E+01	1.0E+04			2.8E+01	2.9E+00	0.1	1			3.3E-04		8.8E+00	1.0E+00	3.7E+00	2.1E-03	1		Yes

Notes:

[1] Henry's Law constant value for Perfluorooctanoic acid (PFOA) was obtained from Sander (2015) and the Koc value was obtained from Larsen and Giovalle (2015).
* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both chromium III and chromium VI analyses.

+++ See Section 6.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

ABS_d = absorbtion dermal pathway
ABS_{GI} = absorption gastro-intestinal
B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis
CAS = Chemical Abstract Service number
D_A = Apparent diffusivity
D_i = Diffusivity in air
D_w = Diffusivity in water
H = Henry's Law Constant
K_d = Soil-water partition coefficient
K_{d_VF} = Soil-water partition coefficient
K_{oc} = Soil-organic carbon-water partition coefficient
Kp.org = Dermal pereability coefficent - organic chemcial
Kp.inorg = Dermal pereability coefficent - inorganic chemcial
MCL = Maximum contaminant level
MW = Molecular weight
RBA = Relative bioavailability
S = Solubility
SAT = Saturation in soils
soil-to-gw = soil to groundwater
t_star = time to reach steady state
tau_event = lag time per event
VF = Volatilization factor
VOL = Volatile compound
VP = Vapor pressure

Sander, R. 2005. Compilation fo Henry's Law Constants (version 4.0) for water as a solvent. Atmos. Chem. Phys. 15, 4399-4981.
Larsen, P.B., and E. Giovalle. 2015. Perfluoralklated substances: PFOA, PFOS, and PFSOA. Environmental Project No. 1665, The Danish Environmental Protection Agency. Copenhagen.

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Acephate	--	--	--	--	6.0E+00	8.6E+03	--	6.0E+00
Acetaldehyde	--	--	2.6E+00	2.6E+00	--	--	4.7E+00	4.7E+00
Acetochlor	--	--	--	--	1.0E+02	7.4E+02	--	8.8E+01
Acetone	--	--	--	--	4.5E+03	1.1E+06	1.6E+04	3.5E+03
Acetone cyanohydrin	--	--	--	--	--	--	--	--
Acetonitrile	--	--	--	--	--	--	3.1E+01	3.1E+01
Acrolein	--	--	--	--	2.5E+00	4.2E+02	1.0E-02	1.0E-02
Acrylamide	5.0E-02	2.3E+01	--	5.0E-02	1.0E+01	5.3E+03	--	1.0E+01
Acrylic acid	--	--	--	--	2.5E+03	2.8E+05	5.2E-01	5.2E-01
Acrylonitrile	1.4E-01	1.4E+01	8.3E-02	5.2E-02	2.0E+02	2.2E+04	1.0E+00	1.0E+00
Alachlor	1.4E+00	4.4E+00	--	1.1E+00	5.0E+01	1.7E+02	--	3.9E+01
Aldicarb	--	--	--	--	5.0E+00	3.6E+02	--	4.9E+00
Aldicarb sulfone	--	--	--	--	5.0E+00	6.0E+03	--	5.0E+00
Aldrin	4.6E-03	--	1.1E-03	9.2E-04	1.5E-01	--	--	1.5E-01
Allyl alcohol	--	--	--	--	2.5E+01	3.3E+03	5.2E-02	5.2E-02
Allyl chloride	3.7E+00	3.5E+01	9.4E-01	7.3E-01	--	--	5.2E-01	5.2E-01
Aluminum	--	--	--	--	5.0E+03	1.1E+06	--	5.0E+03
Aluminum phosphide	--	--	--	--	2.0E+00	4.6E+02	--	2.0E+00
Ametryn	--	--	--	--	4.5E+01	2.4E+02	--	3.8E+01
m-Aminophenol	--	--	--	--	4.0E+02	7.0E+04	--	4.0E+02
Amitraz	--	--	--	--	1.3E+01	2.4E+00	--	2.0E+00
Ammonia +++	--	--	--	--	--	--	2.6E+02	2.6E+02
Ammonium sulfamate	--	--	--	--	1.0E+03	2.3E+05	--	1.0E+03
Aniline	1.4E+01	6.9E+02	--	1.3E+01	3.5E+01	1.9E+03	--	3.4E+01
Antimony and compounds	--	--	--	--	2.0E+00	6.8E+01	--	1.9E+00
Antimony pentoxide	--	--	--	--	2.5E+00	8.5E+01	--	2.4E+00
Antimony potassium tartrate	--	--	--	--	4.5E+00	1.5E+02	--	4.4E+00
Antimony tetroxide	--	--	--	--	2.0E+00	6.8E+01	--	1.9E+00
Antimony trioxide	--	--	--	--	--	--	--	--
Arsenic (inorganic) +++	5.2E-02	1.5E+00	--	5.0E-02	1.5E+00	5.1E+01	--	1.5E+00
Arsine	--	--	--	--	1.8E-02	2.0E+00	--	1.7E-02
Assure	--	--	--	--	4.5E+01	9.5E+01	--	3.1E+01
Asulam	--	--	--	--	1.8E+02	1.4E+05	--	1.8E+02
Atrazine	3.4E-01	2.8E+00	--	3.0E-01	1.8E+02	1.6E+03	--	1.6E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Avermectin B1	--	--	--	--	2.0E+00	--	--	2.0E+00
Azobenzene	7.1E-01	7.3E-01	1.8E-01	1.2E-01	--	--	--	--
Barium and compounds	--	--	--	--	1.0E+03	1.6E+04	--	9.4E+02
Benfluralin (Benefin)	--	--	--	--	2.5E+01	9.9E+00	--	7.1E+00
Bensulfuron-methyl (Londax)	--	--	--	--	1.0E+03	6.0E+04	--	9.9E+02
Bentazone (Bentazon)	--	--	--	--	1.5E+02	2.4E+03	--	1.4E+02
Benzaldehyde	1.9E+01	4.4E+02	--	1.9E+01	5.0E+02	1.2E+04	--	4.8E+02
Benzene	1.4E+00	9.8E+00	7.2E-01	4.6E-01	2.0E+01	1.5E+02	1.6E+01	8.3E+00
Benzidine	1.1E-04	5.0E-03	--	1.1E-04	1.5E+01	7.6E+02	--	1.5E+01
Benzoic acid	--	--	--	--	2.0E+04	3.0E+05	--	1.9E+04
Benzotrichloride	6.0E-03	6.0E-03	--	3.0E-03	--	--	--	--
Benzyl alcohol	--	--	--	--	5.0E+02	2.2E+04	--	4.9E+02
Benzyl chloride	4.6E-01	3.4E+00	1.1E-01	8.9E-02	1.0E+01	8.0E+01	5.2E-01	4.9E-01
Beryllium and compounds	--	--	--	--	1.0E+01	1.6E+01	--	6.2E+00
Biphenthrin (Talstar)	--	--	--	--	7.5E+01	--	--	7.5E+01
1,1-Biphenyl	9.7E+00	6.5E+00	--	3.9E+00	2.5E+03	1.8E+03	2.1E-01	2.1E-01
Bis(2-chloroethyl)ether	7.1E-02	2.7E+00	1.7E-02	1.4E-02	--	--	--	--
Bis(chloromethyl)ether	3.5E-04	3.4E-02	9.1E-05	7.2E-05	--	--	--	--
Bis(2-chloro-1-methylethyl)ether	--	--	--	--	2.0E+02	1.6E+03	--	1.8E+02
Bis(2-ethylhexyl)phthalate (DEHP)	5.6E+00	--	--	5.6E+00	1.0E+02	--	--	1.0E+02
Bisphenol A	--	--	--	--	2.5E+02	8.1E+02	--	1.9E+02
Boron	--	--	--	--	1.0E+03	2.3E+05	--	1.0E+03
Boron trifluoride	--	--	--	--	2.0E+02	4.6E+04	6.8E+00	6.6E+00
Bromate	1.1E-01	2.1E+01	--	1.1E-01	2.0E+01	4.6E+03	--	2.0E+01
Bromobenzene	--	--	--	--	4.0E+01	1.4E+02	3.1E+01	1.6E+01
Bromodichloromethane	1.3E+00	1.9E+01	1.5E-01	1.3E-01	1.0E+02	1.6E+03	--	9.4E+01
Bromoform (Tribromomethane)	9.9E+00	1.4E+02	5.1E+00	3.3E+00	1.0E+02	1.6E+03	--	9.4E+01
Bromomethane	--	--	--	--	7.0E+00	2.5E+02	2.6E+00	1.9E+00
Bromophos	--	--	--	--	2.5E+01	1.4E+01	--	8.9E+00
Bromoxynil	7.8E-01	3.2E+00	--	6.3E-01	7.5E+01	3.3E+02	--	6.1E+01
Bromoxynil octanoate	7.8E-01	3.7E-01	--	2.5E-01	7.5E+01	3.9E+01	--	2.6E+01
1,3-Butadiene	2.3E-02	1.6E-01	1.9E-01	1.8E-02	--	--	1.0E+00	1.0E+00
1-Butanol	--	--	--	--	5.0E+02	2.5E+04	--	4.9E+02
Butylate	--	--	--	--	2.5E+02	2.1E+02	--	1.1E+02
Butyl benzyl phthalate	4.1E+01	2.7E+01	--	1.6E+01	1.0E+03	7.2E+02	--	4.2E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Butylphthalyl butylglycolate	--	--	--	--	5.0E+03	1.0E+04	--	3.4E+03
Cacodylic acid	--	--	--	--	1.0E+02	1.7E+04	--	1.0E+02
Cadmium and compounds +++	--	--	--	--	5.0E+00	--	--	5.0E+00
Camphechlor (Toxaphene)	7.1E-02	--	--	7.1E-02	--	--	--	--
Caprolactam	--	--	--	--	2.5E+03	2.2E+05	--	2.5E+03
Captafol	5.2E-01	1.8E+00	--	4.0E-01	1.0E+01	3.8E+01	--	7.9E+00
Captan	3.4E+01	3.6E+02	--	3.1E+01	6.5E+02	7.5E+03	--	6.0E+02
Carbaryl	--	--	--	--	5.0E+02	5.9E+03	--	4.6E+02
Carbofuran	--	--	--	--	2.5E+01	3.6E+02	--	2.3E+01
Carbon disulfide	--	--	--	--	5.0E+02	5.0E+03	3.7E+02	2.0E+02
Carbon tetrachloride	1.1E+00	4.3E+00	9.4E-01	4.6E-01	2.0E+01	8.5E+01	5.2E+01	1.2E+01
Carbosulfan	--	--	--	--	2.5E+00	1.7E+01	--	2.2E+00
Carboxin	--	--	--	--	5.0E+02	1.0E+04	--	4.8E+02
Chloramben	--	--	--	--	7.5E+01	1.8E+03	--	7.2E+01
Chloranil	1.9E-01	3.5E+00	--	1.8E-01	--	--	--	--
Chlordane	2.2E-01	3.6E-02	5.6E-02	2.0E-02	2.5E+00	4.4E-01	3.7E-01	1.9E-01
Chlordecone (Kepone)	7.8E-03	6.5E-03	--	3.5E-03	1.5E+00	1.4E+00	--	7.1E-01
Chlorimuron-ethyl	--	--	--	--	4.5E+02	1.7E+04	--	4.4E+02
Chlorine	--	--	--	--	5.0E+02	1.1E+05	7.8E-02	7.8E-02
Chlorine dioxide	--	--	--	--	1.5E+02	3.4E+04	1.0E-01	1.0E-01
Chloroacetic acid	--	--	--	--	--	--	--	--
2-Chloroacetophenone	--	--	--	--	--	--	--	--
4-Chloroaniline	3.9E-01	5.9E+00	--	3.7E-01	2.0E+01	3.3E+02	--	1.9E+01
Chlorobenzene	--	--	--	--	1.0E+02	3.2E+02	2.6E+01	1.9E+01
Chlorobenzilate	7.1E-01	5.6E-01	--	3.1E-01	1.0E+02	8.7E+01	--	4.6E+01
p-Chlorobenzoic acid	--	--	--	--	1.5E+02	8.5E+02	--	1.3E+02
4-Chlorobenzotrifluoride	--	--	--	--	1.5E+01	2.3E+01	1.6E+02	8.6E+00
2-Chloro-1,3-butadiene	--	--	1.9E-02	1.9E-02	1.0E+02	4.4E+02	1.0E+01	9.2E+00
1-Chlorobutane	--	--	--	--	2.0E+02	7.6E+02	--	1.6E+02
1-Chloro-1,1-difluoroethane	--	--	--	--	--	--	2.6E+04	2.6E+04
Chlorodifluoromethane	--	--	--	--	--	--	2.6E+04	2.6E+04
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester s	3.1E+00	2.3E+00	--	1.3E+00	2.5E+02	2.1E+02	--	1.1E+02
Chloroform	2.5E+00	2.9E+01	2.4E-01	2.2E-01	5.0E+01	6.3E+02	5.1E+01	2.4E+01
Chloromethane	--	--	--	--	--	--	4.7E+01	4.7E+01
4-Chloro-2-methylaniline hydrochloride	1.7E-01	5.1E+02	--	1.7E-01	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
beta-Chloronaphthalene	--	--	--	--	4.0E+02	3.5E+02	--	1.9E+02
o-Chloronitrobenzene	2.6E-01	2.6E+00	--	2.4E-01	1.5E+01	1.6E+02	--	1.4E+01
p-Chloronitrobenzene	1.3E+00	1.0E+01	--	1.2E+00	3.5E+00	3.0E+01	--	3.1E+00
2-Chlorophenol	--	--	--	--	2.5E+01	2.5E+02	--	2.3E+01
Chlorothalonil	2.5E+01	1.6E+02	--	2.2E+01	7.5E+01	5.2E+02	--	6.6E+01
o-Chlorotoluene	--	--	--	--	1.0E+02	1.4E+02	--	5.9E+01
Chlorpropham	--	--	--	--	2.5E+02	6.1E+02	--	1.8E+02
Chlorpyrifos	--	--	--	--	5.0E+00	3.6E+00	--	2.1E+00
Chlorpyrifos-methyl	--	--	--	--	5.0E+01	7.3E+01	--	3.0E+01
Chlorsulfuron	--	--	--	--	2.5E+02	1.4E+04	--	2.5E+02
Chlorthiophos	--	--	--	--	4.0E+00	8.6E-01	--	7.1E-01
Chromium, Total	--	--	--	--	--	--	--	--
Chromium III *	--	--	--	--	7.5E+03	2.2E+04	--	5.6E+03
Chromium VI +++	5.0E-02	1.2E-01	--	3.5E-02	1.5E+01	4.3E+01	--	1.1E+01
Clofentezine (Apollo)	--	--	--	--	6.5E+01	5.3E+02	--	5.8E+01
Cobalt	--	--	--	--	1.5E+00	8.5E+02	--	1.5E+00
Coke Oven Emissions	--	--	3.3E-03	3.3E-03	--	--	--	--
Copper and compounds	--	--	--	--	2.0E+02	4.6E+04	--	2.0E+02
Crotonaldehyde	--	--	--	--	--	3.7E+02	--	--
Cumene (Isopropylbenzene)	--	--	--	--	5.0E+02	4.8E+02	2.1E+02	1.1E+02
Cyanazine	9.3E-02	1.6E+00	--	8.8E-02	1.0E+01	1.9E+02	--	9.5E+00
Cyanide (free)	--	--	--	--	3.0E+00	6.8E+02	4.2E-01	3.7E-01
Cyanide (hydrogen)	--	--	--	--	3.0E+00	6.8E+02	4.2E-01	3.7E-01
Cyanogen	--	--	--	--	5.0E+00	1.3E+03	--	5.0E+00
Cyanogen bromide	--	--	--	--	4.5E+02	4.0E+05	--	4.5E+02
Cyanogen chloride	--	--	--	--	2.5E+02	1.4E+05	--	2.5E+02
Cyclohexane	--	--	--	--	--	--	3.1E+03	3.1E+03
Cyclohexanone	--	--	--	--	2.5E+04	1.6E+06	3.7E+02	3.6E+02
Cyclohexylamine	--	--	--	--	1.0E+03	2.3E+04	--	9.6E+02
Cyfluthrin (Baythroid)	--	--	--	--	1.3E+02	3.9E+01	--	3.0E+01
Cyhalothrin (Karate)	--	--	--	--	5.0E+00	--	--	5.0E+00
Cyromazine	--	--	--	--	2.5E+03	2.0E+05	--	2.5E+03
Dacthal	--	--	--	--	5.0E+01	8.1E+01	--	3.1E+01
Dalapon	--	--	--	--	1.5E+02	1.4E+04	--	1.5E+02
Daminozide (Alar)	4.3E+00	1.3E+04	--	4.3E+00	7.5E+02	2.5E+06	--	7.5E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Demeton	--	--	--	--	2.0E-01	2.2E-01	--	1.1E-01
Diallate	1.3E+00	9.2E-01	--	5.4E-01	--	--	--	--
Diazinon	--	--	--	--	3.5E+00	9.8E+00	--	2.6E+00
Dibenzofuran	--	--	--	--	5.0E+00	3.2E+00	--	2.0E+00
1,4-Dibromobenzene	--	--	--	--	5.0E+01	9.2E+01	--	3.3E+01
Dibromochloromethane	9.3E-01	1.4E+01	--	8.7E-01	1.0E+02	1.7E+03	--	9.5E+01
1,2-Dibromo-3-chloropropane	3.1E-02	1.7E-01	3.4E-04	3.3E-04	1.0E+00	5.9E+00	1.0E-01	9.3E-02
1,2-Dibromoethane	3.9E-02	7.1E-01	9.4E-03	7.5E-03	4.5E+01	9.0E+02	4.7E+00	4.2E+00
Dibutyl phthalate	--	--	--	--	5.0E+02	4.1E+02	--	2.3E+02
Dicamba	--	--	--	--	1.5E+02	2.5E+03	--	1.4E+02
1,2-Dichlorobenzene	--	--	--	--	4.5E+02	7.3E+02	1.0E+02	7.6E+01
1,4-Dichlorobenzene	1.4E+01	2.1E+01	5.1E-01	4.8E-01	3.5E+02	5.6E+02	4.2E+02	1.4E+02
3,3-Dichlorobenzidine	1.7E-01	4.5E-01	--	1.3E-01	--	--	--	--
4,4'-Dichlorobenzophenone	--	--	--	--	4.5E+01	3.4E+01	--	1.9E+01
1,4-Dichloro-2-butene	--	--	1.3E-03	1.3E-03	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	1.0E+03	9.6E+03	5.2E+01	4.9E+01
p,p'-Dichlorodiphenyldichloroethane (DDD)	3.2E-01	3.5E-02	--	3.2E-02	1.5E-01	1.8E-02	--	1.6E-02
p,p'-Dichlorodiphenyldichloroethylene (DDE)	2.3E-01	--	5.8E-02	4.6E-02	1.5E+00	--	--	1.5E+00
p,p'-Dichlorodiphenyltrichloroethane (DDT)	2.3E-01	--	--	2.3E-01	2.5E+00	--	--	2.5E+00
1,1-Dichloroethane	1.4E+01	1.8E+02	3.5E+00	2.8E+00	1.0E+03	1.5E+04	--	9.4E+02
1,2-Dichloroethane	8.6E-01	1.8E+01	2.2E-01	1.7E-01	3.0E+01	7.0E+02	3.7E+00	3.2E+00
1,1-Dichloroethylene	--	--	--	--	2.5E+02	2.1E+03	1.0E+02	7.1E+01
1,2-Dichloroethylene (cis)	--	--	--	--	1.0E+01	9.1E+01	--	9.0E+00
1,2-Dichloroethylene (trans)	--	--	--	--	1.0E+02	9.1E+02	--	9.0E+01
2,4-Dichlorophenol	--	--	--	--	1.5E+01	4.7E+01	--	1.1E+01
2,4-Dichlorophenoxy acetic acid (2,4-D)	--	--	--	--	5.0E+01	3.4E+02	--	4.4E+01
2,4-Dichlorophenoxy butyric acid (2,4-DB)	--	--	--	--	1.5E+02	4.5E+02	--	1.1E+02
Decabromodiphenyl ether (BDE-209)	1.1E+02	--	--	1.1E+02	3.5E+01	--	--	3.5E+01
1,2-Dichloropropane	2.1E+00	2.3E+01	1.5E+00	8.5E-01	2.0E+02	2.4E+03	2.1E+00	2.1E+00
2,3-Dichloropropanol	--	--	--	--	1.5E+01	1.2E+03	--	1.5E+01
1,3-Dichloropropene	7.8E-01	7.8E+00	1.4E+00	4.7E-01	1.5E+02	1.6E+03	1.0E+01	9.7E+00
Dichlorvos	2.7E-01	1.4E+01	--	2.6E-01	2.5E+00	1.4E+02	--	2.5E+00
Dicrotophos (Bidrin)	--	--	--	--	1.5E-01	8.3E+01	--	1.5E-01
Dicyclopentadiene	--	--	--	--	4.0E+02	8.8E+02	1.6E-01	1.6E-01
Dieldrin	4.9E-03	2.7E-03	--	1.8E-03	2.5E-01	1.5E-01	--	9.5E-02

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	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Diethylene glycol, monobutyl ether	--	--	--	--	1.5E+02	2.2E+04	--	1.5E+02
Diethylene glycol, monoethyl ether	--	--	--	--	3.0E+02	1.9E+05	--	3.0E+02
Diethylformamide	--	--	--	--	5.0E+00	1.1E+03	--	5.0E+00
Di(2-ethylhexyl)adipate	6.5E+01	--	--	6.5E+01	3.0E+03	--	--	3.0E+03
Diethyl phthalate	--	--	--	--	4.0E+03	4.9E+04	--	3.7E+03
Diethylstilbestrol	2.2E-04	6.6E-05	--	5.1E-05	--	--	--	--
Difenzoquat (Avenge)	--	--	--	--	4.2E+02	1.9E+05	--	4.2E+02
Diflubenzuron	--	--	--	--	1.0E+02	2.6E+02	--	7.2E+01
1,1-Difluoroethane	--	--	--	--	--	--	2.1E+04	2.1E+04
Diisopropyl methylphosphonate (DIMP)	--	--	--	--	4.0E+02	3.2E+04	--	4.0E+02
Dimethipin	--	--	--	--	1.1E+02	6.6E+04	--	1.1E+02
Dimethoate	--	--	--	--	1.1E+01	1.8E+03	--	1.1E+01
3,3'-Dimethoxybenzidine	4.9E-02	1.6E+00	--	4.7E-02	--	--	--	--
N-N-Dimethylaniline	2.9E+00	2.0E+01	--	2.5E+00	1.0E+01	7.6E+01	--	8.9E+00
2,4-Dimethylaniline	3.9E-01	7.1E+00	--	3.7E-01	1.0E+01	2.0E+02	--	9.5E+00
2,4-Dimethylaniline hydrochloride	1.3E-01	5.2E+02	--	1.3E-01	--	--	--	--
3,3'-Dimethylbenzidine	7.1E-03	8.5E-02	--	6.5E-03	--	--	--	--
N,N-Dimethylformamide	--	--	--	--	5.0E+02	4.5E+05	1.6E+01	1.5E+01
2,4-Dimethylphenol	--	--	--	--	1.0E+02	7.8E+02	--	8.9E+01
2,6-Dimethylphenol	--	--	--	--	3.0E+00	2.1E+01	--	2.6E+00
3,4-Dimethylphenol	--	--	--	--	5.0E+00	4.3E+01	--	4.5E+00
Dimethyl terephthalate	--	--	--	--	5.0E+02	6.7E+03	--	4.7E+02
4,6-Dinitro-o-cyclohexyl phenol	--	--	--	--	1.0E+01	1.4E+01	--	5.8E+00
1,2-Dinitrobenzene	--	--	--	--	5.0E-01	1.3E+01	--	4.8E-01
1,3-Dinitrobenzene	--	--	--	--	5.0E-01	1.8E+01	--	4.9E-01
1,4-Dinitrobenzene	--	--	--	--	5.0E-01	1.9E+01	--	4.9E-01
2,4-Dinitrophenol	--	--	--	--	1.0E+01	3.0E+02	--	9.7E+00
Dinitrotoluene mixture	1.7E-01	2.6E-01	--	1.0E-01	4.5E+00	7.4E+00	--	2.8E+00
2,4-Dinitrotoluene	2.5E-01	4.3E+00	--	2.4E-01	1.0E+01	1.9E+02	--	9.5E+00
2,6-Dinitrotoluene	5.2E-02	7.4E-01	--	4.9E-02	1.5E+00	2.3E+01	--	1.4E+00
Dinoseb	--	--	--	--	5.0E+00	1.4E+01	--	3.7E+00
1,4-Dioxane	7.8E-01	2.3E+02	1.1E+00	4.6E-01	1.5E+02	4.8E+04	1.6E+01	1.4E+01
Diphenamid	--	--	--	--	1.5E+02	1.1E+03	--	1.3E+02
Diphenylamine	--	--	--	--	5.0E+02	8.4E+02	--	3.1E+02
N,N-Diphenyl-1,4 benzenediamine (DPPD)	--	--	--	--	1.5E+00	2.2E+00	--	9.0E-01

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
1,2-Diphenylhydrazine	9.7E-02	3.9E-01	--	7.8E-02	--	--	--	--
Diphenyl sulfone	--	--	--	--	4.0E+00	5.0E+01	--	3.7E+00
Diquat dibromide (Diquat)	--	--	--	--	1.1E+01	--	--	1.1E+01
Direct black 38	1.1E-02	--	--	1.1E-02	--	--	--	--
Direct blue 6	1.1E-02	--	--	1.1E-02	--	--	--	--
Direct brown 95	1.2E-02	--	--	1.2E-02	--	--	--	--
Disulfoton	--	--	--	--	2.0E-01	3.3E-01	--	1.3E-01
1,4-Dithiane	--	--	--	--	5.0E+01	4.0E+03	--	5.0E+01
Diuron	--	--	--	--	1.0E+01	8.9E+01	--	9.0E+00
Dodine	--	--	--	--	1.0E+02	1.3E+04	--	1.0E+02
Endosulfan	--	--	--	--	3.0E+01	1.6E+02	--	2.5E+01
Endothall	--	--	--	--	1.0E+02	2.1E+03	--	9.6E+01
Endrin	--	--	--	--	1.5E+00	9.2E-01	--	5.7E-01
Enilconazole (Imazalil)	1.3E+00	3.1E+00	--	9.0E-01	1.3E+01	3.3E+01	--	9.1E+00
Epichlorohydrin	7.9E+00	7.9E+02	4.7E+00	2.9E+00	3.0E+01	3.3E+03	5.2E-01	5.1E-01
1,2-Epoxybutane	--	--	--	--	--	--	1.0E+01	1.0E+01
S-Ethyl dipropylthiocarbamate (EPTC)	--	--	--	--	2.5E+02	7.5E+02	--	1.9E+02
2-Chloroethyl phosphonic acid (Ethephon)	--	--	--	--	2.5E+01	1.1E+04	--	2.5E+01
Ethion	--	--	--	--	2.5E+00	1.9E+00	--	1.1E+00
2-Ethoxyethanol	--	--	--	--	4.5E+02	1.6E+05	1.0E+02	8.5E+01
2-Ethoxyethanol acetate	--	--	--	--	5.0E+02	5.7E+04	3.1E+01	2.9E+01
Ethyl acetate	--	--	--	--	4.5E+03	3.1E+05	3.7E+01	3.6E+01
Ethyl acrylate	--	--	--	--	2.5E+01	7.5E+02	4.2E+00	3.6E+00
Ethylbenzene	7.1E+00	1.2E+01	2.2E+00	1.5E+00	5.0E+02	9.5E+02	5.2E+02	2.0E+02
Ethyl chloride (Chloroethane)	--	--	--	--	--	--	5.2E+03	5.2E+03
Ethylene cyanohydrin	--	--	--	--	3.5E+02	2.8E+05	--	3.5E+02
Ethylene diamine	--	--	--	--	4.5E+02	--	--	4.5E+02
Ethylene glycol	--	--	--	--	1.0E+04	1.4E+07	--	1.0E+04
Ethylene glycol, monobutyl ether	--	--	--	--	5.0E+02	3.6E+04	--	4.9E+02
Ethylene oxide	8.1E-02	1.7E+01	6.8E-04	6.7E-04	--	--	1.6E+01	1.6E+01
Ethylene thiourea (ETU)	1.7E+00	1.0E+03	--	1.7E+00	4.0E-01	2.5E+02	--	4.0E-01
Ethyl ether	--	--	--	--	1.0E+03	4.9E+04	--	9.8E+02
Ethyl methacrylate	--	--	--	--	--	--	1.6E+02	1.6E+02
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	--	--	--	--	5.0E-02	4.0E-02	--	2.2E-02
Ethylphthalyl ethyl glycolate	--	--	--	--	1.5E+04	3.9E+05	--	1.4E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Fenamiphos	--	--	--	--	1.3E+00	8.4E+00	--	1.1E+00
Fenpropathrin (Danitol)	--	--	--	--	1.3E+02	1.8E+01	--	1.6E+01
Fenvalerate (Pydrin)	--	--	--	--	1.3E+02	--	--	1.3E+02
Fluometuron	--	--	--	--	6.5E+01	8.6E+02	--	6.1E+01
Fluoride	--	--	--	--	2.0E+02	4.6E+04	--	2.0E+02
Fluoridone	--	--	--	--	4.0E+02	3.5E+03	--	3.6E+02
Flurprimidol	--	--	--	--	2.0E+02	1.2E+03	--	1.7E+02
Flusilazole (NuStar)	--	--	--	--	1.0E+01	3.5E+01	--	7.8E+00
Flutolanil	--	--	--	--	2.5E+03	9.3E+03	--	2.0E+03
Fluvalinate	--	--	--	--	5.0E+01	--	--	5.0E+01
Folpet	--	--	--	--	4.5E+02	4.7E+03	--	4.1E+02
Fomesafen	--	--	--	--	1.3E+01	3.0E+02	--	1.2E+01
Fonofos	--	--	--	--	1.0E+01	1.6E+01	--	6.1E+00
Formaldehyde	--	--	4.3E-01	4.3E-01	1.0E+03	8.0E+04	5.1E+00	5.1E+00
Formic acid	--	--	--	--	4.5E+03	1.6E+06	1.6E-01	1.6E-01
Fosetyl-al	--	--	--	--	1.3E+04	--	--	1.3E+04
Furan	--	--	--	--	5.0E+00	1.2E+02	--	4.8E+00
Furazolidone	2.1E-02	1.0E+01	--	2.0E-02	--	--	--	--
Furfural	--	--	--	--	1.5E+01	1.8E+03	2.6E+01	9.5E+00
Furmecyclox	2.6E+00	2.0E+00	--	1.1E+00	--	--	--	--
Furothiazole (Furium)	5.2E-02	1.9E+00	--	5.1E-02	--	--	--	--
Glufosinate-ammonium	--	--	--	--	3.0E+01	--	--	3.0E+01
Glycidaldehyde	--	--	--	--	2.0E+00	4.5E+02	5.2E-01	4.1E-01
Glyphosate	--	--	--	--	5.0E+02	--	--	5.0E+02
Haloxyfop-methyl	--	--	--	--	2.5E-01	7.7E-01	--	1.9E-01
Thifensulfuron-methyl (Harmony)	--	--	--	--	2.2E+02	2.9E+04	--	2.1E+02
Heptachlor	1.7E-02	2.3E-03	4.3E-03	1.4E-03	2.5E+00	3.7E-01	--	3.2E-01
Heptachlor epoxide	8.6E-03	7.1E-03	2.2E-03	1.4E-03	6.5E-02	5.9E-02	--	3.1E-02
Hexabromobenzene	--	--	--	--	1.0E+01	--	--	1.0E+01
Hexachlorobenzene	4.9E-02	--	1.2E-02	9.8E-03	4.0E+00	--	--	4.0E+00
Hexachlorobutadiene	1.0E+00	4.4E-01	2.6E-01	1.4E-01	5.0E+00	2.4E+00	--	1.6E+00
alpha-Hexachlorocyclohexane (alpha-HCH)	1.2E-02	1.8E-02	--	7.2E-03	4.0E+01	6.2E+01	--	2.4E+01
beta-Hexachlorocyclohexane (beta-HCH)	4.3E-02	6.1E-02	--	2.5E-02	--	--	--	--
gamma-Hexachlorocyclohexane (Lindane)	7.1E-02	1.0E-01	--	4.2E-02	1.5E+00	2.3E+00	--	9.1E-01
Hexachlorocyclohexane technical	4.3E-02	6.1E-02	--	2.5E-02	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Hexachlorocyclopentadiene	--	--	--	--	3.0E+01	1.0E+01	1.0E-01	1.0E-01
Hexachloroethane	1.9E+00	1.7E+00	5.1E-01	3.3E-01	3.5E+00	3.4E+00	1.6E+01	1.6E+00
Hexachlorophene	--	--	--	--	1.5E+00	--	--	1.5E+00
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	7.1E-01	8.6E+01	--	7.0E-01	1.5E+01	2.0E+03	--	1.5E+01
1,6-Hexamethylene diisocyanate	--	--	--	--	--	--	5.2E-03	5.2E-03
n-Hexane	--	--	--	--	--	--	3.7E+02	3.7E+02
Hexazinone	--	--	--	--	1.7E+02	5.9E+03	--	1.6E+02
Hexythiazox (Savey)	--	--	--	--	1.3E+02	3.6E+01	--	2.8E+01
Hydramethylnon (Amdro)	--	--	--	--	8.5E+01	7.3E+03	--	8.4E+01
Hydrazine, hydrazine sulfate	2.6E-02	7.6E+01	1.1E-03	1.1E-03	--	--	1.6E-02	1.6E-02
Hydrazine, dimethyl	--	--	--	--	5.0E-01	8.7E+02	1.0E-03	1.0E-03
Hydrogen chloride	--	--	--	--	--	--	1.0E+01	1.0E+01
Hydrogen sulfide	--	--	--	--	--	--	1.0E+00	1.0E+00
p-Hydroquinone	1.3E+00	1.2E+02	--	1.3E+00	2.0E+02	2.0E+04	--	2.0E+02
Imazaquin	--	--	--	--	1.3E+03	6.5E+04	--	1.2E+03
Imazethapyr (Pursuit)	--	--	--	--	1.3E+04	1.8E+05	--	1.2E+04
Iprodione	--	--	--	--	2.0E+02	2.3E+03	--	1.8E+02
Iron	--	--	--	--	3.5E+03	8.0E+05	--	3.5E+03
Isobutanol (Isobutyl alcohol)	--	--	--	--	1.5E+03	9.0E+04	--	1.5E+03
Isophorone	8.2E+01	1.6E+03	--	7.8E+01	1.0E+03	2.2E+04	--	9.6E+02
Isopropalin	--	--	--	--	7.5E+01	1.1E+01	--	1.0E+01
Isopropyl methyl phosphonic acid	--	--	--	--	5.0E+02	9.7E+04	--	5.0E+02
Isoxaben	--	--	--	--	2.5E+02	6.9E+02	--	1.8E+02
Lactofen	--	--	--	--	4.0E+01	6.7E+01	--	2.5E+01
Lead +++	--	--	--	--	--	--	--	--
Lead (tetraethyl)	--	--	--	--	5.0E-04	9.4E-04	--	3.3E-04
Linuron	--	--	--	--	3.9E+01	1.9E+02	--	3.2E+01
Lithium	--	--	--	--	1.0E+01	2.3E+03	--	1.0E+01
Malathion	--	--	--	--	1.0E+02	2.7E+03	--	9.7E+01
Maleic anhydride	--	--	--	--	5.0E+02	9.4E+03	--	4.8E+02
Maleic hydrazide	--	--	--	--	2.5E+03	2.2E+06	--	2.5E+03
Malononitrile	--	--	--	--	5.0E-01	2.3E+02	--	5.0E-01
Mancozeb	--	--	--	--	1.5E+02	1.2E+03	--	1.3E+02
Maneb	--	--	--	--	2.5E+01	9.0E+02	--	2.4E+01
Manganese (non-food) +++	--	--	--	--	7.0E+02	--	--	7.0E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Mephosfolan	--	--	--	--	4.5E-01	6.2E+01	--	4.5E-01
Mepiquat chloride (Mepiquat)	--	--	--	--	1.5E+02	--	--	1.5E+02
Mercury and compounds	--	--	--	--	1.5E+00	2.4E+01	--	1.4E+00
Mercury (elemental)	--	--	--	--	--	--	1.6E-01	1.6E-01
Mercury (methyl)	--	--	--	--	5.0E-01	2.3E+01	--	4.9E-01
Merphos	--	--	--	--	1.5E-01	--	--	1.5E-01
Merphos oxide	--	--	--	--	5.0E-01	8.3E-02	--	7.1E-02
Metalaxyl	--	--	--	--	3.0E+02	1.6E+04	--	3.0E+02
Methacrylonitrile	--	--	--	--	5.0E-01	3.3E+01	1.6E+01	4.8E-01
Methamidophos	--	--	--	--	2.5E-01	2.5E+02	--	2.5E-01
Methanol	--	--	--	--	1.0E+04	4.5E+06	1.0E+04	5.1E+03
Methidathion	--	--	--	--	7.5E+00	2.2E+02	--	7.3E+00
Methomyl	--	--	--	--	1.3E+02	1.7E+04	--	1.2E+02
Methoxychlor	--	--	--	--	2.5E+01	1.5E+01	--	9.3E+00
2-Methoxyethanol	--	--	--	--	2.5E+01	1.6E+04	1.0E+01	7.4E+00
2-Methoxyethanol acetate	--	--	--	--	4.0E+01	8.8E+03	5.2E-01	5.1E-01
2-Methoxy-5-nitroaniline	1.6E+00	5.4E+01	--	1.5E+00	--	--	--	--
Methyl acetate	--	--	--	--	5.0E+03	7.3E+05	--	5.0E+03
Methyl acrylate	--	--	--	--	--	--	1.0E+01	1.0E+01
2-Methylaniline hydrochloride	6.0E-01	3.9E+03	--	6.0E-01	--	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	--	--	--	--	2.5E+02	7.6E+03	--	2.4E+02
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	--	--	--	--	2.5E+00	7.6E+00	--	1.9E+00
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	--	--	--	--	2.2E+01	6.0E+01	--	1.6E+01
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	--	--	--	--	5.0E+00	1.8E+01	--	3.9E+00
4,4'-Methylenebisbenzeneamine	4.9E-02	1.7E+00	--	4.7E-02	--	--	--	--
4,4'-Methylene bis(2-chloroaniline)	2.5E-01	4.3E-01	--	1.6E-01	1.0E+01	1.9E+01	--	6.5E+00
4,4'-Methylene bis(N,N'-dimethyl)aniline	1.7E+00	6.7E-01	--	4.8E-01	--	--	--	--
Methylene bromide	--	--	--	--	--	--	2.1E+00	2.1E+00
Methylene chloride	1.3E+01	3.5E+02	2.0E+02	1.1E+01	3.0E+01	9.1E+02	3.1E+02	2.7E+01
4,4'-Methylenediphenyl isocyanate	--	--	--	--	--	--	--	--
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	--	--	--	--	2.0E+01	9.0E+02	--	2.0E+01
Methyl ethyl ketone (2-Butanone)	--	--	--	--	3.0E+03	3.7E+05	2.6E+03	1.4E+03
Methyl isobutyl ketone (4-Methyl-2-pentanone)	--	--	--	--	--	--	1.6E+03	1.6E+03
Methyl methacrylate	--	--	--	--	7.0E+03	1.9E+05	3.7E+02	3.5E+02
2-Methyl-5-nitroaniline	8.7E+00	1.4E+02	--	8.2E+00	1.0E+02	1.8E+03	--	9.5E+01

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	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Methyl parathion	--	--	--	--	1.3E+00	1.0E+01	--	1.1E+00
2-Methylphenol	--	--	--	--	2.5E+02	3.0E+03	--	2.3E+02
3-Methylphenol	--	--	--	--	2.5E+02	3.0E+03	--	2.3E+02
4-Methylphenol	--	--	--	--	5.0E+02	6.2E+03	--	4.6E+02
Methyl phosphonic acid	--	--	--	--	3.0E+02	3.1E+05	--	3.0E+02
Methyl styrene (mixture)	--	--	--	--	3.0E+01	1.1E+01	2.1E+01	5.7E+00
Methyl styrene (alpha)	--	--	--	--	3.5E+02	4.4E+02	--	1.9E+02
Methyl tertbutyl ether (MTBE)	4.3E+01	2.0E+03	2.2E+01	1.4E+01	--	--	1.6E+03	1.6E+03
Metolaclor (Dual)	--	--	--	--	7.5E+02	6.6E+03	--	6.8E+02
Metribuzin	--	--	--	--	1.3E+02	4.4E+03	--	1.2E+02
Metsulfuron-methyl (Ally)	--	--	--	--	1.3E+03	6.1E+04	--	1.2E+03
Mirex	4.3E-03	--	1.1E-03	8.8E-04	1.0E+00	--	--	1.0E+00
Molinate	--	--	--	--	1.0E+01	3.0E+01	--	7.5E+00
Molybdenum	--	--	--	--	2.5E+01	2.5E+03	--	2.5E+01
Monochloramine	--	--	--	--	5.0E+02	6.5E+04	--	5.0E+02
Myclobutanil (Systhane)	--	--	--	--	1.3E+02	1.2E+03	--	1.1E+02
Naled	--	--	--	--	1.0E+01	1.7E+03	--	1.0E+01
Napropamide	--	--	--	--	6.0E+02	2.7E+03	--	4.9E+02
Nickel and compounds	--	--	--	--	1.0E+02	4.6E+03	--	9.8E+01
Nickel refinery dust	--	--	--	--	5.5E+01	2.5E+03	--	5.4E+01
Nickel subsulfide	4.6E-02	1.7E+00	--	4.5E-02	5.5E+01	2.5E+03	--	5.4E+01
Nitrate	--	--	--	--	8.0E+03	1.8E+06	--	8.0E+03
Nitrite	--	--	--	--	5.0E+02	1.1E+05	--	5.0E+02
2-Nitroaniline	--	--	--	--	5.0E+01	8.6E+02	--	4.7E+01
Nitrobenzene	--	--	1.4E-01	1.4E-01	1.0E+01	1.6E+02	4.7E+00	3.1E+00
Nitrofurantoin	--	--	--	--	3.5E+02	4.0E+05	--	3.5E+02
Nitrofurazone	6.0E-02	1.7E+01	--	6.0E-02	--	--	--	--
Nitroglycerin	4.6E+00	1.8E+02	--	4.5E+00	5.0E-01	2.2E+01	--	4.9E-01
Nitroguanidine	--	--	--	--	5.0E+02	4.5E+05	--	5.0E+02
2-Nitropropane	--	--	2.1E-03	2.1E-03	--	--	1.0E+01	1.0E+01
N-Nitrosodi-n-butylamine	1.4E-02	7.9E-02	3.5E-03	2.7E-03	--	--	--	--
N-Nitrosodiethanolamine	2.8E-02	8.1E+01	--	2.8E-02	--	--	--	--
N-Nitrosodiethylamine	1.7E-04	1.7E-02	--	1.7E-04	--	--	--	--
N-Nitrosodimethylamine	4.9E-04	2.0E-01	1.4E-04	1.1E-04	4.0E-02	1.8E+01	2.1E-02	1.4E-02
N-Nitrosodiphenylamine	1.6E+01	5.2E+01	--	1.2E+01	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
N-Nitroso di-n-propylamine	1.1E-02	3.5E-01	--	1.1E-02	--	--	--	--
N-Nitroso-N-methylethylamine	3.5E-03	6.4E-01	8.9E-04	7.1E-04	--	--	--	--
N-Nitrosopyrrolidine	3.7E-02	1.0E+01	--	3.7E-02	--	--	--	--
m-Nitrotoluene	--	--	--	--	5.0E-01	3.4E+00	--	4.4E-01
o-Nitrotoluene	3.5E-01	2.8E+00	--	3.1E-01	4.5E+00	3.9E+01	--	4.0E+00
p-Nitrotoluene	4.9E+00	3.4E+01	--	4.3E+00	2.0E+01	1.5E+02	--	1.8E+01
Norflurazon	--	--	--	--	7.5E+01	1.9E+03	--	7.2E+01
Octabromodiphenyl ether	--	--	--	--	1.5E+01	--	--	1.5E+01
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	--	--	--	--	2.5E+02	1.6E+05	--	2.5E+02
Octamethylpyrophosphoramide	--	--	--	--	1.0E+01	3.6E+04	--	1.0E+01
Oryzalin	1.0E+01	3.8E+01	--	7.9E+00	7.0E+02	2.9E+03	--	5.7E+02
Oxadiazon	--	--	--	--	2.5E+01	2.2E+01	--	1.2E+01
Oxamyl	--	--	--	--	1.3E+02	1.3E+05	--	1.3E+02
Oxyfluorfen	1.1E+00	1.1E+00	--	5.4E-01	1.5E+02	1.7E+02	--	7.9E+01
Paclobutrazol	--	--	--	--	6.5E+01	4.3E+02	--	5.7E+01
Paraquat	--	--	--	--	2.3E+01	--	--	2.3E+01
Parathion	--	--	--	--	3.0E+01	7.4E+01	--	2.1E+01
Pebulate	--	--	--	--	2.5E+02	3.2E+02	--	1.4E+02
Pendimethalin	--	--	--	--	1.5E+02	4.4E+01	--	3.4E+01
Pentabromo-6-chloro cyclohexane	3.9E+00	9.6E+00	--	2.8E+00	1.0E+02	2.7E+02	--	7.3E+01
Pentabromodiphenyl ether	--	--	--	--	1.0E+01	--	--	1.0E+01
Pentachlorobenzene	--	--	--	--	4.0E+00	9.8E-01	--	7.9E-01
Pentachloronitrobenzene	3.0E-01	2.0E-01	--	1.2E-01	1.5E+01	1.1E+01	--	6.4E+00
Pentachlorophenol	1.9E-01	5.2E-02	--	4.1E-02	2.5E+01	7.3E+00	--	5.7E+00
Perchlorate	--	--	--	--	3.5E+00	8.0E+02	--	3.5E+00
Perfluoroalkyl Compounds								
Perfluoro-octanesulfonate (PFOS)^^	--	--	--	--	1.0E+00	--	--	1.0E+00
Perfluorooctanoic acid (PFOA)^^	1.1E+00	--	--	1.1E+00	1.0E-01	--	--	1.0E-01
Permethrin	--	--	--	--	2.5E+02	--	--	2.5E+02
Phenmedipham	--	--	--	--	1.2E+03	4.6E+03	--	9.5E+02
Phenol	--	--	--	--	1.5E+03	3.5E+04	--	1.4E+03
m-Phenylenediamine	--	--	--	--	3.0E+01	1.2E+04	--	3.0E+01
p-Phenylenediamine	--	--	--	--	5.0E+00	1.9E+03	--	5.0E+00
Phenylmercuric acetate	--	--	--	--	4.0E-01	1.4E+02	--	4.0E-01
2-Phenylphenol	4.1E+01	1.2E+02	--	3.1E+01	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-3: GROUNDWATER REMEDIAL GOALS

CONTAMINANT	RESIDENTIAL GROUNDWATER							
	Cancer Risk = 1E-06				Chronic HQ = 0.25			
	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Phorate	--	--	--	--	1.0E+00	3.1E+00	--	7.6E-01
Phosmet	--	--	--	--	1.0E+02	1.3E+03	--	9.3E+01
Phosphine	--	--	--	--	1.5E+00	2.1E+02	1.6E-01	1.4E-01
Phosphoric acid	--	--	--	--	2.5E+05	2.4E+07	--	2.4E+05
Phosphorus (white)	--	--	--	--	1.0E-01	1.4E+01	--	1.0E-01
p-Phthalic acid	--	--	--	--	5.0E+03	8.2E+04	--	4.7E+03
Phthalic anhydride	--	--	--	--	1.0E+04	2.7E+05	--	9.7E+03
Picloram	--	--	--	--	3.5E+02	1.1E+04	--	3.4E+02
Pirimiphos-methyl	--	--	--	--	3.5E-01	5.4E-01	--	2.1E-01
Polybrominated biphenyls (PBBs)	2.6E-03	--	--	2.6E-03	3.5E-02	--	--	3.5E-02
Polychlorinated biphenyls (PCBs)	3.9E-02	--	9.9E-03	7.9E-03	--	--	--	--
Aroclor 1016	1.1E+00	--	--	1.1E+00	3.5E-01	--	--	3.5E-01
Aroclor 1221	3.9E-02	1.2E-02	9.9E-03	4.7E-03	--	--	--	--
Aroclor 1232	3.9E-02	1.2E-02	9.9E-03	4.7E-03	--	--	--	--
Aroclor 1242	3.9E-02	--	9.9E-03	7.9E-03	--	--	--	--
Aroclor 1248	3.9E-02	--	9.9E-03	7.9E-03	--	--	--	--
Aroclor 1254	3.9E-02	--	9.9E-03	7.9E-03	1.0E-01	--	--	1.0E-01
Aroclor 1260	3.9E-02	--	9.9E-03	7.9E-03	--	--	--	--

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Polynuclear aromatic hydrocarbons (PAHs)								
Acenaphthene	--	--	--	--	3.0E+02	2.4E+02	--	1.3E+02
Anthracene								
Benz[a]anthracene	2.5E-01	--	3.4E-02	3.0E-02	--	--	--	--
Benzo[a]pyrene	2.5E-02	--	--	2.5E-02	1.5E+00	--	--	1.5E+00
Benzo[b]fluoranthene	2.5E-01	--	--	2.5E-01	--	--	--	--
Benzo[k]fluoranthene	2.5E+00	--	--	2.5E+00	--	--	--	--
Chrysene	2.5E+01	--	--	2.5E+01	--	--	--	--
Dibenz[ah]anthracene	2.5E-02	--	--	2.5E-02	--	--	--	--
Fluoranthene	--	--	--	--	2.0E+02	--	--	2.0E+02
Fluorene	--	--	--	--	2.0E+02	1.2E+02	--	7.4E+01
Indeno[1,2,3-cd]pyrene	2.5E-01	--	--	2.5E-01	--	--	--	--
Naphthalene	--	--	1.7E-01	1.7E-01	1.0E+02	1.8E+02	1.6E+00	1.5E+00
Pyrene	--	--	--	--	1.5E+02	3.8E+01	--	3.0E+01
Prochloraz	5.2E-01	1.4E+00	--	3.8E-01	4.5E+01	1.3E+02	--	3.3E+01
Profluralin	--	--	--	--	3.0E+01	8.3E+00	--	6.5E+00
Prometon	--	--	--	--	7.5E+01	4.0E+02	--	6.3E+01
Prometryn	--	--	--	--	2.0E+02	5.9E+02	--	1.5E+02
Propyzamide (Pronamide)	--	--	--	--	3.8E+02	1.4E+03	--	2.9E+02
Propachlor	--	--	--	--	6.5E+01	1.1E+03	--	6.1E+01
Propanil	--	--	--	--	2.5E+01	1.1E+02	--	2.0E+01
Propargite	4.1E-01	2.6E-01	--	1.6E-01	2.0E+02	1.4E+02	--	8.1E+01
Propargyl alcohol	--	--	--	--	1.0E+01	3.0E+03	--	1.0E+01
Propazine	--	--	--	--	1.0E+02	6.0E+02	--	8.6E+01
Propham	--	--	--	--	1.0E+02	7.1E+02	--	8.8E+01
Propiconazole	--	--	--	--	5.0E+02	2.0E+03	--	4.0E+02
n-Propylbenzene	--	--	--	--	5.0E+02	4.6E+02	5.2E+02	1.6E+02
Propylene glycol	--	--	--	--	1.0E+05	8.0E+07	--	1.0E+05
Propylene glycol, monoethyl ether	--	--	--	--	3.5E+03	9.8E+05	1.0E+03	8.0E+02
Propylene glycol, monomethyl ether	--	--	--	--	3.5E+03	9.8E+05	1.0E+03	8.0E+02
Propylene oxide	3.2E-01	8.4E+01	1.5E+00	2.7E-01	--	--	1.6E+01	1.6E+01
Pyridine	--	--	--	--	5.0E+00	3.7E+02	--	4.9E+00
Quinalphos	--	--	--	--	2.5E+00	2.6E+00	--	1.3E+00
Quinoline	2.6E-02	2.9E-01	--	2.4E-02	--	--	--	--
Resmethrin	--	--	--	--	1.5E+02	1.9E+01	--	1.7E+01

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)	water-ingest (µg/L)	water-derm (µg/L)	water-inhale (µg/L)	combined (µg/L)
Ronnel	--	--	--	--	2.5E+02	1.7E+02	--	1.0E+02
Rotenone	--	--	--	--	2.0E+01	6.4E+01	--	1.5E+01
Selenious Acid	--	--	--	--	2.5E+01	5.7E+03	--	2.5E+01
Selenium	--	--	--	--	2.5E+01	5.7E+03	--	2.5E+01
Sethoxydim	--	--	--	--	7.0E+02	9.5E+02	--	4.0E+02
Silver and compounds	--	--	--	--	2.5E+01	3.8E+02	--	2.4E+01
Simazine	6.5E-01	9.3E+00	--	6.1E-01	2.5E+01	3.9E+02	--	2.4E+01
Sodium azide	--	--	--	--	2.0E+01	2.5E+03	--	2.0E+01
Sodium diethyldithiocarbamate	2.9E-01	8.5E+02	--	2.9E-01	1.5E+02	4.8E+05	--	1.5E+02
Sodium fluoroacetate	--	--	--	--	1.0E-01	--	--	1.0E-01
Sodium metavanadate	--	--	--	--	5.0E+00	4.3E+02	--	5.0E+00
Strontium, stable	--	--	--	--	3.0E+03	6.8E+05	--	3.0E+03
Strychnine	--	--	--	--	1.5E+00	8.1E+01	--	1.5E+00
Styrene	--	--	--	--	1.0E+03	2.6E+03	5.2E+02	3.0E+02
1,1'-Sulfonylbis (4-Chlorobenzene)	--	--	--	--	4.0E+00	8.7E+00	--	2.7E+00
Tebuthiuron	--	--	--	--	3.5E+02	1.2E+04	--	3.4E+02
Temephos	--	--	--	--	1.0E+02	--	--	1.0E+02
Terbacil	--	--	--	--	6.5E+01	1.7E+03	--	6.3E+01
Terbufos	--	--	--	--	1.3E-01	1.1E-01	--	5.9E-02
Terbutryn	--	--	--	--	5.0E+00	1.0E+01	--	3.4E+00
1,2,4,5-Tetrachlorobenzene	--	--	--	--	1.5E+00	5.9E-01	--	4.3E-01
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	6.0E-07	--	1.5E-07	1.2E-07	3.5E-06	--	2.1E-05	3.0E-06
1,1,1,2-Tetrachloroethane	3.0E+00	1.1E+01	7.6E-01	5.7E-01	1.5E+02	6.0E+02	--	1.2E+02
1,1,2,2-Tetrachloroethane	3.9E-01	3.3E+00	9.7E-02	7.6E-02	1.0E+02	9.1E+02	--	9.0E+01
Tetrachloroethylene (PCE)	3.7E+01	6.5E+01	2.2E+01	1.1E+01	3.0E+01	5.8E+01	2.1E+01	1.0E+01
2,3,4,6-Tetrachlorophenol	--	--	--	--	1.5E+02	9.8E+01	--	5.9E+01
p,a,a,a-Tetrachlorotoluene	3.9E-03	2.0E-03	--	1.3E-03	--	--	--	--
Tetrachlorovinphos (Stirofos)	3.2E+00	1.9E+01	--	2.8E+00	1.5E+02	9.6E+02	--	1.3E+02
Tetraethyldithiopyrophosphate	--	--	--	--	2.5E+00	6.0E+00	--	1.8E+00
Thallium and compounds	--	--	--	--	5.0E-02	1.1E+01	--	5.0E-02
Thiobencarb	--	--	--	--	5.0E+01	1.9E+02	--	4.0E+01
Thiofanox	--	--	--	--	1.5E+00	1.1E+01	--	1.3E+00
Thiophanate-methyl	6.5E+00	7.6E+02	--	6.4E+00	1.4E+02	1.7E+04	--	1.3E+02
Thiram	--	--	--	--	7.5E+01	3.0E+03	--	7.3E+01
Tin and compounds	--	--	--	--	3.0E+03	6.8E+05	--	3.0E+03

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Toluene	--	--	--	--	4.0E+02	1.3E+03	2.6E+03	2.8E+02
p-Toluidine	2.6E+00	6.8E+01	--	2.5E+00	2.0E+01	5.7E+02	--	1.9E+01
Tralomethrin	--	--	--	--	3.8E+01	--	--	3.8E+01
Triadimefon (Bayleton)	--	--	--	--	1.7E+02	2.0E+03	--	1.6E+02
Triallate	1.1E+00	8.3E-01	--	4.7E-01	1.3E+02	1.0E+02	--	5.7E+01
Triasulfuron	--	--	--	--	5.0E+01	1.5E+04	--	5.0E+01
Tribenuron-methyl (Express)	--	--	--	--	4.0E+01	1.2E+03	--	3.9E+01
1,2,4-Tribromobenzene	--	--	--	--	2.5E+01	2.0E+01	--	1.1E+01
Tributyltin oxide (TBTO)	--	--	--	--	1.5E+00	2.4E+01	--	1.4E+00
2,4,6-Trichloroaniline	1.1E+01	2.0E+01	--	7.1E+00	1.5E-01	2.9E-01	--	9.9E-02
2,4,6-Trichloroaniline hydrochloride	2.7E+00	3.7E+03	--	2.7E+00	--	--	--	--
1,2,4-Trichlorobenzene	2.7E+00	2.0E+00	--	1.2E+00	5.0E+01	4.1E+01	1.0E+00	1.0E+00
1,1,1-Trichloroethane	--	--	--	--	1.0E+04	6.3E+04	2.6E+03	2.0E+03
1,1,2-Trichloroethane	1.4E+00	2.0E+01	3.5E-01	2.8E-01	2.0E+01	3.1E+02	1.0E-01	1.0E-01
Trichloroethylene (TCE) Long-term +++	5.4E-01	3.4E+00	4.9E-01	2.4E-01	2.5E+00	1.7E+01	1.0E+00	7.1E-01
Trichloroethylene (TCE) Short-term ‡	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	1.5E+03	9.1E+03	--	1.3E+03
2,4,5-Trichlorophenol	--	--	--	--	5.0E+02	7.2E+02	--	3.0E+02
2,4,6-Trichlorophenol	7.1E+00	9.8E+00	--	4.1E+00	5.0E+00	7.5E+00	--	3.0E+00
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	--	--	--	--	5.0E+01	2.2E+02	--	4.1E+01
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	--	--	--	--	4.0E+01	9.1E+01	--	2.8E+01
1,1,2-Trichloropropane	--	--	--	--	2.5E+01	1.9E+02	--	2.2E+01
1,2,3-Trichloropropane	8.4E-04	7.3E-03	--	7.5E-04	2.0E+01	1.9E+02	1.6E-01	1.6E-01
1,2,3-Trichloropropene	--	--	--	--	1.5E+01	6.5E+01	1.6E-01	1.5E-01
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	--	--	--	--	1.5E+05	4.8E+05	2.6E+03	2.5E+03
Tridiphane	--	--	--	--	1.5E+01	6.4E+00	--	4.5E+00
Triethylamine	--	--	--	--	--	--	3.7E+00	3.7E+00
Trifluralin	1.0E+01	3.4E+00	--	2.6E+00	3.8E+01	1.4E+01	--	1.0E+01
1,2,4-Trimethylbenzene	--	--	--	--	5.0E+01	5.0E+01	3.1E+01	1.4E+01
1,3,5-Trimethylbenzene	--	--	--	--	5.0E+01	6.9E+01	3.1E+01	1.5E+01
Trimethyl phosphate	3.9E+00	2.8E+03	--	3.9E+00	5.0E+01	4.0E+04	--	5.0E+01
1,3,5-Trinitrobenzene	--	--	--	--	1.5E+02	1.2E+04	--	1.5E+02
Trinitrophenylmethylnitramine (Tetryl)	--	--	--	--	1.0E+01	6.2E+02	--	9.9E+00
2,4,6-Trinitrotoluene (TNT)	2.6E+00	1.1E+02	--	2.5E+00	2.5E+00	1.1E+02	--	2.5E+00
Triphenylphosphine oxide	--	--	--	--	1.0E+02	9.5E+02	--	9.1E+01

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Tris(2-chloroethyl) phosphate	3.9E+00	3.0E+02	--	3.8E+00	3.5E+01	2.9E+03	--	3.5E+01
Uranium (chemical toxicity only)	--	--	--	--	1.0E+00	4.0E+01	--	9.8E-01
Vanadium and compounds +++	--	--	--	--	2.5E+01	1.5E+02	--	2.1E+01
Vernolate (Vernam)	--	--	--	--	5.0E+00	6.2E+00	--	2.8E+00
Vinclozolin	--	--	--	--	6.0E+00	4.4E+01	--	5.3E+00
Vinyl acetate	--	--	--	--	5.0E+03	3.4E+05	1.0E+02	1.0E+02
Vinyl bromide	--	--	1.8E-01	1.8E-01	--	--	1.6E+00	1.6E+00
Vinyl chloride +++	3.5E-02	4.5E-01	4.6E-01	3.0E-02	1.5E+01	2.2E+02	5.2E+01	1.1E+01
Warfarin	--	--	--	--	1.5E+00	2.1E+01	--	1.4E+00
Xylenes	--	--	--	--	1.0E+03	1.9E+03	5.2E+01	4.8E+01
Zinc	--	--	--	--	1.5E+03	5.7E+05	--	1.5E+03
Zinc phosphide	--	--	--	--	1.5E+00	5.7E+02	--	1.5E+00
Zineb	--	--	--	--	2.5E+02	2.4E+04	--	2.5E+02

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both Chromium III and Chromium VI analyses.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

µg/L = microgram per liter
HQ = Hazard quotient
water-dermal = water dermal pathway
water-ingest = water ingestion pathway
water-inhale = vapors from water inhalation pathway (domestic use)

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Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Acephate	30560-19-1	--	--	--	--	2.3E+01	9.9E+01	--	1.9E+01
Acetaldehyde	75-07-0	--	--	1.1E+01	1.1E+01	--	--	2.0E+01	2.0E+01
Acetochlor	34256-82-1	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Acetone	67-64-1	--	--	--	--	1.8E+04	--	1.1E+05	1.5E+04
Acetone cyanohydrin	75-86-5	--	--	--	--	--	--	1.0E+06	1.0E+06
Acetonitrile	75-05-8	--	--	--	--	--	--	2.0E+02	2.0E+02
Acrolein	107-02-8	--	--	--	--	9.8E+00	--	3.6E-02	3.6E-02
Acrylamide	79-06-1	3.1E-01	1.2E+00	2.0E+04	2.4E-01	3.9E+01	1.6E+02	3.1E+06	3.2E+01
Acrylic acid	79-10-7	--	--	--	--	9.8E+03	--	2.5E+01	2.5E+01
Acrylonitrile	107-13-1	1.3E+00	--	3.2E-01	2.5E-01	7.8E+02	--	4.0E+00	4.0E+00
Alachlor	15972-60-8	1.2E+01	4.4E+01	--	9.7E+00	2.0E+02	8.2E+02	--	1.6E+02
Aldicarb	116-06-3	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Aldicarb sulfone	1646-88-4	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Aldrin	309-00-2	4.1E-02	--	9.8E-01	3.9E-02	5.9E-01	--	--	5.9E-01
Allyl alcohol	107-18-6	--	--	--	--	9.8E+01	--	8.9E-01	8.8E-01
Allyl chloride	107-05-1	3.3E+01	--	7.4E-01	7.2E-01	--	--	4.1E-01	4.1E-01
Aluminum	7429-90-5	--	--	--	--	2.0E+04	--	2.6E+06	1.9E+04
Aluminum phosphide	20859-73-8	--	--	--	--	7.8E+00	--	--	7.8E+00
Ametryn	834-12-8	--	--	--	--	1.8E+02	7.4E+02	--	1.4E+02
m-Aminophenol	591-27-5	--	--	--	--	1.6E+03	6.6E+03	--	1.3E+03
Amitraz	33089-61-1	--	--	--	--	4.9E+01	2.1E+02	--	4.0E+01
Ammonia +++	7664-41-7	--	--	--	--	--	--	2.6E+08	2.6E+08
Ammonium sulfamate	7773-06-0	--	--	--	--	3.9E+03	--	--	3.9E+03
Aniline	62-53-3	1.2E+02	4.3E+02	3.5E+06	9.5E+01	1.4E+02	5.8E+02	5.2E+05	1.1E+02
Antimony and compounds	7440-36-0	--	--	--	--	7.8E+00	--	--	7.8E+00
Antimony pentoxide	1314-60-9	--	--	--	--	9.8E+00	--	--	9.8E+00
Antimony potassium tartrate	28300-74-5	--	--	--	--	1.8E+01	--	--	1.8E+01
Antimony tetroxide	1332-81-6	--	--	--	--	7.8E+00	--	--	7.8E+00
Antimony trioxide	1309-64-4	--	--	--	--	--	--	1.0E+05	1.0E+05
Arsenic (inorganic) +++	7440-38-2	4.6E-01	--	1.3E+03	4.6E-01	5.9E+00	--	7.8E+03	5.9E+00
Arsine	7784-42-1	--	--	--	--	6.8E-02	--	2.6E+04	6.8E-02
Assure	76578-14-8	--	--	--	--	1.8E+02	7.4E+02	--	1.4E+02
Asulam	3337-71-1	--	--	--	--	7.0E+02	3.0E+03	--	5.7E+02
Atrazine	1912-24-9	3.0E+00	1.1E+01	--	2.4E+00	6.8E+02	2.9E+03	--	5.5E+02
Avermectin B1	65195-55-3	--	--	--	--	7.8E+00	3.3E+01	--	6.3E+00
Azobenzene	103-33-3	6.3E+00	--	4.7E+01	5.6E+00	--	--	--	--
Barium and compounds	7440-39-3	--	--	--	--	3.9E+03	--	2.6E+05	3.9E+03
Benfluralin (Benefin)	1861-40-1	--	--	--	--	9.8E+01	--	--	9.8E+01
Bensulfuron-methyl (Londax)	83055-99-6	--	--	--	--	3.9E+03	1.6E+04	--	3.2E+03
Bentazone (Bentazon)	25057-89-0	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Benzaldehyde	100-52-7	1.7E+02	--	--	1.7E+02	2.0E+03	--	--	2.0E+03
Benzene	71-43-2	1.3E+01	--	1.3E+00	1.2E+00	7.8E+01	--	2.8E+01	2.0E+01
Benzidine	92-87-5	6.7E-04	2.6E-03	3.0E+01	5.3E-04	5.9E+01	2.5E+02	--	4.7E+01
Benzoic acid	65-85-0	--	--	--	--	7.8E+04	3.3E+05	--	6.3E+04
Benzotrichloride	98-07-7	5.3E-02	--	--	5.3E-02	--	--	--	--
Benzyl alcohol	100-51-6	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Benzyl chloride	100-44-7	4.1E+00	--	1.5E+00	1.1E+00	3.9E+01	--	6.6E+00	5.7E+00
Beryllium and compounds	7440-41-7	--	--	2.3E+03	2.3E+03	3.9E+01	--	1.0E+04	3.9E+01
Biphenthrin (Talstar)	82657-04-3	--	--	--	--	2.9E+02	1.2E+03	--	2.4E+02
1,1-Biphenyl	92-52-4	8.7E+01	--	--	8.7E+01	9.8E+03	--	1.2E+01	1.2E+01
Bis(2-chloroethyl)ether	111-44-4	6.3E-01	--	3.6E-01	2.3E-01	--	--	--	--
Bis(chloromethyl)ether	542-88-1	3.2E-03	--	8.5E-05	8.3E-05	--	--	--	--
Bis(2-chloro-1-methylethyl)ether	108-60-1	--	--	--	--	7.8E+02	--	--	7.8E+02
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	5.0E+01	1.8E+02	2.3E+06	3.9E+01	3.9E+02	1.6E+03	--	3.2E+02
Bisphenol A	80-05-7	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
Boron	7440-42-8	--	--	--	--	3.9E+03	--	1.0E+07	3.9E+03
Boron trifluoride	7637-07-2	--	--	--	--	7.8E+02	--	6.8E+06	7.8E+02
Bromate	15541-45-4	9.9E-01	--	--	9.9E-01	7.8E+01	--	--	7.8E+01
Bromobenzene	108-86-1	--	--	--	--	1.6E+02	--	1.3E+02	7.1E+01
Bromodichloromethane	75-27-4	1.1E+01	--	3.0E-01	2.9E-01	3.9E+02	--	--	3.9E+02
Bromoform (Tribromomethane)	75-25-2	8.8E+01	--	2.5E+01	1.9E+01	3.9E+02	--	--	3.9E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Bromomethane	74-83-9	--	--	--	--	2.7E+01	--	1.8E+00	1.7E+00
Bromophos	2104-96-3	--	--	--	--	9.8E+01	--	--	9.8E+01
Bromoxynil	1689-84-5	7.0E+00	2.5E+01	--	5.4E+00	2.9E+02	1.2E+03	--	2.4E+02
Bromoxynil octanoate	1689-99-2	7.0E+00	--	--	7.0E+00	2.9E+02	--	--	2.9E+02
1,3-Butadiene	106-99-0	2.0E-01	--	8.1E-02	5.8E-02	--	--	4.5E-01	4.5E-01
1-Butanol	71-36-3	--	--	--	--	2.0E+03	--	--	2.0E+03
Butylate	2008-41-5	--	--	--	--	9.8E+02	--	--	9.8E+02
Butyl benzyl phthalate	85-68-7	3.7E+02	1.3E+03	--	2.9E+02	3.9E+03	1.6E+04	--	3.2E+03
Butylphthalyl butylglycolate	85-70-1	--	--	--	--	2.0E+04	8.2E+04	--	1.6E+04
Cacodylic acid	75-60-5	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Cadmium and compounds +++	7440-43-9	--	--	3.1E+03	3.1E+03	2.0E+01	2.1E+02	5.2E+03	1.8E+01
Camphechlor (Toxaphene)	8001-35-2	6.3E-01	2.2E+00	1.8E+04	4.9E-01	--	--	--	--
Caprolactam	105-60-2	--	--	--	--	9.8E+03	4.1E+04	1.1E+06	7.8E+03
Captafol	2425-06-1	4.6E+00	1.6E+01	1.3E+05	3.6E+00	3.9E+01	1.6E+02	--	3.2E+01
Captan	133-06-2	3.0E+02	1.1E+03	8.5E+06	2.4E+02	2.5E+03	1.1E+04	--	2.1E+03
Carbaryl	63-25-2	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Carbofuran	1563-66-2	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
Carbon disulfide	75-15-0	--	--	--	--	2.0E+03	--	2.1E+02	1.9E+02
Carbon tetrachloride	56-23-5	9.9E+00	--	7.0E-01	6.5E-01	7.8E+01	--	3.9E+01	2.6E+01
Carbosulfan	55285-14-8	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Carboxin	5234-68-4	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Chloramben	133-90-4	--	--	--	--	2.9E+02	1.2E+03	--	2.4E+02
Chloranil	118-75-2	1.7E+00	6.2E+00	--	1.4E+00	--	--	--	--
Chlordane	12789-03-6	2.0E+00	1.8E+01	4.3E+01	1.7E+00	9.8E+00	1.0E+02	2.8E+02	8.7E+00
Chlordecone (Kepone)	143-50-0	7.0E-02	2.5E-01	1.2E+03	5.4E-02	5.9E+00	2.5E+01	--	4.7E+00
Chlorimuron-ethyl	90982-32-4	--	--	--	--	1.8E+03	7.4E+03	--	1.4E+03
Chlorine	7782-50-5	--	--	--	--	2.0E+03	--	4.8E-02	4.8E-02
Chlorine dioxide	10049-04-4	--	--	--	--	5.9E+02	--	1.0E+05	5.8E+02
Chloroacetic acid	79-11-8	--	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	--	--	--	--	--	--	1.6E+04	1.6E+04
4-Chloroaniline	106-47-8	3.5E+00	1.2E+01	--	2.7E+00	7.8E+01	3.3E+02	--	6.3E+01
Chlorobenzene	108-90-7	--	--	--	--	3.9E+02	--	8.4E+01	6.9E+01
Chlorobenzilate	510-15-6	6.3E+00	2.2E+01	1.8E+05	4.9E+00	3.9E+02	1.6E+03	--	3.2E+02
p-Chlorobenzoic acid	74-11-3	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
4-Chlorobenzotrifluoride	98-56-6	--	--	--	--	5.9E+01	--	5.3E+02	5.3E+01
2-Chloro-1,3-butadiene	126-99-8	--	--	1.0E-02	1.0E-02	3.9E+02	--	5.6E+00	5.5E+00
1-Chlorobutane	109-69-3	--	--	--	--	7.8E+02	--	--	7.8E+02
1-Chloro-1,1-difluoroethane	75-68-3	--	--	--	--	--	--	1.3E+04	1.3E+04
Chlorodifluoromethane	75-45-6	--	--	--	--	--	--	1.2E+04	1.2E+04
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	2.8E+01	9.9E+01	7.9E+05	2.2E+01	9.8E+02	4.1E+03	--	7.9E+02
Chloroform	67-66-3	2.2E+01	--	3.2E-01	3.2E-01	2.0E+02	--	6.7E+01	5.0E+01
Chloromethane	74-87-3	--	--	--	--	--	--	2.8E+01	2.8E+01
4-Chloro-2-methylaniline hydrochloride	3165-93-3	1.5E+00	5.4E+00	--	1.2E+00	--	--	--	--
beta-Chloronaphthalene	91-58-7	--	--	--	--	1.6E+03	5.1E+03	--	1.2E+03
o-Chloronitrobenzene	88-73-3	2.3E+00	8.2E+00	--	1.8E+00	5.9E+01	2.5E+02	5.2E+03	4.7E+01
p-Chloronitrobenzene	100-00-5	1.2E+01	4.1E+01	--	9.0E+00	1.4E+01	5.8E+01	1.0E+06	1.1E+01
2-Chlorophenol	95-57-8	--	--	--	--	9.8E+01	--	--	9.8E+01
Chlorothalonil	1897-45-6	2.2E+02	8.0E+02	6.3E+06	1.8E+02	2.9E+02	1.2E+03	--	2.4E+02
o-Chlorotoluene	95-49-8	--	--	--	--	3.9E+02	--	--	3.9E+02
Chlorpropham	101-21-3	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
Chlorpyrifos	2921-88-2	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Chlorpyrifos-methyl	5598-13-0	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Chlorsulfuron	64902-72-3	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
Chlorthiophos	60238-56-4	--	--	--	--	1.6E+01	6.6E+01	--	1.3E+01
Chromium, Total	7440-47-3	--	--	--	--	--	--	--	--
Chromium III *	16065-83-1	--	--	--	--	2.9E+04	--	--	2.9E+04
Chromium VI +++	18540-29-9	3.1E-01	--	2.4E+01	3.0E-01	5.9E+01	--	5.2E+04	5.9E+01
Clofentezine (Apollo)	74115-24-5	--	--	--	--	2.5E+02	1.1E+03	--	2.1E+02
Cobalt	7440-48-4	--	--	6.2E+02	6.2E+02	5.9E+00	--	3.1E+03	5.9E+00
Coke Oven Emissions	8007-45-2	--	--	3.3E+03	3.3E+03	--	--	--	--
Copper and compounds	7440-50-8	--	--	--	--	7.8E+02	--	--	7.8E+02

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		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Crotonaldehyde	123-73-9	3.7E-01	--	--	3.7E-01	2.0E+01	--	--	2.0E+01
Cumene (Isopropylbenzene)	98-82-8	--	--	--	--	2.0E+03	--	6.5E+02	4.9E+02
Cyanazine	21725-46-2	8.3E-01	2.9E+00	--	6.5E-01	3.9E+01	1.6E+02	--	3.2E+01
Cyanide (free)	57-12-5	--	--	--	--	1.2E+01	--	1.1E+01	5.7E+00
Cyanide (hydrogen)	74-90-8	--	--	--	--	1.2E+01	--	1.1E+01	5.6E+00
Cyanogen	460-19-5	--	--	--	--	2.0E+01	--	--	2.0E+01
Cyanogen bromide	506-68-3	--	--	--	--	1.8E+03	--	--	1.8E+03
Cyanogen chloride	506-77-4	--	--	--	--	9.8E+02	--	--	9.8E+02
Cyclohexane	110-82-7	--	--	--	--	--	--	1.6E+03	1.6E+03
Cyclohexanone	108-94-1	--	--	--	--	9.8E+04	--	7.6E+03	7.1E+03
Cyclohexylamine	108-91-8	--	--	--	--	3.9E+03	--	--	3.9E+03
Cyfluthrin (Baythroid)	68359-37-5	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Cyhalothrin (Karate)	68085-85-8	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Cyromazine	66215-27-8	--	--	--	--	9.8E+03	4.1E+04	--	7.9E+03
Dacthal	1861-32-1	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Dalapon	75-99-0	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Daminozide (Alar)	1596-84-5	3.9E+01	1.4E+02	1.1E+06	3.0E+01	2.9E+03	1.2E+04	--	2.4E+03
Demeton	8065-48-3	--	--	--	--	7.8E-01	3.3E+00	--	6.3E-01
Diallate	2303-16-4	1.1E+01	4.1E+01	--	8.9E+00	--	--	--	--
Diazinon	333-41-5	--	--	--	--	1.4E+01	5.8E+01	--	1.1E+01
Dibenzofuran	132-64-9	--	--	--	--	2.0E+01	2.7E+02	--	1.8E+01
1,4-Dibromobenzene	106-37-6	--	--	--	--	2.0E+02	--	--	2.0E+02
Dibromochloromethane	124-48-1	8.3E+00	--	--	8.3E+00	3.9E+02	--	--	3.9E+02
1,2-Dibromo-3-chloropropane	96-12-8	1.9E-01	--	5.4E-03	5.3E-03	3.9E+00	--	1.7E+00	1.2E+00
1,2-Dibromoethane	106-93-4	3.5E-01	--	4.0E-02	3.6E-02	1.8E+02	--	2.0E+01	1.8E+01
Dibutyl phthalate	84-74-2	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Dicamba	1918-00-9	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
1,2-Dichlorobenzene	95-50-1	--	--	--	--	1.8E+03	--	6.1E+02	4.5E+02
1,4-Dichlorobenzene	106-46-7	1.3E+02	--	2.7E+00	2.6E+00	1.4E+03	--	2.2E+03	8.4E+02
3,3-Dichlorobenzidine	91-94-1	1.5E+00	5.5E+00	1.6E+04	1.2E+00	--	--	--	--
4,4'-Dichlorobenzophenone	90-98-2	--	--	--	--	1.8E+02	7.4E+02	--	1.4E+02
1,4-Dichloro-2-butene	764-41-0	--	--	2.1E-03	2.1E-03	--	--	--	--
Dichlorodifluoromethane	75-71-8	--	--	--	--	3.9E+03	--	2.2E+01	2.2E+01
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	2.9E+00	1.0E+01	8.1E+04	2.3E+00	5.9E-01	2.5E+00	--	4.7E-01
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	2.0E+00	--	6.1E+01	2.0E+00	5.9E+00	--	--	5.9E+00
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.0E+00	2.4E+01	5.8E+04	1.9E+00	9.8E+00	1.4E+02	--	9.1E+00
1,1-Dichloroethane	75-34-3	1.2E+02	--	3.7E+00	3.6E+00	3.9E+03	--	--	3.9E+03
1,2-Dichloroethane	107-06-2	7.6E+00	--	4.9E-01	4.6E-01	1.2E+02	--	8.3E+00	7.8E+00
1,1-Dichloroethylene	75-35-4	--	--	--	--	9.8E+02	--	6.0E+01	5.7E+01
1,2-Dichloroethylene (cis)	156-59-2	--	--	--	--	3.9E+01	--	--	3.9E+01
1,2-Dichloroethylene (trans)	156-60-5	--	--	--	--	3.9E+02	--	--	3.9E+02
2,4-Dichlorophenol	120-83-2	--	--	--	--	5.9E+01	2.5E+02	--	4.7E+01
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	--	--	--	--	2.0E+02	1.6E+03	--	1.7E+02
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Decabromodiphenyl ether (BDE-209)	1163-19-5	9.9E+02	3.5E+03	--	7.8E+02	1.4E+02	5.8E+02	--	1.1E+02
1,2-Dichloropropane	78-87-5	1.9E+01	--	2.9E+00	2.5E+00	7.8E+02	--	3.9E+00	3.9E+00
2,3-Dichloropropanol	616-23-9	--	--	--	--	5.9E+01	2.5E+02	--	4.7E+01
1,3-Dichloropropene	542-75-6	7.0E+00	--	2.5E+00	1.8E+00	5.9E+02	--	1.9E+01	1.8E+01
Dichlorvos	62-73-7	2.4E+00	8.5E+00	6.8E+04	1.9E+00	9.8E+00	4.1E+01	2.6E+05	7.9E+00
Dicrotophos (Bidrin)	141-66-2	--	--	--	--	5.9E-01	2.5E+00	--	4.7E-01
Dicyclopentadiene	77-73-6	--	--	--	--	1.6E+03	--	3.2E-01	3.2E-01
Dieldrin	60-57-1	4.3E-02	1.5E-01	1.2E+03	3.4E-02	9.8E-01	4.1E+00	--	7.9E-01
Diethylene glycol, monobutyl ether	112-34-5	--	--	--	--	5.9E+02	2.5E+03	5.2E+04	4.7E+02
Diethylene glycol, monoethyl ether	111-90-0	--	--	--	--	1.2E+03	4.9E+03	1.6E+05	9.4E+02
Diethylformamide	617-84-5	--	--	--	--	2.0E+01	--	--	2.0E+01
Di(2-ethylhexyl)adipate	103-23-1	5.8E+02	2.1E+03	--	4.5E+02	1.2E+04	4.9E+04	--	9.5E+03
Diethyl phthalate	84-66-2	--	--	--	--	1.6E+04	6.6E+04	--	1.3E+04
Diethylstilbestrol	56-53-1	2.0E-03	7.1E-03	5.6E+01	1.6E-03	--	--	--	--
Difenzoquat (Avenge)	43222-48-6	--	--	--	--	1.6E+03	6.8E+03	--	1.3E+03
Diflubenzuron	35367-38-5	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
1,1-Difluoroethane	75-37-6	--	--	--	--	--	--	1.2E+04	1.2E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Diisopropyl methylphosphonate (DIMP)	1445-75-6	--	--	--	--	1.6E+03	--	--	1.6E+03
Dimethipin	55290-64-7	--	--	--	--	4.3E+02	1.8E+03	--	3.5E+02
Dimethoate	60-51-5	--	--	--	--	4.3E+01	1.8E+02	--	3.5E+01
3,3'-Dimethoxybenzidine	119-90-4	4.3E-01	1.5E+00	--	3.4E-01	--	--	--	--
N-N-Dimethylaniline	121-69-7	2.6E+01	--	--	2.6E+01	3.9E+01	--	--	3.9E+01
2,4-Dimethylaniline	95-68-1	3.5E+00	1.2E+01	--	2.7E+00	3.9E+01	1.6E+02	--	3.2E+01
2,4-Dimethylaniline hydrochloride	21436-96-4	1.2E+00	4.3E+00	--	9.4E-01	--	--	--	--
3,3'-Dimethylbenzidine	119-93-7	6.3E-02	2.2E-01	--	4.9E-02	--	--	--	--
N,N-Dimethylformamide	68-12-2	--	--	--	--	2.0E+03	--	1.0E+03	6.6E+02
2,4-Dimethylphenol	105-67-9	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
2,6-Dimethylphenol	576-26-1	--	--	--	--	1.2E+01	4.9E+01	--	9.5E+00
3,4-Dimethylphenol	95-65-8	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Dimethyl terephthalate	120-61-6	--	--	--	--	2.0E+03	--	--	2.0E+03
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
1,2-Dinitrobenzene	528-29-0	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
1,3-Dinitrobenzene	99-65-0	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
1,4-Dinitrobenzene	100-25-4	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
2,4-Dinitrophenol	51-28-5	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
Dinitrotoluene mixture	25321-14-6	1.5E+00	5.5E+00	--	1.2E+00	1.8E+01	7.4E+01	--	1.4E+01
2,4-Dinitrotoluene	121-14-2	2.2E+00	7.8E+00	6.3E+04	1.7E+00	3.9E+01	1.6E+02	--	3.1E+01
2,6-Dinitrotoluene	606-20-2	4.6E-01	1.7E+00	--	3.6E-01	5.9E+00	2.5E+01	--	4.8E+00
Dinoseb	88-85-7	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
1,4-Dioxane	123-91-1	7.0E+00	--	2.2E+01	5.3E+00	5.9E+02	--	3.1E+02	2.0E+02
Diphenamid	957-51-7	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Diphenylamine	122-39-4	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
1,2-Diphenylhydrazine	122-66-7	8.7E-01	3.1E+00	2.5E+04	6.8E-01	--	--	--	--
Diphenyl sulfone	127-63-9	--	--	--	--	1.6E+01	6.6E+01	--	1.3E+01
Diquat dibromide (Diquat)	85-00-7	--	--	--	--	4.3E+01	1.8E+02	--	3.5E+01
Direct black 38	1937-37-7	9.8E-02	3.5E-01	4.0E+01	7.6E-02	--	--	--	--
Direct blue 6	2602-46-2	9.4E-02	3.3E-01	4.0E+01	7.3E-02	--	--	--	--
Direct brown 95	16071-86-6	1.0E-01	3.7E-01	4.0E+01	8.1E-02	--	--	--	--
Disulfoton	298-04-4	--	--	--	--	7.8E-01	3.3E+00	--	6.3E-01
1,4-Dithiane	505-29-3	--	--	--	--	2.0E+02	--	--	2.0E+02
Diuron	330-54-1	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
Dodine	2439-10-3	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Endosulfan	115-29-7	--	--	--	--	1.2E+02	--	--	1.2E+02
Endothall	145-73-3	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Endrin	72-20-8	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
Enilconazole (Imazalil)	35554-44-0	1.1E+01	4.1E+01	--	8.9E+00	4.9E+01	2.1E+02	--	4.0E+01
Epichlorohydrin	106-89-8	7.0E+01	--	4.4E+01	2.7E+01	1.2E+02	--	4.9E+00	4.7E+00
1,2-Epoxybutane	106-88-7	--	--	--	--	--	--	4.0E+01	4.0E+01
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	--	--	--	--	9.8E+02	--	--	9.8E+02
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
Ethion	563-12-2	--	--	--	--	9.8E+00	4.1E+01	--	7.9E+00
2-Ethoxyethanol	110-80-5	--	--	--	--	1.8E+03	--	5.1E+03	1.3E+03
2-Ethoxyethanol acetate	111-15-9	--	--	--	--	2.0E+03	--	9.6E+02	6.4E+02
Ethyl acetate	141-78-6	--	--	--	--	1.8E+04	--	1.6E+02	1.6E+02
Ethyl acrylate	140-88-5	--	--	--	--	9.8E+01	--	1.3E+01	1.2E+01
Ethylbenzene	100-41-4	6.3E+01	--	6.4E+00	5.8E+00	2.0E+03	--	1.5E+03	8.4E+02
Ethyl chloride (Chloroethane)	75-00-3	--	--	--	--	--	--	3.4E+03	3.4E+03
Ethylene cyanohydrin	109-78-4	--	--	--	--	1.4E+03	5.8E+03	--	1.1E+03
Ethylene diamine	107-15-3	--	--	--	--	1.8E+03	--	--	1.8E+03
Ethylene glycol	107-21-1	--	--	--	--	3.9E+04	1.6E+05	2.1E+08	3.2E+04
Ethylene glycol, monobutyl ether	111-76-2	--	--	--	--	2.0E+03	8.2E+03	8.3E+08	1.6E+03
Ethylene oxide	75-21-8	4.9E-01	--	2.1E-03	2.0E-03	--	--	4.8E+01	4.8E+01
Ethylene thiourea (ETU)	96-45-7	1.5E+01	5.5E+01	4.3E+05	1.2E+01	1.6E+00	6.6E+00	--	1.3E+00
Ethyl ether	60-29-7	--	--	--	--	3.9E+03	--	--	3.9E+03
Ethyl methacrylate	97-63-2	--	--	--	--	--	--	4.5E+02	4.5E+02
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	--	--	--	--	2.0E-01	8.2E-01	--	1.6E-01
Ethylphthalyl ethyl glycolate	84-72-0	--	--	--	--	5.9E+04	2.5E+05	--	4.7E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Fenamiphos	22224-92-6	--	--	--	--	4.9E+00	2.1E+01	--	4.0E+00
Fenpropathrin (Danitol)	39515-41-8	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Fenvalerate (Pydrin)	51630-58-1	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Fluometuron	2164-17-2	--	--	--	--	2.5E+02	1.1E+03	--	2.1E+02
Fluoride	16984-48-8	--	--	--	--	7.8E+02	--	6.8E+06	7.8E+02
Fluoridone	59756-60-4	--	--	--	--	1.6E+03	6.6E+03	--	1.3E+03
Flurprimidol	56425-91-3	--	--	--	--	7.8E+02	3.3E+03	--	6.3E+02
Flusilazole (NuStar)	85509-19-9	--	--	--	--	3.9E+01	--	--	3.9E+01
Flutolanil	66332-96-5	--	--	--	--	9.8E+03	4.1E+04	--	7.9E+03
Fluvalinate	69409-94-5	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Folpet	133-07-3	--	--	--	--	1.8E+03	7.4E+03	--	1.4E+03
Fomesafen	72178-02-0	--	--	--	--	4.9E+01	2.1E+02	--	4.0E+01
Fonofos	944-22-9	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
Formaldehyde	50-00-0	--	--	1.7E+01	1.7E+01	3.9E+03	--	2.0E+02	1.9E+02
Formic acid	64-18-6	--	--	--	--	1.8E+04	--	7.3E+00	7.3E+00
Fosetyl-al	39148-24-8	--	--	--	--	4.9E+04	2.1E+05	--	4.0E+04
Furan	110-00-9	--	--	--	--	2.0E+01	2.7E+02	--	1.8E+01
Furazolidone	67-45-8	1.8E-01	6.5E-01	--	1.4E-01	--	--	--	--
Furfural	98-01-1	--	--	--	--	5.9E+01	--	6.3E+02	5.4E+01
Furmecyclox	60568-05-0	2.3E+01	8.2E+01	6.5E+05	1.8E+01	--	--	--	--
Furothiazole (Furium)	531-82-8	4.6E-01	1.6E+00	1.3E+04	3.6E-01	--	--	--	--
Glufosinate-ammonium	77182-82-2	--	--	--	--	1.2E+02	4.9E+02	--	9.5E+01
Glycidaldehyde	765-34-4	--	--	--	--	7.8E+00	--	2.2E+01	5.8E+00
Glyphosate	1071-83-6	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Haloxyfop-methyl	69806-40-2	--	--	--	--	9.8E-01	4.1E+00	--	7.9E-01
Thifensulfuron-methyl (Harmony)	79277-27-3	--	--	--	--	8.4E+02	3.5E+03	--	6.8E+02
Heptachlor	76-44-8	1.5E-01	--	1.0E+00	1.3E-01	9.8E+00	--	--	9.8E+00
Heptachlor epoxide	1024-57-3	7.6E-02	--	9.1E-01	7.0E-02	2.5E-01	--	--	2.5E-01
Hexabromobenzene	87-82-1	--	--	--	--	3.9E+01	--	--	3.9E+01
Hexachlorobenzene	118-74-1	4.3E-01	--	4.1E-01	2.1E-01	1.6E+01	--	--	1.6E+01
Hexachlorobutadiene	87-68-3	8.9E+00	--	1.4E+00	1.2E+00	2.0E+01	--	--	2.0E+01
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	1.1E-01	3.9E-01	3.1E+03	8.6E-02	1.6E+02	6.6E+02	--	1.3E+02
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	3.9E-01	1.4E+00	1.1E+04	3.0E-01	--	--	--	--
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	6.3E-01	5.6E+00	1.8E+04	5.7E-01	5.9E+00	6.2E+01	--	5.4E+00
Hexachlorocyclohexane technical	608-73-1	3.9E-01	1.4E+00	1.1E+04	3.0E-01	--	--	--	--
Hexachlorocyclopentadiene	77-47-4	--	--	--	--	1.2E+02	--	4.4E-01	4.4E-01
Hexachloroethane	67-72-1	1.7E+01	--	2.0E+00	1.8E+00	1.4E+01	--	6.3E+01	1.1E+01
Hexachlorophene	70-30-4	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	6.3E+00	1.5E+02	--	6.1E+00	5.9E+01	1.6E+03	--	5.7E+01
1,6-Hexamethylene diisocyanate	822-06-0	--	--	--	--	--	--	7.8E-01	7.8E-01
n-Hexane	110-54-3	--	--	--	--	--	--	1.5E+02	1.5E+02
Hexazinone	51235-04-2	--	--	--	--	6.5E+02	2.7E+03	--	5.2E+02
Hexythiazox (Savey)	78587-05-0	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Hydramethylnon (Amdro)	67485-29-4	--	--	--	--	3.3E+02	1.4E+03	--	2.7E+02
Hydrazine, hydrazine sulfate	302-01-2	2.3E-01	--	1.1E+03	2.3E-01	--	--	1.6E+04	1.6E+04
Hydrazine, dimethyl	57-14-7	--	--	--	--	2.0E+00	--	1.4E-02	1.4E-02
Hydrogen chloride	7647-01-0	--	--	--	--	--	--	1.0E+07	1.0E+07
Hydrogen sulfide	7783-06-4	--	--	--	--	--	--	1.0E+06	1.0E+06
p-Hydroquinone	123-31-9	1.2E+01	4.1E+01	--	9.0E+00	7.8E+02	3.3E+03	--	6.3E+02
Imazaquin	81335-37-7	--	--	--	--	4.9E+03	2.1E+04	--	4.0E+03
Imazethapyr (Pursuit)	81335-77-5	--	--	--	--	4.9E+04	2.1E+05	--	4.0E+04
Iprodione	36734-19-7	--	--	--	--	7.8E+02	3.3E+03	--	6.3E+02
Iron	7439-89-6	--	--	--	--	1.4E+04	--	--	1.4E+04
Isobutanol (Isobutyl alcohol)	78-83-1	--	--	--	--	5.9E+03	--	--	5.9E+03
Isophorone	78-59-1	7.3E+02	2.6E+03	--	5.7E+02	3.9E+03	1.6E+04	1.0E+09	3.2E+03
Isopropalin	33820-53-0	--	--	--	--	2.9E+02	--	--	2.9E+02
Isopropyl methyl phosphonic acid	1832-54-8	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
Isoxaben	82558-50-7	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
Lactofen	77501-63-4	--	--	--	--	1.6E+02	6.6E+02	--	1.3E+02
Lead +++	7439-92-1	--	--	--	--	--	--	--	--
Lead (tetraethyl)	78-00-2	--	--	--	--	2.0E-03	--	--	2.0E-03

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Linuron	330-55-2	--	--	--	--	1.5E+02	6.3E+02	--	1.2E+02
Lithium	7439-93-2	--	--	--	--	3.9E+01	--	--	3.9E+01
Malathion	121-75-5	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Maleic anhydride	108-31-6	--	--	--	--	2.0E+03	8.2E+03	3.6E+05	1.6E+03
Maleic hydrazide	123-33-1	--	--	--	--	9.8E+03	4.1E+04	--	7.9E+03
Malononitrile	109-77-3	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
Mancozeb	8018-01-7	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Maneb	12427-38-2	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
Manganese (non-food) +++	7439-96-5	--	--	--	--	2.7E+03	--	2.6E+04	2.5E+03
Mephosfolan	950-10-7	--	--	--	--	1.8E+00	7.4E+00	--	1.4E+00
Mepiquat chloride (Mepiquat)	24307-26-4	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Mercury and compounds	7487-94-7	--	--	--	--	5.9E+00	--	1.6E+05	5.9E+00
Mercury (elemental)	7439-97-6	--	--	--	--	--	--	2.7E+00	2.7E+00
Mercury (methyl)	22967-92-6	--	--	--	--	2.0E+00	--	--	2.0E+00
Merphos	150-50-5	--	--	--	--	5.9E-01	--	--	5.9E-01
Merphos oxide	78-48-8	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
Metalaxyl	57837-19-1	--	--	--	--	1.2E+03	4.9E+03	--	9.5E+02
Methacrylonitrile	126-98-7	--	--	--	--	2.0E+00	--	5.3E+01	1.9E+00
Methamidophos	10265-92-6	--	--	--	--	9.8E-01	4.1E+00	--	7.9E-01
Methanol	67-56-1	--	--	--	--	3.9E+04	--	1.5E+05	3.1E+04
Methidathion	950-37-8	--	--	--	--	2.9E+01	1.2E+02	--	2.4E+01
Methomyl	16752-77-5	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Methoxychlor	72-43-5	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
2-Methoxyethanol	109-86-4	--	--	--	--	9.8E+01	--	5.3E+02	8.2E+01
2-Methoxyethanol acetate	110-49-6	--	--	--	--	1.6E+02	--	3.2E+01	2.7E+01
2-Methoxy-5-nitroaniline	99-59-2	1.4E+01	5.0E+01	4.0E+05	1.1E+01	--	--	--	--
Methyl acetate	79-20-9	--	--	--	--	2.0E+04	--	--	2.0E+04
Methyl acrylate	96-33-3	--	--	--	--	--	--	3.6E+01	3.6E+01
2-Methylaniline hydrochloride	636-21-5	5.3E+00	1.9E+01	1.5E+05	4.2E+00	--	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	--	--	--	--	9.8E+00	4.1E+01	--	7.9E+00
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	--	--	--	--	8.6E+01	3.6E+02	--	7.0E+01
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
4,4'-Methylenebisbenzeneamine	101-77-9	4.3E-01	1.5E+00	1.2E+04	3.4E-01	--	--	1.0E+07	1.0E+07
4,4'-Methylene bis(2-chloroaniline)	101-14-4	1.5E+00	6.0E+00	4.7E+03	1.2E+00	3.9E+01	1.6E+02	--	3.2E+01
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	1.5E+01	5.4E+01	4.3E+05	1.2E+01	--	--	--	--
Methylene bromide	74-95-3	--	--	--	--	--	--	5.9E+00	5.9E+00
Methylene chloride	75-09-2	7.7E+01	--	2.2E+02	5.7E+01	1.2E+02	--	3.4E+02	8.7E+01
4,4'-Methylenediphenyl isocyanate	101-68-8	--	--	--	--	--	--	3.1E+05	3.1E+05
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	--	--	--	--	7.8E+01	3.3E+02	--	6.3E+01
Methyl ethyl ketone (2-Butanone)	78-93-3	--	--	--	--	1.2E+04	--	1.6E+04	6.8E+03
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	--	--	--	--	--	--	8.3E+03	8.3E+03
Methyl methacrylate	80-62-6	--	--	--	--	2.7E+04	--	1.2E+03	1.1E+03
2-Methyl-5-nitroaniline	99-55-8	7.7E+01	2.7E+02	--	6.0E+01	3.9E+02	1.6E+03	--	3.2E+02
Methyl parathion	298-00-0	--	--	--	--	4.9E+00	2.1E+01	--	4.0E+00
2-Methylphenol	95-48-7	--	--	--	--	9.8E+02	4.1E+03	3.1E+08	7.9E+02
3-Methylphenol	108-39-4	--	--	--	--	9.8E+02	4.1E+03	3.1E+08	7.9E+02
4-Methylphenol	106-44-5	--	--	--	--	2.0E+03	8.2E+03	3.1E+08	1.6E+03
Methyl phosphonic acid	993-13-5	--	--	--	--	1.2E+03	4.9E+03	--	9.5E+02
Methyl styrene (mixture)	25013-15-4	--	--	--	--	1.2E+02	--	2.5E+02	8.0E+01
Methyl styrene (alpha)	98-83-9	--	--	--	--	1.4E+03	--	--	1.4E+03
Methyl tertbutyl ether (MTBE)	1634-04-4	3.9E+02	--	5.3E+01	4.7E+01	--	--	3.8E+03	3.8E+03
Metolaclor (Dual)	51218-45-2	--	--	--	--	2.9E+03	1.2E+04	--	2.4E+03
Metribuzin	21087-64-9	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Metsulfuron-methyl (Ally)	74223-64-6	--	--	--	--	4.9E+03	2.1E+04	--	4.0E+03
Mirex	2385-85-5	3.9E-02	--	4.7E-01	3.6E-02	3.9E+00	--	--	3.9E+00
Molinate	2212-67-1	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
Molybdenum	7439-98-7	--	--	--	--	9.8E+01	--	--	9.8E+01
Monochloramine	10599-90-3	--	--	--	--	2.0E+03	--	--	2.0E+03
Myclobutanil (Systhane)	88671-89-0	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Naled	300-76-5	--	--	--	--	3.9E+01	--	--	3.9E+01

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CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Napropamide	15299-99-7	--	--	--	--	2.3E+03	9.9E+03	--	1.9E+03
Nickel and compounds	7440-02-0	--	--	2.2E+04	2.2E+04	3.9E+02	--	4.7E+04	3.9E+02
Nickel refinery dust	7440-02-0-NRD	--	--	2.3E+04	2.3E+04	2.2E+02	--	7.3E+03	2.1E+02
Nickel subsulfide	12035-72-2	4.1E-01	--	1.2E+04	4.1E-01	2.2E+02	--	7.3E+03	2.1E+02
Nitrate	14797-55-8	--	--	--	--	3.1E+04	--	--	3.1E+04
Nitrite	14797-65-0	--	--	--	--	2.0E+03	--	--	2.0E+03
2-Nitroaniline	88-74-4	--	--	--	--	2.0E+02	8.2E+02	2.6E+04	1.6E+02
Nitrobenzene	98-95-3	--	--	5.1E+00	5.1E+00	3.9E+01	--	1.7E+02	3.2E+01
Nitrofurantoin	67-20-9	--	--	--	--	1.4E+03	5.8E+03	--	1.1E+03
Nitrofurazone	59-87-0	5.3E-01	1.9E+00	1.5E+04	4.2E-01	--	--	--	--
Nitroglycerin	55-63-0	4.1E+01	1.5E+02	--	3.2E+01	2.0E+00	8.2E+00	--	1.6E+00
Nitroguanidine	556-88-7	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
2-Nitropropane	79-46-9	--	--	1.4E-02	1.4E-02	--	--	6.8E+01	6.8E+01
N-Nitrosodi-n-butylamine	924-16-3	1.3E-01	--	4.3E-01	9.9E-02	--	--	--	--
N-Nitrosodiethanolamine	1116-54-7	2.5E-01	8.8E-01	7.0E+03	1.9E-01	--	--	--	--
N-Nitrosodiethylamine	55-18-5	1.0E-03	4.0E-03	4.7E+01	8.1E-04	--	--	--	--
N-Nitrosodimethylamine	62-75-9	3.0E-03	--	6.0E-03	2.0E-03	1.6E-01	--	8.6E-01	1.3E-01
N-Nitrosodiphenylamine	86-30-6	1.4E+02	5.0E+02	2.2E+06	1.1E+02	--	--	--	--
N-Nitroso di-n-propylamine	621-64-7	9.9E-02	3.5E-01	2.8E+03	7.8E-02	--	--	--	--
N-Nitroso-N-methylethylamine	10595-95-6	3.2E-02	--	5.4E-02	2.0E-02	--	--	--	--
N-Nitrosopyrrolidine	930-55-2	3.3E-01	1.2E+00	9.2E+03	2.6E-01	--	--	--	--
m-Nitrotoluene	99-08-1	--	--	--	--	2.0E+00	8.2E+00	--	1.6E+00
o-Nitrotoluene	88-72-2	3.2E+00	--	--	3.2E+00	1.8E+01	--	--	1.8E+01
p-Nitrotoluene	99-99-0	4.3E+01	1.5E+02	--	3.4E+01	7.8E+01	3.3E+02	--	6.3E+01
Norflurazon	27314-13-2	--	--	--	--	2.9E+02	1.2E+03	--	2.4E+02
Octabromodiphenyl ether	32536-52-0	--	--	--	--	5.9E+01	2.5E+02	--	4.7E+01
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--	--	--	--	9.8E+02	6.9E+04	--	9.6E+02
Octamethylpyrophosphoramide	152-16-9	--	--	--	--	3.9E+01	1.6E+02	--	3.2E+01
Oryzalin	19044-88-3	8.9E+01	3.2E+02	--	7.0E+01	2.7E+03	1.2E+04	--	2.2E+03
Oxadiazon	19666-30-9	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
Oxamyl	23135-22-0	--	--	--	--	4.9E+02	2.1E+03	--	4.0E+02
Oxyfluorfen	42874-03-3	9.5E+00	3.4E+01	--	7.4E+00	5.9E+02	2.5E+03	--	4.7E+02
Paclobutrazol	76738-62-0	--	--	--	--	2.5E+02	1.1E+03	--	2.1E+02
Paraquat	4685-14-7	--	--	--	--	8.8E+01	3.7E+02	--	7.1E+01
Parathion	56-38-2	--	--	--	--	1.2E+02	4.9E+02	--	9.5E+01
Pebulate	1114-71-2	--	--	--	--	9.8E+02	--	--	9.8E+02
Pendimethalin	40487-42-1	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Pentabromo-6-chloro cyclohexane	87-84-3	3.5E+01	1.2E+02	--	2.7E+01	3.9E+02	1.6E+03	--	3.2E+02
Pentabromodiphenyl ether	32534-81-9	--	--	--	--	3.9E+01	--	--	3.9E+01
Pentachlorobenzene	608-93-5	--	--	--	--	1.6E+01	--	--	1.6E+01
Pentachloronitrobenzene	82-68-8	2.7E+00	--	--	2.7E+00	5.9E+01	--	--	5.9E+01
Pentachlorophenol	87-86-5	1.7E+00	2.5E+00	1.1E+06	1.0E+00	9.8E+01	1.6E+02	--	6.1E+01
Perchlorate	14797-73-0	--	--	--	--	1.4E+01	--	--	1.4E+01
Perfluoroalkyl Compounds	**0.0E+00**								
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	--	--	--	--	3.9E+00	1.6E+01	--	3.2E+00
Perfluorooctanoic acid (PFOA)^^	335-67-1	9.9E+00	3.5E+01	--	7.8E+00	3.9E-01	1.6E+00	--	3.2E-01
Permethrin	52645-53-1	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02
Phenmedipham	13684-63-4	--	--	--	--	4.7E+03	2.0E+04	--	3.8E+03
Phenol	108-95-2	--	--	--	--	5.9E+03	2.5E+04	1.0E+08	4.7E+03
m-Phenylenediamine	108-45-2	--	--	--	--	1.2E+02	4.9E+02	--	9.5E+01
p-Phenylenediamine	106-50-3	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
Phenylmercuric acetate	62-38-4	--	--	--	--	1.6E+00	6.6E+00	--	1.3E+00
2-Phenylphenol	90-43-7	3.7E+02	1.3E+03	--	2.9E+02	--	--	--	--
Phorate	298-02-2	--	--	--	--	3.9E+00	1.6E+01	--	3.2E+00
Phosmet	732-11-6	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Phosphine	7803-51-2	--	--	--	--	5.9E+00	--	1.6E+05	5.9E+00
Phosphoric acid	7664-38-2	--	--	--	--	9.6E+05	--	5.2E+06	8.1E+05
Phosphorus (white)	7723-14-0	--	--	--	--	3.9E-01	--	--	3.9E-01
p-Phthalic acid	100-21-0	--	--	--	--	2.0E+04	8.2E+04	--	1.6E+04
Phthalic anhydride	85-44-9	--	--	--	--	3.9E+04	1.6E+05	1.0E+07	3.2E+04
Picloram	1918-02-1	--	--	--	--	1.4E+03	5.8E+03	--	1.1E+03

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		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Pirimiphos-methyl	29232-93-7	--	--	--	--	1.4E+00	5.8E+00	--	1.1E+00
Polybrominated biphenyls (PBBs)	59536-65-1	2.3E-02	8.2E-02	6.5E+02	1.8E-02	1.4E-01	5.8E-01	--	1.1E-01
Polychlorinated biphenyls (PCBs)	1336-36-3	3.5E-01	8.8E-01	2.6E+00	2.3E-01	--	--	--	--
Aroclor 1016	12674-11-2	9.9E+00	--	2.8E+05	9.9E+00	1.4E+00	--	--	1.4E+00
Aroclor 1221	11104-28-2	3.5E-01	8.8E-01	1.0E+00	2.0E-01	--	--	--	--
Aroclor 1232	11141-16-5	3.5E-01	8.8E-01	5.5E-01	1.7E-01	--	--	--	--
Aroclor 1242	53469-21-9	3.5E-01	8.8E-01	2.9E+00	2.3E-01	--	--	--	--
Aroclor 1248	12672-29-6	3.5E-01	8.8E-01	3.1E+00	2.3E-01	--	--	--	--
Aroclor 1254	11097-69-1	3.5E-01	8.8E-01	4.1E+00	2.4E-01	3.9E-01	1.2E+00	--	2.9E-01
Aroclor 1260	11096-82-5	3.5E-01	8.8E-01	6.5E+00	2.4E-01	--	--	--	--
Polynuclear aromatic hydrocarbons (PAHs)	0.0E+00								
Acenaphthene	83-32-9	--	--	--	--	1.2E+03	3.8E+03	--	9.0E+02
Anthracene									
Benz[a]anthracene	56-55-3	1.5E+00	4.6E+00	7.4E+01	1.1E+00	--	--	--	--
Benzo[a]pyrene	50-32-8	1.5E-01	4.6E-01	3.4E+03	1.1E-01	5.9E+00	1.9E+01	1.0E+03	4.5E+00
Benzo[b]fluoranthene	205-99-2								
Benzo[k]fluoranthene	207-08-9	1.5E+01	4.6E+01	3.4E+05	1.1E+01	--	--	--	--
Chrysene	218-01-9	1.5E+02	4.6E+02	3.4E+06	1.1E+02	--	--	--	--
Dibenz[ah]anthracene	53-70-3	1.5E-01	4.6E-01	3.4E+03	1.1E-01	--	--	--	--
Fluoranthene	206-44-0	--	--	--	--	7.8E+02	2.5E+03	--	6.0E+02
Fluorene	86-73-7	--	--	--	--	7.8E+02	2.5E+03	--	6.0E+02
Indeno[1,2,3-cd]pyrene	193-39-5	1.5E+00	4.6E+00	3.4E+04	1.1E+00	--	--	--	--
Naphthalene	91-20-3	--	--	3.8E+00	3.8E+00	3.9E+02	1.3E+03	3.6E+01	3.2E+01
Pyrene	129-00-0								
Prochloraz	67747-09-5	4.6E+00	1.6E+01	--	3.6E+00	1.8E+02	7.4E+02	--	1.4E+02
Profluralin	26399-36-0	--	--	--	--	1.2E+02	--	--	1.2E+02
Prometon	1610-18-0	--	--	--	--	2.9E+02	1.2E+03	--	2.4E+02
Prometryn	7287-19-6	--	--	--	--	7.8E+02	3.3E+03	--	6.3E+02
Propyzamide (Pronamide)	23950-58-5	--	--	--	--	1.5E+03	6.2E+03	--	1.2E+03
Propachlor	1918-16-7	--	--	--	--	2.5E+02	1.1E+03	--	2.1E+02
Propanil	709-98-8	--	--	--	--	9.8E+01	4.1E+02	--	7.9E+01
Propargite	2312-35-8	3.7E+00	1.3E+01	--	2.9E+00	7.8E+02	3.3E+03	--	6.3E+02
Propargyl alcohol	107-19-7	--	--	--	--	3.9E+01	--	--	3.9E+01
Propazine	139-40-2	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Propham	122-42-9	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Propiconazole	60207-90-1	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
n-Propylbenzene	103-65-1	--	--	--	--	2.0E+03	--	1.8E+03	9.4E+02
Propylene glycol	57-55-6	--	--	--	--	3.9E+05	1.6E+06	--	3.2E+05
Propylene glycol, monoethyl ether	52125-53-8	--	--	--	--	1.4E+04	--	4.1E+04	1.0E+04
Propylene glycol, monomethyl ether	107-98-2	--	--	--	--	1.4E+04	--	4.1E+04	1.0E+04
Propylene oxide	75-56-9	2.9E+00	--	5.9E+01	2.8E+00	--	--	6.1E+02	6.1E+02
Pyridine	110-86-1	--	--	--	--	2.0E+01	--	--	2.0E+01
Quinalphos	13593-03-8	--	--	--	--	9.8E+00	4.1E+01	--	7.9E+00
Quinoline	91-22-5	2.3E-01	8.2E-01	--	1.8E-01	--	--	--	--
Resmethrin	10453-86-8	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
Ronnel	299-84-3	--	--	--	--	9.8E+02	--	--	9.8E+02
Rotenone	83-79-4	--	--	--	--	7.8E+01	3.3E+02	--	6.3E+01
Selenious Acid	7783-00-8	--	--	--	--	9.8E+01	--	--	9.8E+01
Selenium	7782-49-2	--	--	--	--	9.8E+01	--	1.0E+07	9.8E+01
Sethoxydim	74051-80-2	--	--	--	--	2.7E+03	1.2E+04	--	2.2E+03
Silver and compounds	7440-22-4	--	--	--	--	9.8E+01	--	--	9.8E+01
Simazine	122-34-9	5.8E+00	2.1E+01	--	4.5E+00	9.8E+01	4.1E+02	--	7.9E+01
Sodium azide	26628-22-8	--	--	--	--	7.8E+01	--	--	7.8E+01
Sodium diethyldithiocarbamate	148-18-5	2.6E+00	9.2E+00	--	2.0E+00	5.9E+02	2.5E+03	--	4.7E+02
Sodium fluoroacetate	62-74-8	--	--	--	--	3.9E-01	1.6E+00	--	3.2E-01
Sodium metavanadate	13718-26-8	--	--	--	--	2.0E+01	--	--	2.0E+01
Strontium, stable	7440-24-6	--	--	--	--	1.2E+04	--	--	1.2E+04
Strychnine	57-24-9	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
Styrene	100-42-5	--	--	--	--	3.9E+03	--	2.4E+03	1.5E+03
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	--	--	--	--	1.6E+01	6.6E+01	--	1.3E+01
Tebuthiuron	34014-18-1	--	--	--	--	1.4E+03	5.8E+03	--	1.1E+03

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Temephos	3383-96-8	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Terbacil	5902-51-2	--	--	--	--	2.5E+02	1.1E+03	--	2.1E+02
Terbufos	13071-79-9	--	--	--	--	4.9E-01	--	--	4.9E-01
Terbutryn	886-50-0	--	--	--	--	2.0E+01	8.2E+01	--	1.6E+01
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	--	--	5.9E+00	--	--	5.9E+00
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	5.3E-06	6.3E-05	1.4E-04	4.8E-06	1.4E-05	1.9E-04	2.0E-02	1.3E-05
1,1,1,2-Tetrachloroethane	630-20-6	2.7E+01	--	2.2E+00	2.0E+00	5.9E+02	--	--	5.9E+02
1,1,2,2-Tetrachloroethane	79-34-5	3.5E+00	--	7.3E-01	6.0E-01	3.9E+02	--	--	3.9E+02
Tetrachloroethylene (PCE)	127-18-4	3.3E+02	--	2.5E+01	2.4E+01	1.2E+02	--	2.4E+01	2.0E+01
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	--	--	5.9E+02	2.5E+03	--	4.7E+02
p,a,a,a-Tetrachlorotoluene	5216-25-1	3.5E-02	--	--	3.5E-02	--	--	--	--
Tetrachlorovinphos (Stirofos)	961-11-5	2.9E+01	1.0E+02	--	2.3E+01	5.9E+02	2.5E+03	--	4.7E+02
Tetraethyldithiopyrophosphate	3689-24-5	--	--	--	--	9.8E+00	4.1E+01	--	7.9E+00
Thallium and compounds	7440-28-0	--	--	--	--	2.0E-01	--	--	2.0E-01
Thiobencarb	28249-77-6	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Thiofanox	39196-18-4	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
Thiophanate-methyl	23564-05-8	5.8E+01	2.1E+02	--	4.5E+01	5.3E+02	2.2E+03	--	4.3E+02
Thiram	137-26-8	--	--	--	--	2.9E+02	1.2E+03	--	2.4E+02
Tin and compounds	7440-31-5	--	--	--	--	1.2E+04	--	--	1.2E+04
Toluene	108-88-3	--	--	--	--	1.6E+03	--	5.6E+03	1.2E+03
p-Toluidine	106-49-0	2.3E+01	8.2E+01	--	1.8E+01	7.8E+01	3.3E+02	--	6.3E+01
Tralomethrin	66841-25-6	--	--	--	--	1.5E+02	6.2E+02	--	1.2E+02
Triadimefon (Bayleton)	43121-43-3	--	--	--	--	6.6E+02	2.8E+03	--	5.4E+02
Triallate	2303-17-5	9.7E+00	--	--	9.7E+00	4.9E+02	--	--	4.9E+02
Triasulfuron	82097-50-5	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
Tribenuron-methyl (Express)	101200-48-0	--	--	--	--	1.6E+02	6.6E+02	--	1.3E+02
1,2,4-Tribromobenzene	615-54-3	--	--	--	--	9.8E+01	--	--	9.8E+01
Tributyltin oxide (TBTO)	56-35-9	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
2,4,6-Trichloroaniline	634-93-5	9.9E+01	3.5E+02	--	7.8E+01	5.9E-01	2.5E+00	--	4.7E-01
2,4,6-Trichloroaniline hydrochloride	33663-50-2	2.4E+01	8.5E+01	--	1.9E+01	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	2.4E+01	--	--	2.4E+01	2.0E+02	--	1.6E+01	1.4E+01
1,1,1-Trichloroethane	71-55-6	--	--	--	--	3.9E+04	--	2.1E+03	2.0E+03
1,1,2-Trichloroethane	79-00-5	1.2E+01	--	1.3E+00	1.1E+00	7.8E+01	--	3.8E-01	3.7E-01
Trichloroethylene (TCE) Long-term +++	79-01-6	3.3E+00	--	5.5E-01	4.7E-01	9.8E+00	--	1.2E+00	1.0E+00
Trichloroethylene (TCE) Short-term ‡	79-01-6	--	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	--	--	--	--	5.9E+03	--	--	5.9E+03
2,4,5-Trichlorophenol	95-95-4	--	--	--	--	2.0E+03	8.2E+03	--	1.6E+03
2,4,6-Trichlorophenol	88-06-2	6.3E+01	2.2E+02	1.8E+06	4.9E+01	2.0E+01	8.2E+01	--	1.6E+01
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	--	--	--	--	2.0E+02	8.2E+02	--	1.6E+02
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	--	--	--	--	1.6E+02	6.6E+02	--	1.3E+02
1,1,2-Trichloropropane	598-77-6	--	--	--	--	9.8E+01	--	--	9.8E+01
1,2,3-Trichloropropane	96-18-4	5.1E-03	--	--	5.1E-03	7.8E+01	--	1.2E+00	1.2E+00
1,2,3-Trichloropropene	96-19-5	--	--	--	--	5.9E+01	--	1.8E-01	1.8E-01
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	--	--	--	--	5.9E+05	--	1.7E+03	1.7E+03
Tridiphane	58138-08-2	--	--	--	--	5.9E+01	2.5E+02	--	4.7E+01
Triethylamine	121-44-8	--	--	--	--	--	--	2.9E+01	2.9E+01
Trifluralin	1582-09-8	9.0E+01	--	--	9.0E+01	1.5E+02	--	--	1.5E+02
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	2.0E+02	--	1.2E+02	7.6E+01
1,3,5-Trimethylbenzene	108-67-8	--	--	--	--	2.0E+02	--	1.0E+02	6.8E+01
Trimethyl phosphate	512-56-1	3.5E+01	1.2E+02	--	2.7E+01	2.0E+02	8.2E+02	--	1.6E+02
1,3,5-Trinitrobenzene	99-35-4	--	--	--	--	5.9E+02	1.3E+04	--	5.6E+02
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	--	--	--	--	3.9E+01	2.5E+04	--	3.9E+01
2,4,6-Trinitrotoluene (TNT)	118-96-7	2.3E+01	2.6E+02	--	2.1E+01	9.8E+00	1.3E+02	--	9.1E+00
Triphenylphosphine oxide	791-28-6	--	--	--	--	3.9E+02	1.6E+03	--	3.2E+02
Tris(2-chloroethyl) phosphate	115-96-8	3.5E+01	1.2E+02	--	2.7E+01	1.4E+02	5.8E+02	--	1.1E+02
Uranium (chemical toxicity only)	7440-61-0	--	--	--	--	3.9E+00	--	2.1E+04	3.9E+00
Vanadium and compounds +++	7440-62-2	--	--	--	--	9.8E+01	--	5.2E+04	9.8E+01
Vernolate (Vernam)	1929-77-7	--	--	--	--	2.0E+01	--	--	2.0E+01
Vinclozolin	50471-44-8	--	--	--	--	2.3E+01	9.9E+01	--	1.9E+01
Vinyl acetate	108-05-4	--	--	--	--	2.0E+04	--	2.3E+02	2.3E+02
Vinyl bromide	593-60-2	--	--	1.2E-01	1.2E-01	--	--	1.1E+00	1.1E+00

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL SOIL							
		Cancer Risk = 1E-06				Chronic HQ = 0.25			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Vinyl chloride +++	75-01-4	2.1E-01	--	2.2E-01	1.1E-01	5.9E+01	--	2.5E+01	1.7E+01
Warfarin	81-81-2	--	--	--	--	5.9E+00	2.5E+01	--	4.7E+00
Xylenes	1330-20-7	--	--	--	--	3.9E+03	--	1.5E+02	1.4E+02
Zinc	7440-66-6	--	--	--	--	5.9E+03	--	--	5.9E+03
Zinc phosphide	1314-84-7	--	--	--	--	5.9E+00	--	--	5.9E+00
Zineb	12122-67-7	--	--	--	--	9.8E+02	4.1E+03	--	7.9E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Acephate	30560-19-1	--	--	--	--	1.4E+03	2.6E+03	--	9.1E+02
Acetaldehyde	75-07-0	--	--	4.9E+02	4.9E+02	--	--	3.4E+02	3.4E+02
Acetochlor	34256-82-1	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Acetone	67-64-1	--	--	--	--	1.1E+06	--	1.9E+06	6.7E+05
Acetone cyanohydrin	75-86-5	--	--	--	--	--	--	1.7E+07	1.7E+07
Acetonitrile	75-05-8	--	--	--	--	--	--	3.4E+03	3.4E+03
Acrolein	107-02-8	--	--	--	--	5.8E+02	--	6.1E-01	6.0E-01
Acrylamide	79-06-1	6.5E+01	1.2E+02	2.4E+06	4.3E+01	2.3E+03	4.3E+03	5.2E+07	1.5E+03
Acrylic acid	79-10-7	--	--	--	--	5.8E+05	--	4.2E+02	4.2E+02
Acrylonitrile	107-13-1	6.1E+01	--	1.4E+01	1.1E+01	4.7E+04	--	6.7E+01	6.7E+01
Alachlor	15972-60-8	5.8E+02	1.1E+03	--	3.8E+02	1.2E+04	2.2E+04	--	7.6E+03
Aldicarb	116-06-3	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Aldicarb sulfone	1646-88-4	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Aldrin	309-00-2	1.9E+00	--	4.3E+01	1.8E+00	3.5E+01	--	--	3.5E+01
Allyl alcohol	107-18-6	--	--	--	--	5.8E+03	--	1.5E+01	1.5E+01
Allyl chloride	107-05-1	1.6E+03	--	3.2E+01	3.2E+01	--	--	6.9E+00	6.9E+00
Aluminum	7429-90-5	--	--	--	--	1.2E+06	--	4.4E+07	1.1E+06
Aluminum phosphide	20859-73-8	--	--	--	--	4.7E+02	--	--	4.7E+02
Ametryn	834-12-8	--	--	--	--	1.1E+04	2.0E+04	--	6.8E+03
m-Aminophenol	591-27-5	--	--	--	--	9.3E+04	1.7E+05	--	6.1E+04
Amitraz	33089-61-1	--	--	--	--	2.9E+03	5.4E+03	--	1.9E+03
Ammonia +++	7664-41-7	--	--	--	--	--	--	4.4E+09	4.4E+09
Ammonium sulfamate	7773-06-0	--	--	--	--	2.3E+05	--	--	2.3E+05
Aniline	62-53-3	5.7E+03	1.1E+04	1.5E+08	3.7E+03	8.2E+03	1.5E+04	8.7E+06	5.3E+03
Antimony and compounds	7440-36-0	--	--	--	--	4.7E+02	--	--	4.7E+02
Antimony pentoxide	1314-60-9	--	--	--	--	5.8E+02	--	--	5.8E+02
Antimony potassium tartrate	28300-74-5	--	--	--	--	1.1E+03	--	--	1.1E+03
Antimony tetroxide	1332-81-6	--	--	--	--	4.7E+02	--	--	4.7E+02
Antimony trioxide	1309-64-4	--	--	--	--	--	--	1.7E+06	1.7E+06
Arsenic (inorganic) +++	7440-38-2	2.2E+01	--	5.7E+04	2.2E+01	3.5E+02	--	1.3E+05	3.5E+02
Arsine	7784-42-1	--	--	--	--	4.1E+00	--	4.4E+05	4.1E+00
Assure	76578-14-8	--	--	--	--	1.1E+04	2.0E+04	--	6.8E+03
Asulam	3337-71-1	--	--	--	--	4.2E+04	7.8E+04	--	2.7E+04
Atrazine	1912-24-9	1.4E+02	2.6E+02	--	9.2E+01	4.1E+04	7.6E+04	--	2.7E+04
Avermectin B1	65195-55-3	--	--	--	--	4.7E+02	8.7E+02	--	3.0E+02
Azobenzene	103-33-3	3.0E+02	--	2.1E+03	2.6E+02	--	--	--	--
Barium and compounds	7440-39-3	--	--	--	--	2.3E+05	--	4.4E+06	2.2E+05
Benfluralin (Benefin)	1861-40-1	--	--	--	--	5.8E+03	--	--	5.8E+03
Bensulfuron-methyl (Londax)	83055-99-6	--	--	--	--	2.3E+05	4.3E+05	--	1.5E+05
Bentazone (Bentazon)	25057-89-0	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Benzaldehyde	100-52-7	8.2E+03	--	--	8.2E+03	1.2E+05	--	--	1.2E+05
Benzene	71-43-2	5.9E+02	--	5.6E+01	5.1E+01	4.7E+03	--	4.6E+02	4.2E+02
Benzidine	92-87-5	1.4E-01	2.6E-01	3.7E+03	9.2E-02	3.5E+03	6.5E+03	--	2.3E+03
Benzoic acid	65-85-0	--	--	--	--	4.7E+06	8.7E+06	--	3.0E+06
Benzotrichloride	98-07-7	2.5E+00	--	--	2.5E+00	--	--	--	--
Benzyl alcohol	100-51-6	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Benzyl chloride	100-44-7	1.9E+02	--	6.4E+01	4.8E+01	2.3E+03	--	1.1E+02	1.1E+02
Beryllium and compounds	7440-41-7	--	--	1.0E+05	1.0E+05	2.3E+03	--	1.7E+05	2.3E+03
Biphenthrin (Talstar)	82657-04-3	--	--	--	--	1.8E+04	3.3E+04	--	1.1E+04
1,1-Biphenyl	92-52-4	4.1E+03	--	--	4.1E+03	5.8E+05	--	2.0E+02	2.0E+02
Bis(2-chloroethyl)ether	111-44-4	3.0E+01	--	1.6E+01	1.0E+01	--	--	--	--
Bis(chloromethyl)ether	542-88-1	1.5E-01	--	3.7E-03	3.6E-03	--	--	--	--
Bis(2-chloro-1-methylethyl)ether	108-60-1	--	--	--	--	4.7E+04	--	--	4.7E+04
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	2.3E+03	4.3E+03	1.0E+08	1.5E+03	2.3E+04	4.3E+04	--	1.5E+04
Bisphenol A	80-05-7	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
Boron	7440-42-8	--	--	--	--	2.3E+05	--	1.7E+08	2.3E+05
Boron trifluoride	7637-07-2	--	--	--	--	4.7E+04	--	1.1E+08	4.7E+04
Bromate	15541-45-4	4.7E+01	--	--	4.7E+01	4.7E+03	--	--	4.7E+03
Bromobenzene	108-86-1	--	--	--	--	9.3E+03	--	2.2E+03	1.8E+03
Bromodichloromethane	75-27-4	5.3E+02	--	1.3E+01	1.3E+01	2.3E+04	--	--	2.3E+04
Bromoform (Tribromomethane)	75-25-2	4.1E+03	--	1.1E+03	8.6E+02	2.3E+04	--	--	2.3E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Bromomethane	74-83-9	--	--	--	--	1.6E+03	--	3.1E+01	3.0E+01
Bromophos	2104-96-3	--	--	--	--	5.8E+03	--	--	5.8E+03
Bromoxynil	1689-84-5	3.3E+02	6.1E+02	--	2.1E+02	1.8E+04	3.3E+04	--	1.1E+04
Bromoxynil octanoate	1689-99-2	3.3E+02	--	--	3.3E+02	1.8E+04	--	--	1.8E+04
1,3-Butadiene	106-99-0	9.6E+00	--	3.5E+00	2.6E+00	--	--	7.6E+00	7.6E+00
1-Butanol	71-36-3	--	--	--	--	1.2E+05	--	--	1.2E+05
Butylate	2008-41-5	--	--	--	--	5.8E+04	--	--	5.8E+04
Butyl benzyl phthalate	85-68-7	1.7E+04	3.2E+04	--	1.1E+04	2.3E+05	4.3E+05	--	1.5E+05
Butylphthalyl butylglycolate	85-70-1	--	--	--	--	1.2E+06	2.2E+06	--	7.6E+05
Cacodylic acid	75-60-5	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Cadmium and compounds +++	7440-43-9	--	--	1.4E+05	1.4E+05	1.2E+03	5.4E+03	8.7E+04	9.5E+02
Camphechlor (Toxaphene)	8001-35-2	3.0E+01	5.5E+01	7.7E+05	1.9E+01	--	--	--	--
Caprolactam	105-60-2	--	--	--	--	5.8E+05	1.1E+06	1.9E+07	3.7E+05
Captafol	2425-06-1	2.2E+02	4.1E+02	5.7E+06	1.4E+02	2.3E+03	4.3E+03	--	1.5E+03
Captan	133-06-2	1.4E+04	2.6E+04	3.7E+08	9.2E+03	1.5E+05	2.8E+05	--	9.9E+04
Carbaryl	63-25-2	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Carbofuran	1563-66-2	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
Carbon disulfide	75-15-0	--	--	--	--	1.2E+05	--	3.6E+03	3.5E+03
Carbon tetrachloride	56-23-5	4.7E+02	--	3.1E+01	2.9E+01	4.7E+03	--	6.5E+02	5.7E+02
Carbosulfan	55285-14-8	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Carboxin	5234-68-4	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Chloramben	133-90-4	--	--	--	--	1.8E+04	3.3E+04	--	1.1E+04
Chloranil	118-75-2	8.2E+01	1.5E+02	--	5.3E+01	--	--	--	--
Chlordane	12789-03-6	9.3E+01	4.3E+02	1.9E+03	7.4E+01	5.8E+02	2.7E+03	4.7E+03	4.4E+02
Chlordecone (Kepone)	143-50-0	3.3E+00	6.1E+00	5.3E+04	2.1E+00	3.5E+02	6.5E+02	--	2.3E+02
Chlorimuron-ethyl	90982-32-4	--	--	--	--	1.1E+05	2.0E+05	--	6.8E+04
Chlorine	7782-50-5	--	--	--	--	1.2E+05	--	8.0E-01	8.0E-01
Chlorine dioxide	10049-04-4	--	--	--	--	3.5E+04	--	1.7E+06	3.4E+04
Chloroacetic acid	79-11-8	--	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	--	--	--	--	--	--	2.6E+05	2.6E+05
4-Chloroaniline	106-47-8	1.6E+02	3.0E+02	--	1.1E+02	4.7E+03	8.7E+03	--	3.0E+03
Chlorobenzene	108-90-7	--	--	--	--	2.3E+04	--	1.4E+03	1.3E+03
Chlorobenzilate	510-15-6	3.0E+02	5.5E+02	7.9E+06	1.9E+02	2.3E+04	4.3E+04	--	1.5E+04
p-Chlorobenzoic acid	74-11-3	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
4-Chlorobenzotrifluoride	98-56-6	--	--	--	--	3.5E+03	--	8.9E+03	2.5E+03
2-Chloro-1,3-butadiene	126-99-8	--	--	4.4E-01	4.4E-01	2.3E+04	--	9.4E+01	9.4E+01
1-Chlorobutane	109-69-3	--	--	--	--	4.7E+04	--	--	4.7E+04
1-Chloro-1,1-difluoroethane	75-68-3	--	--	--	--	--	--	2.3E+05	2.3E+05
Chlorodifluoromethane	75-45-6	--	--	--	--	--	--	2.1E+05	2.1E+05
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	1.3E+03	2.4E+03	3.4E+07	8.5E+02	5.8E+04	1.1E+05	--	3.8E+04
Chloroform	67-66-3	1.1E+03	--	1.4E+01	1.4E+01	1.2E+04	--	1.1E+03	1.0E+03
Chloromethane	74-87-3	--	--	--	--	--	--	4.6E+02	4.6E+02
4-Chloro-2-methylaniline hydrochloride	3165-93-3	7.1E+01	1.3E+02	--	4.6E+01	--	--	--	--
beta-Chloronaphthalene	91-58-7	--	--	--	--	9.3E+04	1.3E+05	--	5.5E+04
o-Chloronitrobenzene	88-73-3	1.1E+02	2.0E+02	--	7.1E+01	3.5E+03	6.5E+03	8.7E+04	2.2E+03
p-Chloronitrobenzene	100-00-5	5.5E+02	1.0E+03	--	3.5E+02	8.2E+02	1.5E+03	1.7E+07	5.3E+02
2-Chlorophenol	95-57-8	--	--	--	--	5.8E+03	--	--	5.8E+03
Chlorothalonil	1897-45-6	1.1E+04	2.0E+04	2.8E+08	6.9E+03	1.8E+04	3.3E+04	--	1.1E+04
o-Chlorotoluene	95-49-8	--	--	--	--	2.3E+04	--	--	2.3E+04
Chlorpropham	101-21-3	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
Chlorpyrifos	2921-88-2	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Chlorpyrifos-methyl	5598-13-0	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Chlorsulfuron	64902-72-3	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
Chlorthiophos	60238-56-4	--	--	--	--	9.3E+02	1.7E+03	--	6.1E+02
Chromium, Total	7440-47-3	--	--	--	--	--	--	--	--
Chromium III *	16065-83-1	--	--	--	--	1.8E+06	--	--	1.8E+06
Chromium VI +++	18540-29-9	6.5E+01	--	2.9E+03	6.4E+01	3.5E+03	--	8.7E+05	3.5E+03
Clofentezine (Apollo)	74115-24-5	--	--	--	--	1.5E+04	2.8E+04	--	9.9E+03
Cobalt	7440-48-4	--	--	2.7E+04	2.7E+04	3.5E+02	--	5.2E+04	3.5E+02
Coke Oven Emissions	8007-45-2	--	--	4.0E+05	4.0E+05	--	--	--	--
Copper and compounds	7440-50-8	--	--	--	--	4.7E+04	--	--	4.7E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Crotonaldehyde	123-73-9	1.7E+01	--	--	1.7E+01	1.2E+03	--	--	1.2E+03
Cumene (Isopropylbenzene)	98-82-8	--	--	--	--	1.2E+05	--	1.1E+04	9.9E+03
Cyanazine	21725-46-2	3.9E+01	7.2E+01	--	2.5E+01	2.3E+03	4.3E+03	--	1.5E+03
Cyanide (free)	57-12-5	--	--	--	--	7.0E+02	--	1.9E+02	1.5E+02
Cyanide (hydrogen)	74-90-8	--	--	--	--	7.0E+02	--	1.8E+02	1.5E+02
Cyanogen	460-19-5	--	--	--	--	1.2E+03	--	--	1.2E+03
Cyanogen bromide	506-68-3	--	--	--	--	1.1E+05	--	--	1.1E+05
Cyanogen chloride	506-77-4	--	--	--	--	5.8E+04	--	--	5.8E+04
Cyclohexane	110-82-7	--	--	--	--	--	--	2.7E+04	2.7E+04
Cyclohexanone	108-94-1	--	--	--	--	5.8E+06	--	1.3E+05	1.3E+05
Cyclohexylamine	108-91-8	--	--	--	--	2.3E+05	--	--	2.3E+05
Cyfluthrin (Baythroid)	68359-37-5	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Cyhalothrin (Karate)	68085-85-8	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Cyromazine	66215-27-8	--	--	--	--	5.8E+05	1.1E+06	--	3.8E+05
Dacthal	1861-32-1	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Dalapon	75-99-0	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Daminozide (Alar)	1596-84-5	1.8E+03	3.4E+03	4.8E+07	1.2E+03	1.8E+05	3.3E+05	--	1.1E+05
Demeton	8065-48-3	--	--	--	--	4.7E+01	8.7E+01	--	3.0E+01
Diallate	2303-16-4	5.4E+02	1.0E+03	--	3.5E+02	--	--	--	--
Diazinon	333-41-5	--	--	--	--	8.2E+02	1.5E+03	--	5.3E+02
Dibenzofuran	132-64-9	--	--	--	--	1.2E+03	7.2E+03	--	1.0E+03
1,4-Dibromobenzene	106-37-6	--	--	--	--	1.2E+04	--	--	1.2E+04
Dibromochloromethane	124-48-1	3.9E+02	--	--	3.9E+02	2.3E+04	--	--	2.3E+04
1,2-Dibromo-3-chloropropane	96-12-8	4.1E+01	--	6.5E-01	6.4E-01	2.3E+02	--	2.8E+01	2.5E+01
1,2-Dibromoethane	106-93-4	1.6E+01	--	1.8E+00	1.6E+00	1.1E+04	--	3.4E+02	3.3E+02
Dibutyl phthalate	84-74-2	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Dicamba	1918-00-9	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
1,2-Dichlorobenzene	95-50-1	--	--	--	--	1.1E+05	--	1.0E+04	9.3E+03
1,4-Dichlorobenzene	106-46-7	6.1E+03	--	1.2E+02	1.1E+02	8.2E+04	--	3.7E+04	2.5E+04
3,3-Dichlorobenzidine	91-94-1	7.3E+01	1.4E+02	7.2E+05	4.7E+01	--	--	--	--
4,4'-Dichlorobenzophenone	90-98-2	--	--	--	--	1.1E+04	2.0E+04	--	6.8E+03
1,4-Dichloro-2-butene	764-41-0	--	--	9.4E-02	9.4E-02	--	--	--	--
Dichlorodifluoromethane	75-71-8	--	--	--	--	2.3E+05	--	3.7E+02	3.7E+02
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	1.4E+02	2.5E+02	3.5E+06	8.9E+01	3.5E+01	6.5E+01	--	2.3E+01
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	9.6E+01	--	2.7E+03	9.3E+01	3.5E+02	--	--	3.5E+02
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	9.6E+01	6.0E+02	2.5E+06	8.3E+01	5.8E+02	3.6E+03	--	5.0E+02
1,1-Dichloroethane	75-34-3	5.7E+03	--	1.6E+02	1.6E+02	2.3E+05	--	--	2.3E+05
1,2-Dichloroethane	107-06-2	3.6E+02	--	2.2E+01	2.0E+01	7.0E+03	--	1.4E+02	1.4E+02
1,1-Dichloroethylene	75-35-4	--	--	--	--	5.8E+04	--	1.0E+03	1.0E+03
1,2-Dichloroethylene (cis)	156-59-2	--	--	--	--	2.3E+03	--	--	2.3E+03
1,2-Dichloroethylene (trans)	156-60-5	--	--	--	--	2.3E+04	--	--	2.3E+04
2,4-Dichlorophenol	120-83-2	--	--	--	--	3.5E+03	6.5E+03	--	2.3E+03
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	--	--	--	--	1.2E+04	4.3E+04	--	9.2E+03
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Decabromodiphenyl ether (BDE-209)	1163-19-5	4.7E+04	8.7E+04	--	3.0E+04	8.2E+03	1.5E+04	--	5.3E+03
1,2-Dichloropropane	78-87-5	8.8E+02	--	1.3E+02	1.1E+02	4.7E+04	--	6.6E+01	6.6E+01
2,3-Dichloropropanol	616-23-9	--	--	--	--	3.5E+03	6.5E+03	--	2.3E+03
1,3-Dichloropropene	542-75-6	3.3E+02	--	1.1E+02	8.2E+01	3.5E+04	--	3.1E+02	3.1E+02
Dichlorvos	62-73-7	1.1E+02	2.1E+02	3.0E+06	7.3E+01	5.8E+02	1.1E+03	4.4E+06	3.8E+02
Dicrotophos (Bidrin)	141-66-2	--	--	--	--	3.5E+01	6.5E+01	--	2.3E+01
Dicyclopentadiene	77-73-6	--	--	--	--	9.3E+04	--	5.4E+00	5.4E+00
Dieldrin	60-57-1	2.0E+00	3.8E+00	5.3E+04	1.3E+00	5.8E+01	1.1E+02	--	3.8E+01
Diethylene glycol, monobutyl ether	112-34-5	--	--	--	--	3.5E+04	6.5E+04	8.7E+05	2.2E+04
Diethylene glycol, monoethyl ether	111-90-0	--	--	--	--	7.0E+04	1.3E+05	2.6E+06	4.5E+04
Diethylformamide	617-84-5	--	--	--	--	1.2E+03	--	--	1.2E+03
Di(2-ethylhexyl)adipate	103-23-1	2.7E+04	5.1E+04	--	1.8E+04	7.0E+05	1.3E+06	--	4.6E+05
Diethyl phthalate	84-66-2	--	--	--	--	9.3E+05	1.7E+06	--	6.1E+05
Diethylstilbestrol	56-53-1	9.3E-02	1.7E-01	2.4E+03	6.1E-02	--	--	--	--
Difenzoquat (Avenge)	43222-48-6	--	--	--	--	9.7E+04	1.8E+05	--	6.3E+04
Diflubenzuron	35367-38-5	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
1,1-Difluoroethane	75-37-6	--	--	--	--	--	--	2.0E+05	2.0E+05

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CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Diisopropyl methylphosphonate (DIMP)	1445-75-6	--	--	--	--	9.3E+04	--	--	9.3E+04
Dimethipin	55290-64-7	--	--	--	--	2.6E+04	4.8E+04	--	1.7E+04
Dimethoate	60-51-5	--	--	--	--	2.6E+03	4.8E+03	--	1.7E+03
3,3'-Dimethoxybenzidine	119-90-4	2.0E+01	3.8E+01	--	1.3E+01	--	--	--	--
N-N-Dimethylaniline	121-69-7	1.2E+03	--	--	1.2E+03	2.3E+03	--	--	2.3E+03
2,4-Dimethylaniline	95-68-1	1.6E+02	3.0E+02	--	1.1E+02	2.3E+03	4.3E+03	--	1.5E+03
2,4-Dimethylaniline hydrochloride	21436-96-4	5.6E+01	1.0E+02	--	3.7E+01	--	--	--	--
3,3'-Dimethylbenzidine	119-93-7	3.0E+00	5.5E+00	--	1.9E+00	--	--	--	--
N,N-Dimethylformamide	68-12-2	--	--	--	--	1.2E+05	--	1.7E+04	1.5E+04
2,4-Dimethylphenol	105-67-9	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
2,6-Dimethylphenol	576-26-1	--	--	--	--	7.0E+02	1.3E+03	--	4.6E+02
3,4-Dimethylphenol	95-65-8	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Dimethyl terephthalate	120-61-6	--	--	--	--	1.2E+05	--	--	1.2E+05
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
1,2-Dinitrobenzene	528-29-0	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
1,3-Dinitrobenzene	99-65-0	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
1,4-Dinitrobenzene	100-25-4	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
2,4-Dinitrophenol	51-28-5	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
Dinitrotoluene mixture	25321-14-6	7.3E+01	1.4E+02	--	4.7E+01	1.1E+03	2.0E+03	--	6.8E+02
2,4-Dinitrotoluene	121-14-2	1.1E+02	1.9E+02	2.8E+06	6.8E+01	2.3E+03	4.3E+03	--	1.5E+03
2,6-Dinitrotoluene	606-20-2	2.2E+01	4.1E+01	--	1.4E+01	3.5E+02	6.6E+02	--	2.3E+02
Dinoseb	88-85-7	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
1,4-Dioxane	123-91-1	3.3E+02	--	9.7E+02	2.4E+02	3.5E+04	--	5.2E+03	4.5E+03
Diphenamid	957-51-7	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Diphenylamine	122-39-4	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
1,2-Diphenylhydrazine	122-66-7	4.1E+01	7.6E+01	1.1E+06	2.7E+01	--	--	--	--
Diphenyl sulfone	127-63-9	--	--	--	--	9.3E+02	1.7E+03	--	6.1E+02
Diquat dibromide (Diquat)	85-00-7	--	--	--	--	2.6E+03	4.8E+03	--	1.7E+03
Direct black 38	1937-37-7	4.6E+00	8.6E+00	1.7E+03	3.0E+00	--	--	--	--
Direct blue 6	2602-46-2	4.4E+00	8.2E+00	1.7E+03	2.9E+00	--	--	--	--
Direct brown 95	16071-86-6	4.9E+00	9.1E+00	1.7E+03	3.2E+00	--	--	--	--
Disulfoton	298-04-4	--	--	--	--	4.7E+01	8.7E+01	--	3.0E+01
1,4-Dithiane	505-29-3	--	--	--	--	1.2E+04	--	--	1.2E+04
Diuron	330-54-1	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
Dodine	2439-10-3	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Endosulfan	115-29-7	--	--	--	--	7.0E+03	--	--	7.0E+03
Endothall	145-73-3	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Endrin	72-20-8	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
Enilconazole (Imazalil)	35554-44-0	5.4E+02	1.0E+03	--	3.5E+02	2.9E+03	5.4E+03	--	1.9E+03
Epichlorohydrin	106-89-8	3.3E+03	--	1.9E+03	1.2E+03	7.0E+03	--	8.3E+01	8.2E+01
1,2-Epoxybutane	106-88-7	--	--	--	--	--	--	6.7E+02	6.7E+02
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	--	--	--	--	5.8E+04	--	--	5.8E+04
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
Ethion	563-12-2	--	--	--	--	5.8E+02	1.1E+03	--	3.8E+02
2-Ethoxyethanol	110-80-5	--	--	--	--	1.1E+05	--	8.6E+04	4.7E+04
2-Ethoxyethanol acetate	111-15-9	--	--	--	--	1.2E+05	--	1.6E+04	1.4E+04
Ethyl acetate	141-78-6	--	--	--	--	1.1E+06	--	2.6E+03	2.6E+03
Ethyl acrylate	140-88-5	--	--	--	--	5.8E+03	--	2.2E+02	2.1E+02
Ethylbenzene	100-41-4	3.0E+03	--	2.8E+02	2.5E+02	1.2E+05	--	2.5E+04	2.0E+04
Ethyl chloride (Chloroethane)	75-00-3	--	--	--	--	--	--	5.7E+04	5.7E+04
Ethylene cyanohydrin	109-78-4	--	--	--	--	8.2E+04	1.5E+05	--	5.3E+04
Ethylene diamine	107-15-3	--	--	--	--	1.1E+05	--	--	1.1E+05
Ethylene glycol	107-21-1	--	--	--	--	2.3E+06	4.3E+06	3.5E+09	1.5E+06
Ethylene glycol, monobutyl ether	111-76-2	--	--	--	--	1.2E+05	2.2E+05	1.4E+10	7.6E+04
Ethylene oxide	75-21-8	1.1E+02	--	2.5E-01	2.5E-01	--	--	8.0E+02	8.0E+02
Ethylene thiourea (ETU)	96-45-7	7.3E+02	1.4E+03	1.9E+07	4.7E+02	9.3E+01	1.7E+02	--	6.1E+01
Ethyl ether	60-29-7	--	--	--	--	2.3E+05	--	--	2.3E+05
Ethyl methacrylate	97-63-2	--	--	--	--	--	--	7.6E+03	7.6E+03
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	--	--	--	--	1.2E+01	2.2E+01	--	7.6E+00
Ethylphthalyl ethyl glycolate	84-72-0	--	--	--	--	3.5E+06	6.5E+06	--	2.3E+06

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Fenamiphos	22224-92-6	--	--	--	--	2.9E+02	5.4E+02	--	1.9E+02
Fenpropathrin (Danitol)	39515-41-8	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Fenvalerate (Pydrin)	51630-58-1	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Fluometuron	2164-17-2	--	--	--	--	1.5E+04	2.8E+04	--	9.9E+03
Fluoride	16984-48-8	--	--	--	--	4.7E+04	--	1.1E+08	4.7E+04
Fluoridone	59756-60-4	--	--	--	--	9.3E+04	1.7E+05	--	6.1E+04
Flurprimidol	56425-91-3	--	--	--	--	4.7E+04	8.7E+04	--	3.0E+04
Flusilazole (NuStar)	85509-19-9	--	--	--	--	2.3E+03	--	--	2.3E+03
Flutolanil	66332-96-5	--	--	--	--	5.8E+05	1.1E+06	--	3.8E+05
Fluvalinate	69409-94-5	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Folpet	133-07-3	--	--	--	--	1.1E+05	2.0E+05	--	6.8E+04
Fomesafen	72178-02-0	--	--	--	--	2.9E+03	5.4E+03	--	1.9E+03
Fonofos	944-22-9	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
Formaldehyde	50-00-0	--	--	7.3E+02	7.3E+02	2.3E+05	--	3.3E+03	3.3E+03
Formic acid	64-18-6	--	--	--	--	1.1E+06	--	1.2E+02	1.2E+02
Fosetyl-al	39148-24-8	--	--	--	--	2.9E+06	5.4E+06	--	1.9E+06
Furan	110-00-9	--	--	--	--	1.2E+03	7.2E+03	--	1.0E+03
Furazolidone	67-45-8	8.6E+00	1.6E+01	--	5.6E+00	--	--	--	--
Furfural	98-01-1	--	--	--	--	3.5E+03	--	1.1E+04	2.6E+03
Furmecyclox	60568-05-0	1.1E+03	2.0E+03	2.8E+07	7.1E+02	--	--	--	--
Furothiazole (Furium)	531-82-8	2.2E+01	4.1E+01	5.7E+05	1.4E+01	--	--	--	--
Glufosinate-ammonium	77182-82-2	--	--	--	--	7.0E+03	1.3E+04	--	4.6E+03
Glycidaldehyde	765-34-4	--	--	--	--	4.7E+02	--	3.7E+02	2.1E+02
Glyphosate	1071-83-6	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Haloxyfop-methyl	69806-40-2	--	--	--	--	5.8E+01	1.1E+02	--	3.8E+01
Thifensulfuron-methyl (Harmony)	79277-27-3	--	--	--	--	5.0E+04	9.3E+04	--	3.3E+04
Heptachlor	76-44-8	7.3E+00	--	4.5E+01	6.3E+00	5.8E+02	--	--	5.8E+02
Heptachlor epoxide	1024-57-3	3.6E+00	--	4.0E+01	3.3E+00	1.5E+01	--	--	1.5E+01
Hexabromobenzene	87-82-1	--	--	--	--	2.3E+03	--	--	2.3E+03
Hexachlorobenzene	118-74-1	2.0E+01	--	1.8E+01	9.6E+00	9.3E+02	--	--	9.3E+02
Hexachlorobutadiene	87-68-3	4.2E+02	--	6.0E+01	5.3E+01	1.2E+03	--	--	1.2E+03
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	5.2E+00	9.6E+00	1.4E+05	3.4E+00	9.3E+03	1.7E+04	--	6.1E+03
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	1.8E+01	3.4E+01	4.6E+05	1.2E+01	--	--	--	--
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	3.0E+01	1.4E+02	7.9E+05	2.4E+01	3.5E+02	1.6E+03	--	2.9E+02
Hexachlorocyclohexane technical	608-73-1	1.8E+01	3.4E+01	4.8E+05	1.2E+01	--	--	--	--
Hexachlorocyclopentadiene	77-47-4	--	--	--	--	7.0E+03	--	7.5E+00	7.5E+00
Hexachloroethane	67-72-1	8.2E+02	--	8.9E+01	8.0E+01	8.2E+02	--	1.1E+03	4.6E+02
Hexachlorophene	70-30-4	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	3.0E+02	3.7E+03	--	2.8E+02	3.5E+03	4.3E+04	--	3.2E+03
1,6-Hexamethylene diisocyanate	822-06-0	--	--	--	--	--	--	1.3E+01	1.3E+01
n-Hexane	110-54-3	--	--	--	--	--	--	2.5E+03	2.5E+03
Hexazinone	51235-04-2	--	--	--	--	3.9E+04	7.2E+04	--	2.5E+04
Hexythiazox (Savey)	78587-05-0	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Hydramethylnon (Amdro)	67485-29-4	--	--	--	--	2.0E+04	3.7E+04	--	1.3E+04
Hydrazine, hydrazine sulfate	302-01-2	1.1E+01	--	5.0E+04	1.1E+01	--	--	2.6E+05	2.6E+05
Hydrazine, dimethyl	57-14-7	--	--	--	--	1.2E+02	--	2.4E-01	2.4E-01
Hydrogen chloride	7647-01-0	--	--	--	--	--	--	1.7E+08	1.7E+08
Hydrogen sulfide	7783-06-4	--	--	--	--	--	--	1.7E+07	1.7E+07
p-Hydroquinone	123-31-9	5.5E+02	1.0E+03	--	3.5E+02	4.7E+04	8.7E+04	--	3.0E+04
Imazaquin	81335-37-7	--	--	--	--	2.9E+05	5.4E+05	--	1.9E+05
Imazethapyr (Pursuit)	81335-77-5	--	--	--	--	2.9E+06	5.4E+06	--	1.9E+06
Iprodione	36734-19-7	--	--	--	--	4.7E+04	8.7E+04	--	3.0E+04
Iron	7439-89-6	--	--	--	--	8.2E+05	--	--	8.2E+05
Isobutanol (Isobutyl alcohol)	78-83-1	--	--	--	--	3.5E+05	--	--	3.5E+05
Isophorone	78-59-1	3.4E+04	6.4E+04	--	2.2E+04	2.3E+05	4.3E+05	1.7E+10	1.5E+05
Isopropalin	33820-53-0	--	--	--	--	1.8E+04	--	--	1.8E+04
Isopropyl methyl phosphonic acid	1832-54-8	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
Isoxaben	82558-50-7	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
Lactofen	77501-63-4	--	--	--	--	9.3E+03	1.7E+04	--	6.1E+03
Lead +++	7439-92-1	--	--	--	--	--	--	--	--
Lead (tetraethyl)	78-00-2	--	--	--	--	1.2E-01	--	--	1.2E-01

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Linuron	330-55-2	--	--	--	--	9.0E+03	1.7E+04	--	5.8E+03
Lithium	7439-93-2	--	--	--	--	2.3E+03	--	--	2.3E+03
Malathion	121-75-5	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Maleic anhydride	108-31-6	--	--	--	--	1.2E+05	2.2E+05	6.1E+06	7.5E+04
Maleic hydrazide	123-33-1	--	--	--	--	5.8E+05	1.1E+06	--	3.8E+05
Malononitrile	109-77-3	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
Mancozeb	8018-01-7	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Maneb	12427-38-2	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
Manganese (non-food) +++	7439-96-5	--	--	--	--	1.6E+05	--	4.4E+05	1.2E+05
Mephosfolan	950-10-7	--	--	--	--	1.1E+02	2.0E+02	--	6.8E+01
Mepiquat chloride (Mepiquat)	24307-26-4	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Mercury and compounds	7487-94-7	--	--	--	--	3.5E+02	--	2.6E+06	3.5E+02
Mercury (elemental)	7439-97-6	--	--	--	--	--	--	4.6E+01	4.6E+01
Mercury (methyl)	22967-92-6	--	--	--	--	1.2E+02	--	--	1.2E+02
Merphos	150-50-5	--	--	--	--	3.5E+01	--	--	3.5E+01
Merphos oxide	78-48-8	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
Metalaxyl	57837-19-1	--	--	--	--	7.0E+04	1.3E+05	--	4.6E+04
Methacrylonitrile	126-98-7	--	--	--	--	1.2E+02	--	8.9E+02	1.0E+02
Methamidophos	10265-92-6	--	--	--	--	5.8E+01	1.1E+02	--	3.8E+01
Methanol	67-56-1	--	--	--	--	2.3E+06	--	2.5E+06	1.2E+06
Methidathion	950-37-8	--	--	--	--	1.8E+03	3.3E+03	--	1.1E+03
Methomyl	16752-77-5	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Methoxychlor	72-43-5	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
2-Methoxyethanol	109-86-4	--	--	--	--	5.8E+03	--	8.8E+03	3.5E+03
2-Methoxyethanol acetate	110-49-6	--	--	--	--	9.3E+03	--	5.4E+02	5.1E+02
2-Methoxy-5-nitroaniline	99-59-2	6.7E+02	1.2E+03	1.7E+07	4.3E+02	--	--	--	--
Methyl acetate	79-20-9	--	--	--	--	1.2E+06	--	--	1.2E+06
Methyl acrylate	96-33-3	--	--	--	--	--	--	6.1E+02	6.1E+02
2-Methylaniline hydrochloride	636-21-5	2.5E+02	4.7E+02	6.6E+06	1.6E+02	--	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	--	--	--	--	5.8E+02	1.1E+03	--	3.8E+02
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	--	--	--	--	5.1E+03	9.6E+03	--	3.3E+03
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
4,4'-Methylenebisbenzeneamine	101-77-9	2.0E+01	3.8E+01	5.3E+05	1.3E+01	--	--	1.7E+08	1.7E+08
4,4'-Methylene bis(2-chloroaniline)	101-14-4	3.3E+02	6.1E+02	5.7E+05	2.1E+02	2.3E+03	4.3E+03	--	1.5E+03
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	7.1E+02	1.3E+03	1.9E+07	4.6E+02	--	--	--	--
Methylene bromide	74-95-3	--	--	--	--	--	--	9.9E+01	9.9E+01
Methylene chloride	75-09-2	1.6E+04	--	2.7E+04	1.0E+04	7.0E+03	--	5.8E+03	3.2E+03
4,4'-Methylenediphenyl isocyanate	101-68-8	--	--	--	--	--	--	5.2E+06	5.2E+06
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	--	--	--	--	4.7E+03	8.7E+03	--	3.0E+03
Methyl ethyl ketone (2-Butanone)	78-93-3	--	--	--	--	7.0E+05	--	2.7E+05	1.9E+05
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	--	--	--	--	--	--	1.4E+05	1.4E+05
Methyl methacrylate	80-62-6	--	--	--	--	1.6E+06	--	1.9E+04	1.9E+04
2-Methyl-5-nitroaniline	99-55-8	3.6E+03	6.8E+03	--	2.4E+03	2.3E+04	4.3E+04	--	1.5E+04
Methyl parathion	298-00-0	--	--	--	--	2.9E+02	5.4E+02	--	1.9E+02
2-Methylphenol	95-48-7	--	--	--	--	5.8E+04	1.1E+05	5.2E+09	3.8E+04
3-Methylphenol	108-39-4	--	--	--	--	5.8E+04	1.1E+05	5.2E+09	3.8E+04
4-Methylphenol	106-44-5	--	--	--	--	1.2E+05	2.2E+05	5.2E+09	7.6E+04
Methyl phosphonic acid	993-13-5	--	--	--	--	7.0E+04	1.3E+05	--	4.6E+04
Methyl styrene (mixture)	25013-15-4	--	--	--	--	7.0E+03	--	4.3E+03	2.6E+03
Methyl styrene (alpha)	98-83-9	--	--	--	--	8.2E+04	--	--	8.2E+04
Methyl tertbutyl ether (MTBE)	1634-04-4	1.8E+04	--	2.3E+03	2.1E+03	--	--	6.4E+04	6.4E+04
Metolaclor (Dual)	51218-45-2	--	--	--	--	1.8E+05	3.3E+05	--	1.1E+05
Metribuzin	21087-64-9	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Metsulfuron-methyl (Ally)	74223-64-6	--	--	--	--	2.9E+05	5.4E+05	--	1.9E+05
Mirex	2385-85-5	1.8E+00	--	2.1E+01	1.7E+00	2.3E+02	--	--	2.3E+02
Molinate	2212-67-1	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
Molybdenum	7439-98-7	--	--	--	--	5.8E+03	--	--	5.8E+03
Monochloramine	10599-90-3	--	--	--	--	1.2E+05	--	--	1.2E+05
Myclobutanil (Systhane)	88671-89-0	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Naled	300-76-5	--	--	--	--	2.3E+03	--	--	2.3E+03

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Napropamide	15299-99-7	--	--	--	--	1.4E+05	2.6E+05	--	9.1E+04
Nickel and compounds	7440-02-0	--	--	9.4E+05	9.4E+05	2.3E+04	--	7.9E+05	2.3E+04
Nickel refinery dust	7440-02-0-NRD	--	--	1.0E+06	1.0E+06	1.3E+04	--	1.2E+05	1.2E+04
Nickel subsulfide	12035-72-2	1.9E+01	--	5.1E+05	1.9E+01	1.3E+04	--	1.2E+05	1.2E+04
Nitrate	14797-55-8	--	--	--	--	1.9E+06	--	--	1.9E+06
Nitrite	14797-65-0	--	--	--	--	1.2E+05	--	--	1.2E+05
2-Nitroaniline	88-74-4	--	--	--	--	1.2E+04	2.2E+04	4.4E+05	7.5E+03
Nitrobenzene	98-95-3	--	--	2.2E+02	2.2E+02	2.3E+03	--	2.9E+03	1.3E+03
Nitrofurantoin	67-20-9	--	--	--	--	8.2E+04	1.5E+05	--	5.3E+04
Nitrofurazone	59-87-0	2.5E+01	4.7E+01	6.6E+05	1.6E+01	--	--	--	--
Nitroglycerin	55-63-0	1.9E+03	3.6E+03	--	1.3E+03	1.2E+02	2.2E+02	--	7.6E+01
Nitroguanidine	556-88-7	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
2-Nitropropane	79-46-9	--	--	6.0E-01	6.0E-01	--	--	1.2E+03	1.2E+03
N-Nitrosodi-n-butylamine	924-16-3	6.1E+00	--	1.9E+01	4.6E+00	--	--	--	--
N-Nitrosodiethanolamine	1116-54-7	1.2E+01	2.2E+01	3.1E+05	7.6E+00	--	--	--	--
N-Nitrosodiethylamine	55-18-5	2.2E-01	4.1E-01	5.7E+03	1.4E-01	--	--	--	--
N-Nitrosodimethylamine	62-75-9	6.4E-01	--	7.2E-01	3.4E-01	9.3E+00	--	1.4E+01	5.7E+00
N-Nitrosodiphenylamine	86-30-6	6.7E+03	1.2E+04	9.4E+07	4.3E+03	--	--	--	--
N-Nitroso di-n-propylamine	621-64-7	4.7E+00	8.7E+00	1.2E+05	3.0E+00	--	--	--	--
N-Nitroso-N-methylethylamine	10595-95-6	1.5E+00	--	2.4E+00	9.1E-01	--	--	--	--
N-Nitrosopyrrolidine	930-55-2	1.6E+01	2.9E+01	4.0E+05	1.0E+01	--	--	--	--
m-Nitrotoluene	99-08-1	--	--	--	--	1.2E+02	2.2E+02	--	7.6E+01
o-Nitrotoluene	88-72-2	1.5E+02	--	--	1.5E+02	1.1E+03	--	--	1.1E+03
p-Nitrotoluene	99-99-0	2.0E+03	3.8E+03	--	1.3E+03	4.7E+03	8.7E+03	--	3.0E+03
Norflurazon	27314-13-2	--	--	--	--	1.8E+04	3.3E+04	--	1.1E+04
Octabromodiphenyl ether	32536-52-0	--	--	--	--	3.5E+03	6.5E+03	--	2.3E+03
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--	--	--	--	5.8E+04	1.8E+06	--	5.7E+04
Octamethylpyrophosphoramide	152-16-9	--	--	--	--	2.3E+03	4.3E+03	--	1.5E+03
Oryzalin	19044-88-3	4.2E+03	7.8E+03	--	2.7E+03	1.6E+05	3.0E+05	--	1.1E+05
Oxadiazon	19666-30-9	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
Oxamyl	23135-22-0	--	--	--	--	2.9E+04	5.4E+04	--	1.9E+04
Oxyfluorfen	42874-03-3	4.5E+02	8.3E+02	--	2.9E+02	3.5E+04	6.5E+04	--	2.3E+04
Paclobutrazol	76738-62-0	--	--	--	--	1.5E+04	2.8E+04	--	9.9E+03
Paraquat	4685-14-7	--	--	--	--	5.3E+03	9.8E+03	--	3.4E+03
Parathion	56-38-2	--	--	--	--	7.0E+03	1.3E+04	--	4.6E+03
Pebulate	1114-71-2	--	--	--	--	5.8E+04	--	--	5.8E+04
Pendimethalin	40487-42-1	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Pentabromo-6-chloro cyclohexane	87-84-3	1.6E+03	3.0E+03	--	1.1E+03	2.3E+04	4.3E+04	--	1.5E+04
Pentabromodiphenyl ether	32534-81-9	--	--	--	--	2.3E+03	--	--	2.3E+03
Pentachlorobenzene	608-93-5	--	--	--	--	9.3E+02	--	--	9.3E+02
Pentachloronitrobenzene	82-68-8	1.3E+02	--	--	1.3E+02	3.5E+03	--	--	3.5E+03
Pentachlorophenol	87-86-5	8.2E+01	6.1E+01	4.8E+07	3.5E+01	5.8E+03	4.3E+03	--	2.5E+03
Perchlorate	14797-73-0	--	--	--	--	8.2E+02	--	--	8.2E+02
Perfluoroalkyl Compounds	**0.0E+00**								
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	--	--	--	--	2.3E+02	4.3E+02	--	1.5E+02
Perfluorooctanoic acid (PFOA)^^	335-67-1	4.7E+02	8.7E+02	--	3.0E+02	2.3E+01	4.3E+01	--	1.5E+01
Permethrin	52645-53-1	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04
Phenmedipham	13684-63-4	--	--	--	--	2.8E+05	5.2E+05	--	1.8E+05
Phenol	108-95-2	--	--	--	--	3.5E+05	6.5E+05	1.7E+09	2.3E+05
m-Phenylenediamine	108-45-2	--	--	--	--	7.0E+03	1.3E+04	--	4.6E+03
p-Phenylenediamine	106-50-3	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
Phenylmercuric acetate	62-38-4	--	--	--	--	9.3E+01	1.7E+02	--	6.1E+01
2-Phenylphenol	90-43-7	1.7E+04	3.2E+04	--	1.1E+04	--	--	--	--
Phorate	298-02-2	--	--	--	--	2.3E+02	4.3E+02	--	1.5E+02
Phosmet	732-11-6	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Phosphine	7803-51-2	--	--	--	--	3.5E+02	--	2.6E+06	3.5E+02
Phosphoric acid	7664-38-2	--	--	--	--	5.7E+07	--	8.7E+07	3.5E+07
Phosphorus (white)	7723-14-0	--	--	--	--	2.3E+01	--	--	2.3E+01
p-Phthalic acid	100-21-0	--	--	--	--	1.2E+06	2.2E+06	--	7.6E+05
Phthalic anhydride	85-44-9	--	--	--	--	2.3E+06	4.3E+06	1.7E+08	1.5E+06
Picloram	1918-02-1	--	--	--	--	8.2E+04	1.5E+05	--	5.3E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Pirimiphos-methyl	29232-93-7	--	--	--	--	8.2E+01	1.5E+02	--	5.3E+01
Polybrominated biphenyls (PBBs)	59536-65-1	1.1E+00	2.0E+00	2.8E+04	7.1E-01	8.2E+00	1.5E+01	--	5.3E+00
Polychlorinated biphenyls (PCBs)	1336-36-3	1.6E+01	2.2E+01	1.1E+02	8.6E+00	--	--	--	--
Aroclor 1016	12674-11-2	4.7E+02	--	1.2E+07	4.7E+02	8.2E+01	--	--	8.2E+01
Aroclor 1221	11104-28-2	1.6E+01	2.2E+01	4.4E+01	7.7E+00	--	--	--	--
Aroclor 1232	11141-16-5	1.6E+01	2.2E+01	2.4E+01	6.7E+00	--	--	--	--
Aroclor 1242	53469-21-9	1.6E+01	2.2E+01	1.3E+02	8.7E+00	--	--	--	--
Aroclor 1248	12672-29-6	1.6E+01	2.2E+01	1.3E+02	8.7E+00	--	--	--	--
Aroclor 1254	11097-69-1	1.6E+01	2.2E+01	1.8E+02	8.9E+00	2.3E+01	3.1E+01	--	1.3E+01
Aroclor 1260	11096-82-5	1.6E+01	2.2E+01	2.8E+02	9.0E+00	--	--	--	--
Polynuclear aromatic hydrocarbons (PAHs)	0.0E+00								
Acenaphthene	83-32-9	--	--	--	--	7.0E+04	1.0E+05	--	4.1E+04
Anthracene									
Benz[a]anthracene	56-55-3	3.3E+02	4.7E+02	9.0E+03	1.9E+02	--	--	--	--
Benzo[a]pyrene	50-32-8	3.3E+01	4.7E+01	4.1E+05	1.9E+01	3.5E+02	5.0E+02	1.7E+04	2.0E+02
Benzo[b]fluoranthene	205-99-2								
Benzo[k]fluoranthene	207-08-9	3.3E+03	4.7E+03	4.1E+07	1.9E+03	--	--	--	--
Chrysene	218-01-9	3.3E+04	4.7E+04	4.1E+08	1.9E+04	--	--	--	--
Dibenz[ah]anthracene	53-70-3	3.3E+01	4.7E+01	4.1E+05	1.9E+01	--	--	--	--
Fluoranthene	206-44-0	--	--	--	--	4.7E+04	6.7E+04	--	2.7E+04
Fluorene	86-73-7	--	--	--	--	4.7E+04	6.7E+04	--	2.7E+04
Indeno[1,2,3-cd]pyrene	193-39-5	3.3E+02	4.7E+02	4.1E+06	1.9E+02	--	--	--	--
Naphthalene	91-20-3	--	--	1.7E+02	1.7E+02	2.3E+04	3.3E+04	6.1E+02	5.8E+02
Pyrene	129-00-0								
Prochloraz	67747-09-5	2.2E+02	4.1E+02	--	1.4E+02	1.1E+04	2.0E+04	--	6.8E+03
Profluralin	26399-36-0	--	--	--	--	7.0E+03	--	--	7.0E+03
Prometon	1610-18-0	--	--	--	--	1.8E+04	3.3E+04	--	1.1E+04
Prometryn	7287-19-6	--	--	--	--	4.7E+04	8.7E+04	--	3.0E+04
Propyzamide (Pronamide)	23950-58-5	--	--	--	--	8.8E+04	1.6E+05	--	5.7E+04
Propachlor	1918-16-7	--	--	--	--	1.5E+04	2.8E+04	--	9.9E+03
Propanil	709-98-8	--	--	--	--	5.8E+03	1.1E+04	--	3.8E+03
Propargite	2312-35-8	1.7E+02	3.2E+02	--	1.1E+02	4.7E+04	8.7E+04	--	3.0E+04
Propargyl alcohol	107-19-7	--	--	--	--	2.3E+03	--	--	2.3E+03
Propazine	139-40-2	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Propham	122-42-9	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Propiconazole	60207-90-1	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
n-Propylbenzene	103-65-1	--	--	--	--	1.2E+05	--	3.1E+04	2.4E+04
Propylene glycol	57-55-6	--	--	--	--	2.3E+07	4.3E+07	--	1.5E+07
Propylene glycol, monoethyl ether	52125-53-8	--	--	--	--	8.2E+05	--	6.9E+05	3.7E+05
Propylene glycol, monomethyl ether	107-98-2	--	--	--	--	8.2E+05	--	6.9E+05	3.7E+05
Propylene oxide	75-56-9	1.4E+02	--	2.6E+03	1.3E+02	--	--	1.0E+04	1.0E+04
Pyridine	110-86-1	--	--	--	--	1.2E+03	--	--	1.2E+03
Quinalphos	13593-03-8	--	--	--	--	5.8E+02	1.1E+03	--	3.8E+02
Quinoline	91-22-5	1.1E+01	2.0E+01	--	7.1E+00	--	--	--	--
Resmethrin	10453-86-8	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
Ronnel	299-84-3	--	--	--	--	5.8E+04	--	--	5.8E+04
Rotenone	83-79-4	--	--	--	--	4.7E+03	8.7E+03	--	3.0E+03
Selenious Acid	7783-00-8	--	--	--	--	5.8E+03	--	--	5.8E+03
Selenium	7782-49-2	--	--	--	--	5.8E+03	--	1.7E+08	5.8E+03
Sethoxydim	74051-80-2	--	--	--	--	1.6E+05	3.0E+05	--	1.1E+05
Silver and compounds	7440-22-4	--	--	--	--	5.8E+03	--	--	5.8E+03
Simazine	122-34-9	2.7E+02	5.1E+02	--	1.8E+02	5.8E+03	1.1E+04	--	3.8E+03
Sodium azide	26628-22-8	--	--	--	--	4.7E+03	--	--	4.7E+03
Sodium diethyldithiocarbamate	148-18-5	1.2E+02	2.3E+02	--	7.9E+01	3.5E+04	6.5E+04	--	2.3E+04
Sodium fluoroacetate	62-74-8	--	--	--	--	2.3E+01	4.3E+01	--	1.5E+01
Sodium metavanadate	13718-26-8	--	--	--	--	1.2E+03	--	--	1.2E+03
Strontium, stable	7440-24-6	--	--	--	--	7.0E+05	--	--	7.0E+05
Strychnine	57-24-9	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
Styrene	100-42-5	--	--	--	--	2.3E+05	--	4.1E+04	3.5E+04
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	--	--	--	--	9.3E+02	1.7E+03	--	6.1E+02
Tebuthiuron	34014-18-1	--	--	--	--	8.2E+04	1.5E+05	--	5.3E+04

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Temephos	3383-96-8	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Terbacil	5902-51-2	--	--	--	--	1.5E+04	2.8E+04	--	9.9E+03
Terbufos	13071-79-9	--	--	--	--	2.9E+01	--	--	2.9E+01
Terbutryn	886-50-0	--	--	--	--	1.2E+03	2.2E+03	--	7.6E+02
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	--	--	3.5E+02	--	--	3.5E+02
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	2.5E-04	1.6E-03	6.3E-03	2.1E-04	8.2E-04	5.1E-03	3.4E-01	7.0E-04
1,1,1,2-Tetrachloroethane	630-20-6	1.3E+03	--	9.4E+01	8.8E+01	3.5E+04	--	--	3.5E+04
1,1,2,2-Tetrachloroethane	79-34-5	1.6E+02	--	3.2E+01	2.7E+01	2.3E+04	--	--	2.3E+04
Tetrachloroethylene (PCE)	127-18-4	1.6E+04	--	1.1E+03	1.0E+03	7.0E+03	--	4.1E+02	3.9E+02
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	--	--	3.5E+04	6.5E+04	--	2.3E+04
p,a,a,a-Tetrachlorotoluene	5216-25-1	1.6E+00	--	--	1.6E+00	--	--	--	--
Tetrachlorovinphos (Stirofos)	961-11-5	1.4E+03	2.5E+03	--	8.9E+02	3.5E+04	6.5E+04	--	2.3E+04
Tetraethyldithiopyrophosphate	3689-24-5	--	--	--	--	5.8E+02	1.1E+03	--	3.8E+02
Thallium and compounds	7440-28-0	--	--	--	--	1.2E+01	--	--	1.2E+01
Thiobencarb	28249-77-6	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Thiofanox	39196-18-4	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
Thiophanate-methyl	23564-05-8	2.7E+03	5.1E+03	--	1.8E+03	3.2E+04	5.9E+04	--	2.1E+04
Thiram	137-26-8	--	--	--	--	1.8E+04	3.3E+04	--	1.1E+04
Tin and compounds	7440-31-5	--	--	--	--	7.0E+05	--	--	7.0E+05
Toluene	108-88-3	--	--	--	--	9.3E+04	--	9.4E+04	4.7E+04
p-Toluidine	106-49-0	1.1E+03	2.0E+03	--	7.1E+02	4.7E+03	8.7E+03	--	3.0E+03
Tralomethrin	66841-25-6	--	--	--	--	8.8E+03	1.6E+04	--	5.7E+03
Triadimefon (Bayleton)	43121-43-3	--	--	--	--	4.0E+04	7.4E+04	--	2.6E+04
Triallate	2303-17-5	4.5E+02	--	--	4.5E+02	2.9E+04	--	--	2.9E+04
Triasulfuron	82097-50-5	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
Tribenuron-methyl (Express)	101200-48-0	--	--	--	--	9.3E+03	1.7E+04	--	6.1E+03
1,2,4-Tribromobenzene	615-54-3	--	--	--	--	5.8E+03	--	--	5.8E+03
Tributyltin oxide (TBTO)	56-35-9	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
2,4,6-Trichloroaniline	634-93-5	4.7E+03	8.7E+03	--	3.0E+03	3.5E+01	6.5E+01	--	2.3E+01
2,4,6-Trichloroaniline hydrochloride	33663-50-2	1.1E+03	2.1E+03	--	7.3E+02	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	1.1E+03	--	--	1.1E+03	1.2E+04	--	2.6E+02	2.6E+02
1,1,1-Trichloroethane	71-55-6	--	--	--	--	2.3E+06	--	3.6E+04	3.6E+04
1,1,2-Trichloroethane	79-00-5	5.7E+02	--	5.5E+01	5.0E+01	4.7E+03	--	6.3E+00	6.3E+00
Trichloroethylene (TCE) Long-term +++	79-01-6	7.1E+02	--	6.6E+01	6.0E+01	5.8E+02	--	1.9E+01	1.9E+01
Trichloroethylene (TCE) Short-term ‡	79-01-6	--	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	--	--	--	--	3.5E+05	--	--	3.5E+05
2,4,5-Trichlorophenol	95-95-4	--	--	--	--	1.2E+05	2.2E+05	--	7.6E+04
2,4,6-Trichlorophenol	88-06-2	3.0E+03	5.5E+03	7.9E+07	1.9E+03	1.2E+03	2.2E+03	--	7.6E+02
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	--	--	--	--	1.2E+04	2.2E+04	--	7.6E+03
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	--	--	--	--	9.3E+03	1.7E+04	--	6.1E+03
1,1,2-Trichloropropane	598-77-6	--	--	--	--	5.8E+03	--	--	5.8E+03
1,2,3-Trichloropropane	96-18-4	1.1E+00	--	--	1.1E+00	4.7E+03	--	2.1E+01	2.1E+01
1,2,3-Trichloropropene	96-19-5	--	--	--	--	3.5E+03	--	3.1E+00	3.1E+00
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	--	--	--	--	3.5E+07	--	2.8E+04	2.8E+04
Tridiphane	58138-08-2	--	--	--	--	3.5E+03	6.5E+03	--	2.3E+03
Triethylamine	121-44-8	--	--	--	--	--	--	4.8E+02	4.8E+02
Trifluralin	1582-09-8	4.2E+03	--	--	4.2E+03	8.8E+03	--	--	8.8E+03
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	1.2E+04	--	2.1E+03	1.8E+03
1,3,5-Trimethylbenzene	108-67-8	--	--	--	--	1.2E+04	--	1.7E+03	1.5E+03
Trimethyl phosphate	512-56-1	1.6E+03	3.0E+03	--	1.1E+03	1.2E+04	2.2E+04	--	7.6E+03
1,3,5-Trinitrobenzene	99-35-4	--	--	--	--	3.5E+04	3.4E+05	--	3.2E+04
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	--	--	--	--	2.3E+03	6.7E+05	--	2.3E+03
2,4,6-Trinitrotoluene (TNT)	118-96-7	1.1E+03	6.3E+03	--	9.3E+02	5.8E+02	3.4E+03	--	5.0E+02
Triphenylphosphine oxide	791-28-6	--	--	--	--	2.3E+04	4.3E+04	--	1.5E+04
Tris(2-chloroethyl) phosphate	115-96-8	1.6E+03	3.0E+03	--	1.1E+03	8.2E+03	1.5E+04	--	5.3E+03
Uranium (chemical toxicity only)	7440-61-0	--	--	--	--	2.3E+02	--	3.5E+05	2.3E+02
Vanadium and compounds +++	7440-62-2	--	--	--	--	5.8E+03	--	8.7E+05	5.8E+03
Vernolate (Vernam)	1929-77-7	--	--	--	--	1.2E+03	--	--	1.2E+03
Vinclozolin	50471-44-8	--	--	--	--	1.4E+03	2.6E+03	--	9.1E+02
Vinyl acetate	108-05-4	--	--	--	--	1.2E+06	--	3.9E+03	3.8E+03
Vinyl bromide	593-60-2	--	--	5.2E+00	5.2E+00	--	--	1.8E+01	1.8E+01

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-4: SOIL REMEDIAL GOALS

CONTAMINANT	CAS No.	INDUSTRIAL SOIL							
		Cancer Risk = 1E-05				Chronic HQ = 1			
		soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)	soil-ingest (mg/kg)	soil-dermal (mg/kg)	soil-inhale (mg/kg)	combined (mg/kg)
Vinyl chloride +++	75-01-4	4.5E+01	--	2.7E+01	1.7E+01	3.5E+03	--	4.2E+02	3.7E+02
Warfarin	81-81-2	--	--	--	--	3.5E+02	6.5E+02	--	2.3E+02
Xylenes	1330-20-7	--	--	--	--	2.3E+05	--	2.5E+03	2.5E+03
Zinc	7440-66-6	--	--	--	--	3.5E+05	--	--	3.5E+05
Zinc phosphide	1314-84-7	--	--	--	--	3.5E+02	--	--	3.5E+02
Zineb	12122-67-7	--	--	--	--	5.8E+04	1.1E+05	--	3.8E+04

Notes:

* At VCP sites where chromium is a potential contaminant of concern, such as a former metal plating facility, the VCP applicant should collect media samples for both Chromium III and Chromium VI analyses.

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

HQ = hazard quotient
mg/kg = milligram per kilogram
soil-dermal = soil dermal pathway
soil-ingest = soil ingestion pathway
soil-inhale = soil inhalation pathway

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Acephate	30560-19-1	--	--	--	--	--	--	--	--
Acetaldehyde	75-07-0	1.3E+00	2.3E+00	4.3E+01	7.9E+02	5.6E+01	3.9E+01	1.3E+03	2.4E+04
Acetochlor	34256-82-1	--	--	--	--	--	--	--	--
Acetone	67-64-1	--	8.1E+03	2.7E+05	1.1E+07	--	1.4E+05	4.5E+06	1.8E+08
Acetone cyanohydrin	75-86-5	--	5.2E-01	--	--	--	8.8E+00	--	--
Acetonitrile	75-05-8	--	1.6E+01	5.2E+02	2.1E+04	--	2.6E+02	8.8E+03	3.5E+05
Acrolein	107-02-8	--	5.2E-03	1.7E-01	1.9E+00	--	8.8E-02	2.9E+00	3.2E+01
Acrylamide	79-06-1	1.0E-02	1.6E+00	--	--	1.2E+00	2.6E+01	--	--
Acrylic acid	79-10-7	--	2.6E-01	8.7E+00	5.2E+04	--	4.4E+00	1.5E+02	8.8E+05
Acrylonitrile	107-13-1	4.1E-02	5.2E-01	1.4E+00	1.5E+01	1.8E+00	8.8E+00	6.0E+01	6.7E+02
Alachlor	15972-60-8	--	--	--	--	--	--	--	--
Aldicarb	116-06-3	--	--	--	--	--	--	--	--
Aldicarb sulfone	1646-88-4	--	--	--	--	--	--	--	--
Aldrin	309-00-2	5.7E-04	--	1.9E-02	1.4E+00	2.5E-02	--	8.3E-01	NVT
Allyl alcohol	107-18-6	--	2.6E-02	8.7E-01	3.3E+02	--	4.4E-01	1.5E+01	5.5E+03
Allyl chloride	107-05-1	4.7E-01	2.6E-01	8.7E+00	1.1E+00	2.0E+01	4.4E+00	1.5E+02	1.8E+01
Aluminum	7429-90-5	--	1.3E+00	--	--	--	2.2E+01	--	--
Aluminum phosphide	20859-73-8	--	--	--	--	--	--	--	--
Ametryn	834-12-8	--	--	--	--	--	--	--	--
m-Aminophenol	591-27-5	--	--	--	--	--	--	--	--
Amitraz	33089-61-1	--	--	--	--	--	--	--	--
Ammonia +++	7664-41-7	--	1.3E+02	4.3E+03	3.0E+05	--	2.2E+03	7.3E+04	5.1E+06
Ammonium sulfamate	7773-06-0	--	--	--	--	--	--	--	--
Aniline	62-53-3	1.8E+00	2.6E-01	--	--	7.7E+01	4.4E+00	--	--
Antimony and compounds	7440-36-0	--	--	--	--	--	--	--	--
Antimony pentoxide	1314-60-9	--	--	--	--	--	--	--	--
Antimony potassium tartrate	28300-74-5	--	--	--	--	--	--	--	--
Antimony tetroxide	1332-81-6	--	--	--	--	--	--	--	--
Antimony trioxide	1309-64-4	--	5.2E-02	--	--	--	8.8E-01	--	--
Arsenic (inorganic) +++	7440-38-2	--	--	--	--	--	--	--	--
Arsine	7784-42-1	--	1.3E-02	--	--	--	2.2E-01	--	--
Assure	76578-14-8	--	--	--	--	--	--	--	--
Asulam	3337-71-1	--	--	--	--	--	--	--	--
Atrazine	1912-24-9	--	--	--	--	--	--	--	--
Avermectin B1	65195-55-3	--	--	--	--	--	--	--	--
Azobenzene	103-33-3	9.1E-02	--	3.0E+00	1.6E+02	4.0E+00	--	1.3E+02	NVT
Barium and compounds	7440-39-3	--	1.3E-01	--	--	--	2.2E+00	--	--
Benfluralin (Benefin)	1861-40-1	--	--	--	--	--	--	--	--
Bensulfuron-methyl (Londax)	83055-99-6	--	--	--	--	--	--	--	--
Bentazone (Bentazon)	25057-89-0	--	--	--	--	--	--	--	--
Benzaldehyde	100-52-7	--	--	--	--	--	--	--	--
Benzene	71-43-2	3.6E-01	7.8E+00	1.2E+01	3.1E+00	1.6E+01	1.3E+02	5.2E+02	1.4E+02
Benzidine	92-87-5	1.5E-05	--	--	--	1.8E-03	--	--	--
Benzoic acid	65-85-0	--	--	--	--	--	--	--	--
Benzotrichloride	98-07-7	--	--	--	--	--	--	--	--
Benzyl alcohol	100-51-6	--	--	--	--	--	--	--	--
Benzyl chloride	100-44-7	5.7E-02	2.6E-01	1.9E+00	8.3E+00	2.5E+00	4.4E+00	8.3E+01	3.6E+02

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Beryllium and compounds	7440-41-7	1.2E-03	5.2E-03	--	--	5.1E-02	8.8E-02	--	--
Biphenthrin (Talstar)	82657-04-3	--	--	--	--	--	--	--	--
1,1-Biphenyl	92-52-4	--	1.0E-01	3.5E+00	2.7E+01	--	1.8E+00	5.8E+01	4.5E+02
Bis(2-chloroethyl)ether	111-44-4	8.5E-03	--	2.8E-01	3.8E+01	3.7E-01	--	1.2E+01	1.7E+03
Bis(chloromethyl)ether	542-88-1	4.5E-05	--	1.5E-03	2.5E-04	2.0E-03	--	6.6E-02	1.1E-02
Bis(2-chloro-1-methylethyl)ether	108-60-1	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	1.2E+00	--	--	--	5.1E+01	--	--	--
Bisphenol A	80-05-7	--	--	--	--	--	--	--	--
Boron	7440-42-8	--	5.2E+00	--	--	--	8.8E+01	--	--
Boron trifluoride	7637-07-2	--	3.4E+00	1.1E+02	No HLC	--	5.7E+01	1.9E+03	No HLC
Bromate	15541-45-4	--	--	--	--	--	--	--	--
Bromobenzene	108-86-1	--	1.6E+01	5.2E+02	4.4E+02	--	2.6E+02	8.8E+03	7.4E+03
Bromodichloromethane	75-27-4	7.6E-02	--	2.5E+00	1.8E+00	3.3E+00	--	1.1E+02	7.9E+01
Bromoform (Tribromomethane)	75-25-2	2.6E+00	--	8.5E+01	3.0E+02	1.1E+02	--	3.7E+03	1.3E+04
Bromomethane	74-83-9	--	1.3E+00	4.3E+01	6.9E+00	--	2.2E+01	7.3E+02	1.2E+02
Bromophos	2104-96-3	--	--	--	--	--	--	--	--
Bromoxynil	1689-84-5	--	--	--	--	--	--	--	--
Bromoxynil octanoate	1689-99-2	--	--	--	--	--	--	--	--
1,3-Butadiene	106-99-0	9.4E-02	5.2E-01	3.1E+00	--	4.1E+00	8.8E+00	1.4E+02	--
1-Butanol	71-36-3	--	--	--	--	--	--	--	--
Butylate	2008-41-5	--	--	--	--	--	--	--	--
Butyl benzyl phthalate	85-68-7	--	--	--	--	--	--	--	--
Butylphthalyl butylglycolate	85-70-1	--	--	--	--	--	--	--	--
Cacodylic acid	75-60-5	--	--	--	--	--	--	--	--
Cadmium and compounds +++	7440-43-9	1.6E-03	2.6E-03	--	--	6.8E-02	4.4E-02	--	--
Camphechlor (Toxaphene)	8001-35-2	8.8E-03	--	--	--	3.8E-01	--	--	--
Caprolactam	105-60-2	--	5.7E-01	--	--	--	9.6E+00	--	--
Captafol	2425-06-1	6.5E-02	--	--	--	2.9E+00	--	--	--
Captan	133-06-2	4.3E+00	--	--	--	1.9E+02	--	--	--
Carbaryl	63-25-2	--	--	--	--	--	--	--	--
Carbofuran	1563-66-2	--	--	--	--	--	--	--	--
Carbon disulfide	75-15-0	--	1.8E+02	6.1E+03	5.4E+02	--	3.1E+03	1.0E+05	9.1E+03
Carbon tetrachloride	56-23-5	4.7E-01	2.6E+01	1.6E+01	8.0E-01	2.0E+01	4.4E+02	6.8E+02	3.5E+01
Carbosulfan	55285-14-8	--	--	--	--	--	--	--	--
Carboxin	5234-68-4	--	--	--	--	--	--	--	--
Chloramben	133-90-4	--	--	--	--	--	--	--	--
Chloranil	118-75-2	--	--	--	--	--	--	--	--
Chlordane	12789-03-6	2.8E-02	1.8E-01	9.4E-01	NVT	1.2E+00	3.1E+00	4.1E+01	NVT
Chlordecone (Kepone)	143-50-0	6.1E-04	--	--	--	2.7E-02	--	--	--
Chlorimuron-ethyl	90982-32-4	--	--	--	--	--	--	--	--
Chlorine	7782-50-5	--	3.9E-02	1.3E+00	1.5E+01	--	6.6E-01	2.2E+01	2.5E+02
Chlorine dioxide	10049-04-4	--	5.2E-02	1.7E+00	No S	--	8.8E-01	2.9E+01	No S
Chloroacetic acid	79-11-8	--	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	--	7.8E-03	--	--	--	1.3E-01	--	--
4-Chloroaniline	106-47-8	--	--	--	--	--	--	--	--
Chlorobenzene	108-90-7	--	1.3E+01	4.3E+02	2.3E+02	--	2.2E+02	7.3E+03	3.9E+03
Chlorobenzilate	510-15-6	9.1E-02	--	--	--	4.0E+00	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
p-Chlorobenzoic acid	74-11-3	--	--	--	--	--	--	--	--
4-Chlorobenzotrifluoride	98-56-6	--	7.8E+01	2.6E+03	--	--	1.3E+03	4.4E+04	--
2-Chloro-1,3-butadiene	126-99-8	9.4E-03	5.2E+00	3.1E-01	8.4E-03	4.1E-01	8.8E+01	1.4E+01	3.7E-01
1-Chlorobutane	109-69-3	--	--	--	--	--	--	--	--
1-Chloro-1,1-difluoroethane	75-68-3	--	1.3E+04	4.3E+05	3.6E+05	--	2.2E+05	7.3E+06	NVT
Chlorodifluoromethane	75-45-6	--	1.3E+04	4.3E+05	1.1E+04	--	2.2E+05	7.3E+06	1.9E+05
2-Chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester sulfurous acid (Aramite)	140-57-8	4.0E-01	--	--	--	1.7E+01	--	--	--
Chloroform	67-66-3	1.2E-01	2.6E+01	4.1E+00	1.5E+00	5.3E+00	4.3E+02	1.8E+02	6.7E+01
Chloromethane	74-87-3	--	2.3E+01	7.8E+02	9.7E+01	--	3.9E+02	1.3E+04	1.6E+03
4-Chloro-2-methylaniline hydrochloride	3165-93-3	--	--	--	--	--	--	--	--
beta-Chloronaphthalene	91-58-7	--	--	--	--	--	--	--	--
o-Chloronitrobenzene	88-73-3	--	2.6E-03	--	--	--	4.4E-02	--	--
p-Chloronitrobenzene	100-00-5	--	5.2E-01	--	--	--	8.8E+00	--	--
2-Chlorophenol	95-57-8	--	--	--	--	--	--	--	--
Chlorothalonil	1897-45-6	3.2E+00	--	--	--	1.4E+02	--	--	--
o-Chlorotoluene	95-49-8	--	--	--	--	--	--	--	--
Chlorpropham	101-21-3	--	--	--	--	--	--	--	--
Chlorpyrifos	2921-88-2	--	--	--	--	--	--	--	--
Chlorpyrifos-methyl	5598-13-0	--	--	--	--	--	--	--	--
Chlorsulfuron	64902-72-3	--	--	--	--	--	--	--	--
Chlorthiophos	60238-56-4	--	--	--	--	--	--	--	--
Chromium, Total	7440-47-3	--	--	--	--	--	--	--	--
Chromium III *	16065-83-1	--	--	--	--	--	--	--	--
Chromium VI +++	18540-29-9	1.2E-05	2.6E-02	--	--	1.5E-03	4.4E-01	--	--
Clofentezine (Apollo)	74115-24-5	--	--	--	--	--	--	--	--
Cobalt	7440-48-4	3.1E-04	1.6E-03	--	--	1.4E-02	2.6E-02	--	--
Coke Oven Emissions	8007-45-2	1.6E-03	--	No MW	No MW	2.0E-01	--	No MW	No MW
Copper and compounds	7440-50-8	--	--	--	--	--	--	--	--
Crotonaldehyde	123-73-9	--	--	--	--	--	--	--	--
Cumene (Isopropylbenzene)	98-82-8	--	1.0E+02	3.5E+03	6.3E+02	--	1.8E+03	5.8E+04	1.1E+04
Cyanazine	21725-46-2	--	--	--	--	--	--	--	--
Cyanide (free)	57-12-5	--	2.1E-01	7.0E+00	5.0E+01	--	3.5E+00	1.2E+02	8.4E+02
Cyanide (hydrogen)	74-90-8	--	2.1E-01	7.0E+00	6.8E+01	--	3.5E+00	1.2E+02	1.1E+03
Cyanogen	460-19-5	--	--	--	--	--	--	--	--
Cyanogen bromide	506-68-3	--	--	--	--	--	--	--	--
Cyanogen chloride	506-77-4	--	--	--	--	--	--	--	--
Cyclohexane	110-82-7	--	1.6E+03	5.2E+04	4.9E+02	--	2.6E+04	8.8E+05	8.3E+03
Cyclohexanone	108-94-1	--	1.8E+02	6.1E+03	1.5E+06	--	3.1E+03	1.0E+05	NVT
Cyclohexylamine	108-91-8	--	--	--	--	--	--	--	--
Cyfluthrin (Baythroid)	68359-37-5	--	--	--	--	--	--	--	--
Cyhalothrin (Karate)	68085-85-8	--	--	--	--	--	--	--	--
Cyromazine	66215-27-8	--	--	--	--	--	--	--	--
Dacthal	1861-32-1	--	--	--	--	--	--	--	--
Dalapon	75-99-0	--	--	--	--	--	--	--	--
Daminozide (Alar)	1596-84-5	5.5E-01	--	--	--	2.4E+01	--	--	--
Demeton	8065-48-3	--	--	--	--	--	--	--	--
Diallate	2303-16-4	--	--	--	--	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Diazinon	333-41-5	--	--	--	--	--	--	--	--
Dibenzofuran	132-64-9	--	--	--	--	--	--	--	--
1,4-Dibromobenzene	106-37-6	--	--	--	--	--	--	--	--
Dibromochloromethane	124-48-1	--	--	--	--	--	--	--	--
1,2-Dibromo-3-chloropropane	96-12-8	1.7E-04	5.2E-02	5.6E-03	7.9E-02	2.0E-02	8.8E-01	6.8E-01	9.6E+00
1,2-Dibromoethane	106-93-4	4.7E-03	2.3E+00	1.6E-01	4.1E-01	2.0E-01	3.9E+01	6.8E+00	1.8E+01
Dibutyl phthalate	84-74-2	--	--	--	--	--	--	--	--
Dicamba	1918-00-9	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	95-50-1	--	5.2E+01	1.7E+03	1.8E+03	--	8.8E+02	2.9E+04	2.9E+04
1,4-Dichlorobenzene	106-46-7	2.6E-01	2.1E+02	8.5E+00	6.6E+00	1.1E+01	3.5E+03	3.7E+02	2.9E+02
3,3-Dichlorobenzidine	91-94-1	8.3E-03	--	--	--	3.6E-01	--	--	--
4,4'-Dichlorobenzophenone	90-98-2	--	--	--	--	--	--	--	--
1,4-Dichloro-2-butene	764-41-0	6.7E-04	--	2.2E-02	1.9E-03	2.9E-02	--	9.7E-01	8.4E-02
Dichlorodifluoromethane	75-71-8	--	2.6E+01	8.7E+02	3.7E+00	--	4.4E+02	1.5E+04	6.3E+01
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	4.1E-02	--	--	--	1.8E+00	--	--	--
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	2.9E-02	--	9.6E-01	NVT	1.3E+00	--	4.2E+01	NVT
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	2.9E-02	--	--	--	1.3E+00	--	--	--
1,1-Dichloroethane	75-34-3	1.8E+00	--	5.8E+01	1.4E+01	7.7E+01	--	2.6E+03	6.2E+02
1,2-Dichloroethane	107-06-2	1.1E-01	1.8E+00	3.6E+00	4.5E+00	4.7E+00	3.1E+01	1.6E+02	2.0E+02
1,1-Dichloroethylene	75-35-4	--	5.2E+01	1.7E+03	8.3E+01	--	8.8E+02	2.9E+04	1.4E+03
1,2-Dichloroethylene (cis)	156-59-2	--	--	--	--	--	--	--	--
1,2-Dichloroethylene (trans)	156-60-5	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--	--	--
2,4-Dichlorophenoxy acetic acid (2,4-D)	94-75-7	--	--	--	--	--	--	--	--
2,4-Dichlorophenoxy butyric acid (2,4-DB)	94-82-6	--	--	--	--	--	--	--	--
Decabromodiphenyl ether (BDE-209)	1163-19-5	--	--	--	--	--	--	--	--
1,2-Dichloropropane	78-87-5	7.5E-01	1.0E+00	2.5E+01	1.3E+01	3.3E+01	1.8E+01	5.8E+02	3.1E+02
2,3-Dichloropropanol	616-23-9	--	--	--	--	--	--	--	--
1,3-Dichloropropene	542-75-6	7.0E-01	5.2E+00	2.3E+01	1.0E+01	3.1E+01	8.8E+01	1.0E+03	4.5E+02
Dichlorvos	62-73-7	3.4E-02	1.3E-01	--	--	1.5E+00	2.2E+00	--	--
Dicrotophos (Bidrin)	141-66-2	--	--	--	--	--	--	--	--
Dicyclopentadiene	77-73-6	--	7.8E-02	2.6E+00	3.8E-02	--	1.3E+00	4.4E+01	6.4E-01
Dieldrin	60-57-1	6.1E-04	--	--	--	2.7E-02	--	--	--
Diethylene glycol, monobutyl ether	112-34-5	--	2.6E-02	--	--	--	4.4E-01	--	--
Diethylene glycol, monoethyl ether	111-90-0	--	7.8E-02	--	--	--	1.3E+00	--	--
Diethylformamide	617-84-5	--	--	--	--	--	--	--	--
Di(2-ethylhexyl)adipate	103-23-1	--	--	--	--	--	--	--	--
Diethyl phthalate	84-66-2	--	--	--	--	--	--	--	--
Diethylstilbestrol	56-53-1	2.8E-05	--	--	--	1.2E-03	--	--	--
Difenzoquat (Avenge)	43222-48-6	--	--	--	--	--	--	--	--
Diflubenzuron	35367-38-5	--	--	--	--	--	--	--	--
1,1-Difluoroethane	75-37-6	--	1.0E+04	3.5E+05	1.8E+04	--	1.8E+05	5.8E+06	3.1E+05
Diisopropyl methylphosphonate (DIMP)	1445-75-6	--	--	--	--	--	--	--	--
Dimethipin	55290-64-7	--	--	--	--	--	--	--	--
Dimethoate	60-51-5	--	--	--	--	--	--	--	--
3,3'-Dimethoxybenzidine	119-90-4	--	--	--	--	--	--	--	--
N-N-Dimethylaniline	121-69-7	--	--	--	--	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
2,4-Dimethylaniline	95-68-1	--	--	--	--	--	--	--	--
2,4-Dimethylaniline hydrochloride	21436-96-4	--	--	--	--	--	--	--	--
3,3'-Dimethylbenzidine	119-93-7	--	--	--	--	--	--	--	--
N,N-Dimethylformamide	68-12-2	--	7.8E+00	2.6E+02	8.1E+06	--	1.3E+02	4.4E+03	1.4E+08
2,4-Dimethylphenol	105-67-9	--	--	--	--	--	--	--	--
2,6-Dimethylphenol	576-26-1	--	--	--	--	--	--	--	--
3,4-Dimethylphenol	95-65-8	--	--	--	--	--	--	--	--
Dimethyl terephthalate	120-61-6	--	--	--	--	--	--	--	--
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	--	--	--	--	--	--	--	--
1,2-Dinitrobenzene	528-29-0	--	--	--	--	--	--	--	--
1,3-Dinitrobenzene	99-65-0	--	--	--	--	--	--	--	--
1,4-Dinitrobenzene	100-25-4	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	51-28-5	--	--	--	--	--	--	--	--
Dinitrotoluene mixture	25321-14-6	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	121-14-2	3.2E-02	--	--	--	1.4E+00	--	--	--
2,6-Dinitrotoluene	606-20-2	--	--	--	--	--	--	--	--
Dinoseb	88-85-7	--	--	--	--	--	--	--	--
1,4-Dioxane	123-91-1	5.6E-01	7.8E+00	1.9E+01	6.5E+03	2.5E+01	1.3E+02	8.2E+02	2.8E+05
Diphenamid	957-51-7	--	--	--	--	--	--	--	--
Diphenylamine	122-39-4	--	--	--	--	--	--	--	--
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	--	--	--	--	--	--	--	--
1,2-Diphenylhydrazine	122-66-7	1.3E-02	--	--	--	5.6E-01	--	--	--
Diphenyl sulfone	127-63-9	--	--	--	--	--	--	--	--
Diquat dibromide (Diquat)	85-00-7	--	--	--	--	--	--	--	--
Direct black 38	1937-37-7	2.0E-05	--	--	--	8.8E-04	--	--	--
Direct blue 6	2602-46-2	2.0E-05	--	--	--	8.8E-04	--	--	--
Direct brown 95	16071-86-6	2.0E-05	--	--	--	8.8E-04	--	--	--
Disulfoton	298-04-4	--	--	--	--	--	--	--	--
1,4-Dithiane	505-29-3	--	--	--	--	--	--	--	--
Diuron	330-54-1	--	--	--	--	--	--	--	--
Dodine	2439-10-3	--	--	--	--	--	--	--	--
Endosulfan	115-29-7	--	--	--	--	--	--	--	--
Endothall	145-73-3	--	--	--	--	--	--	--	--
Endrin	72-20-8	--	--	--	--	--	--	--	--
Enilconazole (Imazalil)	35554-44-0	--	--	--	--	--	--	--	--
Epichlorohydrin	106-89-8	2.3E+00	2.6E-01	8.7E+00	2.1E+02	1.0E+02	4.4E+00	1.5E+02	3.5E+03
1,2-Epoxybutane	106-88-7	--	5.2E+00	1.7E+02	1.4E+03	--	8.8E+01	2.9E+03	2.3E+04
S-Ethyl dipropylthiocarbamate (EPTC)	759-94-4	--	--	--	--	--	--	--	--
2-Chloroethyl phosphonic acid (Ethephon)	16672-87-0	--	--	--	--	--	--	--	--
Ethion	563-12-2	--	--	--	--	--	--	--	--
2-Ethoxyethanol	110-80-5	--	5.2E+01	1.7E+03	7.1E+06	--	8.8E+02	2.9E+04	1.2E+08
2-Ethoxyethanol acetate	111-15-9	--	1.6E+01	5.2E+02	3.4E+05	--	2.6E+02	8.8E+03	5.7E+06
Ethyl acetate	141-78-6	--	1.8E+01	6.1E+02	6.8E+03	--	3.1E+02	1.0E+04	1.1E+05
Ethyl acrylate	140-88-5	--	2.1E+00	7.0E+01	3.7E+02	--	3.5E+01	1.2E+03	6.2E+03
Ethylbenzene	100-41-4	1.1E+00	2.6E+02	3.7E+01	8.1E+00	4.9E+01	4.4E+03	1.6E+03	3.5E+02
Ethyl chloride (Chloroethane)	75-00-3	--	2.6E+03	8.7E+04	9.4E+03	--	4.4E+04	1.5E+06	1.6E+05
Ethylene cyanohydrin	109-78-4	--	--	--	--	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Ethylene diamine	107-15-3	--	--	--	--	--	--	--	--
Ethylene glycol	107-21-1	--	1.0E+02	--	--	--	1.8E+03	--	--
Ethylene glycol, monobutyl ether	111-76-2	--	4.2E+02	--	--	--	7.0E+03	--	--
Ethylene oxide	75-21-8	3.4E-04	7.8E+00	1.1E-02	9.3E-02	4.1E-02	1.3E+02	1.4E+00	1.1E+01
Ethylene thiourea (ETU)	96-45-7	2.2E-01	--	--	--	9.4E+00	--	--	--
Ethyl ether	60-29-7	--	--	--	--	--	--	--	--
Ethyl methacrylate	97-63-2	--	7.8E+01	2.6E+03	9.9E+03	--	1.3E+03	4.4E+04	1.7E+05
Ethyl p-nitrophenyl phenylphosphorothioate (EPN)	2104-64-5	--	--	--	--	--	--	--	--
Ethylphthalyl ethyl glycolate	84-72-0	--	--	--	--	--	--	--	--
Fenamiphos	22224-92-6	--	--	--	--	--	--	--	--
Fenpropathrin (Danitol)	39515-41-8	--	--	--	--	--	--	--	--
Fenvalerate (Pydrin)	51630-58-1	--	--	--	--	--	--	--	--
Fluometuron	2164-17-2	--	--	--	--	--	--	--	--
Fluoride	16984-48-8	--	3.4E+00	--	--	--	5.7E+01	--	--
Fluoridone	59756-60-4	--	--	--	--	--	--	--	--
Flurprimidol	56425-91-3	--	--	--	--	--	--	--	--
Flusilazole (NuStar)	85509-19-9	--	--	--	--	--	--	--	--
Flutolanil	66332-96-5	--	--	--	--	--	--	--	--
Fluvalinate	69409-94-5	--	--	--	--	--	--	--	--
Folpet	133-07-3	--	--	--	--	--	--	--	--
Fomesafen	72178-02-0	--	--	--	--	--	--	--	--
Fonofos	944-22-9	--	--	--	--	--	--	--	--
Formaldehyde	50-00-0	2.2E-01	2.6E+00	7.2E+00	2.5E+04	9.4E+00	4.3E+01	3.1E+02	1.1E+06
Formic acid	64-18-6	--	7.8E-02	2.6E+00	1.8E+04	--	1.3E+00	4.4E+01	3.0E+05
Fosetyl-al	39148-24-8	--	--	--	--	--	--	--	--
Furan	110-00-9	--	--	--	--	--	--	--	--
Furazolidone	67-45-8	--	--	--	--	--	--	--	--
Furfural	98-01-1	--	1.3E+01	4.3E+02	2.1E+05	--	2.2E+02	7.3E+03	3.6E+06
Furmecyclox	60568-05-0	3.3E-01	--	--	--	1.4E+01	--	--	--
Furothiazole (Furium)	531-82-8	6.5E-03	--	--	--	2.9E-01	--	--	--
Glufosinate-ammonium	77182-82-2	--	--	--	--	--	--	--	--
Glycidaldehyde	765-34-4	--	2.6E-01	8.7E+00	1.2E+04	--	4.4E+00	1.5E+02	2.1E+05
Glyphosate	1071-83-6	--	--	--	--	--	--	--	--
Haloxyfop-methyl	69806-40-2	--	--	--	--	--	--	--	--
Thifensulfuron-methyl (Harmony)	79277-27-3	--	--	--	--	--	--	--	--
Heptachlor	76-44-8	2.2E-03	--	7.2E-02	7.4E-01	9.4E-02	--	3.1E+00	3.2E+01
Heptachlor epoxide	1024-57-3	1.1E-03	--	3.6E-02	7.3E+00	4.7E-02	--	1.6E+00	NVT
Hexabromobenzene	87-82-1	--	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	6.1E-03	--	2.0E-01	3.2E-01	2.7E-01	--	8.9E+00	NVT
Hexachlorobutadiene	87-68-3	1.3E-01	--	4.3E+00	8.8E-01	5.6E+00	--	1.9E+02	3.9E+01
alpha-Hexachlorocyclohexane (alpha-HCH)	319-84-6	1.6E-03	--	--	--	6.8E-02	--	--	--
beta-Hexachlorocyclohexane (beta-HCH)	319-85-7	5.3E-03	--	--	--	2.3E-01	--	--	--
gamma-Hexachlorocyclohexane (Lindane)	58-89-9	9.1E-03	--	--	--	4.0E-01	--	--	--
Hexachlorocyclohexane technical	608-73-1	5.5E-03	--	--	--	2.4E-01	--	--	--
Hexachlorocyclopentadiene	77-47-4	--	5.2E-02	1.7E+00	4.5E+00	--	8.8E-01	2.9E+01	7.5E+01
Hexachloroethane	67-72-1	2.6E-01	7.8E+00	8.5E+00	5.2E+00	1.1E+01	1.3E+02	3.7E+02	2.3E+02
Hexachlorophene	70-30-4	--	--	--	--	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX/Cyclonite)	121-82-4	--	--	--	--	--	--	--	--
1,6-Hexamethylene diisocyanate	822-06-0	--	2.6E-03	8.7E-02	1.3E+00	--	4.4E-02	1.5E+00	2.2E+01
n-Hexane	110-54-3	--	1.8E+02	6.1E+03	4.7E+00	--	3.1E+03	1.0E+05	7.9E+01
Hexazinone	51235-04-2	--	--	--	--	--	--	--	--
Hexythiazox (Savey)	78587-05-0	--	--	--	--	--	--	--	--
Hydramethylnon (Amdro)	67485-29-4	--	--	--	--	--	--	--	--
Hydrazine, hydrazine sulfate	302-01-2	5.7E-04	7.8E-03	1.9E-02	6.2E+01	2.5E-02	1.3E-01	8.3E-01	2.7E+03
Hydrazine, dimethyl	57-14-7	--	5.2E-04	1.7E-02	2.0E+00	--	8.8E-03	2.9E-01	3.4E+01
Hydrogen chloride	7647-01-0	--	5.2E+00	1.7E+02	7.8E-08	--	8.8E+01	2.9E+03	1.3E-06
Hydrogen sulfide	7783-06-4	--	5.2E-01	1.7E+01	2.0E+00	--	8.8E+00	2.9E+02	3.4E+01
p-Hydroquinone	123-31-9	--	--	--	--	--	--	--	--
Imazaquin	81335-37-7	--	--	--	--	--	--	--	--
Imazethapyr (Pursuit)	81335-77-5	--	--	--	--	--	--	--	--
Iprodione	36734-19-7	--	--	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--	--	--
Isobutanol (Isobutyl alcohol)	78-83-1	--	--	--	--	--	--	--	--
Isophorone	78-59-1	--	5.2E+02	--	--	--	8.8E+03	--	--
Isopropalin	33820-53-0	--	--	--	--	--	--	--	--
Isopropyl methyl phosphonic acid	1832-54-8	--	--	--	--	--	--	--	--
Isoxaben	82558-50-7	--	--	--	--	--	--	--	--
Lactofen	77501-63-4	--	--	--	--	--	--	--	--
Lead +++	7439-92-1	--	--	--	--	--	--	--	--
Lead (tetraethyl)	78-00-2	--	--	--	--	--	--	--	--
Linuron	330-55-2	--	--	--	--	--	--	--	--
Lithium	7439-93-2	--	--	--	--	--	--	--	--
Malathion	121-75-5	--	--	--	--	--	--	--	--
Maleic anhydride	108-31-6	--	1.8E-01	--	--	--	3.1E+00	--	--
Maleic hydrazide	123-33-1	--	--	--	--	--	--	--	--
Malononitrile	109-77-3	--	--	--	--	--	--	--	--
Mancozeb	8018-01-7	--	--	--	--	--	--	--	--
Maneb	12427-38-2	--	--	--	--	--	--	--	--
Manganese (non-food) +++	7439-96-5	--	1.3E-02	--	--	--	2.2E-01	--	--
Mephosfolan	950-10-7	--	--	--	--	--	--	--	--
Mepiquat chloride (Mepiquat)	24307-26-4	--	--	--	--	--	--	--	--
Mercury and compounds	7487-94-7	--	7.8E-02	--	--	--	1.3E+00	--	--
Mercury (elemental)	7439-97-6	--	7.8E-02	2.6E+00	7.3E-01	--	1.3E+00	4.4E+01	1.2E+01
Mercury (methyl)	22967-92-6	--	--	--	--	--	--	--	--
Merphos	150-50-5	--	--	--	--	--	--	--	--
Merphos oxide	78-48-8	--	--	--	--	--	--	--	--
Metalaxyl	57837-19-1	--	--	--	--	--	--	--	--
Methacrylonitrile	126-98-7	--	7.8E+00	2.6E+02	1.6E+03	--	1.3E+02	4.4E+03	2.7E+04
Methamidophos	10265-92-6	--	--	--	--	--	--	--	--
Methanol	67-56-1	--	5.2E+03	1.7E+05	6.4E+07	--	8.8E+04	2.9E+06	NVT
Methidathion	950-37-8	--	--	--	--	--	--	--	--
Methomyl	16752-77-5	--	--	--	--	--	--	--	--
Methoxychlor	72-43-5	--	--	--	--	--	--	--	--
2-Methoxyethanol	109-86-4	--	5.2E+00	1.7E+02	9.3E+05	--	8.8E+01	2.9E+03	1.6E+07

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
2-Methoxyethanol acetate	110-49-6	--	2.6E-01	8.7E+00	5.9E+04	--	4.4E+00	1.5E+02	9.9E+05
2-Methoxy-5-nitroaniline	99-59-2	2.0E-01	--	--	--	8.8E+00	--	--	--
Methyl acetate	79-20-9	--	--	--	--	--	--	--	--
Methyl acrylate	96-33-3	--	5.2E+00	1.7E+02	1.3E+03	--	8.8E+01	2.9E+03	2.2E+04
2-Methylaniline hydrochloride	636-21-5	7.6E-02	--	--	--	3.3E+00	--	--	--
Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benomyl)	17804-35-2	--	--	--	--	--	--	--	--
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-74-6	--	--	--	--	--	--	--	--
4-(2-Methyl-4-chlorophenoxy) butyric acid (MCPB)	94-81-5	--	--	--	--	--	--	--	--
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	--	--	--	--	--	--	--	--
4,4'-Methylenebisbenzeneamine	101-77-9	6.1E-03	5.2E+00	--	--	2.7E-01	8.8E+01	--	--
4,4'-Methylene bis(2-chloroaniline)	101-14-4	2.4E-03	--	--	--	2.9E-01	--	--	--
4,4'-Methylene bis(N,N'-dimethyl)aniline	101-61-1	2.2E-01	--	--	--	9.4E+00	--	--	--
Methylene bromide	74-95-3	--	1.0E+00	3.5E+01	6.5E+01	--	1.8E+01	5.8E+02	1.1E+03
Methylene chloride	75-09-2	1.0E+02	1.6E+02	3.4E+03	1.4E+03	1.2E+04	2.6E+03	8.8E+04	3.5E+04
4,4'-Methylenediphenyl isocyanate	101-68-8	--	1.6E-01	--	--	--	2.6E+00	--	--
2-(1-Methylethoxy)phenol methylcarbamate (Baygon)	114-26-1	--	--	--	--	--	--	--	--
Methyl ethyl ketone (2-Butanone)	78-93-3	--	1.3E+03	4.3E+04	1.1E+06	--	2.2E+04	7.3E+05	1.9E+07
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	--	7.8E+02	2.6E+04	3.1E+05	--	1.3E+04	4.4E+05	5.3E+06
Methyl methacrylate	80-62-6	--	1.8E+02	6.1E+03	3.3E+04	--	3.1E+03	1.0E+05	5.6E+05
2-Methyl-5-nitroaniline	99-55-8	--	--	--	--	--	--	--	--
Methyl parathion	298-00-0	--	--	--	--	--	--	--	--
2-Methylphenol	95-48-7	--	1.6E+02	--	--	--	2.6E+03	--	--
3-Methylphenol	108-39-4	--	1.6E+02	--	--	--	2.6E+03	--	--
4-Methylphenol	106-44-5	--	1.6E+02	--	--	--	2.6E+03	--	--
Methyl phosphonic acid	993-13-5	--	--	--	--	--	--	--	--
Methyl styrene (mixture)	25013-15-4	--	1.0E+01	3.5E+02	3.3E+02	--	1.8E+02	5.8E+03	5.6E+03
Methyl styrene (alpha)	98-83-9	--	--	--	--	--	--	--	--
Methyl tertbutyl ether (MTBE)	1634-04-4	1.1E+01	7.8E+02	3.6E+02	8.2E+02	4.7E+02	1.3E+04	1.6E+04	3.6E+04
Metolaclor (Dual)	51218-45-2	--	--	--	--	--	--	--	--
Metribuzin	21087-64-9	--	--	--	--	--	--	--	--
Metsulfuron-methyl (Ally)	74223-64-6	--	--	--	--	--	--	--	--
Mirex	2385-85-5	5.5E-04	--	1.8E-02	1.7E-02	2.4E-02	--	8.0E-01	7.3E-01
Molinate	2212-67-1	--	--	--	--	--	--	--	--
Molybdenum	7439-98-7	--	--	--	--	--	--	--	--
Monochloramine	10599-90-3	--	--	--	--	--	--	--	--
Myclobutanil (Systhane)	88671-89-0	--	--	--	--	--	--	--	--
Naled	300-76-5	--	--	--	--	--	--	--	--
Napropamide	15299-99-7	--	--	--	--	--	--	--	--
Nickel and compounds	7440-02-0	1.1E-02	2.3E-02	--	--	4.7E-01	3.9E-01	--	--
Nickel refinery dust	7440-02-0-NRD	1.2E-02	3.7E-03	--	--	5.1E-01	6.1E-02	--	--
Nickel subsulfide	12035-72-2	5.8E-03	3.7E-03	--	--	2.6E-01	6.1E-02	--	--
Nitrate	14797-55-8	--	--	--	--	--	--	--	--
Nitrite	14797-65-0	--	--	--	--	--	--	--	--
2-Nitroaniline	88-74-4	--	1.3E-02	--	--	--	2.2E-01	--	--
Nitrobenzene	98-95-3	7.0E-02	2.3E+00	2.3E+00	2.2E+02	3.1E+00	3.9E+01	1.0E+02	9.5E+03
Nitrofurantoin	67-20-9	--	--	--	--	--	--	--	--
Nitrofurazone	59-87-0	7.6E-03	--	--	--	3.3E-01	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Nitroglycerin	55-63-0	--	--	--	--	--	--	--	--
Nitroguanidine	556-88-7	--	--	--	--	--	--	--	--
2-Nitropropane	79-46-9	1.0E-03	5.2E+00	3.5E-02	4.9E-01	4.5E-02	8.8E+01	1.5E+00	2.1E+01
N-Nitrosodi-n-butylamine	924-16-3	1.8E-03	--	5.8E-02	3.3E+00	7.7E-02	--	2.6E+00	1.4E+02
N-Nitrosodiethanolamine	1116-54-7	3.5E-03	--	--	--	1.5E-01	--	--	--
N-Nitrosodiethylamine	55-18-5	2.4E-05	--	--	--	2.9E-03	--	--	--
N-Nitrosodimethylamine	62-75-9	7.2E-05	1.0E-02	2.4E-03	9.7E-01	8.8E-03	1.8E-01	2.9E-01	1.2E+02
N-Nitrosodiphenylamine	86-30-6	1.1E+00	--	--	--	4.7E+01	--	--	--
N-Nitroso di-n-propylamine	621-64-7	1.4E-03	--	--	--	6.1E-02	--	--	--
N-Nitroso-N-methylethylamine	10595-95-6	4.5E-04	--	1.5E-02	7.6E+00	1.9E-02	--	6.5E-01	3.3E+02
N-Nitrosopyrrolidine	930-55-2	4.6E-03	--	--	--	2.0E-01	--	--	--
m-Nitrotoluene	99-08-1	--	--	--	--	--	--	--	--
o-Nitrotoluene	88-72-2	--	--	--	--	--	--	--	--
p-Nitrotoluene	99-99-0	--	--	--	--	--	--	--	--
Norflurazon	27314-13-2	--	--	--	--	--	--	--	--
Octabromodiphenyl ether	32536-52-0	--	--	--	--	--	--	--	--
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	--	--	--	--	--	--	--	--
Octamethylpyrophosphoramide	152-16-9	--	--	--	--	--	--	--	--
Oryzalin	19044-88-3	--	--	--	--	--	--	--	--
Oxadiazon	19666-30-9	--	--	--	--	--	--	--	--
Oxamyl	23135-22-0	--	--	--	--	--	--	--	--
Oxyfluorfen	42874-03-3	--	--	--	--	--	--	--	--
Paclobutrazol	76738-62-0	--	--	--	--	--	--	--	--
Paraquat	4685-14-7	--	--	--	--	--	--	--	--
Parathion	56-38-2	--	--	--	--	--	--	--	--
Pebulate	1114-71-2	--	--	--	--	--	--	--	--
Pendimethalin	40487-42-1	--	--	--	--	--	--	--	--
Pentabromo-6-chloro cyclohexane	87-84-3	--	--	--	--	--	--	--	--
Pentabromodiphenyl ether	32534-81-9	--	--	--	--	--	--	--	--
Pentachlorobenzene	608-93-5	--	--	--	--	--	--	--	--
Pentachloronitrobenzene	82-68-8	--	--	--	--	--	--	--	--
Pentachlorophenol	87-86-5	5.5E-01	--	--	--	2.4E+01	--	--	--
Perchlorate	14797-73-0	--	--	--	--	--	--	--	--
Perfluoroalkyl Compounds	**0.0E+00**								
Perfluoro-octanesulfonate (PFOS)^^	1763-23-1	--	--	--	--	--	--	--	--
Perfluorooctanoic acid (PFOA)^^	335-67-1	--	--	--	--	--	--	--	--
Permethrin	52645-53-1	--	--	--	--	--	--	--	--
Phenmedipham	13684-63-4	--	--	--	--	--	--	--	--
Phenol	108-95-2	--	5.2E+01	--	--	--	8.8E+02	--	--
m-Phenylenediamine	108-45-2	--	--	--	--	--	--	--	--
p-Phenylenediamine	106-50-3	--	--	--	--	--	--	--	--
Phenylmercuric acetate	62-38-4	--	--	--	--	--	--	--	--
2-Phenylphenol	90-43-7	--	--	--	--	--	--	--	--
Phorate	298-02-2	--	--	--	--	--	--	--	--
Phosmet	732-11-6	--	--	--	--	--	--	--	--
Phosphine	7803-51-2	--	7.8E-02	2.6E+00	7.8E-02	--	1.3E+00	4.4E+01	1.3E+00
Phosphoric acid	7664-38-2	--	2.6E+00	--	--	--	4.4E+01	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
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CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Phosphorus (white)	7723-14-0	--	--	--	--	--	--	--	--
p-Phthalic acid	100-21-0	--	--	--	--	--	--	--	--
Phthalic anhydride	85-44-9	--	5.2E+00	--	--	--	8.8E+01	--	--
Picloram	1918-02-1	--	--	--	--	--	--	--	--
Pirimiphos-methyl	29232-93-7	--	--	--	--	--	--	--	--
Polybrominated biphenyls (PBBs)	59536-65-1	--	--	--	--	--	--	--	--
Polychlorinated biphenyls (PCBs)	1336-36-3	--	--	--	--	--	--	--	--
Aroclor 1016	12674-11-2	--	--	--	--	--	--	--	--
Aroclor 1221	11104-28-2	--	--	--	--	--	--	--	--
Aroclor 1232	11141-16-5	4.9E-03	--	1.6E-01	1.6E-01	2.2E-01	--	7.2E+00	7.2E+00
Aroclor 1242	53469-21-9	4.9E-03	--	1.6E-01	3.5E-01	2.2E-01	--	7.2E+00	1.5E+01
Aroclor 1248	12672-29-6	4.9E-03	--	1.6E-01	2.7E-01	2.2E-01	--	7.2E+00	1.2E+01
Aroclor 1254	11097-69-1	4.9E-03	--	1.6E-01	4.3E-01	2.2E-01	--	7.2E+00	1.9E+01
Aroclor 1260	11096-82-5	4.9E-03	--	1.6E-01	3.6E-01	2.2E-01	--	7.2E+00	NVT
Polynuclear aromatic hydrocarbons (PAHs)									
Acenaphthene	83-32-9	--	--	--	--	--	--	--	--
Anthracene	120-12-7	--	--	--	--	--	--	--	--
Benz[a]anthracene	56-55-3	1.7E-02	--	5.6E-01	NVT	2.0E+00	--	NVT	NVT
Benzo[a]pyrene	50-32-8	1.7E-03	5.2E-04	--	--	2.0E-01	8.8E-03	--	--
Benzo[b]fluoranthene	205-99-2	1.7E-02	--	--	--	2.0E+00	--	--	--
Benzo[k]fluoranthene	207-08-9	1.7E-01	--	--	--	2.0E+01	--	--	--
Chrysene	218-01-9	1.7E+00	--	--	--	2.0E+02	--	--	--
Dibenz[ah]anthracene	53-70-3	1.7E-03	--	--	--	2.0E-01	--	--	--
Fluoranthene	206-44-0	--	--	--	--	--	--	--	--
Fluorene	86-73-7	--	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	1.7E-02	--	--	--	2.0E+00	--	--	--
Naphthalene	91-20-3	8.3E-02	7.8E-01	2.8E+00	1.3E+01	3.6E+00	1.3E+01	1.2E+02	5.9E+02
Pyrene	129-00-0	--	--	--	--	--	--	--	--
Prochloraz	67747-09-5	--	--	--	--	--	--	--	--
Profluralin	26399-36-0	--	--	--	--	--	--	--	--
Prometon	1610-18-0	--	--	--	--	--	--	--	--
Prometryn	7287-19-6	--	--	--	--	--	--	--	--
Propyzamide (Pronamide)	23950-58-5	--	--	--	--	--	--	--	--
Propachlor	1918-16-7	--	--	--	--	--	--	--	--
Propanil	709-98-8	--	--	--	--	--	--	--	--
Propargite	2312-35-8	--	--	--	--	--	--	--	--
Propargyl alcohol	107-19-7	--	--	--	--	--	--	--	--
Propazine	139-40-2	--	--	--	--	--	--	--	--
Propham	122-42-9	--	--	--	--	--	--	--	--
Propiconazole	60207-90-1	--	--	--	--	--	--	--	--
n-Propylbenzene	103-65-1	--	2.6E+02	8.7E+03	1.6E+03	--	4.4E+03	1.5E+05	2.6E+04
Propylene glycol	57-55-6	--	--	--	--	--	--	--	--
Propylene glycol, monoethyl ether	52125-53-8	--	5.2E+02	1.7E+04	3.0E+07	--	8.8E+03	2.9E+05	5.0E+08
Propylene glycol, monomethyl ether	107-98-2	--	5.2E+02	1.7E+04	3.0E+07	--	8.8E+03	2.9E+05	5.0E+08
Propylene oxide	75-56-9	7.6E-01	7.8E+00	2.5E+01	4.7E+02	3.3E+01	1.3E+02	1.1E+03	2.1E+04
Pyridine	110-86-1	--	--	--	--	--	--	--	--
Quinalphos	13593-03-8	--	--	--	--	--	--	--	--

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		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
Quinoline	91-22-5	--	--	--	--	--	--	--	--
Resmethrin	10453-86-8	--	--	--	--	--	--	--	--
Ronnel	299-84-3	--	--	--	--	--	--	--	--
Rotenone	83-79-4	--	--	--	--	--	--	--	--
Selenious Acid	7783-00-8	--	--	--	--	--	--	--	--
Selenium	7782-49-2	--	5.2E+00	--	--	--	8.8E+01	--	--
Sethoxydim	74051-80-2	--	--	--	--	--	--	--	--
Silver and compounds	7440-22-4	--	--	--	--	--	--	--	--
Simazine	122-34-9	--	--	--	--	--	--	--	--
Sodium azide	26628-22-8	--	--	--	--	--	--	--	--
Sodium diethyldithiocarbamate	148-18-5	--	--	--	--	--	--	--	--
Sodium fluoroacetate	62-74-8	--	--	--	--	--	--	--	--
Sodium metavanadate	13718-26-8	--	--	--	--	--	--	--	--
Strontium, stable	7440-24-6	--	--	--	--	--	--	--	--
Strychnine	57-24-9	--	--	--	--	--	--	--	--
Styrene	100-42-5	--	2.6E+02	8.7E+03	5.5E+03	--	4.4E+03	1.5E+05	9.3E+04
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	--	--	--	--	--	--	--	--
Tebuthiuron	34014-18-1	--	--	--	--	--	--	--	--
Temephos	3383-96-8	--	--	--	--	--	--	--	--
Terbacil	5902-51-2	--	--	--	--	--	--	--	--
Terbufos	13071-79-9	--	--	--	--	--	--	--	--
Terbutryn	886-50-0	--	--	--	--	--	--	--	--
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	1746-01-6	7.4E-08	1.0E-05	2.5E-06	3.6E-05	3.2E-06	1.8E-04	1.1E-04	1.6E-03
1,1,1,2-Tetrachloroethane	630-20-6	3.8E-01	--	1.3E+01	9.6E+00	1.7E+01	--	5.5E+02	4.2E+02
1,1,2,2-Tetrachloroethane	79-34-5	4.8E-02	--	1.6E+00	7.8E+00	2.1E+00	--	7.0E+01	3.4E+02
Tetrachloroethylene (PCE)	127-18-4	1.1E+01	1.0E+01	3.5E+02	3.2E+01	4.7E+02	1.8E+02	5.8E+03	5.4E+02
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	--	--	--	--	--	--
p,a,a,a-Tetrachlorotoluene	5216-25-1	--	--	--	--	--	--	--	--
Tetrachlorovinphos (Stirofos)	961-11-5	--	--	--	--	--	--	--	--
Tetraethyldithiopyrophosphate	3689-24-5	--	--	--	--	--	--	--	--
Thallium and compounds	7440-28-0	--	--	--	--	--	--	--	--
Thiobencarb	28249-77-6	--	--	--	--	--	--	--	--
Thiofanox	39196-18-4	--	--	--	--	--	--	--	--
Thiophanate-methyl	23564-05-8	--	--	--	--	--	--	--	--
Thiram	137-26-8	--	--	--	--	--	--	--	--
Tin and compounds	7440-31-5	--	--	--	--	--	--	--	--
Toluene	108-88-3	--	1.3E+03	4.3E+04	1.0E+04	--	2.2E+04	7.3E+05	1.7E+05
p-Toluidine	106-49-0	--	--	--	--	--	--	--	--
Tralomethrin	66841-25-6	--	--	--	--	--	--	--	--
Triadimefon (Bayleton)	43121-43-3	--	--	--	--	--	--	--	--
Triallate	2303-17-5	--	--	--	--	--	--	--	--
Triasulfuron	82097-50-5	--	--	--	--	--	--	--	--
Tribenuron-methyl (Express)	101200-48-0	--	--	--	--	--	--	--	--
1,2,4-Tribromobenzene	615-54-3	--	--	--	--	--	--	--	--
Tributyltin oxide (TBTO)	56-35-9	--	--	--	--	--	--	--	--
2,4,6-Trichloroaniline	634-93-5	--	--	--	--	--	--	--	--

Nebraska Department of Environmental Quality Voluntary Cleanup Program Remedial Goals
TABLE B-5: SUBSLAB AND EXTERIOR SOIL GAS and GROUNDWATER TO INDOOR AIR REMEDIAL GOALS

CONTAMINANT	CAS No.	RESIDENTIAL VAPOR INTRUSION				INDUSTRIAL VAPOR INTRUSION			
		Indoor Air		Soil Gas	Groundwater	Indoor Air		Soil Gas	Groundwater
		TCR = 1E-06	THQ = 0.25	TCR=1E-06/ THQ=0.25	TCR=1E-06/ THQ=0.25	TCR = 1E-05	THQ = 1.0	TCR=1E-05/ THQ=1.0	TCR=1E-05/ THQ=1.0
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/L)
2,4,6-Trichloroaniline hydrochloride	33663-50-2	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	--	5.2E-01	1.7E+01	2.7E+01	--	8.8E+00	2.9E+02	4.5E+02
1,1,1-Trichloroethane	71-55-6	--	1.3E+03	4.3E+04	3.6E+03	--	2.2E+04	7.3E+05	6.0E+04
1,1,2-Trichloroethane	79-00-5	1.8E-01	5.2E-02	1.7E+00	3.4E+00	7.7E+00	8.8E-01	2.9E+01	5.8E+01
Trichloroethylene (TCE) Long-term +++	79-01-6	4.8E-01	5.2E-01	1.6E+01	2.4E+00	3.0E+01	8.8E+00	2.9E+02	4.4E+01
Trichloroethylene (TCE) Short-term ‡	79-01-6	4.8E-01	5.2E-01	1.6E+01	2.4E+00	3.0E+01	8.8E+00	2.9E+02	4.4E+01
Trichlorofluoromethane	75-69-4	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	95-95-4	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	9.1E-01	--	--	--	4.0E+01	--	--	--
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	--	--	--	--	--	--	--	--
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1	--	--	--	--	--	--	--	--
1,1,2-Trichloropropane	598-77-6	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	96-18-4	--	7.8E-02	2.6E+00	1.4E+01	--	1.3E+00	4.4E+01	2.4E+02
1,2,3-Trichloropropene	96-19-5	--	7.8E-02	2.6E+00	1.1E-01	--	1.3E+00	4.4E+01	1.8E+00
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	--	1.3E+03	4.3E+04	1.1E+02	--	2.2E+04	7.3E+05	1.8E+03
Tridiphane	58138-08-2	--	--	--	--	--	--	--	--
Triethylamine	121-44-8	--	1.8E+00	6.1E+01	6.5E+02	--	3.1E+01	1.0E+03	1.1E+04
Trifluralin	1582-09-8	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	1.6E+01	5.2E+02	1.6E+02	--	2.6E+02	8.8E+03	2.8E+03
1,3,5-Trimethylbenzene	108-67-8	--	1.6E+01	--	--	--	2.6E+02	--	--
Trimethyl phosphate	512-56-1	--	--	--	--	--	--	--	--
1,3,5-Trinitrobenzene	99-35-4	--	--	--	--	--	--	--	--
Trinitrophenylmethylnitramine (Tetryl)	479-45-8	--	--	--	--	--	--	--	--
2,4,6-Trinitrotoluene (TNT)	118-96-7	--	--	--	--	--	--	--	--
Triphenylphosphine oxide	791-28-6	--	--	--	--	--	--	--	--
Tris(2-chloroethyl) phosphate	115-96-8	--	--	--	--	--	--	--	--
Uranium (chemical toxicity only)	7440-61-0	--	1.0E-02	--	--	--	1.8E-01	--	--
Vanadium and compounds +++	7440-62-2	--	2.6E-02	--	--	--	4.4E-01	--	--
Vernolate (Vernam)	1929-77-7	--	--	--	--	--	--	--	--
Vinclozolin	50471-44-8	--	--	--	--	--	--	--	--
Vinyl acetate	108-05-4	--	5.2E+01	1.7E+03	5.2E+03	--	8.8E+02	2.9E+04	8.7E+04
Vinyl bromide	593-60-2	8.8E-02	7.8E-01	2.9E+00	2.7E-01	3.8E+00	1.3E+01	1.3E+02	1.2E+01
Vinyl chloride +++	75-01-4	1.7E-01	2.6E+01	5.6E+00	2.2E-01	2.8E+01	4.4E+02	9.3E+02	3.7E+01
Warfarin	81-81-2	--	--	--	--	--	--	--	--
Xylenes	1330-20-7	--	2.6E+01	8.7E+02	2.3E+02	--	4.4E+02	1.5E+04	3.8E+03
Zinc	7440-66-6	--	--	No VP	No VP	--	--	No VP	No VP
Zinc phosphide	1314-84-7	--	--	No VP	No VP	--	--	No VP	No VP
Zineb	12122-67-7	--	--	--	--	--	--	--	--

Notes:

+++ See Section 5.4 of Appendix A, Protocol for VCP Remediation Goal Lookup Tables, Nebraska Voluntary Cleanup Program for more information.

-- = Not available/not applicable

µg/L = Micrograms per liter

µg/m^3 = Micrograms per cubic meter

ca = cancer

CAS No. = Chemical Abstract Service Number

nc = noncancer

NVT = Not sufficiently volatile or toxic (in selected exposure scenario)

TCR = Target cancer risk

THQ = Target hazard quotient

ATTACHMENT C

STANDARDIZED EQUATIONS FOR CALCULATING THE VCP REMEDIATION GOALS

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EQUATIONS AND EXPOSURE PARAMETERS FOR CALCULATING THE VCP REMEDIATION GOALS

The equations used to calculate the Nebraska Voluntary Cleanup Program (VCP) remediation goals (RG) for carcinogenic risks and noncarcinogenic effects are presented herein. Note: the VCP RG lookup tables (Attachment B) also include pathway-specific VCP RGs if the user decides against combining specific exposure pathways or if the user wants to identify the relative contribution of each pathway to exposure.

To calculate VCP RGs for volatile contaminants in soil, a chemical-specific volatilization factor is calculated per the volatization factor (VF_s) equation presented here. Because of its reliance on Henry's law, the VF_s model applies only when the contaminant concentration in soil is at or below saturation (i.e., no free-phase contaminant is present). Soil saturation ("sat") corresponds to the contaminant concentration in soil at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above this point, pure liquid-phase contaminant is expected in the soil. If the VCP RG calculated using VF_s exceeds the calculated "sat," the VCP RG was set equal to "sat," in accordance with the "Soil Screening Guidance" (U.S. EPA 1996a, 1996b). The equation for deriving "sat" is presented in this attachment.

VCP RG Equations

All terms within the equations are defined in the text or in **Table C-1** at the end of the attachment. Consistent with U.S. Environmental Protection Agency (U.S. EPA) guidance (2005, 2018), there are separate equations for the various types of chemicals – those that are carcinogenic, noncarcinogenic, mutagenic and also specific equations for trichloroethylene and vinyl chloride – and the equations are grouped by media (U.S. EPA 2017). Those compounds that are mutagenic are noted in Table B-2. For mutagenic compounds, the exposure rates take into account age-specific susceptibility to mutagens through the use of an age dependent adjustment factor (ADAF). For the inhalation pathway, exposure durations were adjusted to account for mutagenic potential.

Residential Soils

Carcinogenic

Residential Soil Incidental Ingestion – Carcinogenic Risks

$$C_{res\ soil\ \ ingestion-ca}\ (mg/kg) = \frac{TR_r \times AT_c}{EF_r \times \left(\frac{IFS_{adj} \times SF_o}{1E+06\, mg/kg}\right)}$$

where:

$$IFS_{adj}\left(\frac{mg-Year}{Kg-day}\right) = \left(\frac{ED_c \times IRS_c}{BW_c}\right) + \left(\frac{ED_r - ED_c \times IRS_a}{BW_a}\right)$$

Residential Dermal Exposure to Soil – Carcinogenic Risks

$$C_{res\ soil\ \ dermal-ca}\ (mg/kg) = \frac{TR_r \times AT_c}{EF_r \times \left(\frac{DFS_{adj} \times ABS_d \times [SF_o / ABS_{GI}]}{1E+06\, mg/kg}\right)}$$

where:

$$DFS_{adj}\left(\frac{mg-Year}{Kg-day}\right) = \frac{ED_c \times SA_c \times AF_c}{BW_c} + \frac{ED_r - ED_c \times SA_a \times AF_a}{BW_a}$$

Residential Soil Inhalation– Carcinogenic Risks

$$C_{res\ soil\ \ inhalation-ca}\ (mg/kg) = \frac{TR_r \times AT_{c-inh}}{EF_r \times ED_a \times IUR \times 1000\,\mu g/mg \times (\frac{1}{VF} + \frac{1}{PEF})}$$

Combined Residential Soil Equation - Carcinogenic Risk

$$C_{res\ soil\text{-}ca} = \frac{1}{\frac{1}{C_{res\ soil\ \ ingestion-ca}} + \frac{1}{C_{res\ soil\ \ dermal-ca}} + \frac{1}{C_{res\ soil\ \ inhalation-ca}}}$$

Noncancer

Residential Soil Incidental Ingestion – Noncarcinogenic Effects (Child)

$$C_{res\,soil\ ingestion-nc}\ (mg/kg) = \frac{THQ_r \times BW_c \times AT_{nc-c}}{EF_r \times ED_{r-c} \times \left(\frac{RBA}{RfD_o}\right) \times IRS_{r-c} \times 1E-06 \frac{kg}{mg}}$$

Residential Dermal Exposure to Soil – Noncarcinogenic Effects

$$C_{res\,soil\ \ dermal-nc}\ (mg/kg) = \frac{THQ_r \times BW_c \times AT_{n-c}}{EF_r \times ED_{r-c} \times \left(\frac{1}{[RfD_o \times ABS_{GI}]}\right) \times SA_{r-c} \times AF_{r-c} \times ABS_d \times 1E-06 \frac{kg}{mg}}$$

Residential Soil Inhalation– Noncarcinogenic Effects

$$C_{res\,soil\ \ inhalation-nc}\ (mg/kg) = \frac{THQ_r \times AT_{nc-c}}{EF_r \times ED_{r-c} \times ET_r \times \left(\frac{1day}{24hours}\right) \times \left(\frac{1}{RfC}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right)}$$

Combined Residential Soil Equation - Noncarcinogenic Effects

$$C_{\,res\,soil\,-\,nc}\ (mg/kg) = \frac{1}{\frac{1}{C_{res\,soil\ ingestion-nc}} + \frac{1}{C_{res\,soil\ \ dermal-nc}} + \frac{1}{C_{res\,soil\ \ inhalation-nc}}}$$

Mutagenic

Residential Soil Incidental Ingestion – Mutagenic Risks

$$C_{res\,soil\ \ ingestion-m}\ (mg/kg) = \frac{TR_r \times AT_c}{SF_o \times RBA \times EF_r \times IFSM_{adj} \times 1E-06 \frac{kg}{mg}}$$

where:

$$IFS(M)_{adj} = \frac{ED_{0-2} \times IRS_c \times ADAF_{0-2}}{BW_c} + \frac{ED_{2-6} \times IRS_c \times ADAF_{2-6}}{BW_c} + \frac{ED_{6-16} \times IRS_a \times ADAF_{6-16}}{BW_a} + \frac{ED_{16-26} \times IRS_a \times ADAF_{16-26}}{BW_a}$$

Residential Dermal Exposure to Soil – Mutagenic Risks

$$C_{res\ soil\ dermal-m}\ (mg/kg) = \frac{TR_r \times AT_c}{EF_r \times \left(\frac{DFSM_{adj} \times ABS_d \times [SF_o / ABS_{GI}]}{1E+06\, mg/kg} \right)}$$

where:

$$DFS(M)_{adj} = \frac{ED_{0-2} \times SA_c \times AF_c \times 10}{BW_c} + \frac{ED_{2-6} \times SA_c \times AF_c \times 3}{BW_c} + \frac{ED_{6-16} \times SA_a \times AF_a \times 3}{BW_a} + \frac{ED_{16-26} \times SA_a \times AF_a \times 1}{BW_a}$$

Residential Soil Inhalation– Mutagenic Risks

$$C_{res\ soil\ inhalation-m}\ (mg/kg) = \frac{TR_r\ x\ AT_c}{IUR \times \left(\frac{1}{VF} + \frac{1}{PEF} \right) \times 1000 \frac{\mu g}{mg} \times ET_r \times \frac{1 day}{24 hours} \times EF_R \times EDM}$$

where:

$$EDM = ED_{0-2} \times 10 + ED_{2-6} \times 3 + ED_{6-16} \times 3 + ED_{16-26} \times 1$$

Combined Residential Soil Equation - Mutagenic Risks

$$C_{res\ soil-m}\ (mg/kg) = \frac{1}{\frac{1}{C_{res\ soil\ ingestion-m}} + \frac{1}{C_{res\ soil\ dermal-m}} + \frac{1}{C_{res\ soil\ inhalation-m}}}$$

Trichloroethylene (TCE)

Note: Only the incidental ingestion and inhalation pathways are evaluated for TCE in soil because it is a volatile compound.

Residential Soil Incidental Ingestion – TCE Carcinogenic/Mutagenic Risks

$$C_{res\ soil\ ingestion-TCE}\ (mg/kg) = \frac{TR_r \times AT_c}{SF_O \times EF_r \times 1E-06 \frac{kg}{mg} \times [IFS_{adj} \times CAFo + IFSM_{adj} \times MAFo]}$$

where:

$$IFS_{adj} \left(\frac{mg-Year}{Kg-day} \right) = \left(\frac{ED_c \times IRS_c}{BW_c} \right) + \left(\frac{ED_r - ED_c \times IRS_a}{BW_a} \right)$$

$$IFS(M)_{adj} = \frac{ED_{0-2} \times IRS_{child} \times ADAF_{0-2}}{BW_{child}} + \frac{ED_{2-6} \times IRS_{child} \times ADAF_{2-6}}{BW_{child}} + \frac{ED_{6-16} \times IRS_{adult} \times ADAF_{6-16}}{BW_{adult}} + \frac{ED_{16-30} \times IRS_{adult} \times ADAF_{16-30}}{BW_{adult}}$$

Residential Soil Inhalation – TCE Carcinogenic/Mutagenic Risks

$$C_{res\ soil\ inhalation-TCE}\ (mg/kg) = \frac{TR_r\ x\ AT_c}{IUR \times \left(\frac{1}{VF} + \frac{1}{PEF}\right) \times 1000\frac{\mu g}{mg} \times ET_r \times \frac{1day}{24hours} \times EF_R \times \left(ED_r \times CAF_i + EDM_r \times MAF_i\right)}$$

where:

$$EDM = ED_{0-2} \times 10 + ED_{2-6} \times 3 + ED_{6-16} \times 3 + ED_{16-26} \times 1$$

Combined Residential Soil Equation – TCE Risks

$$C_{res\ soil\ -\ TCE} = \frac{1}{\frac{1}{C_{res\ soil\ ingestion-TCE}} + \frac{1}{C_{res\ soil\ inhalation-TCE}}}$$

Vinyl Chloride

Note: Only the incidental ingestion and inhalation pathways are evaluated for vinyl chloride in soil because it is a volatile compound.

Residential Soil Incidental Ingestion – Vinyl Chloride Carcinogenic/Mutagenic Risks

$$C_{res\ soil\ ingestion-VC}\ (mg/kg) = \frac{TR_r}{\left(\frac{SF_o \times EF_r \times IFS_{adj} \times 1E-06\frac{kg}{mg}}{AT_c}\right) + \left(\frac{SF_o \times IRS_c \times 1E-06\frac{kg}{mg}}{BW_c}\right)}$$

where:

$$IFS_{adj}\left(\frac{mg-Year}{Kg-day}\right) = \left(\frac{ED_c \times IRS_c}{BW_c}\right) + \left(\frac{ED_r - ED_c \times IRS_a}{BW_a}\right)$$

Residential Soil Inhalation – Vinyl Chloride Carcinogenic/Mutagenic Risks

$$C_{res\ soil\ inhalation-VC}\ (mg/kg) = \frac{TR_r}{\left(\frac{IUR \times EF_r \times ED_r \times ET_r \times \frac{1day}{24hours} \times 1000\frac{\mu g}{mg}}{AT_c \times VF}\right) + \left(\frac{IUR}{VF_s} \times 1000\frac{\mu g}{mg}\right)}$$

Combined Residential Soil Equation – Vinyl Chloride Effects

$$C_{res\ soil\text{-}VC} = \frac{1}{\frac{1}{C_{res\ soil\ ingestion-VC}} + \frac{1}{C_{res\ soil\ inhalation-VC}}}$$

Industrial Soil

Carcinogenic

Industrial Soil Incidental Ingestion – Carcinogenic Risks

$$C_{ind\ soil\ ingestion-ca}\ (mg/kg) = \frac{TR_w \times BW_a \times AT_c}{EF_w \times ED_w \times \left(\frac{IRS_w \times SF_o}{1E+06\, mg/kg}\right)}$$

Industrial Dermal Exposure to Soil – Carcinogenic Risks

$$C_{ind\ soil\ dermal-ca}\ (mg/kg) = \frac{TR_w \times BW_a \times AT_c}{EF_w \times ED_w \times \left(\frac{SA_{a-w} \times AF_{a-w} \times ABS_d \times SF_o / ABS_{GI}}{1E+06\, mg/kg}\right)}$$

Industrial Soil Inhalation– Carcinogenic Risks

$$C_{ind\ soil\ inhalation-ca}\ (mg/kg) = \frac{TR_w \times AT_{c-inh}}{EF_w \times ED_w \times ET_w \times \left(\frac{1000\,\mu g/mg\ x\ IUR}{VF_s}\right)}$$

Combined Industrial Soil Equation – Carcinogenic Risks

$$\frac{1}{\frac{1}{C_{ind\ soil\ ingestion-ca}} + \frac{1}{C_{ind\ soil\ dermal-ca}} + \frac{1}{C_{ind\ soil\ inhalation-ca}}}$$

Noncancer

Industrial Soil Incidental Ingestion – Noncarcinogenic Effects

$$C_{ind\ soil\ ingestion-nc}\ (mg/kg) = \frac{THQ_w \times BW_a \times AT_n}{EF_w \times ED_w \times \left(\frac{1}{RfD_o} \times \frac{IRS_w}{1E+06\, mg/kg}\right)}$$

Industrial Dermal Exposure to Soil – Noncarcinogenic Effects

$$C_{ind\ soil\ dermal-nc}\ (mg/kg) = \frac{THQ_w \times BW_a \times AT_n}{EF_w \times ED_w \times \left(\frac{1}{[RfD_o \times ABS_{GI}]} \times \frac{SA_{a-w} \times AF_{a-w} \times ABS_d}{1E+06\, mg/kg} \right)}$$

Industrial Soil Inhalation– Noncarcinogenic Effects

$$C_{ind\ soil\ ingestion-nc}\ (mg/kg) = \frac{THQ_w \times RfC \times AT_{n-inh}}{EF_w \times ED_w \times ET_w \times \left(\frac{1}{VF} + \frac{1}{PEF} \right)}$$

Combined Industrial Soil Equation - Noncarcinogenic Effects

$$C_{ind\ soil-nc} = \frac{1}{\frac{1}{C_{ind\ soil\ ingestion-nc}} + \frac{1}{C_{ind\ soil\ dermal-nc}} + \frac{1}{C_{ind\ soil\ inhalation-nc}}}$$

Groundwater Equations: For groundwater, equations were based on ingestion, dermal contact, and inhalation of vapors (volatile compounds only).

Carcinogenic

Ground Water Ingestion – Carcinogenic Risks

$$C_{wat\ ingestion-ca}\ (\mu g/L) = \frac{TR_r \times AT_c \times 1000\,\mu g/mg}{SF_o \times EF_r \times IFW_{adj}}$$

where:

$$IFW_{adj} = \frac{ED_c \times IRW_c}{BW_c} + \frac{ED_r - ED_c \times IRW_a}{BW_a}$$

Ground Water Dermal Contact – Carcinogenic Risks

If EPD is Yes, then:

For Inorganics:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times FA \times Kp \times ET_b}$$

For Organics:

If ET ≤ t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times FA \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_b}{\Pi}}}$$

If ET > t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{FA \times Kp \times \left[\frac{ET_b}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

where:

$$DA_{event} = \frac{TR_r \times AT_c \times 1000 \frac{\mu g}{mg}}{\left(\frac{SFo}{ABS_{GI}}\right) \times EF_r \times DFW_{adj}}$$

$$DFW_{adj} = \frac{ED_c \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times SA_a}{BW_a}$$

Ground Water Inhalation – Carcinogenic Risks

$$C_{wat\ inhalation-ca}\ (\mu g / L) = \frac{TR_r \times AT_c}{EF_r \times ED_r \times ET_r \times K \times CF_i \times IUR}$$

Combined Ground Water Equation – Carcinogenic Contaminants

$$C_{wat\ gw\text{-}ca} = \frac{1}{\frac{1}{C_{wat\ ingestion-ca}} + \frac{1}{C_{wat\ dermal-ca}} + \frac{1}{C_{wat\ inhalation-ca}}}$$

Noncancer

Ground Water Ingestion – Noncarcinogenic Effects

$$C_{wat\ ingestion-nc}\ (\mu g / L) = \frac{THQ_r \times BW_c \times AT_{nc-c} \times 1000\ \mu g / mg}{EF_r \times ED_c \times \left(\frac{1}{RfD_o}\right) \times IRW_c}$$

Ground Water Dermal Contact – Noncarcinogenic Effects

If EPD is Yes, then:

For Inorganics:

$$C_{wat\ dermal-nc}\ (\mu g / L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times ET_b}$$

For Organics:

If ET ≤ t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times FA \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_b}{\Pi}}}$$

If ET > t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{FA \times Kp \times \left[\frac{ET_b}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]}$$

where:

$$DA_{event} = \frac{THQ_r \times AT_{nc-c} \times 1000 \frac{\mu g}{mg}}{\left(\frac{1}{RfDo \times ABS_{GI}} \right) \times ED_c \times EF_r \times SA_c}$$

$$DFW_{adj} = \frac{ED_c \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times SA_a}{BW_a}$$

Ground Water Inhalation – Noncarcinogenic Effects

$$C_{wat\ inhalation-nc}\ (\mu g/L) = \frac{THQ_r \times AT_{nc} \times 1000\ \mu g/mg}{EF_r \times ED_c \times ET_c \times \left(\frac{1day}{24hours} \right) \times \left(\frac{1}{RfC} \right) \times K}$$

Combined Ground Water Equation – Noncarcinogenic Contaminants

$$C_{wat\ gw\text{-}nc} = \frac{1}{\frac{1}{C_{wat\ ingestion-nc}} + \frac{1}{C_{wat\ dermal-nc}} + \frac{1}{C_{wat\ inhalation-nc}}}$$

Mutagenic

Ground Water Ingestion – Mutagenic Risks

$$C_{wat\ ingestion-ca}\ (\mu g/L) = \frac{TR_r \times AT_c \times 1000\,\mu g/mg}{EF_r \times IFW(M)_{adj} \times SF_o}$$

where:

$$IFWM_{adj} = \frac{ED_{0-2} \times IFW_{child} \times ADAF_{0-2}}{BW_{child}} + \frac{ED_{2-6} \times IFW_{child} \times ADAF_{2-6}}{BW_{child}} + \frac{ED_{6-16} \times IFW_{adult} \times ADAF_{6-16}}{BW_{adult}} + \frac{ED_{16-30} \times IFW_{adult} \times ADAF_{16-30}}{BW_{adult}}$$

Ground Water Dermal Contact – Mutagenic Risks

If EPD is Yes, then:

For Inorganics:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000\frac{cm^3}{L}}{2 \times FA \times Kp \times ET_b}$$

For Organics:

If ET ≤ t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000\frac{cm^3}{L}}{2 \times FA \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_b}{\Pi}}}$$

If ET > t*, then:

$$C_{wat\ dermal-ca}\ (\mu g/L) = \frac{DA_{event} \times 1000\frac{cm^3}{L}}{FA \times Kp \times \left[\frac{ETb_{adj}}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

where:

$$DA_{event} = \frac{TR_r \times AT_c \times 1000\frac{\mu g}{mg}}{\left(\frac{SFo}{ABS_{GI}}\right) \times EF_r \times DFWM_{adj}}$$

$$DFWM_{adj} = \frac{ED_{0-2} \times SA_c \times 10}{BW_c} + \frac{ED_{2-6} \times SA_c \times 3}{BW_c} + \frac{ED_{6-16} \times SA_a \times 3}{BW_a} + \frac{ED_{16-26} \times SA_a \times 1}{BW_a}$$

Ground Water Inhalation – Mutagenic Risks

$$C_{wat\ inhalation-m}\ (\mu g/L) = \frac{TR_r \times AT_c}{EF_r \times EDM \times ET_r \times K \times CF_i \times IUR}$$

where:

$$EDM = ED_{0-2} \times 10 + ED_{2-6} \times 3 + ED_{6-16} \times 3 + ED_{16-26} \times 1$$

Combined Ground Water Equation – Mutagenic Contaminants

$$C_{wat\ gw\text{-}m} = \frac{1}{\frac{1}{C_{wat\ ingestion-m}} + \frac{1}{C_{wat\ dermal-m}} + \frac{1}{C_{wat\ inhalation-m}}}$$

Trichloroethylene (TCE)

Ground Water Ingestion

$$C_{wat\ ingestion-ca-TCE}\ (\mu g/L) = \frac{TR_r \times AT_c \times 1000\,\mu g/mg}{EF_r \times [IFW_{adj} \times CAFo + IFWM_{adj} \times MAFo] \times SF_o}$$

where:

$$IFW_{adj} = \frac{ED_c \times IRW_c}{BW_c} + \frac{ED_r - ED_c \times IRW_a}{BW_a}$$

$$IFWM_{adj} = \frac{ED_{0-2} \times IFW_{child} \times ADAF_{0-2}}{BW_{child}} + \frac{ED_{2-6} \times IFW_{child} \times ADAF_{2-6}}{BW_{child}} + \frac{ED_{6-16} \times IFW_{adult} \times ADAF_{6-16}}{BW_{adult}} + \frac{ED_{16-30} \times IFW_{adult} \times ADAF_{16-30}}{BW_{adult}}$$

Ground Water Dermal Contact – TCE Carcinogenic/Mutagenic Risks

If ET ≤ t*, then:

$$C_{wat\ dermal-ca-TCE}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times FA \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_b}{\Pi}}}$$

If ET > t*, then:

$$C_{wat\ dermal-ca-TCE}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{FA \times Kp \times \left[\frac{ET_b}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]}$$

where:

$$DA_{event-TCE} = \frac{TR_r \times AT_c \times 1000 \frac{\mu g}{mg}}{\left(\frac{SFo}{ABS_{GI}} \right) \times EF_r \times (DFW_{adj} \times CAFo + DFWM_{adj} \times MAFo)}$$

$$DFW_{adj} = \frac{ED_c \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times SA_a}{BW_a}$$

$$DFWM_{adj} = \frac{ED_{0-2} \times SA_c \times 10}{BW_c} + \frac{ED_{2-6} \times SA_c \times 3}{BW_c} + \frac{ED_{6-16} \times SA_a \times 3}{BW_a} + \frac{ED_{16-26} \times SA_a \times 1}{BW_a}$$

Ground Water Inhalation-TCE Carcinogenic/Mutagenic Risks

$$C_{wat\ inhalation-ca-TCE}\ (\mu g/L) = \frac{TR_r \times AT_c}{EF_r \times (EDr \times CAFi + EDM \times MAFi) \times ET_r \times K \times CF_i \times IUR}$$

where:

$$EDM = ED_{0-2} \times 10 + ED_{2-6} \times 3 + ED_{6-16} \times 3 + ED_{16-26} \times 1$$

Vinyl Chloride

Ground Water Ingestion – Vinyl Chloride Risks

$$C_{wat\ ingestion-vc}\ (\mu g/L) = \frac{TR_r \times 1000\ \mu g/mg}{\left(\left(EF_r \times IFW_{adj} \times SF_o \right) \frac{1}{AT_c} \right) + \left(\frac{SF_o \times IRW_c}{BW_c} \right)}$$

Ground Water Dermal Contact – Vinyl Chloride Risks

If ET ≤ t*, then:

$$C_{wat\ dermal-ca-VC}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{2 \times FA \times Kp \times \sqrt{\frac{6 \times \tau_{event} \times ET_b}{\Pi}}}$$

If ET > t*, then:

$$C_{wat\ dermal-ca-VC}\ (\mu g/L) = \frac{DA_{event} \times 1000 \frac{cm^3}{L}}{FA \times Kp \times \left[\frac{ET_b}{1+B} + 2 \times \tau_{event} \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

where:

$$DA_{event-VC} = \frac{TR_r \times AT_c \times 1000 \frac{\mu g}{mg}}{\left(\frac{SFo}{ABS_{GI}}\right) \times EF_r \times DFW_{adj}}$$

$$DFW_{adj} = \frac{ED_c \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times SA_a}{BW_a}$$

$$DFWM_{adj} = \frac{ED_{0-2} \times SA_c \times 10}{BW_c} + \frac{ED_{2-6} \times SA_c \times 3}{BW_c} + \frac{ED_{6-16} \times SA_a \times 3}{BW_a} + \frac{ED_{16-26} \times SA_a \times 1}{BW_a}$$

Ground Water Inhalation – Vinyl Chloride Risks

$$C_{wat\ inhalation-vc}\ (\mu g/L) = \frac{TR_r}{\left((EF_r \times ED_a \times ET_a \times K \times CF_i \times IUR) \times \frac{1}{AT_c}\right) + (IUR \times K)}$$

Combined Ground Water Equation – Vinyl Chloride

$$\frac{1}{\frac{1}{C_{wat\ ingestion-VC}} + \frac{1}{C_{wat\ dermal-VC}} + \frac{1}{C_{wat\ inhalation-VC}}}$$

SUPPORTING EQUATIONS

Soil-to-Air Volatilization Factor (VF_s)

Derivation of the Volatilization Factor

$$VF_s\,(m^3/kg) = Q/C\; x\; \frac{(3.14\,x\,D_A\,x\,T)^{1/2}}{(2\,x\,\rho_b\,x\,D_A)}\; x1E-04\,m^2/cm^2$$

Where:

$$D_A\,(cm^2/\sec) = \frac{[(\theta_a^{\,10/3}\;x\,D_i\,x\,H' + \theta_w^{\,10/3}\,x\,D_w)/n^2]}{\rho_b\,x\,K_d + \theta_w + \theta_a\,x\,H'}$$

Where:

Parameter	Definition	Units	Default Value
D_A	Apparent diffusivity	cm^2/sec	Chemical-specific (calculated)
D_i	Diffusivity in air	cm^2/sec	Chemical-specific
D_w	Diffusivity in water	cm^2/sec	Chemical-specific
f_{oc}	Fraction organic carbon in soil	g/g	0.006 (0.6%)
H	Henry's Law Constant	atm-m^3/mole	Chemical-specific
H'	Dimensionless Henry's Law Constant, = H x 41	unitless	Chemical-specific (calculated)
K_d	Soil-water partition coefficient, = K_{oc} x f_{oc}	cm^3/g	Chemical-specific (calculated for organics)
K_{oc}	Soil-organic carbon-water partition coefficient	cm^3/g	Chemical-specific
n	Total soil porosity	(L_{pore}/L_{soil})	0.43 or 1-(ρ_b/ρ_s)
Q/C	Inverse of the mean contaminant conc. at the center of a 0.5-acre square source	g/m^2-sec/kg-m^3	81.64 (value for Lincoln, NE)
T	Exposure interval	sec	9.5E+08
VF_s	Volatilization factor	m^3/kg	Chemical-specific (calculated)
θ_a	Air-filled soil porosity	(L_{air}/L_{soil})	0.28 or n-θ_w
θ_w	Water-filled soil porosity	(L_{water}/L_{soil})	0.15
ρ_b	Dry soil bulk density	g/cm^3	1.5
ρ_s	Soil particle density	g/cm^3	2.65

Soil-to-Air Particulate Emission Factor (PEF)

Derivation of the Particulate Emission Factor

$$PEF\ m^3/kg = Q/C\ x\left(\frac{[3600\ \text{sec}/hr]}{[0.036\ x\ (1-V)\ x\ (U_m/U_t)^3\ x\ F(x)]}\right)$$

Where:

Parameter	Definition	Units	Default Value
F(x)	Function dependent on U_m/U_t derived using Cowherd and others (1985)	unitless	0.194
PEF	Particulate emission factor	m3/kg	1.2E+09 (calculated)
Q/C	Inverse of the mean contaminant conc. at the center of a 0.5-acre square source	g/m^2-sec/kg-m^3	81.64 (value for Lincoln, NE)
U_m	Mean annual windspeed	m/sec	4.69
U_t	Equivalent threshold value of windspeed at 7 m	m/sec	11.32
V	Fraction of vegetative cover	unitless	0.5

Soil Saturation Concentration (sat)

Derivation of the Soil Saturation Limit

$$sat = \frac{S}{\rho_b}\ x\ (K_d\ x\ \rho_b + \theta_w + H'\ x\ \theta_a)$$

Where:

Parameter	Definition	Units	Default Value
sat	Soil saturation concentration	mg/kg	Chemical-specific (calculated)
S	Solubility in water	mg/L-water	Chemical-specific
ρ_b	Dry soil bulk density	kg/L	1.5
n	Total soil porosity	L_{pore}/L_{soil}	0.43 or 1-ρ_b/ρ_s
ρ_s	Soil particle density	kg/L	2.65
K_d	Soil-water partition coefficient, = K_{oc} x f_{oc}	L/kg	Chemical-specific (calculated for organics)
K_{oc}	Soil-organic carbon-water partition coefficient	L/kg	Chemical-specific
f_{oc}	Fraction organic carbon content of soil	g/g	0.006 (0.6%)
θ_w	Water-filled soil porosity	L_{water}/L_{soil}	0.15
θ_a	Air-filled soil porosity	L_{air}/Ls_{oil}	0.28 or n-θ_w
w	Average soil moisture content	kg_{water}/kg_{soil} or L_{water}/kg_{soil}	0.1
H	Henry's Law Constant	atm-m^3/mole	Chemical-specific
H'	Dimensionless Henry's Law Constant, = H x 41	unitless	Chemical-specific (calculated)

Soil-to-Ground Water RG

Derivation of the Soil-to-Ground water RG

$$RG(mg/kg) = C_w \; x \; DAF \; x [K_d + \frac{(\theta_w + \theta_a \; x \; H')}{\rho_b}]$$

Where:

Parameter	Definition	Units	Default Value
C_w	Target soil leachate concentration	mg/L	Chemical-specific (MCL, or calculated ground water combined value if no MCL available)
DAF	Dilution attenuation factor	unitless	20
f_{oc}	Fraction organic carbon content of soil	g/g	0.002 (0.2%)
H	Henry's Law Constant	atm-m^3/mole	Chemical-specific
H'	Dimensionless Henry's Law Constant = H x 41	unitless	Chemical-specific (calculated)
K_d	Soil-organic carbon/water partition coefficient, = K_{oc} x f_{oc}	L/kg	Chemical-specific (calculated for organics)
n	Total soil porosity	L_{pore}/L_{soil}	0.43 or 1-ρ_b/ρ_s
θ_a	Air-filled soil porosity	L_{air}/Ls_{oil}	0.13 or n-θ_w
θ_w	Water-filled soil porosity	L_{water}/L_{soil}	0.3
ρ_b	Dry soil bulk density	kg/L	1.5
ρ_s	Soil particle density	kg/L	2.65

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TABLE C-1

STANDARD DEFAULT FACTORS

Symbol	Definition	Units	Default Value	Reference
ABS_d	Dermal absorption factors	unitless	Chemical-specific	RAGS (Part E), U.S. EPA 2004
AF_{a-r}	Adherence factor for soils, adult resident	mg/cm^2	0.07	RAGS (Part E), U.S. EPA 2004
AF_{a-w}	Adherence factor for soils, adult worker	mg/cm^2	0.2	RAGS (Part E), U.S. EPA 2004
AF_c	Adherence factor for soils, child	mg/cm^2	0.2	RAGS (Part E), U.S. EPA 2004
AT_c	Averaging time, carcinogens	days	25,550	RAGS (Part A), U.S. EPA 1989
AT_n	Averaging time, noncarcinogens	days	ED x 365	RAGS (Part A), U.S. EPA 1989
BW_a	Body weight, adult	kg	80	Exposure Factors, U.S. EPA 2014
BW_c	Body weight, child	kg	15	Exposure Factors, U.S. EPA 2014
CAFi	Cancer Adjustment Factor – inhalation	unitless	0.756	EPA 2017
CAFo	Cancer Adjustment Factor - oral	unitless	0.804	EPA 2017
DFS_{adj}	Age-adjusted dermal factor – soil	mg-year/kg-day	295 (calculated)	U.S. EPA 2005
$DFSM_{adj}$	Age-adjusted dermal factor – soil, mutagenic	mg-year/kg-day	1,224 (calculated)	U.S. EPA 2005
DFW_{adj}	Age-adjusted dermal factor – water	events-cm^2/kg	7,459 (calculated)	U.S. EPA 2005
$DFWM_{adj}$	Age-adjusted dermal factor – water, mutagenic	events-cm^2/kg	23,405 (calculated)	U.S. EPA 2005
ED_c	Exposure duration, child	years	6	Exposure Factors, U.S. EPA 2014
ED_a	Exposure duration, adult resident	years	20 [a]	Exposure Factors, U.S. EPA 2014
EDM	Exposure duration, age-adjusted for mutagenic compounds	years	72	U.S. EPA 2005
ED_w	Exposure duration, industrial	years	25	Exposure Factors, U.S. EPA 2014
EF_r	Exposure frequency, residential	days/year	350	Exposure Factors, U.S. EPA 2014
EF_w	Exposure frequency, industrial	days/year	250	Exposure Factors, U.S. EPA 2014
ET_r	Exposure Time, residential	hours/day	24	Exposure Factors, U.S. EPA 2014
ET_w	Exposure Time, worker	hours/day	8	Exposure Factors, U.S. EPA 2014
ETb_{adj}	Exposure time, bathing - age-adjusted.	hours/event	0.67	Exposure Factors, U.S. EPA 2014
ETb_{a-r}	Exposure time, bathing - adult resident	hours/day	0.54	Exposure Factors, U.S. EPA 2014
ETb_{a-c}	Exposure time, bathing - child resident	hours/day	0.71	Exposure Factors, U.S. EPA 2014
EV	Event frequency	Events per day	1	Exposure Factors, U.S. EPA 2014
IFS_{adj}	Age-adjusted soil ingestion factor	mg-year/kg-day	105 (calculated)	U.S. EPA 2005
$IFSM_{adj}$	Age-adjusted soil ingestion factor - mutagenic	mg-year/kg-day	477 (calculated)	U.S. EPA 2005
IFW_{adj}	Age-adjusted water ingestion factor	L-year/kg-day	0.94 (calculated)	U.S. EPA 2005

TABLE C-1 (Continued)

STANDARD DEFAULT FACTORS

Symbol	Definition	Units	Default Value	Reference
$IFWM_{adj}$	Age-adjusted water ingestion factor - mutagenic	L-year/kg-day	2.91 (calculated)	U.S. EPA 2005
IRS_a	Soil ingestion rate, adult	mg/day	100	Exposure Factors, U.S. EPA 2014
IRS_c	Soil ingestion rate, child	mg/day	200	Exposure Factors, U.S. EPA 2014
IRS_w	Soil ingestion rate, industrial	mg/day	100	Soil Screening Guidance, U.S. EPA 2002
IRW_a	Drinking water ingestion rate, adult	L/day	2.5	Exposure Factors, U.S. EPA 2014
IRW_c	Drinking water ingestion rate, child	L/day	0.78	Exposure Factors, U.S. EPA 2014
IUR	Inhalation unit risk factor	$(\mu g/m^3)^{-1}$	Chemical-specific	EPA 2017
K	Volatilization factor for water (Andelman Volatilization Factor)	L/m^3	0.5	RAGS (Part B), U.S. EPA 1991
MAFi	Mutagenic adjustment factor - inhalation	unitless	0.244	EPA 2017
MAFo	Mutagenic adjustment factor - oral	unitless	0.202	EPA 2017
PEF	Particulate emission factor	m^3/kg	2.0E+09 (calculated)	Soil Screening Guidance, U.S. EPA 1996a; and 1996b
RfC	Inhalation reference concentration	mg/m^3	Chemical-specific	EPA 2017
RfD_o	Reference dose, oral	mg/kg-day	Chemical-specific	EPA 2017
SA_{a-r}	Exposed surface area for soil/dust, adult resident	cm^2/day	6,032	Exposure Factors, U.S. EPA 2014
SA_{a-w}	Exposed surface area for soil/dust, adult worker	cm^2/day	2,690	Exposure Factors, U.S. EPA 2014
SA_c	Exposed surface area for child in soil	cm^2/day	2,373	Exposure Factors, U.S. EPA 2014
Sat	Soil saturation concentration	mg/kg	Chemical-specific	Soil Screening Guidance, U.S. EPA 1996a; and 1996b
SF_o	Oral cancer slope factor	$(mg/kg\text{-}day)^{-1}$	Chemical-specific	EPA 2017
THQ_r	Target hazard quotient, residential	unitless	0.25	Nebraska Department of Environmental Quality
THQ_w	Target hazard quotient, industrial	unitless	1	Nebraska Department of Environmental Quality
TR_r	Target cancer risk, residential	unitless	1E-06	Nebraska Department of Environmental Quality
TR_w	Target cancer risk, industrial	unitless	1E-05	Nebraska Department of Environmental Quality
VF_s	Volatilization factor for soil	m^3/kg	Chemical-specific	Soil Screening Guidance, U.S. EPA 1996a; 1996b

TABLE C-1 (Continued)

STANDARD DEFAULT FACTORS

Footnotes:

[a] Exposure duration for lifetime residents is assumed to be 26 years total. For carcinogens, exposures are combined for children (6 years) and adults (20 years).

cm^2/day	square centimeters per day
kg	kilogram
L/day	liter per day
L/m^3	liter per cubic meter
m^3-year/kg-day	cubic meter year per kilogram per day
m^3/day	cubic meter per day
m^3/kg	cubic meter per kilogram
mg/cm^3	milligram per cubic centimeter
mg/day	milligram per day
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram body weight per day
mg/m^3	milligram per cubic meter
mg-year/kg-day	milligram year per kilogram per day
µg/m^3	microgram per cubic meter

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ATTACHMENT D

APPROACH FOR THE DEVELOPMENT OF REMEDIATION GOALS FOR THE VAPOR INTRUSION TO INDOOR AIR EXPOSURE PATHWAY

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ATTACHMENT D

APPROACH FOR THE DEVELOPMENT OF NDEE VCP REMEDIATION GOALS FOR THE VAPOR INTRUSION TO INDOOR AIR EXPOSURE PATHWAY

CONTENTS

ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
COPC	Chemical of potential concern
Hg	Mercury
NDEE	Nebraska Department of Environment and Energy
OSHA	Occupational Safety and Health Administration
mm	Millimeter
U.S. EPA	U.S. Environmental Protection Agency
VCP	Voluntary Cleanup Program
VISL	Vapor Intrusion Screening Levels

APPROACH FOR THE DEVELOPMENT OF NDEE VCP REMEDIATION GOALS FOR THE VAPOR INTRUSION TO INDOOR AIR EXPOSURE PATHWAY

1.0 INTRODUCTION

The Nebraska Department of Environment and Energy (NDEE) Voluntary Cleanup Program (VCP) has developed remediation goals for soil and groundwater exposures to residents and commercial/industrial receptors via ingestion, dermal contact, and inhalation of outdoor dust and vapors; however, these remediation goals do not include the potential impacts of vapor intrusion to indoor air from soil or groundwater. This attachment presents the methodology for estimating concentrations of chemicals of potential concern (COPC) in indoor air from impacted soil or groundwater by vapor intrusion. Volatile contamination in a source medium (such as soil or groundwater) can migrate to other environmental media by volatilization, diffusion, or advection. For example, volatile organic compounds in soil can vaporize into soil gas and migrate into indoor air (through cracks in a building's foundation). NDEE has developed remediation goals for volatile COPCs in soil gas and groundwater that would be protective for human receptors exposed via vapor intrusion to indoor air.

Several approaches were considered in developing remediation goals protective for human receptors possibly vulnerable to vapor intrusion to indoor air. One approach would be to develop remediation goals for soils and groundwater that would be protective for this pathway. However, current U.S. Environmental Protection Agency (U.S. EPA) guidance does not recommend using soil data to evaluate vapor intrusion to indoor air (U.S. EPA 2015). U.S. EPA notes concerns with how the data would be obtained and the number of variables that would impact volatilization of compounds from a soil matrix to soil gas followed by migration to indoor air. U.S. EPA recommends use of only soil gas or groundwater data to estimate indoor air concentrations for the vapor intrusion pathway. Therefore, the NDEE VCP approach assumes U.S. EPA's position and develops vapor intrusion-based remediation goals for soil gas and groundwater media.

To develop remediation goals for this pathway, U.S. EPA's Vapor Intrusion Screening Level (VISL) calculator (U.S. EPA 2017a), Version 3.5 updated to 2018 toxicity values (U.S. EPA 2018) is used to estimate concentrations of volatile COPCs in soil gas and groundwater that would result in indoor air concentrations equivalent to the target cancer risk or noncancer hazard.

The VISL is based on the Johnson and Ettinger (1991) vapor intrusion model and uses a standard set of default parameters for the calculations. The Johnson and Ettinger model is a one-dimensional model that estimates convective and diffusive transport of chemical vapors emanating from groundwater and soil gas into indoor spaces located directly above or near the source of contamination. A detailed description of the vapor intrusion model is provided in "Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)" (U.S. EPA 2015). The VISL calculator incorporates simplifying assumptions into the Johnson and Ettinger model regarding the distribution and occurrence of chemicals, subsurface characteristics, transport mechanisms, and building construction.

1.1 INDOOR AIR MIGRATION PATHWAY AND MODELING ANALYSES

The subsurface target concentrations in the VISL Calculator (U.S. EPA 2017a) are based on the generic conceptual model for vapor intrusion described in U.S. EPA's vapor intrusion guidance (2015). This conceptual model assumes a groundwater or vadose zone source of volatile vapors that diffuse upwards through unsaturated soils towards the surface and into buildings. In this model, the soil in the vadose zone is considered to be relatively homogeneous and isotropic. The receptors are assumed to be occupants in buildings with poured concrete foundations (for example, basement or slab on grade foundations or crawlspaces without a liner or other vapor barrier). The underlying assumption for this generic model is that contaminant vapor concentrations will tend to reduce or attenuate in the subsurface as vapors migrate upward from the source through dispersive mechanisms and that site-specific building characteristics will tend to further dilute the vapors as they mix with the air in the building.

Remediation goals for vapor intrusion are limited to volatile chemicals. Volatile chemicals are identified using the definition of volatility (vapor pressure is greater than 1 millimeter of mercury (mm Hg), or Henry's Law constant greater than 1 x 10^{-5} atmosphere-cubic meter per mole) adopted from U.S. EPA (2015). The chemicals that meet the volatile definition are identified in Attachment B of the Remediation Goals Protocol, Table B-2, noted with a "1" in the VOL column. The model incorporates chemical-specific fate and transport values as needed.

Consistent with the current remediation goals, the vapor intrusion goals are calculated using exposure factors established in the VCP guidance and based on standard target excess cancer risks and hazards indices (residential—1E-06 and 0.25, and commercial/industrial—1 E-05 and 1). There are chemicals for

which toxicity values are not provided due to U.S. EPA guidance (2017b) indicating the current opinion that route-to-route extrapolation of toxicity data is not appropriate, and that those chemicals for which no values are provided have no viable toxicity data for the inhalation exposure route. If there is a specific volatile chemical present at a VCP site for which no toxicity data is available, either a Tier 3 assessment could be performed or a proposed remediation goal could be calculated using U.S. EPA vapor intrusion guidance (2015), with an inhalation toxicity value reviewed and ultimately approved by the NDEE.

1.2 RECEPTORS

The VCP soil remediation goals are developed for residential and industrial/commercial receptors, while groundwater remediation goals are developed for residents only. Consistent with the soil remediation goals, the vapor intrusion goals are developed for both residential and industrial/commercial receptors. Current U.S. EPA (2015) guidance acknowledges the potential inconsistency between U.S. EPA and Occupational Safety and Health Administration (OSHA) goals for worker exposure. However, workers in an office setting are not covered by OSHA and these values would be appropriate.

2.0 VAPOR INTRUSION INPUT PARAMETERS

Volatilization of contaminants located in soil and groundwater, and the subsequent mass transport of these vapors into indoor spaces, constitute a potential inhalation exposure pathway evaluated through risk assessment. Johnson and Ettinger (1991) introduced a screening-level model that incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from soil and groundwater into indoor spaces located directly above or in close proximity to the source of contamination.

2.1 VAPOR INTRUSION MODEL

The vapor intrusion model provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. The model for soil gas and groundwater is constructed as a steady-state solution to vapor transport (infinite or nondiminishing source). Air emissions and transport of volatile COPCs from soil gas or groundwater to indoor air, and thus inputs to the model, are based on chemical properties of the contaminant and appropriate exposure assumptions for those receptors under evaluation (U.S. EPA 2015). The model also incorporates default fate and transport chemical parameters such as vapor pressure and Henry's Law constants. Additionally, the model incorporates inhalation toxicity factors selected based on U.S. EPA hierarchy (U.S. EPA 2003) and consistent with the toxicity values used in the Regional Screening Levels (U.S. EPA 2018).

Sub-Slab and Exterior Soil Gas

The VCP RGs for sub-slab and exterior soil gas concentrations that would be protective for indoor air are calculated by dividing the acceptable indoor air concentration by EPA's generic attenuation factor of 0.03 (EPA 2015) using the following equation.

$$C_{soil-gas} = \frac{C_{target,ia}}{AF_{ss}}$$

Where:

$C_{soil-gas}$ = Target soil gas concentration (microgram per cubic meter [µg/m^3])

$C_{target.is}$ = Target indoor air concentrations (µg/m^3)

AF_{ss} = Attenuation factor (ratio of indoor air concentration to sub-slab or soil gas concentration; default value is 0.03)

Groundwater

The VCP RGs for groundwater corresponding to a chemical's target indoor air concentration are calculated by dividing the target indoor air concentration by an attenuation factor of 0.001 (EPA 2015) and then converting the vapor concentration to an equivalent groundwater concentration. This assumes there is equilibrium between the groundwater and the vapor phase at the water table and this equilibrium obeys Henry's Law. The following equations were used.

$$C_{gw} = \frac{C_{target.ia}}{HLC \times AF_{gw} \times \left(\frac{1000\ L}{m^3}\right)}$$

Where:

C_{gw} = Target groundwater concentration (micrograms per liter [µg/L])

$C_{target,ia}$ = Target indoor air concentration (µg/m^3)

AF_{gw} = Attenuation factor (ratio of indoor air concentration to groundwater concentration; default value is 0.001)

HLC = Dimensionless Henry's Law Constant at the specified groundwater temperature [(milligrams per liter [mg/L] – vapor/mg/L – H_2O)]

2.2 SOIL AND GROUNDWATER PROPERTIES

Because remediation goals are to be developed for the entire State, the most health-protective assumptions should be used. The model also assumes homogeneous soil stratigraphy from the soil surface to the top of contamination for modeling indoor air concentrations and the model defaults to the most conservative soil type - sand.

Contaminants in groundwater can become sources for vapor intrusion if they are likely to volatilize under normal temperature and pressure conditions. Water solubility is also a factor for chemicals in source zones that come into contact with migrating groundwater. Common classes of chemicals of concern for vapor intrusion that exhibit these characteristics are volatile organic compounds (VOC), such as tetrachloroethylene (PCE), trichloroethylene (TCE), vinyl chloride, carbon tetrachloride, and benzene, toluene, ethylbenzene and xylenes (collectively, BTEX). Other compounds that are not as volatile as these VOCs (e.g., so-called semi-volatile organic compounds), but that may be cause for concern, include some polycyclic aromatic hydrocarbons (PAHs) (e.g., naphthalene), some polychlorinated biphenyl (PCB) congeners, and elemental mercury.

Migration of chemicals through soil depends on the ability of chemicals to diffuse from the source into the vapor space and through the soil. Vapor space is a function of the total porosity of soil and the volume of water displacing air within the pore volume. The average soil gas and groundwater temperature (11 degrees Celsius [°C]) used in the model is based on the information provided by the U.S. Geological Survey (USGS 1925).

2.3 BUILDING PARAMETERS

This evaluation is based on buildings with either a slab-on-grade construction or a basement, again the distance from the base of the foundation is fixed. The model assumes that the contaminant source is infinite (with respect to modeling time of interest) and vapor infiltration is through cracks in the foundation and below-grade walls, if any (U.S. EPA 2015). The default attenuation factors for soil gas and groundwater assume generic building construction and vapor intrusion pathways.

3.0 SUMMARY AND CONCLUSIONS

This document outlines the approach for developing remediation goals for vapor intrusion to indoor air in both residential and commercial/industrial buildings, assuming sand above the source of soil gas or contaminated groundwater. These are generally considered conservative assumptions. The results for the calculation of the soil gas remediation goals are presented in Attachment A, Table A-2. In addition, Attachment B, Table B-5 provides calculation of acceptable indoor air concentrations, calculation of soil gas values and the groundwater remediation goals for the protection of indoor air.

4.0 REFERENCES

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ATTACHMENT E

TARGET ORGANS FOR NONCARCINOGENIC EFFECTS OF VARIOUS CONTAMINANTS

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ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
1,1,1,2-Tetrachloroethane	630-20-6	Hepatic, Urinary	--
1,1,1-Trichloroethane	71-55-6	Body Weight	Hepatic, Nervous
1,1,2,2-Tetrachloroethane	79-34-5	Hepatic	--
1,1,2-Trichloroethane	79-00-5	Immune, Hematologic	Respiratory
1,1,2-Trichloropropane	598-77-6	Endocrine, Hepatic, Urinary	--
1,1-Biphenyl	92-52-4	Urinary	Respiratory, Hepatic, Urinary
1,1-Dichloroethane	75-34-3	Nervous	--
1,1-Dichloroethylene	75-35-4	Hepatic	Hepatic
1,1-Difluoroethane	75-37-6	--	None
1,1'-Sulfonylbis (4-Chlorobenzene)	80-07-9	Hepatic,	--
1,2,3-Trichloropropane	96-18-4	Hepatic	Lymphatic
1,2,3-Trichloropropene	96-19-5	Body Weight,	Respiratory
1,2,4,5-Tetrachlorobenzene	95-94-3	Urinary	--
1,2,4-Tribromobenzene	615-54-3	Hepatic,	--
1,2,4-Trichlorobenzene	120-82-1	Endocrine	Urinary, Hepatic
1,2,4-Trimethylbenzene	95-63-6	Nervous	Nervous
1,2-Dibromo-3-chloropropane	96-12-8	Reproductive	Reproductive
1,2-Dibromoethane	106-93-4	Endocrine, Reproductive, Hepatic	Respiratory
1,2-Dichlorobenzene	95-50-1	Body Weight	Body Weight
1,2-Dichloroethane	107-06-2	Urinary	Nervous
1,2-Dichloroethylene (cis)	156-59-2	Urinary, Whole Body	--
1,2-Dichloroethylene (trans)	156-60-5	Immune	--
1,2-Dichloropropane	78-87-5	Hepatic, Hematologic, Nervous, Respiratory,	Respiratory
1,2-Dinitrobenzene	528-29-0	Immune	--
1,2-Epoxybutane	106-88-7	--	Respiratory
1,3,5-Trimethylbenzene	108-67-8	Nervous	Nervous
1,3-Butadiene	106-99-0	--	Reproductive
1,3-Dichloropropene	542-75-6	Gastrointestinal	Respiratory
1,3-Dinitrobenzene	99-65-0	Immune	--
1,4-Dibromobenzene	106-37-6	Hepatic	--
1,4-Dichlorobenzene	106-46-7	Dermal, Developmental, Hepatic, Ocular, Urinary	Hepatic
1,4-Dinitrobenzene	100-25-4	Immune	--
1,4-Dioxane	123-91-1	Hepatic, Urinary	Nervous, Respiratory
1,4-Dithiane	505-29-3	Nervous, Respiratory	--
1,6-Hexamethylene diisocyanate	822-06-0	--	Nervous, Respiratory
1-Butanol	71-36-3	Nervous	--
1-Chloro-1,1-difluoroethane	75-68-3	--	No Adverse Effects
1-Chlorobutane	109-69-3	Nervous	--
2-(2,4,5-Trichlorophenoxy)propionic acid	93-72-1	Hepatic	--
2-(2-Methyl-4-chlorophenoxy) propionic acid	93-65-2	Urinary	--
2,3,4,6-Tetrachlorophenol	58-90-2	Hepatic	--
2,3,7,8-TCDD (Dioxin)	1746-01-6	Reproductive, Developmental, Endocrine	Hepatic, Reproductive, Developmental, Endocrine, Respiratory, Hematologic

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
2,3-Dichloropropanol	616-23-9	Urinary, Developmental	--
2,4,5-Trichlorophenol	95-95-4	Hepatic, Urinary	--
2,4,5-Trichlorophenoxyacetic acid	93-76-5	Urinary	--
2,4,6-Trichloroaniline	634-93-5	Hematologic, Reproductive	--
2,4,6-Trichlorophenol	88-06-2	Reproductive	--
2,4,6-Trinitrotoluene	118-96-7	Hepatic	--
2,4-D	94-75-7	Hematologic, Hepatic, Urinary	--
2,4-DB	94-82-6	Urinary, Hepatic	--
2,4-Dichlorophenol	120-83-2	Immune	--
2,4-Dimethylaniline	95-68-1		
2,4-Dimethylphenol	105-67-9	Nervous, Hematologic	--
2,4-Dinitrotoluene	121-14-2	Nervous, Hepatic, Hematologic	--
2,6-Dimethylphenol	576-26-1	Immune, Hepatic, Urinary, Body Weight	--
2,6-Dinitrotoluene	606-20-2	Immune	--
2-Chloro-1,3-butadiene	126-99-8	Dermal, Body Weight	--
2-Chloroacetophenone	532-27-4	Body Weight, Developmental	Developmental, Skeletal
2-Chlorophenol	95-57-8	Reproductive	--
2-Ethoxyethanol	110-80-5	Reproductive	Reproductive, Hematologic
2-Ethoxyethanol acetate	111-15-9	Reproductive	Developmental
2-Methoxyethanol	109-86-4	Reproductive	Reproductive
2-Methoxyethanol acetate	110-49-6	Reproductive	Reproductive
2-Methyl-5-nitroaniline	99-55-8	Body Weight, Hematologic	--
2-Methylphenol	95-48-7	Nervous, Body Weight	Nervous
2-Nitroaniline	88-74-4	Body Weight, Hematologic	Respiratory
2-Nitropropane	79-46-9	--	Hepatic
3,4-Dimethylphenol	95-65-8	Immune, Hepatic, Urinary, Cardiovascular, Body Weight	--
3-Methylphenol	108-39-4	Nervous, Body Weight	Nervous
4,4'-Dichlorobenzophenone	90-98-2	No Adverse Effect	--
4,4'-Methylene bis(2-chloroaniline)	101-14-4	Hepatic	--
4,4'-Methylenebisbenzeneamine	101-77-9	--	Ocular, Hepatic
4,4'-Methylenediphenyl isocyanate	101-68-8	--	Nervous, Respiratory
4,6-Dinitro-o-cyclohexyl phenol	131-89-5	Ocular	--
4-Chloroaniline	106-47-8	Immune	--
4-Chlorobenzotrifluoride	98-56-6	Hepatic, Urinary, , ,	Hepatic
4-Methylphenol	106-44-5	Dermal, Nervous, Respiratory	Nervous
Acephate	30560-19-1	Nervous	--
Acenaphthene	83-32-9	Hepatic	--
Acetaldehyde	75-07-0	--	Nervous, Respiratory
Acetochlor	34256-82-1	Hematologic, Hepatic, Nervous, Reproductive, Urinary	--
Acetone	67-64-1	Urinary	Hematologic, Nervous
Acetone cyanohydrin	75-86-5	--	Respiratory
Acetonitrile	75-05-8	--	Whole Body
Acrolein	107-02-8	Whole Body	Respiratory

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Acrylamide	79-06-1	Nervous	Nervous
Acrylic acid	79-10-7	Developmental	Nervous, Respiratory
Acrylonitrile	107-13-1	Developmental, Hematologic, Nervous, Reproductive	Respiratory
Alachlor	15972-60-8	Hematologic	--
Alar	1596-84-5	No Adverse Effect	--
Aldicarb	116-06-3	Nervous	--
Aldicarb sulfone	1646-88-4	Nervous	--
Aldrin	309-00-2	Hepatic	--
Ally	74223-64-6	Body Weight	--
Allyl alcohol	107-18-6	Hepatic, Urinary	Body Weight
Allyl chloride	107-05-1	--	Nervous
Aluminum	7429-90-5	Nervous, Developmental	Nervous
Aluminum phosphide	20859-73-8	Body Weight	--
Amdro	67485-29-4	Organ Weight	--
Ametryn	834-12-8	Hepatic	--
Amitraz	33089-61-1	Hematologic	--
Ammonia	7664-41-7	--	Respiratory
Ammonium sulfamate	7773-06-0	Body Weight	--
Aniline	62-53-3	Hematologic, Immune	Immune
Antimony and compounds	7440-36-0	Hematologic, Whole Body	--
Antimony pentoxide	1314-60-9	Whole Body, Hematologic	--
Antimony potassium tartrate	28300-74-5	Whole Body, Hematologic	--
Antimony tetroxide	1332-81-6	Whole Body, Hematologic	--
Antimony trioxide	1309-64-4	--	Respiratory
Apollo	74115-24-5	Endocrine, Hepatic	--
Aramite	140-57-8	Hepatic	--
Aroclor 1016	12674-11-2	Developmental	Developmental
Aroclor 1254	11097-69-1	Dermal, Immune, Ocular	--
Arsenic (inorganic)+++	7440-38-2	Cardiovascular, Dermal	Reproductive, Developmental, Cardiovascular, Nervous
Arsine	7784-42-1	Reproductive, Developmental, Cardiovascular, Nervous	Hematologic, Immune
Assure	76578-14-8	Hepatic	--
Asulam	3337-71-1	Hepatic, Reproductive	--
Atrazine	1912-24-9	Body weight	--
Avermectin B1	65195-55-3	Developmental	--
Barium and compounds	7440-39-3	Urinary	Developmental
Baygon	114-26-1	Nervous	--
Bayleton	43121-43-3	Body Weight, Hematologic	--
Baythroid	68359-37-5	Urinary, Body weight	--
Benefin	1861-40-1	Hematologic	--
Benomyl	17804-35-2	Developmental	--
Bentazon	25057-89-0	Hematologic	--
Benzaldehyde	100-52-7	Gastrointestinal, Urinary	--
Benzene	71-43-2	Immune	Immune

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Benzo(a)pyrene	50-32-8	Developmental, Immune, Reproductive	Developmental, Immune, Reproductive
Benzoic acid	65-85-0	No Adverse Effect	--
Benzyl alcohol	100-51-6	Nervous	--
Benzyl chloride	100-44-7	Cardiovascular	Respiratory
Beryllium and compounds	7440-41-7	Gastrointestinal	Immune, Respiratory
beta-Chloronaphthalene	91-58-7	Hepatic, Respiratory	--
Bidrin	141-66-2	Reproductive	--
Biphenthrin (Talstar)	82657-04-3	Nervous	--
Bis(2-chloro-1-methylethyl)ether	108-60-1	Hematologic	--
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	Hepatic	--
Bisphenol A	80-05-7	Body Weight	--
Boron	7440-42-8	Developmental	Respiratory
Boron trifluoride	7637-07-2	Urinary	Urinary
Bromate	15541-45-4	Urinary	--
Bromobenzene	108-86-1	Hepatic	Hepatic
Bromodichloromethane	75-27-4	Urinary	--
Bromoform (tribromomethane)	75-25-2	Hepatic	--
Bromomethane	74-83-9	Gastrointestinal	Nervous, Respiratory
Bromophos	2104-96-3	Hematologic, Hepatic	--
Bromoxynil	1689-84-5	Hepatic, Body weight	--
Bromoxynil octanoate	1689-99-2	Hepatic, Body weight	--
Butyl benzyl phthalate	85-68-7	Hepatic	--
Butylate	2008-41-5	Hepatic	--
Butylphthalyl butylglycolate	85-70-1	No Adverse Effect	--
Cacodylic acid	75-60-5	Dermal, Gastrointestinal, Hepatic, Nervous, Respiratory	--
Cadmium (Water)	7440-43-9	Urinary	--
Cadmium and compounds+++	7440-43-9	Urinary	Respiratory, Urinary
Caprolactam	105-60-2	Developmental	Ocular
Captafol	2425-06-1	Urinary	--
Captan	133-06-2	Body weight	--
Carbaryl	63-25-2	Hepatic, Urinary	--
Carbofuran	1563-66-2	Nervous, Reproductive	--
Carbon disulfide	75-15-0	Developmental	Nervous
Carbon tetrachloride	56-23-5	Hepatic	Hepatic
Carbosulfan	55285-14-8	Body Weight	--
Carboxin	5234-68-4	Body Weight, Organ Weight, Whole Body	--
Chloramben	133-90-4	Hepatic	--
Chlordane	12789-03-6	Hepatic	Hepatic
Chlorimuron-ethyl	90982-32-4	Hematologic	--
Chlorine	7782-50-5	No Adverse Effect	Respiratory
Chlorine dioxide	10049-04-4	Nervous, Developmental	Respiratory, Cardiovascular
Chlorobenzene	108-90-7	Hepatic	Urinary, Hepatic
Chlorobenzilate	510-15-6	Nervous, Body Weight	--

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Chlorodifluoromethane	75-45-6	--	Endocrine, Urinary
Chloroethane	75-00-3	--	Developmental, Skeletal
Chloroform	67-66-3	Hepatic	Hepatic
Chloromethane	74-87-3	--	Nervous
Chlorothalonil	1897-45-6	Urinary	--
Chlorpropham	101-21-3	Hematologic, Hepatic, Immune, Urinary	--
Chlorpyrifos	2921-88-2	Nervous	--
Chlorpyrifos-methyl	5598-13-0	Reproductive, Hepatic	--
Chlorsulfuron	64902-72-3	Body Weight	--
Chlorthiophos	60238-56-4	No Adverse Effect	--
Chromium III	16065-83-1	No Adverse Effect	--
Chromium VI+++	18540-29-9	No Adverse Effect	Respiratory
Cobalt	7440-48-4	Endocrine	Respiratory
Copper and compounds	7440-50-8	Gastrointestinal	--
Crotonaldehyde	123-73-9	Gastrointestinal	--
Cumene (isopropylbenzene)	98-82-8	Urinary	Endocrine, Urinary
Cyanazine	21725-46-2	Body Weight, Hematologic	--
Cyanide (free)	57-12-5	Reproductive	Endocrine
Cyanide (hydrogen)	74-90-8	Reproductive	Endocrine
Cyanogen	460-19-5	Reproductive	--
Cyanogen bromide	506-68-3	Endocrine, Nervous, Body Weight	--
Cyanogen chloride	506-77-4	Endocrine, Nervous	--
Cyclohexane	110-82-7	--	Developmental
Cyclohexanone	108-94-1	Body weight	Respiratory, Nervous, Body Weight
Cyclohexylamine	108-91-8	Reproductive	--
Cyhalothrin/Karate	68085-85-8	Developmental	--
Cypermethrin	52315-07-8	Gastrointestinal	--
Cyromazine	66215-27-8	Hematologic	--
Dacthal	1861-32-1	Endocrine, Hepatic, Urinary, Respiratory, Ocular	--
Dalapon	75-99-0	Urinary, Organ Weight	--
Danitol	39515-41-8	Nervous	--
DDD	72-54-8	Hepatic	--
DDE	72-55-9	Hepatic	--
DDT	50-29-3	Hepatic	--
Decabromodiphenyl ether	1163-19-5	Nervous	--
Demeton	8065-48-3	Nervous	--
Di(2-ethylhexyl)adipate	103-23-1	Developmental, Hepatic, Urinary, Muscoskeletal, Body Weight	--
Diazinon	333-41-5	Nervous	--
Dibenzofuran	132-64-9	Body Weight, Organ Weight	--
Dibromochloromethane	124-48-1	Hepatic	--
Dibutyl phthalate	84-74-2	Whole Body	--
Dichlorodifluoromethane	75-71-8	Body Weight	Body Weight

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Dichlorvos	62-73-7	Nervous	Nervous
Dicyclopentadiene	77-73-6	Developmental	Urinary
Dieldrin	60-57-1	Hepatic	--
Diethyl phthalate	84-66-2	Decreased Growth, Organ Weight	--
Diethylene glycol, monobutyl ether	112-34-5	Hematologic	Hepatic
Diethylene glycol, monoethyl ether	111-90-0	Hepatic, Urinary	Respiratory
Diethylformamide	617-84-5	Body Weight, Immune	--
Difenzoquat (Avenge)	43222-48-6	Body Weight	--
Diflubenzuron	35367-38-5	Hematologic	--
Diisopropyl methylphosphonate (DIMP)	1445-75-6	No Adverse Effect	--
Dimethipin	55290-64-7	Hepatic	--
Dimethoate	60-51-5	Nervous	--
Dimethyl terephthalate	120-61-6	Urinary	--
Dinitrotoluene mixture	25321-14-6	Hepatic, Hematologic, Developmental, Urinary	--
Dinoseb	88-85-7	Developmental	--
Dioxin (2,3,7,8-TCDD)	1746-01-6	Reproductive, Developmental, Endocrine	Hepatic, Reproductive, Developmental, Endocrine, Respiratory, Hematologic
Diphenamid	957-51-7	Hepatic	--
Diphenyl sulfone	127-63-9	Hepatic	--
Diphenylamine	122-39-4	Hepatic, Urinary	--
Diquat	85-00-7	Ocular	--
Disulfoton	298-04-4	Nervous	--
Diuron	330-54-1	Hematologic	--
Dodine	2439-10-3	Endocrine	--
Endosulfan	115-29-7	Body Weight, Urinary, Cardiovascular,	--
Endothall	145-73-3	Gastrointestinal	--
Endrin	72-20-8	Nervous, Hepatic	--
Epichlorohydrin	106-89-8	Gastrointestinal, Urinary, Reproductive	Respiratory
EPTC (S-Ethyl dipropylthiocarbamate)	759-94-4	Cardiovascular	--
Ethephon (2-chloroethyl phosphonic acid)	16672-87-0	Nervous	--
Ethion	563-12-2	Nervous	--
Ethyl acetate	141-78-6	Whole Body, Body Weight	Body Weight, Respiratory
Ethyl acrylate	140-88-5	Gastrointestinal	Respiratory
Ethyl chloride	75-00-3	--	Developmental, Musculoskeletal
Ethyl ether	60-29-7	Body Weight	--
Ethyl methacrylate	97-63-2	--	Body Weight, Developmental
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	Nervous	--
Ethylbenzene	100-41-4	Hepatic, Urinary	Developmental
Ethylene cyanohydrin	109-78-4	Body Weight	--
Ethylene diamine	107-15-3	Hepatic, Urinary	--
Ethylene glycol	107-21-1	Urinary	Respiratory, Urinary, Developmental
Ethylene glycol, monobutyl ether	111-76-2	Hematologic	Hematologic
Ethylene oxide	75-21-8	--	Nervous

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Ethylene thiourea (ETU)	96-45-7	Endocrine	--
Ethylphthalyl ethyl glycolate	84-72-0	Urinary	--
Express	101200-48-0	Urinary	--
Fenamiphos	22224-92-6	Nervous	--
Fluometuron	2164-17-2	No Adverse Effect	--
Fluoranthene	206-44-0	Hepatic, Urinary	--
Fluorene	86-73-7	Hematologic	--
Fluoride	16984-48-8	Muscoskeletal, Gastrointestinal	Respiratory
Fluoridone	59756-60-4	Reproductive, Urinary, Ocular, Body Weight, Organ Weight	--
Flurprimidol	56425-91-3	Hepatic	--
Flutolanil	66332-96-5	Hepatic, Reproductive	--
Fluvalinate	69409-94-5	Dermal, Body Weight	--
Folpet	133-07-3	Hepatic	--
Fomesafen	72178-02-0	Hepatic	--
Fonofos	944-22-9	Nervous, Hepatic	--
Formaldehyde	50-00-0	Urinary, Gastrointestinal, Body Weight	Respiratory
Formic acid	64-18-6	Reproductive, Developmental, Body Weight	Respiratory
Fosetyl-al	39148-24-8	Reproductive	--
Freon 113	76-13-1	Nervous	Body Weight, Nervous
Furan	110-00-9	Hepatic	--
Furfural	98-01-1	Hepatic	Respiratory
Glufosinate-ammonium	77182-82-2	Urinary	--
Glycidaldehyde	765-34-4	Endocrine, Urinary, Hematologic, Body Weight	Body Weight, Urinary
Glyphosate	1071-83-6	Developmental, Urinary	--
Haloxyfop-methyl	69806-40-2	Reproductive, Urinary	--
Harmony	79277-27-3	Body Weight	--
HCH (alpha)	319-84-6	Hepatic, Immune, Neurological	--
HCH (gamma) Lindane	58-89-9	Hepatic, Urinary	--
Heptachlor	76-44-8	Hepatic	--
Heptachlor epoxide	1024-57-3	Hepatic	--
Hexabromobenzene	87-82-1	Hepatic	--
Hexachlorobenzene	118-74-1	Hepatic	--
Hexachlorobutadiene	87-68-3	Urinary	--
Hexachlorocyclopentadiene	77-47-4	Gastrointestinal	Respiratory
Hexachloroethane	67-72-1	Urinary	Nervous
Hexachlorophene	70-30-4	Nervous	Gastrointestinal
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Reproductive	--
Hexazinone	51235-04-2	Body Weight	--
HMX	2691-41-0	Hepatic	--
Hydrazine, dimethyl	57-14-7	Ocular	Reproductive
Hydrazine, hydrazine sulfate	302-01-2	--	Hepatic
Hydrogen chloride	7647-01-0	--	Respiratory
Hydrogen sulfide	7783-06-4	--	Nervous, Respiratory

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Imazalil	35554-44-0	Body Weight	--
Imazaquin	81335-37-7	Immune, Hepatic, Hematologic, Body Weight	--
Iprodione	36734-19-7	Reproductive, Hematologic	--
Iron	7439-89-6	Gastrointestinal	--
Isobutanol	78-83-1	Nervous	--
Isophorone	78-59-1	Urinary	Developmental, Hepatic
Isopropalin	33820-53-0	Hematologic, Organ Weight	--
Isopropyl methyl phosphonic acid	1832-54-8	No Adverse Effect	--
Isoxaben	82558-50-7	Hepatic, Urinary, Cardiovascular	--
Kepone	143-50-0	Urinary	--
Lactofen	77501-63-4	Hepatic	--
Lead (tetraethyl)	78-00-2	Immune, Hepatic	--
Linuron	330-55-2	Hematologic	--
Lithium	7439-93-2	Urinary	--
Londax	83055-99-6	Hepatic	--
Malathion	121-75-5	Nervous	--
Maleic anhydride	108-31-6	Urinary	Respiratory
Maleic hydrazide	123-33-1	Urinary	--
Malononitrile	109-77-3	Hepatic, Immune	--
m-Aminophenol	591-27-5	Hematologic, Endocrine	--
Mancozeb	8018-01-7	Endocrine	--
Maneb	12427-38-2	Endocrine	--
Manganese (non-food)+++	7439-96-5	Nervous	Nervous
MCPA	94-74-6	Urinary, Hepatic	--
MCPB	94-81-5	Hepatic, Reproductive, Urinary	--
Mephosfolan	950-10-7	Hepatic, Urinary, Hematologic, Nervous	--
Mepiquat	24307-26-4	Nervous, Hematologic, Body Weight	--
Mercury (elemental)	7439-97-6	--	Nervous
Mercury (methyl)	22967-92-6	Nervous, Developmental	--
Mercury and compounds	7487-94-7	Immune, Urinary	Nervous
Merphos	150-50-5	Nervous, Body Weight	--
Merphos oxide	78-48-8	Nervous	--
Metalaxyl	57837-19-1	Hepatic	--
Methacrylonitrile	126-98-7	Hepatic	Hepatic
Methamidophos	10265-92-6	Nervous	--
Methanol	67-56-1	Developmental	Nervous, Developmental
Methidathion	950-37-8	Hepatic	--
Methomyl	16752-77-5	Immune, Urinary	--
Methoxychlor	72-43-5	Developmental	--
Methyl acetate	79-20-9	Nervous	--
Methyl acrylate	96-33-3	--	Respiratory
Methyl ethyl ketone	78-93-3	Developmental	Developmental, Musculoskeletal
Methyl isobutyl ketone	108-10-1	--	Developmental, Musculoskeletal

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Methyl methacrylate	80-62-6	No Adverse Effect	Nervous, Respiratory
Methyl parathion	298-00-0	Nervous	Hematologic
Methyl phosphonic acid	993-13-5	Reproductive	--
Methyl styrene (alpha)	98-83-9	Hepatic, Urinary	--
Methyl styrene (mixture)	25013-15-4	Repiratory	Respiratory
Methyl tertbutyl ether (MTBE)	1634-04-4	--	Organ Weight
Methylene bromide	74-95-3	--	Hematologic
Methylene chloride	75-09-2	Hepatic	Hepatic
Metolaclor (Dual)	51218-45-2	Reproductive, Body Weight	--
Metribuzin	21087-64-9	Hepatic, Urinary, Body Weight, Whole Body	--
Mirex	2385-85-5	Endocrine, Hepatic	--
m-Nitrotoluene	99-08-1	Immune	--
Molinate	2212-67-1	Reproductive	--
Molybdenum	7439-98-7	Urinary	--
Monochloramine	10599-90-3	No Adverse Effect	--
m-Phenylenediamine	108-45-2	Hepatic	--
N,N-Dimethylformamide	68-12-2	Hepatic	Hepatic
N,N-Diphenyl-1,4 benzenediamine (DPPD)	74-31-7	Urinary, Body Weight	--
Naled	300-76-5	Nervous	--
Naphthalene	91-20-3		
Napropamide	15299-99-7	Reproductive	--
n-Hexane	110-54-3	--	Nervous
Nickel and compounds	7440-02-0	Body Weight, Organ Weight	Respiratory
Nickel refinery dust	7440-02-0-NRD	Developmental	Respiratory, Hematologic
Nickel subsulfide	12035-72-2	Developmental	Respiratory, Hematologic
Nitrate	14797-55-8	Hematologic	--
Nitrobenzene	98-95-3	Hematologic	Nervous, Respiratory
Nitrofurantoin	67-20-9	Reproductive	--
Nitroglycerin	55-63-0	Cardiovascular	--
Nitroguanidine	556-88-7	Developmental, Body Weight	--
N-N-Dimethylaniline	121-69-7	Immune, Hematologic	--
N-Nitrosodimethylamine	62-75-9	Hepatic, Developmental	Body Weight
Norflurazon	27314-13-2	Endocrine, Hepatic	--
n-Propylbenzene	103-65-1	Hepatic, Urinary	Developmental
NuStar	85509-19-9	Hepatic	--
o-Chloronitrobenzene	88-73-3	Hematologic, Hepatic, Urinary, Immune	Respiratory
o-Chlorotoluene	95-49-8	Body Weight	--
Octabromodiphenyl ether	32536-52-0	Hepatic	--
Octamethylpyrophosphoramide	152-16-9	Hematologic	--
o-Nitrotoluene	99-08-1	Muscoskeletal, Hepatic	--
Oryzalin	19044-88-3	Endocrine, Hepatic, Urinary	--
Oxadiazon	19666-30-9	Hepatic, Hematologic	--
Oxamyl	23135-22-0	Body Weight	--

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Oxyfluorfen	42874-03-3	Hepatic	--
Paclobutrazol	76738-62-0	Hepatic	--
Paraquat	4685-14-7	Respiratory	--
Parathion	56-38-2	Nervous	--
p-Chlorobenzoic acid	74-11-3	Reproductive	--
p-Chloronitrobenzene	100-00-5	Hematologic	Hematologic
Pebulate	1114-71-2	Hematologic	--
Pendimethalin	40487-42-1	Hepatic	--
Pentabromo-6-chloro cyclohexane	87-84-3	Hepatic, Gastrointestinal	--
Pentabromodiphenyl ether	32534-81-9	Hepatic	--
Pentachlorobenzene	608-93-5	Hepatic, Urinary	--
Pentachloronitrobenzene	82-68-8	Hepatic	--
Pentachlorophenol	87-86-5	Hepatic	--
Perchlorate	14797-73-0	Endocrine	--
Perfluorobutane sulfonic acid (PFBS)	375-73-5	Urinary	--
Perfluorobutanesulfonate	45187-15-3	Urinary	--
Perfluoro-octanesulfonate (PFOS)	1763-23-1	Developmental	--
Perfluorooctanoic acid (PFOA)	335-67-1	Hepatic, Muscoskeletal, Developmental, Body Weight, Urinary	--
Permethrin	52645-53-1	Hepatic	--
Phenmedipham	13684-63-4	No Adverse Effect	--
Phenol	108-95-2	Body Weight	Respiratory, Ocular
Phenylmercuric acetate	62-38-4	Urinary	--
Phorate	298-02-2	Nervous	--
Phosmet	732-11-6	Nervous, Hepatic, Body Weight	--
Phosphine	7803-51-2	Body Weight	Body Weight
Phosphoric acid	7664-38-2	Urinary	Respiratory
Phosphorus (white)	7723-14-0	Reproductive, Dermal	--
Phthalic anhydride	85-44-9	Urinary, Respiratory	Respiratory
p-Hydroquinone	123-31-9	Hematologic, Urinary	--
Picloram	1918-02-1	Hepatic	--
Pirimiphos-methyl	29232-93-7	Nervous	--
p-Nitrotoluene	99-99-0	Urinary	--
Polybrominated biphenyls (PBBs)	67774-32-7	Hepatic	--
p-Phenylenediamine	106-50-3	Urinary, Hepatic	--
p-Phthalic acid	100-21-0	Urinary	--
Prochloraz	67747-09-5	Hepatic	--
Profluralin	26399-36-0	No Adverse Effect	--
Prometon	1610-18-0	No Adverse Effect	--
Prometryn	7287-19-6	Hematologic, Hepatic, Immune, Urinary	--
Pronamide	23950-58-5	No Adverse Effect	--
Propachlor	1918-16-7	Hepatic, Body Weight	--
Propanil	709-98-8	Immune	--

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Propargite	2312-35-8	Developmental, Muscoskeletal	--
Propargyl alcohol	107-19-7	Hepatic, Urinary	--
Propazine	139-40-2	Body Weight	--
Propham	122-42-9	Nervous, Immune	--
Propiconazole	60207-90-1	Gastrointestinal	--
Propylene glycol	57-55-6	Hematologic	--
Propylene glycol, monoethyl ether	52125-53-8	Hepatic, Urinary	Hepatic, Respiratory, Ocular
Propylene glycol, monomethyl ether	107-98-2	Hepatic, Urinary	Hepatic, Respiratory, Ocular
Propylene oxide	75-56-9	--	Respiratory
p-Toluidine	106-49-0	Hematologic	--
Pursuit	81335-77-5	Hematologic	--
Pydrin	51630-58-1	Nervous	--
Pyrene	129-00-0	Urinary	--
Pyridine	110-86-1	Hepatic	--
Quinalphos	13593-03-8	No Adverse Effect	--
RDX (Cyclonite)	121-82-4	Reproductive	--
Resmethrin	10453-86-8	Reproductive	--
Ronnel	299-84-3	Hepatic	--
Rotenone	83-79-4	Developmental	--
Savey	78587-05-0	Endocrine, Hematologic	--
Selenious Acid	7783-00-8	Nervous, Hematologic, Dermal	--
Selenium	7782-49-2	Nervous, Hematologic, Dermal,	Hepatic, Cardiovascular, Nervous
Sethoxydim	74051-80-2	Hematologic	--
Silver and compounds	7440-22-4	Dermal	--
Simazine	122-34-9	Hematologic, Body Weight	--
Sodium azide	26628-22-8	Body Weight	--
Sodium diethyldithiocarbamate	148-18-5	Body Weight	--
Sodium fluoroacetate	62-74-8	Reproductive, Cardiovascular	--
Sodium metavanadate	13718-26-8	Urinary	--
Strontium, stable	7440-24-6	Muscoskeletal	--
Strychnine	57-24-9	Whole Body	--
Styrene	100-42-5	Hepatic, Hematologic	Nervous
Systhane	88671-89-0	Reproductive	--
Tebuthiuron	34014-18-1	Body Weight	--
Temephos	3383-96-8	Nervous	--
Terbacil	5902-51-2	Endocrine, Hepatic	--
Terbufos	13071-79-9	Nervous	--
Terbutryn	886-50-0	Hematologic	--
Tetrachloroethylene (PCE)	127-18-4	Nervous, Ocular	Nervous, Ocular
Tetrachlorovinphos	961-11-5	Nervous, Hepatic, Urinary, Body Weight	--
Tetraethyldithiopyrophosphate	3689-24-5	Nervous	--
Thallium and compounds	7440-28-0	Dermal	--
Thiobencarb	28249-77-6	Urinary, Body Weight	--

ATTACHMENT E - TARGET ORGANS FOR NONCARCINOGENIC EFFECTS

Chemical	CASNo	ORAL/DERMAL	INHALATION
		All Organs	All Organs
Thiofanox	39196-18-4	Nervous	--
Thiophanate-methyl	23564-05-8	Endocrine, Reproductive	--
Thiram	137-26-8	Nervous	--
Tin and compounds	7440-31-5	Hepatic, Urinary	--
Toluene	108-88-3	Urinary	Nervous
Tralomethrin	66841-25-6	Body Weight	--
Triallate	2303-17-5	Hepatic	--
Triasulfuron	82097-50-5	Hepatic	--
Tributyltin oxide (TBTO)	56-35-9	Immune	--
Trichloroethylene (TCE)+++	79-01-6	Immune, Cardiovascular, Developmental,	Immune, Cardiovascular, Developmental
Trichlorofluoromethane	75-69-4	Respiratory, Cardiovascular, Whole Body	--
Tridiphane	58138-08-2	Reproductive, Body Weight	--
Triethylamine	121-44-8	--	Respiratory
Trifluralin	1582-09-8	Hepatic, Hematologic	--
Trimethyl phosphate	512-56-1	Body Weight, Reproductive	--
Trinitrophenylmethylnitramine	479-45-8	Hematologic, Urinary, Immune, Hepatic	--
Triphenylphosphine oxide	791-28-6	Nervous	--
Tris(2-chloroethyl) phosphate	115-96-8	Hepatic, Urinary	--
Uranium (chemical toxicity only)	7440-61-0	Urinary	Urinary
Vanadium and compounds+++	7440-62-2	Dermal	Respiratory
Vernam	1929-77-7	Body Weight	--
Vinclozolin	50471-44-8	Endocrine, Urinary	--
Vinyl acetate	108-05-4	Body Weight, Urinary	Nervous, Respiratory
Vinyl bromide	593-60-2	--	Hepatic
Vinyl chloride+++	75-01-4	Hepatic	Hepatic
Warfarin	81-81-2	Hematologic	--
Xylenes	1330-20-7	Body Weight, Whole Body	Nervous
Zinc	7440-66-6	Immune, Hematologic	--
Zinc phosphide	1314-84-7	Body Weight	--
Zineb	12122-67-7	Endocrine	--

ATTACHMENT F

EPA REGION 7 ACTION LEVELS FOR TRICHLOROETHYLENE IN AIR

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

NOV 0 2 2016

MEMORANDUM

SUBJECT: EPA Region 7 Action Levels for Trichloroethylene in Air

FROM: Mike Beringer, Chief
Environmental Data & Assessment Branch
Environmental Sciences & Technology Division

TO: Branch Chiefs
Waste Enforcement and Materials Management Branch
and Waste Remediation & Permitting Branch
Air and Waste Management Division

Branch Chiefs
Superfund Division

The purpose of this memorandum is to update the U.S. Environmental Protection Agency Region 7 RCRA and Superfund programs on the recommended action levels for trichloroethylene (TCE) in air, and provide information on characterizing and addressing human health risks from less-than-lifetime exposures. The action level for a residential scenario is 2 $\mu g/m^3$, and the action level for an industrial/commercial scenario with an 8-hr workday is 6 $\mu g/m^3$. Equations to allow derivation of action levels for alternative scenarios, such as a 10-hr workday, are presented. As described in this attachment, it is assumed that an exposure to TCE at any time during an approximate three-week period in early pregnancy could result in one or more types of cardiac malformations. Thus, the critical exposure period of concern used to evaluate the potential for heart defects and derive action levels for TCE is one day. An exceedance of the TCE action level indicates a potential imminent threat to human health. Region 7 should expedite early or interim action(s) to eliminate, reduce, and/or control the hazards posed by the site as quickly as possible. If you or your staff have any questions or need further assistance, please contact Kelly Schumacher (x7963).

EPA Region 7 Action Levels for Trichloroethylene in Air.	
Exposure Scenario	*Action Level*
Residential (24 hours/day)	**2 $\mu g/m^3$**
Industrial/Commercial (8 hours/day)[1]	**6 $\mu g/m^3$**

[1] Site-specific action levels should be derived when the workday differs from 8 hours/day.

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Attachment

EPA Region 7 Action Levels for Trichloroethylene in Air

Introduction

In 2011, the latest human health toxicity values for trichloroethylene were published by the United States Environmental Protection Agency's Integrated Risk Information System program (EPA, 2011a). As discussed in this document, these new values are partly based on developmental health effects that result from less-than-lifetime exposures. In contrast, the toxicity values typically used to evaluate potential health risks and derive action levels at Superfund and RCRA sites are based on health effects associated with long-term, or chronic exposures. Further, the equations and exposure parameters used typically reflect all or a significant portion of a person's lifetime. Once the current TCE values were released, the protectiveness of using traditional approaches to assess and address TCE exposures was questioned. The purpose of this memorandum is to update the EPA Region 7 RCRA and Superfund programs on the recommended action levels for TCE in air and provide information on characterizing and addressing human health risks from less-than-lifetime exposures. To support these objectives, the window of susceptibility for the developmental toxicity associated with TCE is examined, the critical exposure period of concern is identified, and the appropriate exposure parameters and equations are elucidated.

Toxicity Assessment

The EPA's final toxicological review by the IRIS program incorporates comments by the U.S. National Academy of Sciences (National Research Council, 2006), two U.S. EPA Science Advisory Boards (EPA, 2002 and 2011b), the Executive Office of the President (Office of Management and Budget, 2009 and 2011), the U.S. Department of Defense (DOD, 2009a, 2009b and 2011), the National Aeronautics and Space Administration (NASA, 2009 and 2011), internal Agency reviewers, and the public, among others. The Halogenated Solvents Industry Alliance, Inc., which represents the interests of TCE manufacturers and producers, submitted a Request for Correction of the TCE IRIS assessment (HSIA, 2013), which was denied by the EPA's Acting Assistant Administrator (EPA, 2015). The HSIA then submitted a Request for Reconsideration (HSIA, 2015), which was also denied by the EPA (EPA, 2016a). The EPA found the Requests "directly contrary to the SAB's conclusions and recommendations, such that to accept HSIA's RFC/RFR would require EPA to reject SAB's advice" (EPA, 2016a).

The EPA's Office of Land and Emergency Management recognizes an IRIS assessment as the official Agency scientific position regarding the toxicity of a chemical based on the data available at the time of the review (EPA, 2003). As such, IRIS is generally the preferred source of human health toxicity values used to evaluate risks at Superfund and RCRA hazardous waste sites. In accordance with Directive 9285.7-53 (EPA, 2003), the 2011 IRIS TCE toxicity values will be used to evaluate risks and derive action levels by the Region 7 RCRA and Superfund programs until the 2011 values are either revised or rescinded.

Non-Carcinogenic Health Effects

In general, the EPA assumes that a dose or exposure level exists below which adverse non-carcinogenic health effects will not occur (EPA, 1989). Below this threshold, it is believed that exposure to a chemical is tolerated without adverse effects. Adverse health effects occur only when physiologic protective mechanisms are overcome by exposure to doses or concentrations above the threshold. For chronic toxicity values, the first adverse effect (or its known precursor) that occurs to the most sensitive species as the dose rate of an agent increases, regardless of the exposure duration, is designated the

critical endpoint. The dose or exposure at which the critical endpoint is observed is the point of departure. Uncertainty factors, ranging from 1 to 3,000, reflecting limitations of the data used are applied to the point of departure to derive the inhalation reference concentration. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (EPA, 1989).

The 2011 Scientific Advisory Board panel recommended that, "The two endpoints for immune effects from Keil *et al.* (2009) and the cardiac malformations from Johnson *et al.* (2003) should be considered the principal studies supporting the RfC" (EPA, 2011b). The panel considered the immune effects and cardiac malformations co-critical endpoints (EPA, 2011b). In accordance with the SAB panel recommendations, the IRIS program based the TCE chronic reference concentration of 2 $\mu g/m^3$ on these two co-critical endpoints, each of which can support the RfC independently: autoimmune disease following chronic exposure in adults (0.00033 ppm, or 1.8 $\mu g/m^3$) and heart defects following exposure during early pregnancy (0.00037 ppm, or 2.0 $\mu g/m^3$). The RfC is also supported by nephrotoxicity (kidney effects) following chronic exposure in adults (0.00056 ppm, or 3.0 $\mu g/m^3$). Following publication of these values, the developmental cardiac effects were further addressed by the IRIS program in "TCE Developmental Cardiac Toxicity Assessment Update" (EPA, 2014a) and by scientists in the EPA's Office of Research and Development in the peer-reviewed literature (Makris *et al.*, 2016).

Chronic exposure to TCE poses a potential human health hazard to the central nervous system, kidneys, liver, immune system, and male reproductive system. As mentioned above, immunotoxicity in adults is considered a co-critical endpoint, at a slightly lower concentration than that associated with cardiac defects. Overall, the IRIS program concluded that "the human and animal studies of TCE and immune-related effects provide strong evidence for a role of TCE in autoimmune disease and in a specific type of generalized hypersensitivity syndrome" (EPA, 2011a). Kidney toxicity was considered a supporting endpoint, with high confidence found in multiple lines of evidence in both human and animal studies.

Short-term exposures to TCE during pregnancy are associated with many forms of developmental toxicity, including spontaneous abortions, decreased growth, developmental neurotoxicity, developmental immunotoxicity, and birth defects. However, the critical developmental endpoint is cardiac malformations. The primary types of heart defects observed with TCE exposures include atrial and ventricular septal defects, which are holes in the wall (septa) between the top two chambers (atria) or bottom two chambers (ventricles) of the heart, and pulmonary and aortic valve stenoses, which are thickened or fused heart valves that do not properly open and/or close and may leak blood. The critical window of susceptibility for these types of defects is an approximate three week period (i.e., valvuloseptal morphogenesis, or the period in which major cardiac morphogenic events such as heart valve formation occur) approximately four to seven weeks after conception, early in the first trimester of human pregnancy (Dhanantwari *et al.*, 2009). The type and severity of the resulting cardiac malformation or malformations depends on the timing and level of exposure to TCE within this approximate three week period. Exposures that clear the body before this period do not impact the heart valves and septa, because they have not yet begun to form. In humans, TCE and most of its metabolites are eliminated within a week of exposure (EPA, 2011a).

Carcinogenic Effects

The EPA evaluates carcinogenicity in two parts (EPA, 2005a). First, the Agency evaluates all available scientific information and assigns a weight-of-evidence classification based on a compound's potential to cause cancer in humans. In the absence of sufficient data regarding the mode of action or if the

weight-of-evidence supports a mutagenic mode of action, the EPA generally assumes that any exposure to a chemical will increase an individual's risk of developing cancer. Under this default approach, there is no threshold below which the probability of developing cancer is zero. Second, a toxicity value is derived to define the quantitative relationship between dose or concentration and carcinogenic response. For inhalation exposures using the default approach, this value is known as the inhalation unit risk. The IUR is a generally plausible upper-bound estimate of the increased probability of developing cancer following a lifetime of exposure. This value is used to estimate the increased risk of developing cancer from inhalation of potentially carcinogenic chemicals.

Following the EPA's Guidelines for Carcinogen Risk Assessment (EPA, 2005a), the IRIS program has evaluated the carcinogenic potential of TCE and has classified it as "carcinogenic to humans" by all routes of exposure. This conclusion is based on convincing evidence of a causal association between TCE exposure in humans and kidney cancer, strong evidence of non-Hodgkin's lymphoma, and more limited evidence of liver and biliary tract cancer. The inhalation unit risk for TCE, based on these combined cancer types, is 4.1E-06 $(\mu g/m^3)^{-1}$. Sufficient evidence supports a mutagenic mode of action for TCE-induced kidney tumors in humans, but modes of actions have not been established for the other TCE-induced cancer types. The portion of the TCE IUR specific for kidney tumors is 1.0E-06 $(\mu g/m^3)^{-1}$, while the IUR for non-Hodgkin's lymphoma plus liver and biliary tract cancers is 3.1E-06 $(\mu g/m^3)^{-1}$.

Risk Characterization

The EPA's RCRA and Superfund programs characterize potential human health risks using standardized equations that combine toxicity values with exposure parameters because risk is a function of both hazard and exposure. Typically, the EPA's standard default exposure parameters for chronic scenarios, published in OSWER Directive 9200.1-120 (EPA, 2014b), are used. However, exposure assessments must take into account the time scale related to the specific biological response (NRC, 1991). This means that exposure parameters selected to evaluate risks and/or develop levels of concern for a given chemical and scenario should correspond as closely as possible with the exposure period used to develop the toxicity value. For example, time-weighted average exposures over a lifetime have little relevance for a developmental toxin if the adverse effects could only occur following exposure during a particular stage of development (EPA, 1992).

Non-Cancer Hazard Quotients for Cardiac Defects

The toxicity values considered protective for a lifetime of exposure to TCE are partly based on non-cancer health effects resulting from less-than-lifetime exposures. As previously stated, one of the two co-critical endpoints that serves as the basis for the TCE RfC is cardiac defects. This effect can only occur when the fetus is exposed during the period of heart development. Therefore, the EPA's standard default exposure parameters for chronic exposures are invalid for estimating hazard quotients representing the potential for cardiac defects associated with TCE exposures and for deriving TCE levels of concern that are protective of developmental endpoints. To select appropriate less-than-lifetime exposure parameters that may be used to characterize these hazards and derive levels of concern, the critical exposure period of concern for TCE-related heart malformations must first be identified.

"[F]or developmental toxic effects, a primary assumption is that a single exposure at a critical time in development may produce an adverse developmental effect, i.e., repeated exposure is not a necessary prerequisite for developmental toxicity to be manifested" (EPA, 1991). The EPA's Risk Assessment Guidance for Superfund Part A (EPA, 1989) directs the use of a day or a single exposure incident to assess the potential risks of adverse developmental effects. Following this guidance, it is assumed that a

single exposure to TCE at any time during the approximate three week period of valvuloseptal morphogenesis could result in one or more of the types of heart malformations described previously. Thus, the critical exposure period of concern used to evaluate the potential for cardiac defects is one day. A 24-hour exposure period has been used by the EPA to evaluate acute hazards associated with TCE in the final, peer-reviewed TSCA Work Plan Chemical Risk Assessment (EPA, 2014c).

The EPA's Risk Assessment Guidance for Superfund Part F, Supplemental Guidance for Inhalation Risk Assessment (EPA, 2009) specifies that the exposure concentration (EC) that should be used to evaluate risks and derive levels of concern for acute endpoints is equivalent to the concentration detected in air (CA), as shown in Equation 1.

$$EC\left(\frac{\mu g}{m^3}\right) = CA\left(\frac{\mu g}{m^3}\right) \quad (1)$$

For a residential scenario, in which exposure to TCE inside a home is assumed to occur throughout the entire exposure period of concern, Equation 1 is appropriate. However, for other types of scenarios (e.g., industrial, commercial, recreational), exposures to TCE only occur for a portion of any given 24-hour period. Moreover, exposures to different concentrations of TCE may occur within a single day at some sites. To account for these multiple exposures, Equation 1 can be modified, resulting in a time-weighted average exposure concentration. The 24-hour TWA exposure concentration can be calculated using Equation 2.

$$EC_{24} = \sum_{i=1}^{n}(CA_i \cdot ET_i)/AT_{24} \quad (2)$$

where: EC_{24} ($\mu g/m^3$) = time-weighted average exposure concentration over 24 hours;
CA_i ($\mu g/m^3$) = TCE concentration in air in microenvironment (ME) i;
ET_i (hours) = exposure time spent in ME i;
AT_{24} (hours) = averaging time for the exposure period of concern (24 hours)

In a residential scenario, there is a single microenvironment, the residence, with an exposure time of 24 hours. Thus, the Residential EC_{24} will equal CA_{res}, as shown in Equation 3. To reduce uncertainty in residential scenarios, CA_{res} should be based on air samples collected for an entire 24-hour exposure period. Generally, stationary 24-hour indoor air sample results are used.

$$Residential\ EC_{24} = \frac{(CA_{res} \cdot 24\ hrs)}{24\ hrs} = CA_{res} \quad (3)$$

In a typical industrial or commercial scenario, there are two microenvironments. One is the workplace, and the other is away from the workplace. The Industrial/Commercial EC_{24} can be calculated using Equation 4, below. Although the standard value for ET_{work} is an 8-hour workday, this variable should reflect site-specific conditions. For example, employees at a given site may work longer shifts, such as 10 or 12 hours, and they may or may not take their lunch breaks on site. CA_{work} should be based on air samples collected for the entire exposure time, ET_{work}, during the portion of the day that workers are present. This is to prevent potential underestimates of TCE concentrations if diurnal variations occur at a site, although such variability does not exist at all sites. Generally, stationary 8-hour or 10-hour indoor air samples are appropriate. ET_{away} should equal the remainder of the 24-hour period spent away from the workplace. CA_{away} is generally assumed to equal zero, unless site-specific data suggest otherwise.

$$Industrial/Commercial\ EC_{24} = \frac{(CA_{work} \cdot ET_{work}) + (CA_{away} \cdot ET_{away})}{24\ hrs} \quad (4)$$

If multiple or variable microenvironments are present at a site, it is possible to use Equation 2 to generate a 24-hour TWA exposure concentration. However, consideration should be given to the use of portable sampling equipment to more accurately measure true exposure concentrations to the receptor(s) of concern over the entire exposure time, as opposed to stationary sampling equipment positioned in multiple areas where exposure occurs.

Non-cancer hazard quotients for heart defects can be derived using Equation 5, where HQ_{24} is the developmental hazard quotient; EC_{24} is the 24-hr time-weighted average exposure concentration calculated using Equations 2, 3, or 4; and the RfC is 2 $\mu g/m^3$. As shown in Equation 5, a hazard quotient is the ratio of the exposure to the non-cancer toxicity value. Thus, an HQ greater than 1 means that the exposure is greater than the RfC and exceeds a level of concern for that particular non-cancer health effect.

$$HQ_{24} = \frac{EC_{24}}{RfC} \tag{5}$$

Equation 5 can be combined with Equation 3 or 4 to calculate the developmental hazard quotients (HQ_{24}) for a residential or industrial/commercial receptor, as follows.

$$Residential\ HQ_{24} = \frac{CA_{res}}{2\,\frac{\mu g}{m^3}} \tag{6}$$

$$Industrial/Commercial\ HQ_{24} = \frac{(CA_{work}\cdot ET_{work})+(CA_{away}\cdot ET_{away})}{24\ hrs\cdot 2\,\frac{\mu g}{m^3}} \tag{7}$$

Non-Cancer Hazard Quotients for Chronic Health Effects

Autoimmune disease, a co-critical endpoint upon which the TCE RfC is based, and kidney toxicity, the supporting endpoint, are both health effects associated with chronic or long-term exposures. Equation 8 is the standardized equation used to evaluate non-cancer hazard quotients for chronic health effects; the exposure parameters are defined in Table 1. If seasonal or temporal fluctuations in TCE concentrations potentially exist, consideration should be given as to whether sufficient data are available to generate an average concentration for use as the CA term. If the dataset is limited, it may be more health-protective to use the highest concentration detected.

$$HQ_{chronic} = \frac{CA\left(\frac{\mu g}{m^3}\right)\cdot ET\left(\frac{hrs}{day}\right)\cdot\left(\frac{1\ day}{24\ hrs}\right)\cdot EF\left(\frac{days}{year}\right)\cdot ED(years)}{AT_{nc,chronic}(days)\cdot RfC\left(\frac{\mu g}{m^3}\right)} \tag{8}$$

The above equation can be presented in terms of residential or industrial/commercial exposure scenarios, as shown below. Note that it is only appropriate to calculate non-cancer hazard quotients for chronic health effects for those receptors with long-term exposures.

$$Residential\ HQ_{chronic} = \frac{CA_{res}\left(\frac{\mu g}{m^3}\right)\cdot ET_{res}\left(\frac{hrs}{day}\right)\cdot\left(\frac{1\ day}{24\ hrs}\right)\cdot EF_{res}\left(\frac{days}{year}\right)\cdot ED_{child}(years)}{AT_{nc,chronic,child}(days)\cdot RfC\left(\frac{\mu g}{m^3}\right)} \tag{9}$$

$$Industrial/Commercial\ HQ_{chronic} = \frac{CA_{work}\left(\frac{\mu g}{m^3}\right)\cdot ET_{work}\left(\frac{hrs}{day}\right)\cdot\left(\frac{1\ day}{24\ hrs}\right)\cdot EF_{work}\left(\frac{days}{year}\right)\cdot ED_{work}(years)}{AT_{nc,chronic,work}(days)\cdot RfC\left(\frac{\mu g}{m^3}\right)} \tag{10}$$

Cancer Risks

TCE is classified "carcinogenic to humans," based on kidney cancer, non-Hodgkin's lymphoma, and liver and biliary tract cancer. Equation 11 is the standardized equation used to evaluate excess individual lifetime cancer risks; the exposure parameters are defined in Table 1. If temporal fluctuations in TCE concentrations potentially exist, consideration should be given as to whether sufficient data are available to generate an average concentration for use as the CA term. If the dataset is limited, it may be more health-protective to use the highest concentration detected.

$$CR = \frac{CA\left(\frac{\mu g}{m^3}\right) \cdot ET\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF\left(\frac{days}{year}\right) \cdot ED(years) \cdot IUR\left(\frac{\mu g}{m^3}\right)^{-1}}{AT_{cancer}(days)} \quad (11)$$

The above equation can be presented in terms of residential or industrial/commercial exposure scenarios, as shown below. Because a mutagenic mode of action has been established for kidney tumors associated with TCE, it is necessary to apply age-dependent adjustment factors when deriving risks for this cancer type in children (EPA, 2005b). ADAFs are not applied when deriving risks for non-Hodgkin's lymphoma or liver and biliary tract cancers associated with TCE exposures because they have not been determined to operate via a mutagenic mode of action. Because only adults are evaluated in an industrial/commercial exposure scenario and no adjustments for mutagenicity are made for adults (i.e., $ADAF_{adult} = 1$), ADAFs are not included in Equation 13.

$$Residential\ CR = \left(\frac{CA_{res}\left(\frac{\mu g}{m^3}\right) \cdot ET_{res}\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF_{res}\left(\frac{days}{year}\right)}{AT_{cancer}(days)}\right) \cdot \left[\left(ED_{0-2}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{0-2}\right) + \left(ED_{2-16}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{2-16}\right) + \left(ED_{16-26}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{adult}\right) + \left(ED_{res}(years) \cdot IUR_{N\&L}\left(\frac{\mu g}{m^3}\right)^{-1}\right)\right] \quad (12)$$

$$Industrial/Commercial\ CR = \frac{CA_{work}\left(\frac{\mu g}{m^3}\right) \cdot ET_{work}\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF_{work}\left(\frac{days}{year}\right) \cdot ED_{work}(years) \cdot IUR\left(\frac{\mu g}{m^3}\right)^{-1}}{AT_{cancer}(days)} \quad (13)$$

The definitions, values, and references for the exposure parameters and toxicity values used in this document are provided in Table 1. For the chronic scenarios, the EPA's standard default exposure parameters (EPA, 2014b) are used to best represent reasonable maximum exposure scenarios, which are the highest exposures reasonably expected to occur at a site (EPA, 1989). These values are based on the 2011 Exposure Factors Handbook (EPA, 2011c). Although the default exposure time for an indoor worker is 8 hours/day, it is preferable to identify a site-specific worker exposure time.

Table 1. Exposure Parameters and Toxicity Values.

Parameter	Definition	Units	Value	Reference
$ADAF_{0-2}$	Age-dependent adjustment factor – ages 0 to 2 years	-	10	EPA, 2005b
$ADAF_{2-16}$	Age-dependent adjustment factor – ages 2 to 16 years	-	3	EPA, 2005b
$ADAF_{adult}$	Age-dependent adjustment factor – ages 16 years and older	-	1	EPA, 2005b
AT_{24}	Averaging time – developmental effects	hours	24	-
AT_{cancer}	Averaging time – cancer	days	25,550	EPA, 2014b

Table 1. Exposure Parameters and Toxicity Values.				
Parameter	**Definition**	**Units**	**Value**	**Reference**
$AT_{nc,chronic,\ child}$	Averaging time – chronic non-cancer health effects, resident child	days	2,190	EPA, 2014b
$AT_{nc,chronic,\ work}$	Averaging time – chronic non-cancer health effects, indoor worker	days	9,125	EPA, 2014b
CA	Concentration of TCE in air	$\mu g/m^3$	Measured	-
CA_{res}	Concentration of TCE in air of the residence	$\mu g/m^3$	Measured	-
CA_{work}	Concentration of TCE in air of the workplace	$\mu g/m^3$	Measured	-
$ED_{0\text{-}2}$	Exposure duration – ages 0 to 2 years	years	2	EPA, 2005b
$ED_{2\text{-}16}$	Exposure duration – ages 2 to 16 years	years	14	EPA, 2005b
$ED_{16\text{-}26}$	Exposure duration – ages 16 to 26 years	years	10	EPA, 2005b
ED_{child}	Exposure duration – resident (child, ages 0 to 6 years)	years	6	EPA, 2014b
ED_{res}	Exposure duration – resident (child + adult, ages 0 to 26 years)	years	26	EPA, 2014b
ED_{work}	Exposure duration – indoor worker	years	25	EPA, 2014b
EF_{res}	Exposure frequency – resident	days/yr	350	EPA, 2014b
EF_{work}	Exposure frequency – indoor worker	days/yr	250	EPA, 2014b
ET_{away}	Exposure time – time spent away from work by an indoor worker (24 hrs/day minus ET_{work})	hrs/day	16 or site-specific	-
ET_{res}	Exposure time – time spent at home by a resident	hrs/day	24	EPA, 2014b
ET_{work}	Exposure time – time spent at work by an indoor worker	hrs/day	8 or site-specific	EPA, 2014b or site-specific
IUR	TCE inhalation unit risk - total	$(\mu g/m^3)^{-1}$	4.1E-06	EPA, 2011a
IUR_{kid}	TCE inhalation unit risk – kidney cancer	$(\mu g/m^3)^{-1}$	1.0E-06	EPA, 2011a
$IUR_{N\&L}$	TCE inhalation unit risk – non-Hodgkin's lymphoma and liver and biliary tract cancers	$(\mu g/m^3)^{-1}$	3.1E-06	EPA, 2011a
RfC	TCE reference concentration	$\mu g/m^3$	2	EPA, 2011a
THQ	Target hazard quotient	-	1	-
TR	Target cancer risk	-	1E-04	Upper-end of Target Cancer Risk Range

Action Levels

Level of Concern for Developmental Effects

Equations 2 and 5 can be manipulated to solve for the level of concern for developmental health effects, using a target non-cancer hazard quotient of 1, as follows. Note that the only exposure parameter that can vary in this calculation is the exposure time. The TCE levels of concern for developmental effects based on standard exposure times are provided in Table 2. For a 24-hour residential scenario, the developmental LOC equals 2 $\mu g/m^3$. For a typical 8-hour industrial/commercial scenario, the developmental LOC equals 6 $\mu g/m^3$. Site-specific developmental LOCs may be derived using alternate exposure times; for example, a 10-hour exposure time results in a developmental LOC of 4.8 $\mu g/m^3$.

$$TCE\ LOC_{developmental}\left(\frac{\mu g}{m^3}\right) = \frac{THQ \cdot AT_{24}(hrs) \cdot RfC\left(\frac{\mu g}{m^3}\right)}{ET\left(\frac{hrs}{day}\right)} \quad (14)$$

$$TCE\ Residential\ LOC_{developmental}\left(\frac{\mu g}{m^3}\right) = \frac{1 \cdot 24\ hrs \cdot 2\ \frac{\mu g}{m^3}}{24\ hrs} \quad (15)$$

$$TCE\ Industrial/Commercial\ LOC_{developmental}\left(\frac{\mu g}{m^3}\right) = \frac{1 \cdot 24\ hrs \cdot 2\ \frac{\mu g}{m^3}}{ET_{work}\left(\frac{hrs}{day}\right)} \quad (16)$$

Level of Concern for Chronic Non-Cancer Health Effects

Equation 8 can be manipulated to solve for the level of concern for chronic, non-cancer health effects, using a target non-cancer hazard quotient of 1 and the exposure parameters presented in Table 1, as follows. For a residential scenario, this LOC equals 2.1 µg/m^3, which is the value listed as the non-cancer residential air Regional Screening Level for TCE, based on an HQ of 1 (EPA, 2016b). For an industrial/commercial scenario, the chronic LOC equals 8.8 µg/m^3, which is the value listed as the non-cancer worker air RSL for TCE, based on an HQ of 1. Site-specific chronic LOCs may be derived using alternate exposure times or other parameters.

$$TCE\ LOC_{chronic}\left(\frac{\mu g}{m^3}\right) = \frac{THQ \cdot AT_{nc,chronic}(days) \cdot RfC\left(\frac{\mu g}{m^3}\right)}{ET\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF\left(\frac{days}{year}\right) \cdot ED(years)} \quad (17)$$

$$TCE\ Residential\ LOC_{chronic}\left(\frac{\mu g}{m^3}\right) = \frac{THQ \cdot AT_{nc,chronic,child}(days) \cdot RfC\left(\frac{\mu g}{m^3}\right)}{ET_{res}\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF_{res}\left(\frac{days}{year}\right) \cdot ED_{child}(years)} \quad (18)$$

$$TCE\ Industrial/Commercial\ LOC_{chronic}\left(\frac{\mu g}{m^3}\right) = \frac{THQ \cdot AT_{nc,chronic,work}(days) \cdot RfC\left(\frac{\mu g}{m^3}\right)}{ET_{work}\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF_{work}\left(\frac{days}{year}\right) \cdot ED_{work}(years)} \quad (19)$$

Level of Concern for Cancer Risks

Equations 11, 12, and 13 can be manipulated to solve for the level of concern for cancer risks, using a target excess cancer risk (TR) of 1E-04, which is the upper bound of the EPA's target cancer risk range, and the exposure parameters presented in Table 1, as follows. For a residential scenario, this LOC equals 48 µg/m^3, and for an industrial/commercial scenario, the cancer LOC equals 300 µg/m^3.

$$TCE\ LOC_{cancer}\left(\frac{\mu g}{m^3}\right) = \frac{TR \cdot AT_{cancer}(days)}{ET\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF\left(\frac{days}{year}\right) \cdot ED(years) \cdot IUR\left(\frac{\mu g}{m^3}\right)^{-1}} \quad (20)$$

$$TCE\ Residential\ LOC_{cancer}\left(\frac{\mu g}{m^3}\right) = \frac{TR \cdot AT_{cancer}(days)}{ET\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF\left(\frac{days}{year}\right) \cdot \left[\begin{array}{c}\left(ED_{0-2}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{0-2}\right) + \left(ED_{2-16}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{2-16}\right) + \\ \left(ED_{16-26}(years) \cdot IUR_{kid}\left(\frac{\mu g}{m^3}\right)^{-1} \cdot ADAF_{16-26}\right) + \left(ED_{res}(years) \cdot IUR_{N\&L}\left(\frac{\mu g}{m^3}\right)^{-1}\right)\end{array}\right]} \quad (21)$$

$$TCE\ Industrial/Comm.\ LOC_{cancer}\left(\frac{\mu g}{m^3}\right) = \frac{TR \cdot AT_{cancer}(days)}{ET_{work}\left(\frac{hrs}{day}\right) \cdot \left(\frac{1\ day}{24\ hrs}\right) \cdot EF_{work}\left(\frac{days}{year}\right) \cdot ED_{work}(years) \cdot IUR\left(\frac{\mu g}{m^3}\right)^{-1}} \quad (22)$$

As shown below in Table 2, the levels of concern for developmental health effects are lower than the LOCs for chronic health effects and cancer, for both residential and occupational scenarios, when based on target hazard quotients of 1 or target cancer risks of 1E-04. These are the levels of risk that, when exceeded, warrant action under the National Contingency Plan. Basing the Region 7 TCE action levels

on the developmental LOCs is protective for all potential forms of adverse health effects associated with TCE. Thus, the action level for a residential scenario is 2 $\mu g/m^3$, and the action level for a typical industrial/commercial scenario with an 8-hr workday is 6 $\mu g/m^3$. As previously mentioned, the developmental LOC, and thus the action level, is highly dependent on the exposure time. Therefore, for non-residential exposure scenarios, careful consideration should be given to the value selected as the exposure time.

Table 2. Levels of Health Concern for Trichloroethylene ($\mu g/m^3$), THQ = 1 and TR = 1E-04.	
Residents (24-hr Exposure Scenario)	
Developmental Non-Cancer LOC:	*2*
Chronic Non-Cancer LOC:	*2.1*
Cancer LOC:	*48*
Region 7 Residential TCE Action Level:	**2**
Industrial/Commercial Workers (8-hr Exposure Scenario)	
Developmental Non-Cancer LOC:	*6*
Chronic Non-Cancer LOC:	*8.8*
Cancer LOC:	*300*
Region 7 Industrial/Commercial TCE Action Level:	**6**

Risk Management Considerations

If the TCE action level is exceeded, this indicates a potential imminent threat to human health, and early or interim action(s) should be taken to eliminate, reduce, and/or control the hazards posed by the site (EPA, 2014d). At Superfund sites, coordination between the remedial and removal programs should immediately commence as early as the receipt of preliminary sampling results indicative of a potential human health concern (EPA, 2016c). Potential receptors should be informed of the results and potential risks to human health. Standard Region 7 practice is to communicate this information via data transmittal letters submitted to property owners and employers, but when TCE action levels are exceeded, tenants, residents, employees and others who may be exposed should also be informed. Although the action levels derived in this document are applicable to women in the first trimester of pregnancy, note that the levels protective of autoimmune disease and kidney toxicity in all individuals are not significantly different, at 2.1 and 8.8 $\mu g/m^3$, for residents and workers, respectively. Depending on the concentrations detected, immediate site actions could include relocation, restricting the time residents or workers remain in areas exceeding action levels, opening basement or lower level windows for ventilation (using a fan), sealing cracks in the slab, sealing sump pits, sealing cinder block or stone walls, and/or using air filtration systems. Vapor mitigation systems or adjustments to HVAC systems may be used to minimize exposures on a more long-term basis. Post-remedy testing and continued operation and maintenance is necessary to ensure protection of human health until the source of TCE in soil and/or groundwater is ultimately addressed.

Other EPA Regions and states have derived tiered action levels prescribing the types and urgency of various responses, as described below.

- Although Region 7 consistently uses a THQ of 1 as the basis for both removal and remedial Superfund actions, other Regions have used a THQ of 3 as a science policy approach to prioritize actions that may warrant the use of removal authority, with ultimate cleanup goals based on a THQ of 1. Since non-cancer toxicity values have historically been based on effects resulting from chronic exposure, this practice assumes that the most highly contaminated sites will be remediated first, but all sites will be remediated before exposures have occurred for a sufficiently long duration (e.g., 25 years as a worker or 26 years as a resident) to pose significant health risks.

This assumption is not protective of the short-term health effects associated with TCE, in which the critical window of susceptibility is an approximate three week period and a single exposure during this critical time may result in cardiac malformations.

- Tiered action levels could also be derived by reducing the uncertainty factor applied to the RfC from 10 to 1. The existing UF of 10 is applied for uncertainty regarding differences in pharmacodynamics between animals and humans and between the general population and sensitive subpopulation. Other than the toxicokinetic variability characterized by the physiologically-based pharmacokinetic model, EPA (2011a) indicates that there are inadequate chemical-specific data to quantify the degree of differential susceptibility due to factors such as genetic polymorphisms, race/ethnicity, preexisting health status, lifestyle factors, and nutritional status. The UF of 10 was included in the extensive peer-review process described in this document, and Region 7 does not have justification to alter this value.
- Similarly, the selection of a 1% excess risk as the benchmark response and a human equivalent concentration for a toxicokinetically sensitive individual at the 99th percentile were both extensively reviewed, and Region 7 does not have justification to alter these criteria.

Although Region 7 has not developed tiered levels because this approach may not be protective of human health, higher concentrations of TCE are associated with greater health risks. Actions should be implemented as quickly as is practicable to minimize risks of developmental toxicity. This document reinforces that Region 7 should expedite actions to protect human health whenever the TCE air concentration exceeds 2 $\mu g/m^3$ in a residential scenario or 6 $\mu g/m^3$ for an 8-hour worker scenario.

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ATTACHMENT G

GLOSSARY AND ACRONYMS

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ATTACHMENT G

GLOSSARY AND ACRONYMS FOR TERMS USED IN THE PROTOCOL FOR REMEDIATION GOAL LOOKUP TABLES NEBRASKA VOLUNTARY CLEANUP PROGRAM

"adj": Designation in Table C-1, Standard Default Factors, for exposure parameters which have been calculated using an age-adjusted scenario.

Age-adjusted calculations: Performed for VCP Remediation Goal (RG) calculations for exposure pathways for which the contact rate differs between adults and children (e.g., incidental ingestion of soil). Age-adjusted rates take into account differences in ingestion rates, body weights, and exposure duration for children versus adults. Age-adjusted parameters were used in calculating the residential VCP RGs for carcinogens for all pathways for both soil and ground water. This age-adjusted approach yielded lower (more protective) VCP RGs for carcinogens than would a carcinogenic assessment of only an adult *or* a child.

ALM: Adult Lead Model. Model used to calculate the industrial VCP Remediation Goals (RG) for lead.

Anthropogenic: Describes contaminants present in the environment whose presence is due to man-made sources (e.g., automobiles). Anthropogenic contamination is typically widespread and can be the result of organic or inorganic contaminants.

AREA-ST Model: Dispersion model used for calculating the air dispersion factor (Q/C term), which is used in the volatilization factor for soil (VF_s) and particulate emission factor (PEF) equations. The AREA-ST Model is an updated version of U.S. EPA's Industrial Source Complex (ISC2) Model.

ASTM: American Society for Testing and Materials.

ATSDR ("A"): Agency for Toxic Substances and Disease Registry. A source of toxicity information; "A" is the designation for toxicity factors from ATSDR's minimal risk levels.

Background: Ambient concentrations of contaminants that are present in the environment and have not been influenced by humans. The term "background concentration" is typically reserved for metals, since metals are contaminants which are most likely to be naturally occurring.

Baseline risk assessment: An evaluation of conditions and risks/hazards to human health at a site, assuming current conditions and no controls are in place. Consists of the following steps: data collection and analysis; exposure assessment; toxicity assessment; and risk characterization.

"ca": Designation for VCP remediation goals (RG) which are based on carcinogenic effects.

CAF: Cancer adjustment factor is used to calculate the RGs for trichloroethylene. An oral factor (CAF_o) and inhalation factor (CAF_i) are used.

Cal EPA ("C): California Environmental Protection Agency. A source of toxicity information; "C" is the designation for toxicity factors from Cal EPA's Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels and Cancer Potency Values.

Carcinogen: An agent capable of inducing cancer.

Carcinogenic risk level/target cancer risk: Additional risk of developing cancer due to exposure to a contaminant incurred over the lifetime of the individual. For the VCP remediation goals (RG), the carcinogenic risk levels are set as follows:

Type of Land Use/Scenario	Individual or Combined (Cumulative)Contaminant Exposure	Carcinogenic Risk Level
Residential	Individual	1×10^{-6}
	Combined	1×10^{-5}
Industrial	Individual	1×10^{-5}
	Combined	1×10^{-4}

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act of 1980.

Class GA: Ground water which is currently being used as a public drinking water supply or is proposed to be used as a public drinking water supply. Defined in Nebraska Department of Environmental Quality's (NDEQ) Title 118, Chapter 7.

Class GB: Ground water which is currently being used as a private drinking water supply or has the potential for being used as a public or private drinking water supply but currently cannot be classified as GA. Class GB is assigned to all ground waters in the state except those assigned to Classes GA and GC. Defined in NDEQ Title 118, Chapter 7.

Class GC(R): Ground water assigned to Class GC is not being used, and has little or no potential for being used, as a public or private drinking water supply. Class GC(R) is a subset of Class GC and represents certain portions of ground water for which the NDEQ has determined that restoration or cleanup may be appropriate to allow for attainment of future beneficial uses. Defined in NDEQ Title 118, Chapter 7.

Conceptual site model: A diagram of a site used to identify all potential or suspected sources of contamination, types and concentrations of contaminants detected at the site, potentially contaminated media, and potential exposure pathways, including receptors.

Contiguous: Sharing a boundary; touching.

COPC: Chemical of potential concern. Contaminant that has the potential to adversely affect a human receptor due to its concentration, distribution, and mode of toxicity.

COPEC: Chemical of potential ecological concern. Contaminant that has the potential to adversely affect an ecological receptor due to its concentration, distribution, and mode of toxicity.

2,4-D: 2,4-dichlorophenoxyacetic acid.

DAF: Dilution attenuation factor used in the calculation of soil-to-ground water VCP Remediation Goals (RG). Ratio of soil leachate concentration to receptor point concentration. Represents the reduction in concentration which occurs as soil leachate moves through soil and ground water, as a result of adsorption, degradation, and dilution by clean ground water. The VCP RG calculations use a DAF of 20, which, assumes that there is a 20-fold reduction in contaminant concentration between the soil sampling location and the receptor well location.

DDD: 4,4′- Dichlorodiphenyldichloroethane.

DDE: 4,4′- Dichlorodiphenyldichloroethene.

DDT: 4,4′- Dichlorodiphenyltrichloroethane.

Default values: Exposure factors which are used in calculating the VCP Remediation Goals (RG) and do not vary with the contaminant (e.g., soil ingestion rate, dermal surface area).

Dermal absorption fraction: Fraction of contaminant which is dermally absorbed from soil. Chemical-specific value.

D_i: Diffusivity in air. Chemical-specific value used in calculating the volatilization factor for soil (VF_s) term.

Exposure pathway: Course a contaminant takes from a source to an exposed organism. Includes a source area, point of exposure, and an exposure route (e.g., inhalation), as well as a transport mechanism if the point of exposure is different from the source area.

Exposure point: Location of potential contact between an organism and a contaminant.

Fate and transport: Mechanism whereby contaminants are transferred between environmental media (i.e., the volatilization factor for soil [VF_s] is a fate and transport factor which models how contaminants are transported from soil to ambient air).

GSD: Geometric standard deviation.

Ground water: Supply of fresh water found beneath the earth's surface, usually in aquifers, which supply wells and springs.

HCH: Hexachlorocyclohexane.

HEAST ("H"): U.S. EPA Health Effects Assessment Summary Tables. A source of toxicity information; "H" is the designation for toxicity factors from HEAST.

Henry's Law Constant (H): Principle that at a constant temperature the concentration of a gas dissolved in a fluid with which it does not combine chemically is almost directly proportional to the partial pressure of the gas at the surface of the fluid. Chemical-specific value used in the volatilization factor for soils (VF_s) equation.

HI: Noncarcinogenic hazard index. Sum of more than one hazard quotient (HQ) for multiple noncarcinogenic substances and/or multiple exposure pathways. See definition of HQ above for HI values used for VCP Remediation Goal (RG) calculations.

HQ: Noncarcinogenic hazard quotient. Ratio of a single noncarcinogenic contaminant's exposure level to a reference dose (RfD) or reference concentration (RfC) for that contaminant. For the VCP remediation goals (RG), the noncarcinogenic HQs and hazard indices (HI) are set as follows:

Type of Land Use/Scenario	Individual or Combined (Cumulative)Contaminant Exposure	HQ orchid
Residential	Individual	HQ = 0.25
	Combined	Target organ-specific HI = 1.0
Industrial	Individual	HQ =1.0
	Combined	Target organ-specific HI = 1.0

IEUBK Model: Integrated Exposure Uptake Biokinetic Model for Lead in Children. Model used to calculate the residential VCP Remediation Goals (RG) for lead.

Inorganic: Contaminant not containing carbon.

Institutional control: Legal instrument placed in the property records (e.g., deed notice) which indicates limitations on or conditions governing use of the property which ensures protection of human health and the environmental or equivalent zoning and governmental ordinances. For the VCP Remediation Goals (RG), mainly refers to an institutional control placed on a property stating that it is approved for industrial-commercial use only, since industrial RGs were applied to the site contaminant concentrations.

IRIS ("I"): U.S. EPA Integrated Risk Information System. Primary source of toxicity information; "i" is the designation for toxicity factors from IRIS.

ISC2: Industrial Source Complex Model.

K_d: Soil-water partition coefficient used for inorganics. Chemical-specific value used in calculating the volatilization factor from soil (VF_s) and soil-to- ground water VCP Remediation Goals (RG).

K_{oc}: Octanol-water partition coefficient used for organics. Chemical-specific value converted to a soil-water partition coefficient (K_d) used in calculating the volatilization factor from soils (VF_s) and soil-to-ground water VCP Remediation Goals (RG).

L: Liter.

L/day: Liter per day.

Laboratory detection limit: The lowest concentration of a contaminant that can reliably be distinguished from a zero concentration.

"m": Designation for VCP Remediation Goals (RG) based on the Title 118 Maximum Contaminant Level (MCL) or derived from the MCL.

m^3/kg: Cubic meter per kilogram.

m^3-yr/kg-day: Cubic meter – year per kilogram – day.

MAF: Mutagen adjustment factor is used to calculated the RGs for trichloroethene. An oral factor (MAF_o) and inhalation factor (MAF_i) are used.

"max": Designation for VCP Remediation Goals (RG) based on the non-risk-based "ceiling limit" concentration of 1 x 10^{+5} mg/kg.

MCL: Maximum contaminant level in ground water, from Title 118.

µg/m^3: microgram per cubic meter

µg/L: microgram per liter

mg/kg: Milligram per kilogram.

mg-yr/kg-day: Milligram – year per kilogram – day.

MW: Molecular weight.

"n/a": Designation for volatile inorganic contaminants in the "VOC" column of the VCP Remediation Goal (RG) lookup tables. Indicates that even though these contaminants are volatile, no soil inhalation or particulate values are calculated since they are not organic contaminants.

NAPL: Non-aqueous phase liquid.

"nc": Designation for VCP remediation goals (RG) which are based on noncarcinogenic effects.

NCP: U.S. EPA National Contingency Plan.

NDEE: Nebraska Department of Environment and Energy.

NHHSS: Nebraska Health and Human Services System.

NHL: Non-Hodgkin lymphoma

Noncarcinogen: Contaminant not believed to cause cancer, but which causes other toxic effects.

Nonvolatile: For the VCP Remediation Goals (RG), nonvolatile contaminants are defined as those having a Henry's Law Constant (H) less than or equal to 1 x 10^{-5} atm-m^3/mole and a molecular weight (MW) greater than or equal to 200 grams/mole.

NVCP RG: Nebraska Department of Environmental Quality (NDEQ) Voluntary Cleanup Program Remediation Goal. Term for Tier 2 soil and ground water concentrations calculated using the methods described in the protocol.

"O": Designation for factors from nonstandard ("other") U.S. EPA sources.

Oral absorption factor: Used in the dermal soil contact pathway. Factor estimating gastrointestinal absorption used to modify the oral toxicity factor for use in the dermal pathway.

ORD: U.S. EPA Office of Research and Development.

Organic: Contaminant containing carbon.

OSWER: U.S. EPA Office of Solid Waste and Emergency Response.

PAH: Polycyclic aromatic hydrocarbon.

PCB: Polychlorinated biphenyls.

PEF: Particulate emission factor.

PFOA: Perfluorooctanoic acid.

PFOS: Perfluorooctanesulfonate.

pica: Abnormal appetite in children for consuming large amounts of soil.

PM_{10}: Particulate matter of 10 microns (μm) or less in diameter.

PPRTV ("P" and "X"): U.S. EPA Provisional Peer-Reviewed Toxicity Values. Source of toxicity information; "P" is the designation for toxicity factors which are the PPRTVs derived by U.S. EPA's Health Risk Technical Support Center for the U.S. EPA Superfund Program. Source of toxicity information, "X" is the designation for toxicity factors which are the values derived from the PPRTV Appendix.

Q/C: Air dispersion factor used in the volatilization factor for soil (VF_s) equation and the particulate emission factor (PEF).

RAC: Remedial action class from Title 118.

RAC-1: Remedial action class 1 from Title 118. Includes ground water of Class GA and a portion of Class GB, a 500-foot radius around all private drinking water supply wells. RAC-1 ground water receives the most extensive remedial action measures.

RAC-2: Remedial action class 2 from Title 118. Includes ground water of Class GB (except for the portion of Class GB placed in RAC-1) and Class GC(R).

RAC-3: Remedial action class 3 from Title 118. Includes, but is not limited to, ground water of Class GC—except for Class GC(R) that was placed in RAC-2. RAC-3 ground water receives the least extensive remedial action measures.

RAGS: U.S. EPA Risk Assessment Guidance for Superfund.

RBCA: Risk-based Corrective Action.

RCRA: Resource Conservation and Recovery Act.

Receptor: Organism potentially receiving a contaminant exposure. For the purposes of the VCP Remediation Goals (RG), receptors evaluated include residents (adults and children) and industrial-commercial workers (abbreviated as "industrial").

RfC: Chronic reference concentration. Toxicity factor used to estimate noncarcinogenic hazard from inhalation exposures to site contaminants. An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

RfD: Chronic reference dose. Toxicity factor used to estimate noncarcinogenic hazard from oral and dermal exposures to site contaminants. An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime.

RG: Remediation Goal.

RSL: U.S. EPA Regional Screening Level.

"s": Designation for VCP remediation goals (RG) which are based on the soil saturation limit.

Safe Drinking Water Act: Passed in 1974, aims to ensure that public drinking water supplies meet national standards which protect consumers from harmful contaminants in drinking water.

SARA: Superfund Amendments and Reauthorization Act of 1986.

SEAM: Superfund Exposure Assessment Manual.

SF: Cancer slope factor. Toxicity factor used to estimate cancer risk due to oral and dermal exposures to site contaminants. An upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg/day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

Site-specific: Pertaining to a particular location (i.e., contaminated site). Relevant site-specific parameters include, but are not limited to organic carbon content of soil, depth to ground water, mean annual windspeed, etc.

Soil saturation limit: Measure of the contaminant concentration at which all soil pore space (both air- and water-filled) is saturated with the contaminant and the adsorptive limits of the soil particles have been reached. Represents an upper bound on the applicability of the volatilization factor in soil (VF_s) model, because contaminants exceeding the saturation limit may be present in free phase, which would violate a key principle of the model (i.e., that Henry's Law applies).

Soil to ground water: Migration of contaminants from soil to underlying ground water, through leaching.

Surface water: Above-ground water bodies (e.g., lakes, rivers).

SVOC: Semivolatile organic compound.

Target organ: The biological organ(s) most adversely affected by exposure to a chemical, physical, or biological agent.

TCDD: Tetrachlorodibenxo-p-dioxin.

TCE: Trichloroethylene.

Tier 1: Under VCP, comparison/remediation to background concentrations.

Tier 2: Comparison/remediation to VCP Remediation Goals (RG).

Tier 3: Development of and comparison/remediation to site-specific VCP Remediation Goals (RG) by the participant, under oversight by NDEQ.

Title 118: NDEQ Ground Water Quality Standards and Use Classification.

Ubiquitous: Widespread; present virtually everywhere.

U.S. EPA: U.S. Environmental Protection Agency.

URF: Unit risk factor. Toxicity factor used to estimate cancer risk due to inhalation exposures to site contaminants. The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 $\mu g/m^3$ in air.

VCP: Voluntary Cleanup Program.

VF_s: Volatilization factor for soil inhalation pathway. Calculated, chemical-specific value for volatile organic compounds (VOC).

VF_w: Volatilization factor for ground water inhalation pathway. Default value previously derived using chemical-specific information; used for volatile organic compounds (VOC).

VOC: Contaminant which is considered to be a volatile organic compound. For the VCP Remediation Goal (RG) lookup tables, VOCs are defined as contaminants having a Henry's Law Constant (H) greater than 1×10^{-5} atm-m^3/mole and a molecular weight (MW) less than 200 grams/mole.

Appendix B

EXAMPLE TABLES AND FIGURES

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Table 1 – Compounds Detected in Groundwater Samples Compared to Screening Levels.

Compound	Maximum Concentration Reported in Previous Investigations (µg/L)	Maximum Concentration in January 2004 (µg/L)	MCL (µg/L)
Volatile Organic Compounds			
Benzene	**120**	**10 J**	5
Chlorobenzene	40	12 J	100
1,2-Dichloroethane	**45**	ND	5
1,1-Dichloroethene	**38**	ND	7
1,2-Dichloroethene (total)	**6,400**	**860**	100
Ethylbenzene	**1,600**	ND	700
Tetrachloroethene	**300**	**79**	5
Toluene	120	ND	1,000
1,1,1-Trichloroethane	**260**	ND	200
Trichloroethene	**260**	**50**	5
Vinyl chloride	**2,500**	**1,400**	2
Xylene (total)	5,700	ND	10,000
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	**42**	3 J	6
1,2-Dichlorobenzene	37	ND	600
2-Methylnaphthalene	27	ND	none
Naphthalene	16	ND	none
Pesticides			
Heptachlor epoxide	**0.79**	NA	0.2
Toxaphene	**12**	NA	3
Herbicides			
Atrazine	**3.1**	NA	3
Dichlorophenoxyacetic acid (2,4-D)	NR	NA	70
2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex)	**88**	NA	50

Notes:

This table is derived from Consulting Geologist (2000a) and EPA (2004). Concentrations in bold exceed the EPA MCL.
EPA = U.S. Environmental Protection Agency
J = estimated
MCL = EPA maximum contaminant level (EPA 2002a)
µg/L = micrograms per liter
NA = not analyzed
ND = not detected
NR = not reported

Table 1 – Well and Piezometer Construction Details

Well Designation	Well Type	Sampling/ Measurement Frequency	Depth To Top Of Screen (ft.)	Depth To Bottom Of Screen (ft.)	Sump Length (ft.)	Depth To Water (ft.)	Depth To Bottom (ft.)	Installation Date
MCA-Da	Monitor	Annually	72.8	75.3	2.0	26.54	77.3	7/88
MCA-S	Monitor	Not sampled	12.4	22.4	2.0		24.4	7/88
MCB-Da	Monitor	Annually	78.8	81.3	1.5	28.33	82.8	6/89
MCB-M	Monitor	Annually	38.8	41.3	1.5	27.11	42.8	6/89
MCB-S	Monitor	Not sampled	20.1	30.1	1.5		31.6	6/89
MCC-D	Monitor	Not sampled	37.9	40.4	1.5		41.9	6/89
MCC-Da	Monitor	Not sampled	76.9	79.4	1.5		80.9	6/89
MCC-S	Monitor	Not sampled	19.7	29.7	1.5		31.2	6/89
MCD-Da	Monitor	Annually	78.3	80.8	1.5	27.33	82.3	6/89
MCD-M	Monitor	Quarterly	38.8	41.3	1.5	27.93	42.8	6/89
MCD-S	Monitor	Quarterly	19.6	29.6	1.5	28.18	31.1	6/89
MCE-M	Monitor	Not sampled	40.0	42.5	1.5 – 2.5		44.0 – 45.0	12/89
MCE-S	Monitor	Not sampled	15.0	25.0	1.5 – 2.5		26.5 – 27.5	11/89
MCF-M	Monitor	Not sampled	27.5	30.0	1.5 - 2.5		31.5 – 32.5	11/89
MCF-S	Monitor	Not sampled	12.5	22.5	2.5		25.0	11/89
MCG-M*	Monitor	Not sampled	32.5	35.0	1.5 – 2.5	28.91	36.5 – 37.5	12/89
MCI-M*	Monitor	Not sampled	35.1	37.6	1.5 – 2.5	25.44	39.1 – 40.1	12/89
MCI-S	Monitor	Not sampled	12.6	22.6	2.5		25.1	12/89
MW-1M	Monitor	Quarterly	39.6	49.6	2.5	24.10	52.1	9/94
MW-2	Monitor	Not sampled	14.9	24.9	2.0		26.9	7/88
MW-3	Monitor	Not sampled	16.4	26.4	2.5		28.9	11/89
MW-4	Monitor	Not sampled	26.0	28.5	1.5		30.0	7/90
MW-5	Monitor	Not sampled	32.5	35.0	1.5		36.5	7/90
MW-5D	Monitor	Quarterly	51.7	54.2	2.5	27.93	59.7	9/94
MW-5Da	Monitor	Not sampled	61.4	63.9	2.5		66.4	12/96
MW-5Db	Monitor	Quarterly	78.8	81.3	2.5	28.32	83.8	1997 - 1998
MW-6	Monitor	Not sampled	27.0	29.5	1.5		31.0	7/90
MW-6D	Monitor	Annually	46.5	51.5	0.0	27.32	51.5	1999
MW-7	Monitor	Not sampled	26.0	28.5	1.5		30.3	7/90
MW-8	Monitor	Quarterly	19.9	34.9	0.0	26.56	34.9	1/95
MW-10	Monitor	Quarterly	14.2	29.2	0.0	28.24	29.2	1/95
MW-11D	Monitor	Quarterly	40.3	45.3	2.0	28.04	47.3	4/95
MW-11M	Monitor	Quarterly	30.0	35.0	2.0	28.22	37.0	4/95
MW-12D	Monitor	Annually	42.8	47.8	2.2	28.28	50.0	1/95
MW-12M	Monitor	Not sampled	30.5	35.5	2.0		37.5	1/95
MW-13Da	Monitor	Annually	47.3	52.3	0.0	27.15	52.3	1999
MW-14Da	Monitor	Annually	49.3	54.3	0.0	28.00	54.3	1999
OB-1	Piezometer	Quarterly	26.5	29.0	1.5	25.55	30.5	7/90
P1-D	Piezometer	Quarterly	52.5	55.0	0.0	27.27	55.0	1/90
P1-M	Piezometer	Quarterly	39.3	41.8	0.0	26.25	41.8	2/90
RW-1	Recovery	Not sampled	38.8	58.8	0.0		58.8	1/90
RW-2	Recovery	Not sampled	40.2	60.2	0.0		60.2	1/90
RW-3	Recovery	Not sampled	28.7	59.7	0.0		59.7	4/96

Notes:

* Although these wells are not sampled regularly, water levels were measured during the March 2002 sampling event. Depth to water measured in March 2002 sampling event. Depth was measured from the top of the well casing.

Table 1 – Maximum Concentrations of Constituents in Groundwater Collected from Facility Monitoring Wells

Chemical of Concern	Relevant Standard or Criteria (µg/L)	Maximum Concentration Detected (µg/L)	Location of Maximum Concentration	Sampling Date	Other Wells above MCL or PRG (2002-2003)
Cadmium	MCL, 5	**15**	MW-2	Feb-97	
Chloroethane	PRG, 4.6	**16.7**	MW-17M	Apr-03	
1,2-Dichloroethane	MCL, 5	**15.6**	MW-20M	Sep-02	MW-18M
1,1-Dichloroethene	MCL, 7	**486**	MW-20M	Sep-02	MW-8, MW-15M, MW-16, MW-16M, MW-17, MW-17M, MW-18, MW-18M
Lead	Action Level, 15	**130**	MW-5	Jan-92	
Methylene chloride	MCL, 5	**34**	MW-16	Sep-02	MW-15M
Nitrate	MCL, 10,000	**75,000**	MW-2	Feb-95	
Styrene	MCL, 100	5.1	MW-15M	Jan-03	
Tetrachloroethene	MCL, 5	**186**	MW-8	Jul-03	MW-15M, MW-16M, MW-17M, MW-18M, MW-20M
Toluene	MCL, 1,000	657	MW-16	Apr-03	
1,1,1-Trichloroethane	MCL, 200	**328**	MW-8	Jul-03	MW-15M
1,1,2-Trichloroethane	MCL, 5	**11.9**	MW-15M	Jan-03	MW-16
Trichloroethene	MCL, 5	**44.6**	MW-8	Jul-03	MW-15M, MW-20M
1,2,4-Trimethylbenzene	PRG, 12	**96.6**	MW-15M	Jan-03	MW-8, MW-16, MW-20M
1,3,5-Trimethylbenzene	PRG, 12	**28.6**	MW-15M	Jan-03	MW-16
Vinyl chloride	MCL, 2	**8.44**	MW-15M	Apr-03	MW-17M, MW-18M, MW-20M
Xylene, Total	MCL, 10,000	264	MW-15M	Jan-03	

Notes:

Data provided by NDEQ (1998) and Consulting Geologist (2003b).
Concentrations in bold type exceed the EPA MCL or PRG for drinking water.

EPA U.S. Environmental Protection Agency
MCL EPA maximum contaminant level (EPA 2002a)
µg/L Micrograms per liter
NDEQ Nebraska Department of Environmental Quality
PRG EPA Region 9 preliminary remediation goal (EPA 2002b)

Table 1 – Subsurface Soil VOC Detections – Monitoring Well Installation, August 2002

Boring or Monitoring Well	Maximum Concentration (mg/kg)	Depth (ft bgs)
B-2	2.9	48
B-3	1.3	46
MW-15	1,551	6
MW-15M	355	23
MW-16	3.2	13
MW-16M	153	16
MW-17M	347	23
MW-18	1.4	6
MW-18M	41.4	37
MW-20M	9.0	53

Notes:

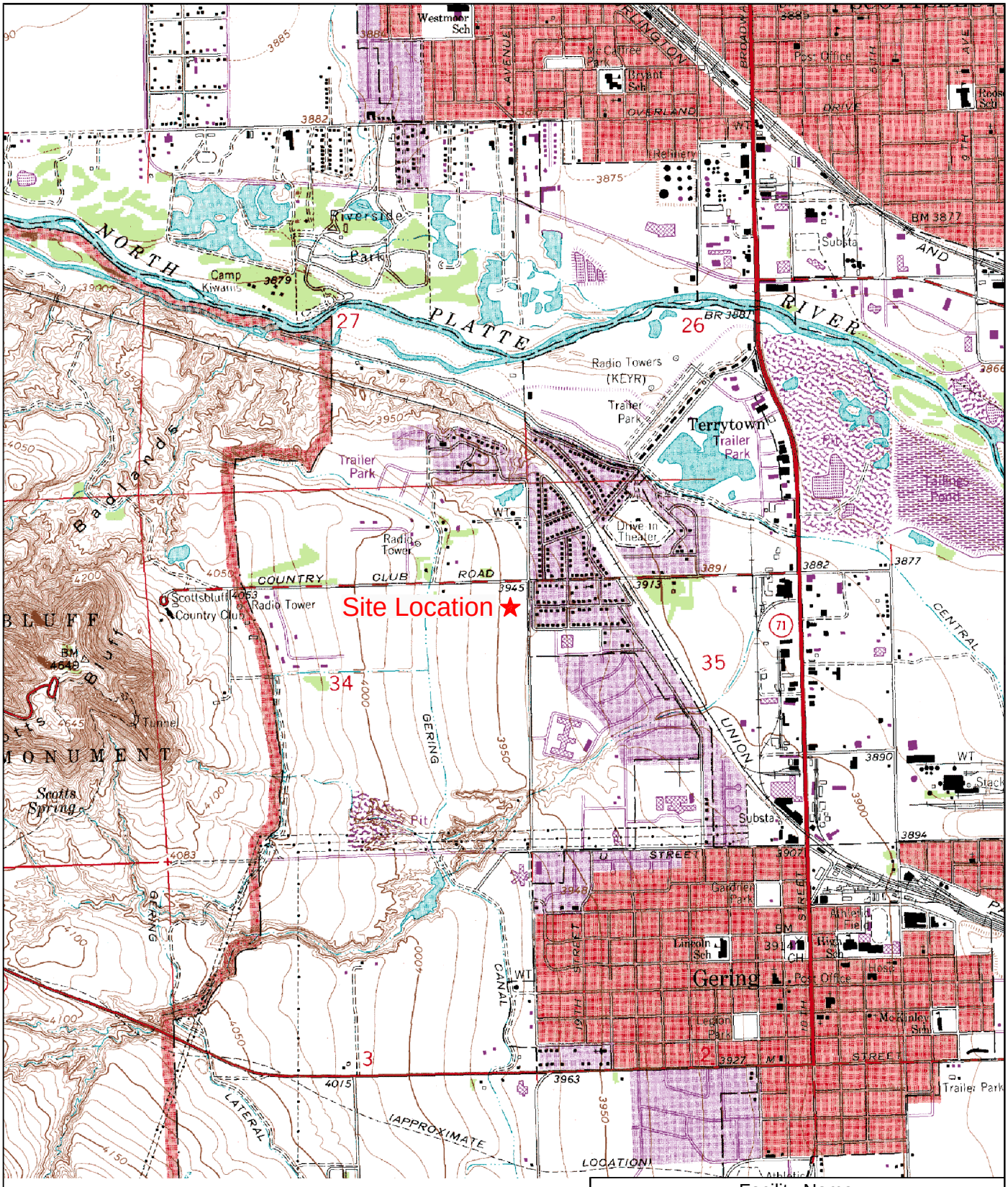
VOC Volatile organic compounds
ft bgs Feet below ground surface

Table 1 – Constituents Detected in Subsurface Soil

Metal	Concentration (mg/kg)	Sample Number	Depth (ft bgs)
Antimony	51.6	B-3	2.5 - 4.33
Arsenic	**704.3**	B-3	2.5 - 4.33
Arsenic	**15.4**	B-2	5.5 - 7.5
Arsenic	**14**	B-2	7.5 - 9.5
Arsenic	*11.7*	B-3	0.5 - 2.5
Cadmium	10.3	B-3	2.5 - 4.33
Copper	431	B-3	2.5 - 4.33
Lead	**9,630**	B-3	2.5 - 4.33
Lead	**6,919**	B-2	2.5 - 4.33
Lead	**590**	B-2	5.5 - 7.5
Lead	**1,633**	B-3	5.0 - 7.0
Zinc	240	B-3	2.5 - 4.33

Notes:

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations.
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram



Source: USGS Scottsbluff N, NE 7.5 Minute Topo Quad, 1963, PR 1976
USGS Scottsbluff S, NE 7.5 Minute Topo Quad, 1963, PR 1976

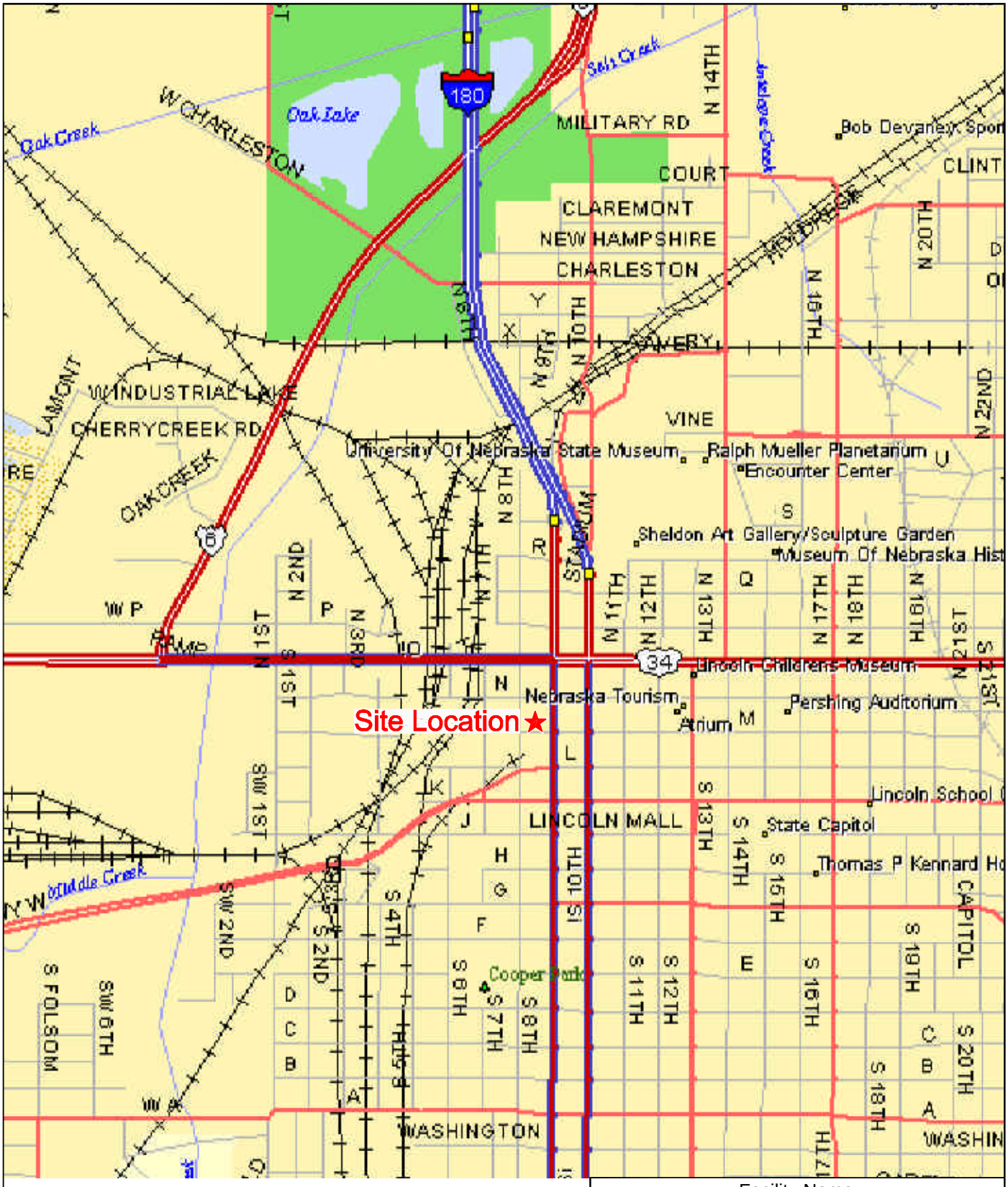
File Path

Facility Name
Address
City, State Zip Code

Figure #
Site Topographic Map

ABC Company, Inc.

Date: XX/XX/XX | Drawn By: Your Name | Project No: ######



Facility Name
Address
City, State Zip Code

Figure #
Site Location Map

ABC Company, Inc.

Source:

Date: XX/XX/XX | Drawn By: Jim Bob Furapples | Project No: G9011.L.00.0000.00

File Path

N

Not to Scale

Facility Name
Address
City, State Zip Code

Figure #
Historical Aerial Photo

ABC Company, Inc.

Source: E Data Resources, Aerial Photo, 1958

Date: XX/XX/XX Drawn By: Your Name Project No: ######

File Path

N

Not to Scale

Facility Name
Address
City, State Zip Code

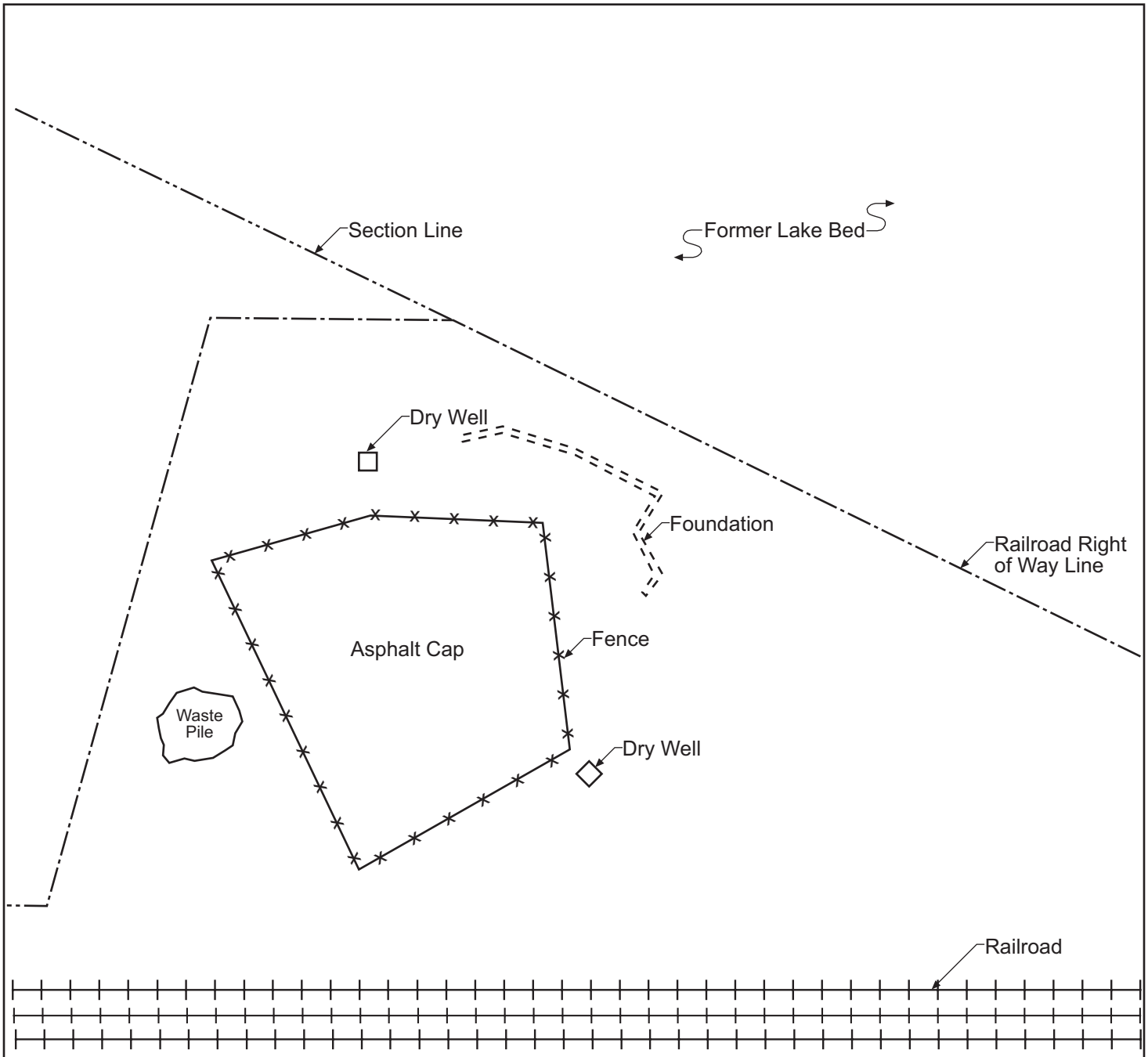
Figure #
Most Recent Aerial Photo

ABC Company, Inc.

Source: E Data Resources, Aerial Photo, 1994

Date: XX/XX/XX Drawn By: Your Name Project No: ######

File Path



N

0 30 60

Scale in Feet

Facility Name
Address
City, State Zip Code

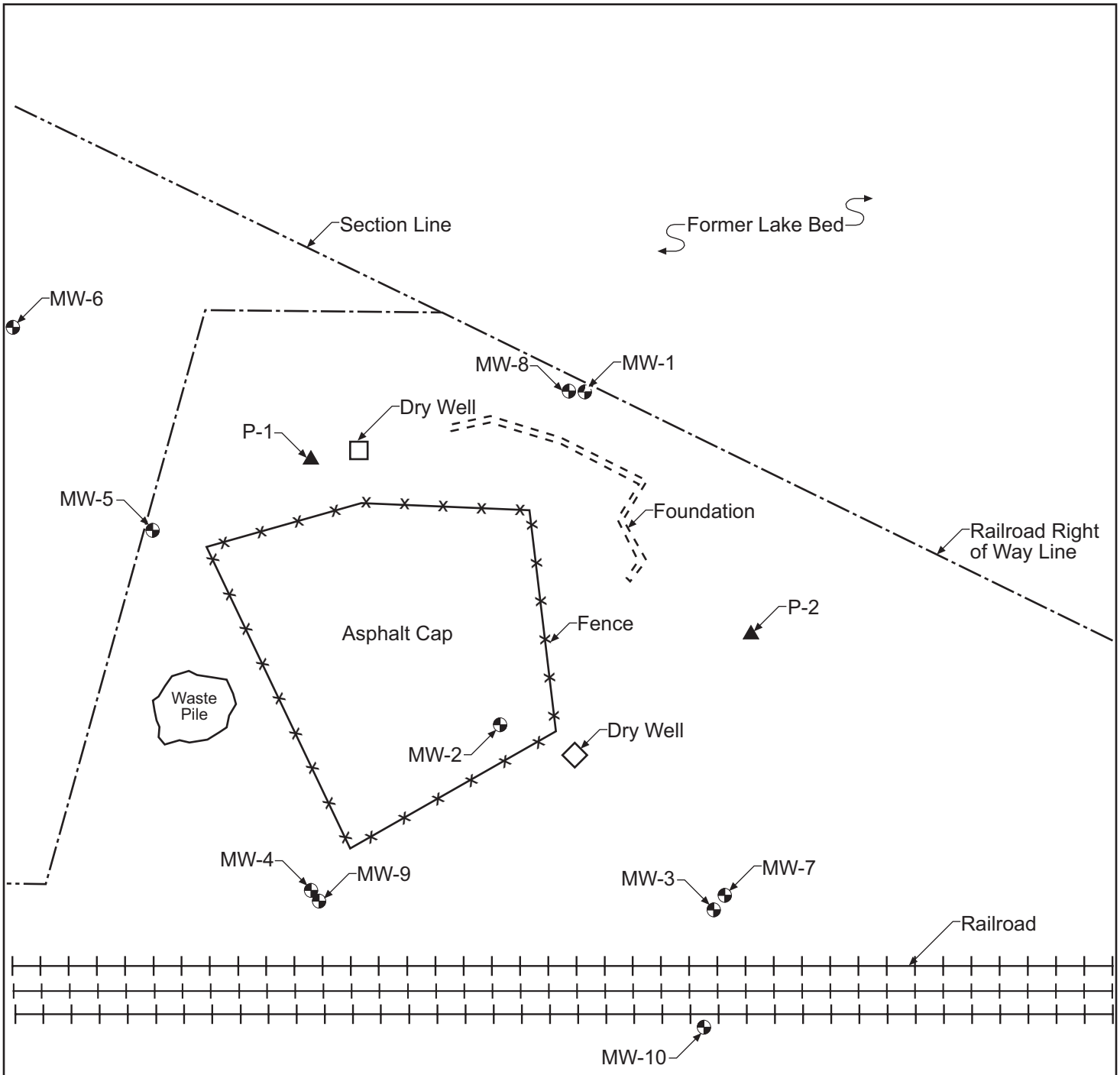
Figure #
Site Layout Map

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######

Base Map Source: Modified from XYZ Company, 2001

File Path



Legend
- Monitoring well location
- Piezometer location

N

0 30 60

Scale in Feet

Base Map Source: Modified from XYZ Company, 2001

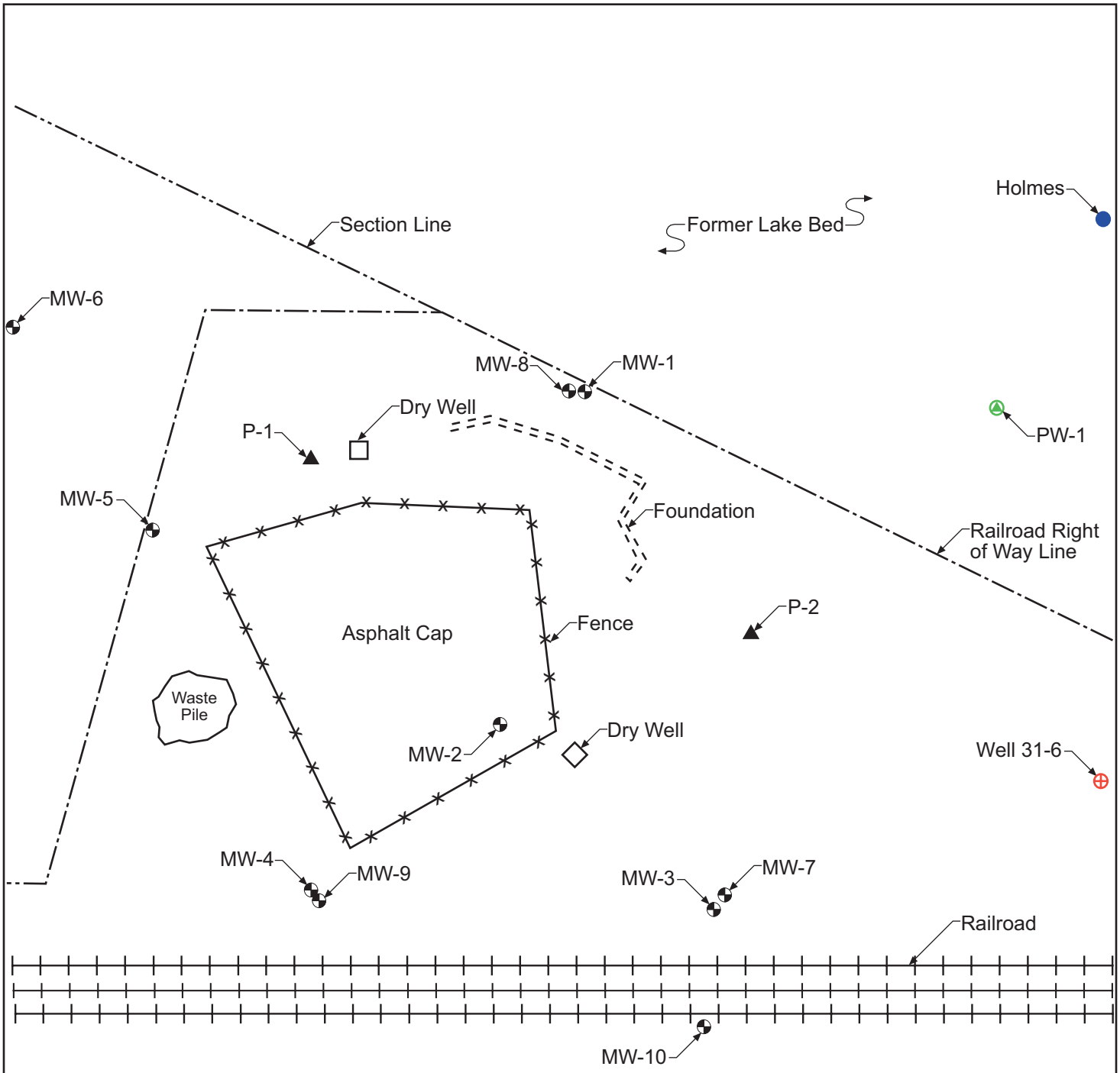
Facility Name
Address
City, State Zip Code

Figure #
Monitoring Well Locations

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######

File Path



Legend

- Monitoring well location
- Piezometer location
- Municipal well location
- Production well location
- Private residential well location

0 30 60

Scale in Feet

Base Map Source: Modified from XYZ Company, 2001

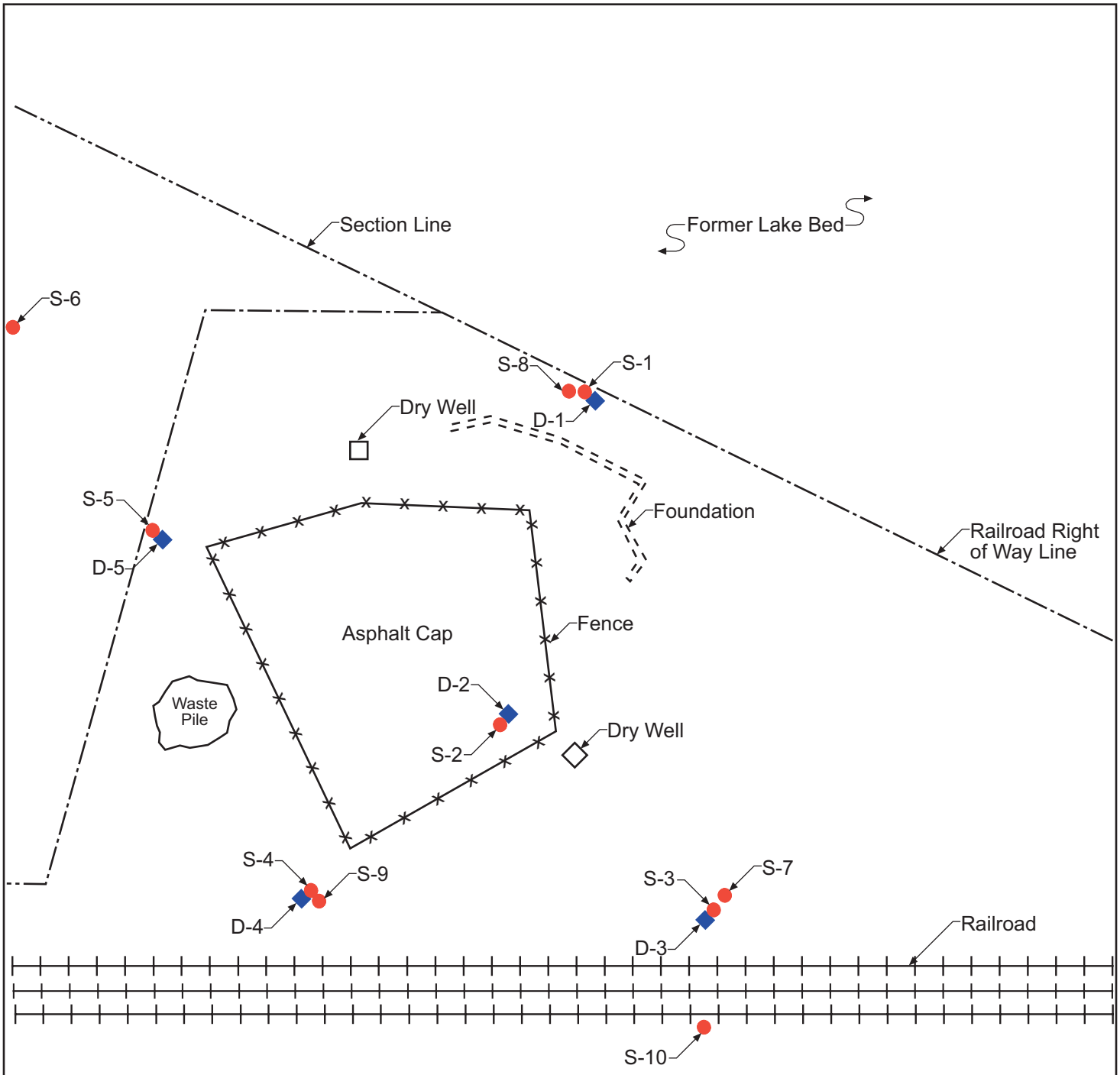
File Path

Facility Name
Address
City, State Zip Code

Figure #
Well Location Map

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######



Legend
- Shallow soil sample location
- Deep soil sample location

0 30 60
Scale in Feet

Base Map Source: Modified from XYZ Company, 2001

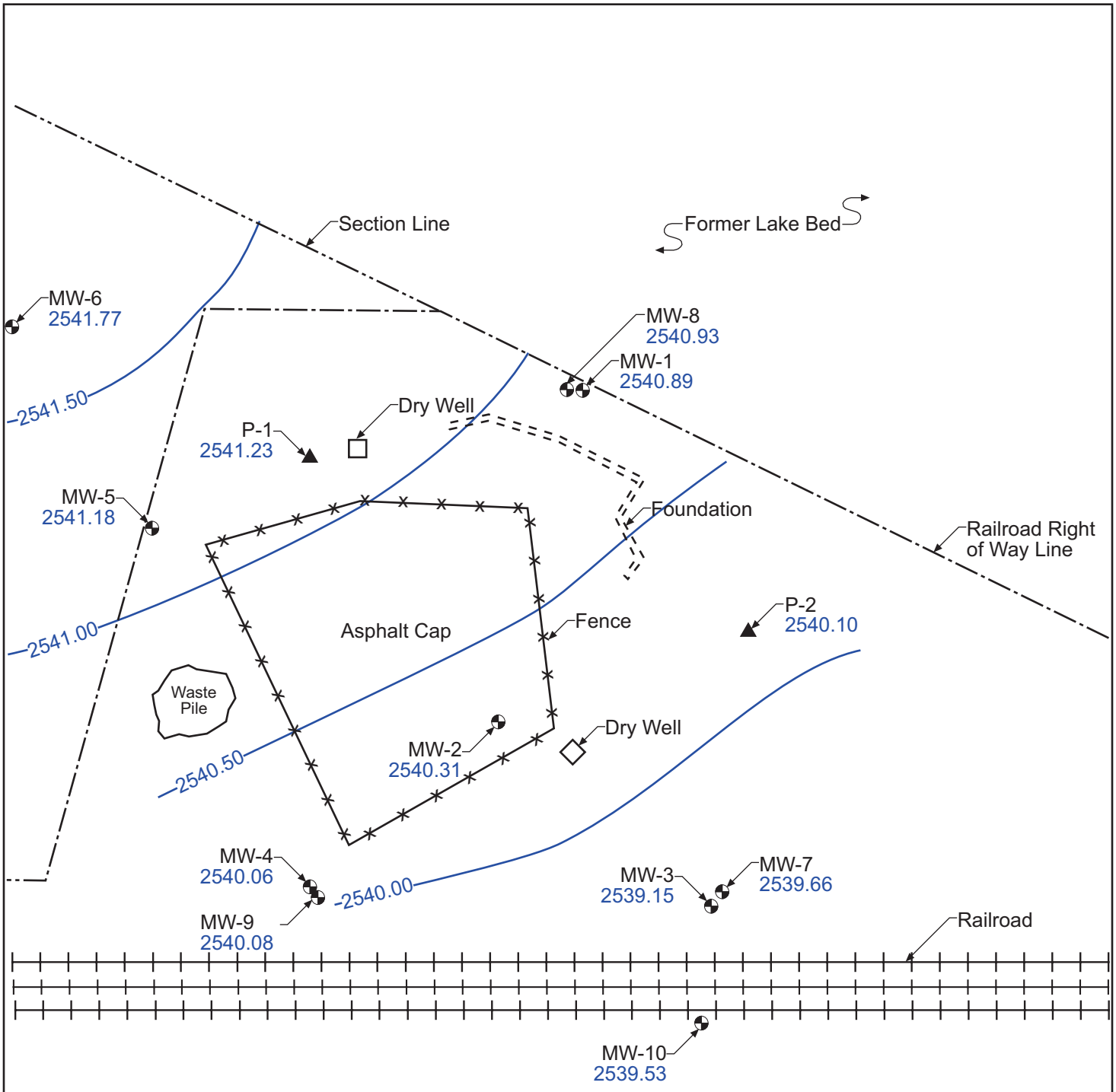
File Path

Facility Name
Address
City, State Zip Code

Figure #
Soil Sampling Locations

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######



Legend

- Monitoring well location
- Piezometer location
- Approximate potentiometric surface contour
- 2540.50 Groundwater elevation(feet above mean sea level)

N

0 30 60

Scale in Feet

Base Map Source: Modified from XYZ Company, 2001

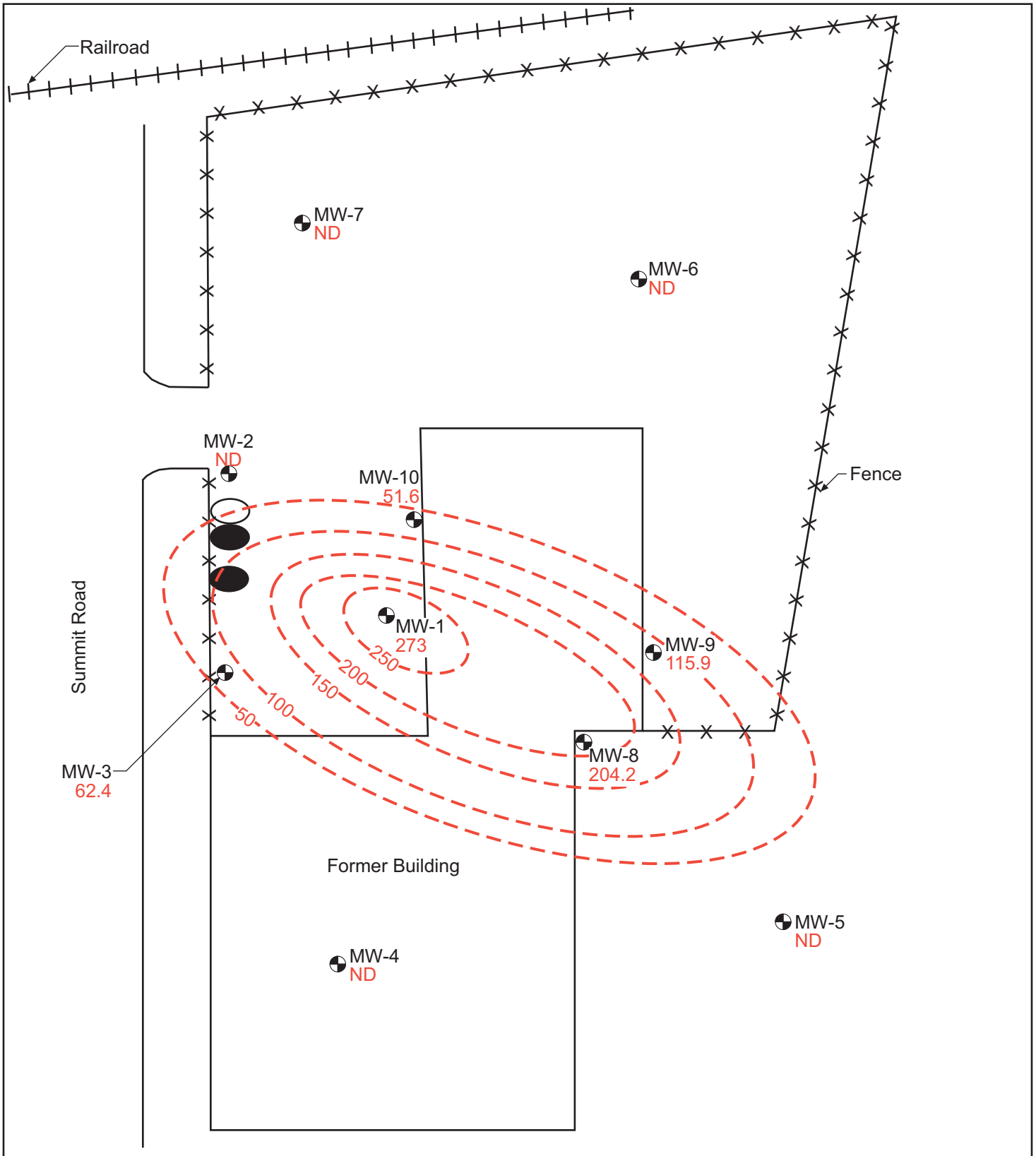
File Path

Facility Name
Address
City, State Zip Code

Figure #
Groundwater Potentiometric Map

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######



Legend

- Former UST
- Former AST
- Monitoring well
- MW-4 Monitoring well ID
- ND Not detected
- — — Approximate benzene isocontour
- 999 Benzene concentration

Not to Scale

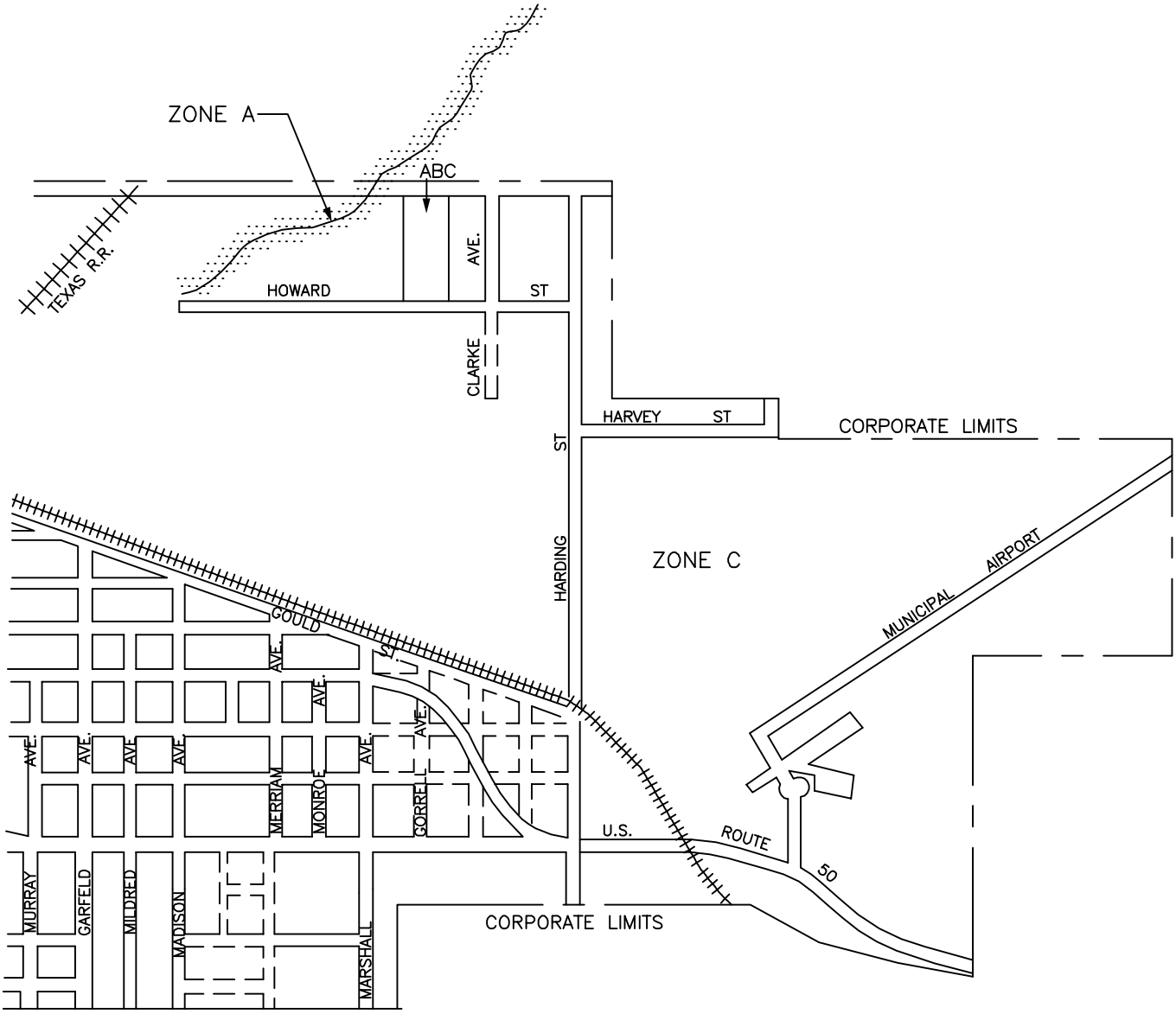
Facility Name
Address
City, State Zip Code

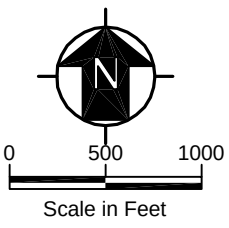
Figure #
Contaminant Plume
Isoconcentration Map

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######

File Path





Source: Modified from FEMA 1985

Facility Name
Address
City, State Zip Code

Figure #
Flood Plain Map

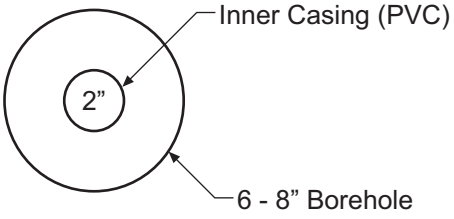
ABC Company, Inc.

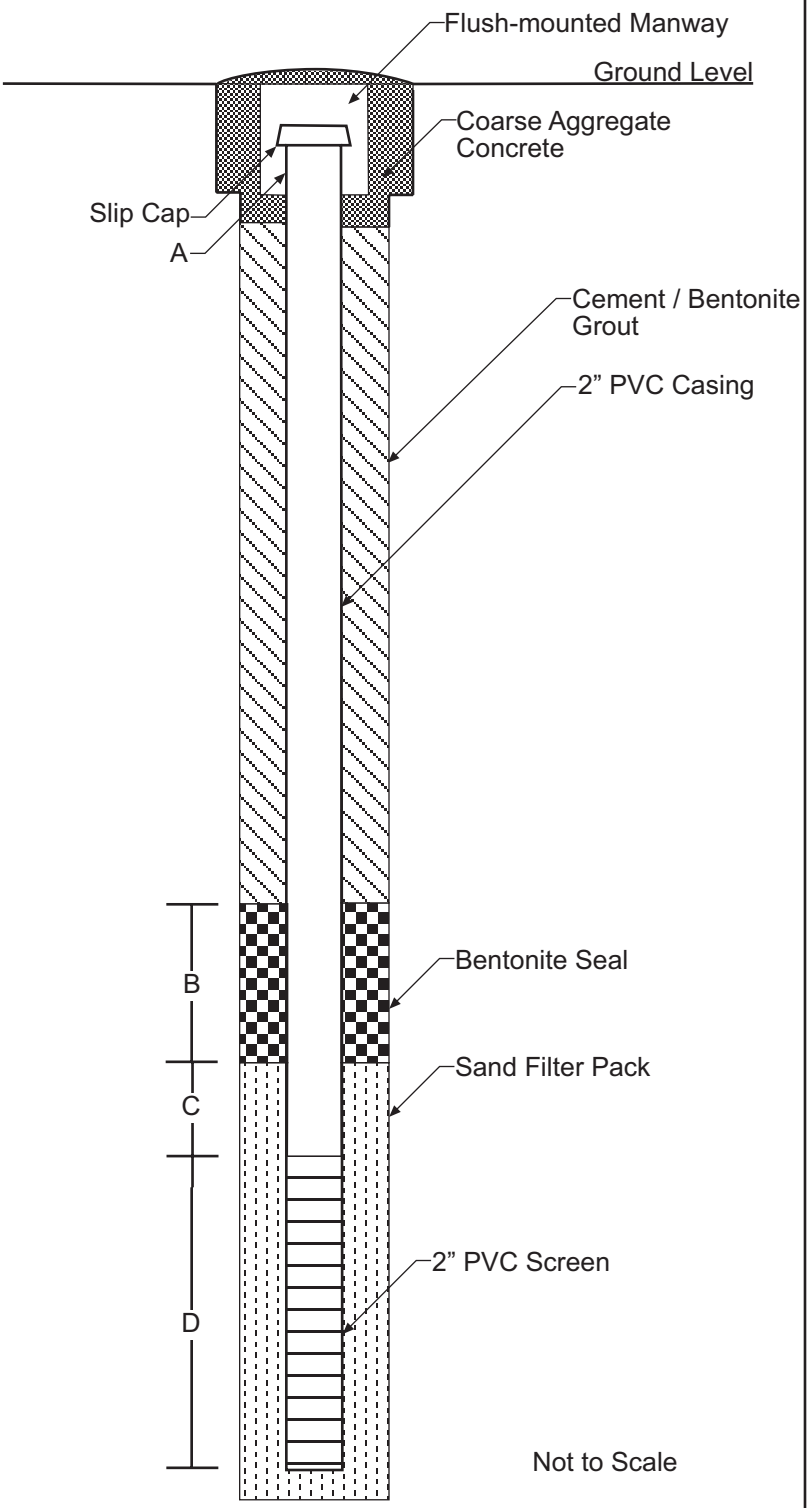
Date: XX/XX/XX | Drawn By: Your Name | Project No: ######

File Path

Well Construction Detail

Plan View





Construction Data

Casing Length: Site Specific
Casing Diameter: 2 in.
Casing Material: Schedule 40 PVC
Screen Size: 0.010 in.
Sand Size: 10-20
Screen Material: Schedule 40 PVC Continuous Wrap

A. Casing Elevation: 0 - 6 in. Below Grade
B. Bentonite Thickness: 3 ft.
C. Sand Depth Above Screen: 2 ft.
D. Screen Length: 10 ft.

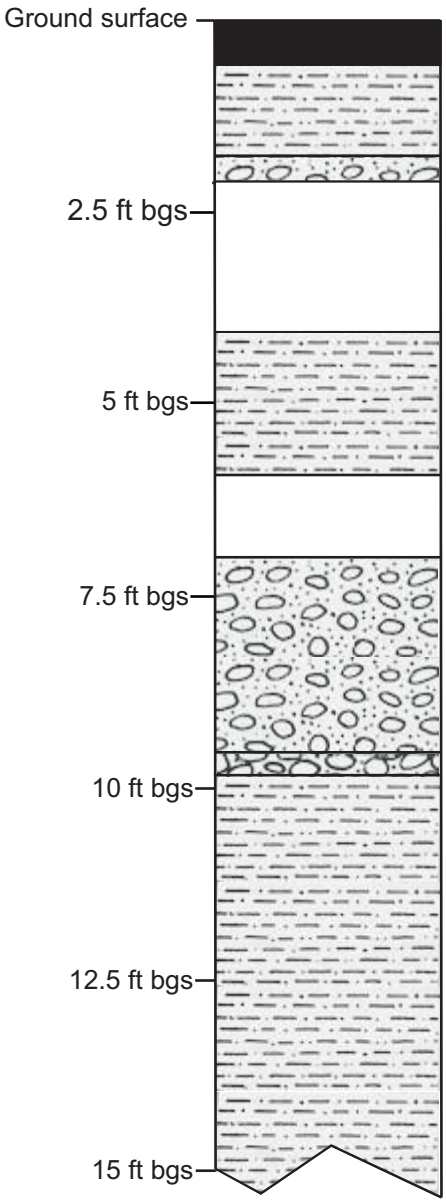
Facility Name
Address
City, State Zip Code

Figure #
Monitoring Well Construction Detail

ABC Company, Inc.

Date: ##/##/## Drawn By: Your Name Project No: ######

File Path



0’-0.5’ Black to brown organic rich silt, rootlets

0.5’-1.8’ Gray to brown silty clay, damp, and minor organics

1.8’-2.0’ Unconsolidated tar ash, gravel, and sands

2.0’-4.0’ Missing

4.0’-6.0’ Brown silty clays and minor organics

6.0’-7.0’ Missing

7.0’-9.5’ Unconsolidated tar ash, gravels, sands, and silts

9.5’-9.8’ Gray indurate fill gravels

9.8’-15’ Black to dark brown organic rich silts and silty clay, damp

Note: bgs abbreviation for below ground surface

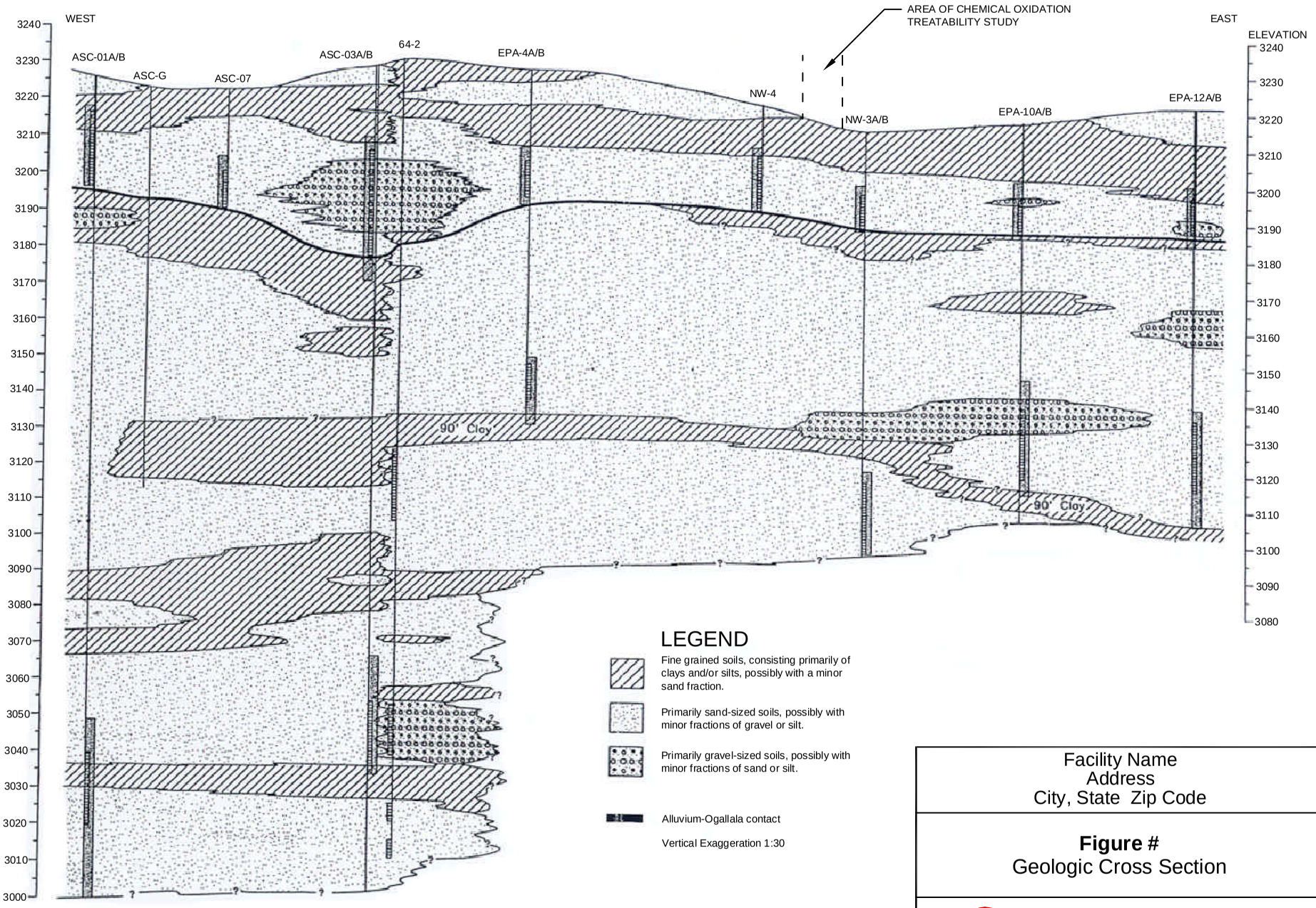
File Path

Facility Name
Address
City, State Zip Code

Figure #
Generalized Stratigraphic Column

ABC Company, Inc.

Date: XX/XX/XX Drawn By: Your Name Project No: ######



Source:

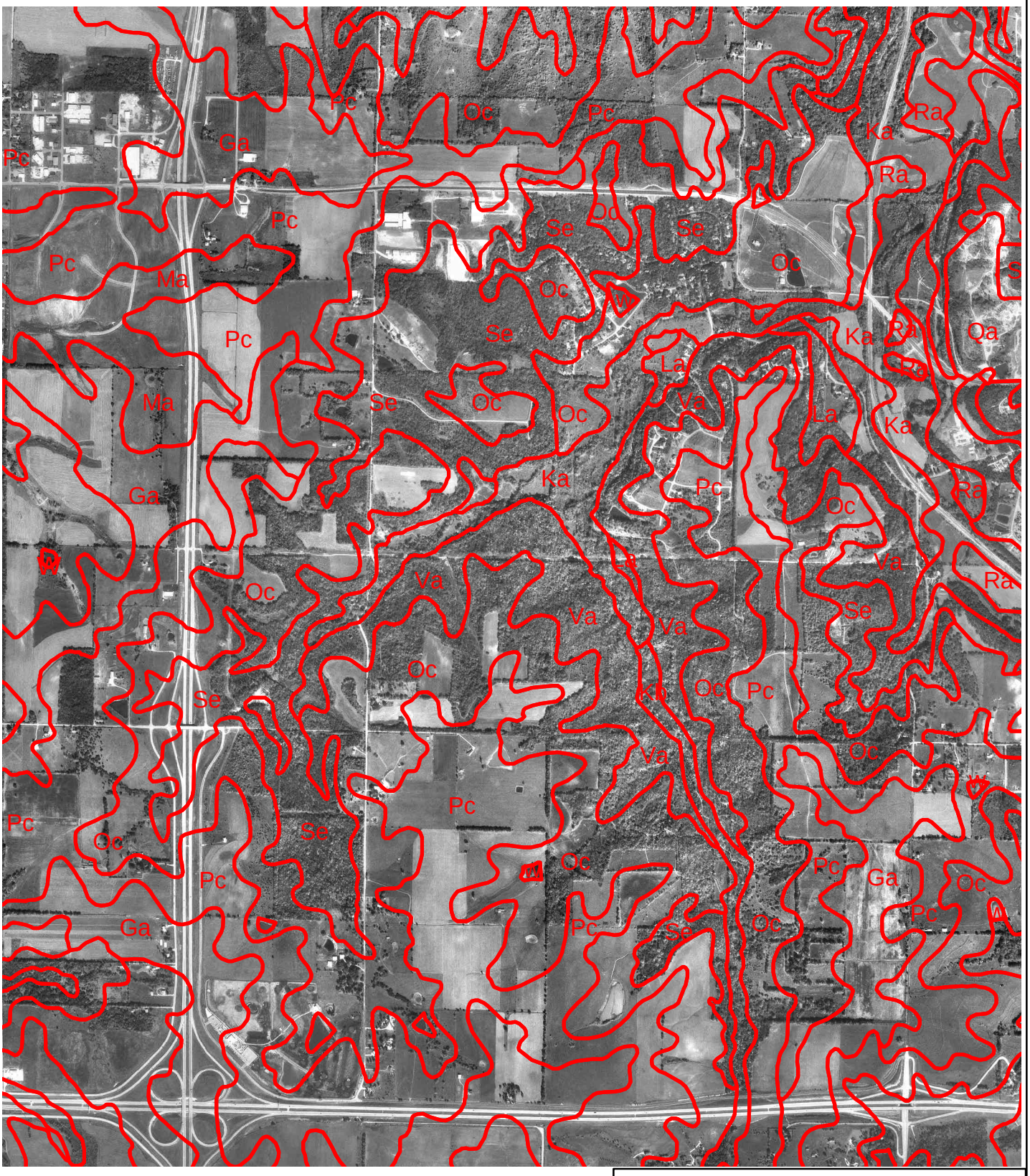
File Path

Facility Name
Address
City, State Zip Code

Figure #
Geologic Cross Section

ABC Company, Inc.

Date: XX/XX/XX | Drawn By: Your Name | Project No: ######



Legend

- Oc Oska-Martin Silty Clay Loam
- Va Vinland-Rock Outcrop Complex
- Pc Polo Silt Loam
- Ma Martin Silty Clay Loam
- Ka Kennebec Silt Loam
- La Ladoqg Silt Loam

N

2000 0 2000 Feet

Source:

File Path

Facility Name
Address
City, State Zip Code

Figure #
Soil Survey

ABC Company, Inc.

Date: 6/19/02 Drawn By: Colin Willits Project No: P1628.03

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Appendix C

BIBLIOGRAPHY

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BIBLIOGRAPHY

This bibliography is a compilation of resources related to site investigations, risk assessment, remedy selection, and other issues relevant to the Remedial Action Plan Monitoring Act Voluntary Cleanup Program. These references will be useful when preparing the remedial action plan and the remedial action report. However, it is not a comprehensive list of all available resources, and additional reference materials may be needed for some sites. In addition, weblinks are provided for many references as a convenience. Because of the website addresses are subject to change, some of these links may no longer be available. For additional information, contact the author.

American Society for Testing and Materials (ASTM). Updated yearly. *Annual Book of Standards.* Philadelphia, PA.

ASTM provides standard methodologies for a large number of site investigation and remediation techniques. Descriptions of methodologies can be purchased for a fee. Listings of individual standards are available on-line under the following remediation-related headings:

- Analytical chemistry (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/mt1.htm?u+mystore+xkdj0443)
- Environmental assessment (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en2.htm?u+mystore+xkdj0443)
- Geotechnical engineering (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/m04.htm?u+mystore+xkdj0443)
- Laboratory testing (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/gm3.htm?u+mystore+xkdj0443)
- Waste management (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en5.htm?u+mystore+xkdj0443)
- Water testing (http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en6.htm?u+mystore+xkdj0443)

More information about ASTM can be found at http://www.astm.org.

ASTM. 1984. "STP 845 Statistics in the Environmental Sciences."

This paper discusses the development and application of mathematical and statistical techniques to environmental problems. The discussion focuses on the types of analyses available, their usefulness in various scenarios, and the evaluation process prior to application of the technique.

ASTM. 1999. *ASTM Standards on Ground Water and Vadose Zone Investigations: Drilling, Sampling, Geophysical Logging, Well Installation and Decommissioning.* 2nd ed. Philadelphia, PA.

The 75 ASTM standards provided in this book provide techniques for drilling, sampling, installation, and development of wells. New standards cover borehole geophysical logging, direct-push soil and groundwater sampling, and nitrogen laser-induced fluorescence.

ASTM. 2004. "E1912-98(2004) Standard Guide for Accelerated Site Characterization for Confirmed or Suspected Petroleum Releases." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1912.htm?L+mystore+izay5771+1092893869

This guide describes a process for rapid and accurate characterization of a site with a confirmed or suspected petroleum release. Users may be responsible parties, contractors, consultants, or regulators wishing to streamline and accelerate the site characterization process or to supplement incomplete characterization data.

ASTM. 2014. "E1689-95(2014)e1 Standard Guide for Developing Conceptual Site Models for Contaminated Sites." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1689.htm?L+mystore+izay5771+1092893042

This purpose of this guide is to assist in the development of conceptual site models for contaminated sites. The guide describes the major components of conceptual site models and provides examples and an outline for developing new site models. A conceptual site model can be used to integrate technical data from various sources, evaluate the potential risk to human health and the environment, identify data needs, support selection of background sample locations, and guide data collection activities.

ASTM. 2015. *ASTM Standards on Environmental Site Characterization.* Philadelphia, Pennsylvania.

The 183 ASTM guides and practices provided in this book provide current standards for site characterization, including those addressing characterization, sampling, and monitoring of soil, vadose zone materials, sediment, surface water, groundwater, and waste.

ASTM. 2015. "E1943-98(2015) Standard Guide for Remediation of Ground Water by Natural Attenuation at Petroleum Release Sites." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1943.htm?L+mystore+izay5771+1092894228

The guide aids the user in evaluating and implementing appropriate remediation by natural attenuation at petroleum release sites, alone or in combination with other remedial actions.

ASTM. 2016. "D5092-04e1 Standard Practice for Design and Installation of Ground Water Monitoring Wells." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/D5092.htm?L+mystore+izay5771+1092893500

This document provides guidelines for designing and installing monitoring wells for the purposes of collecting representative groundwater data and detecting potential contamination in groundwater. Design standards and installation procedures take into consideration the hydrogeology of the intended monitoring zone and are applicable to both detection and assessment monitoring programs.

ASTM. 2017. "E2091-17 Standard Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E2091.htm?L+mystore+izay5771

This guide provides the information needed to incorporate controls that are protective of human health and the environment into risk-based remediation programs. The guide explains the purpose of institutional controls and engineering controls and helps users identify, evaluate, implement, and maintain appropriate controls for their sites. The guide also identifies screening and balancing criteria, as well as long-term monitoring and stewardship needs.

Cherry, J.A. 1992. "Groundwater Monitoring: Some Current Deficiencies and Alternative Approaches." In *Hazardous Waste Site Investigations: Toward Better Decisions*. Lewis Publishers.

This book focuses on the development and application of innovative technologies for hazardous waste site characterization and remediation, with an emphasis on quality assurance. Innovative technologies are presented for field instrumentation, biomonitoring, surface water and groundwater sampling, chemical sensing, and radiochemical measurements and sensing.

Code of Federal Regulations (CFR), Title 40, Part 300. 2003. "National Oil and Hazardous Substances Pollution Contingency Plan." Accessible on-line at: http://www.ecfr.gov

This plan, commonly referred to as the National Contingency Plan (NCP), outlines federal procedures for responding to oil spills and hazardous substance releases. The NCP promotes overall coordination among the hierarchy of responders and contingency plans. It established a response headquarters and regional and national reactions teams, and it provides a system for accident reporting, emergency response, spill containment, clean up, and emergency removal actions.

Davis, T.S. 2001. *Brownfields: A Comprehensive Guide to Redeveloping Contaminated Property.* 2nd Edition. American Bar Association.

This book provides a stepwise, solution-oriented approach to redeveloping brownfields properties. Topics of discussion include finding new funding sources to finance redevelopment; resolving legal, business, financial, and political issues associated with redeveloping contaminated property; interpreting state and federal laws regarding liability for cleanup of brownfield sites; and evaluating existing state voluntary cleanup programs. The book also provides a detailed analysis of the federal brownfields legislation.

Department of Energy (DOE). 1997. "Site Conceptual Exposure Model (SCEM) Builder."

U.S. Environmental Protection Agency (EPA) guidance on the preparation of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) scoping documents requires the development of a SCEM as a planning tool for public health and ecological risk assessments. Resource Conservation and Recovery Act (RCRA) corrective actions also require risk assessments to be conducted to determine the potential impacts to public health and the environment. SCEMs are used as a planning tool during the environmental site investigation phase to allocate finite financial and personnel resources to address data gaps, identify sources of contamination, release mechanisms, exposure pathways, and human or ecological receptors. The SCEMs include a visual presentation of site conditions and provide a narrative description of the assumptions used in the model.

Driscoll, F.G. 1986. *Groundwater and Wells.* Johnson Filtration Systems, Inc.: St. Paul, Minnesota.

This book provides a comprehensive reference for developing groundwater resources, with emphasis on water well design, construction, development, and testing. Other topics of discussion include subsurface exploration, drilling methods, and aquifer properties. The book presents information on transmissivity, well yield, storage, and time and distance drawdown for confined and unconfined conditions.

Einarson, M.D. 1995. "Enviro-Core™ -- A new vibratory direct-push technology for collecting continuous soil cores." In *Proceedings of the 9th National Outdoor Action Conference.* National Ground Water Association, Columbus, OH.

This presentation focused on the Enviro-Core™ sampling system, a patented dual-tube direct push system with a small-diameter drive casing that prevents the probe hole from collapsing between sample runs. By preventing collapse, the Enviro-Core™ sampling system eliminates the potential for cross-contamination of soil samples. The Enviro-Core™ sampling system also allows for soil gas and groundwater sampling, monitoring well installation, and retraction grouting.

Environmental Protection Agency, U.S. (EPA). 1986. "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document." OSWER Directive 9950.1. September. On-line address: https://www.epa.gov/enforcement/rcra-ground-water-monitoring-technical-enforcement-guidance-document-tegd

This guidance details the components of a groundwater monitoring system necessary to comply with RCRA. Discussion primarily is directed toward interim status facilities and covers site characterization; determination of well numbers and locations; well design and construction; development and implementation of groundwater sampling and analysis plans and assessment plans; and statistical analysis of groundwater monitoring data.

EPA. 1986. "Final RCRA Comprehensive Ground-Water Monitoring Evaluation (CME) Guidance Document." OSWER Directive 9950.2. December. On-line address: https://www.epa.gov/enforcement/guidance-rcra-comprehensive-ground-water-monitoring-evaluation-final

This document provides guidance for understanding and completing CMEs of RCRA groundwater monitoring systems. An objective of the CME is determining whether a facility has in place a properly designed, operated, and maintained groundwater monitoring system, capable of adequately detecting and monitoring releases of contamination into groundwater.

EPA. 1988. "Operation and Maintenance Inspection [OMI] Guide (RCRA Ground-Water Monitoring Systems)." OSWER Directive 9950.3. On-line address: https://www.epa.gov/enforcement/operation-and-maintenance-inspection-guide-rcra-ground-water-monitoring-systems

This document provides guidance for understanding and completing OMIs of RCRA groundwater monitoring systems. An objective of the OMI is determining whether monitoring wells and sampling devices are properly maintained and capable of yielding representative groundwater samples and hydrologic data.

EPA. 1988. "Guidance for Conducting Remedial Investigations and Feasibility Studies [RI/FS] Under CERCLA." EPA/540/G-89/004. OSWER Directive 9355.3-01. October.

This guidance provides the user with an overall understanding of the RI/FS process. The RI/FS process is the Superfund method of characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and determining the most appropriate means of remediating those sites. Potential users of this guidance include EPA personnel, state agencies, potentially responsible parties, federal facility coordinators, and consultants contracted to assist with RI/FS activities.

EPA. 1989. "Interim Final RCRA Facility Investigation (RFI) Guidance." Vol. I-IV. EPA 530/SW-89-031. OSWER Directive 9502.00-6D. May. On-line address: https://www.epa.gov/sites/production/files/2016-01/documents/rcrav1.pdf

The purpose of the RFI, the second phase of the RCRA corrective action program, is to collect information to characterize the nature, extent, and rate of migration of releases of hazardous waste or constituents. This information is interpreted to determine whether interim corrective measures or a corrective measures study is necessary. The RFI guidance document provides direction to regulatory agency personnel overseeing the implementation of RFIs at hazardous waste management facilities. The document also provides guidance to facility owners or operators who are developing and performing investigations based on regulatory agency determinations. The RFI Guidance is presented in 4 volumes:

- I - Development of An RFI Work Plan and General Considerations for RFIs
- II - Soil, Ground Water, and Subsurface Gas Releases
- III - Air and Surface Water Releases
- IV - Case Study Examples

EPA. 1989. "Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part A)." EPA/540/1-89/002. December. On-line address: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part

RAGS Part A provides guidance on the human health evaluation activities that are conducted during the baseline risk assessment. The baseline risk assessment is an analysis of the potential adverse health effects (current or future) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases. In Superfund investigations, the results of the baseline risk assessment are used to help determine whether additional response action is necessary at the site, modify PRGs, help support selection of the "no- action" remedial alternative, when appropriate, and document the magnitude of risk at a site, and the primary causes of that risk.

Baseline risk assessments are site-specific and therefore may vary in both detail and the extent to which qualitative and quantitative analyses are used. Causes of variability include: the complexity and particular circumstances of the site; availability of applicable or relevant and appropriate requirements; and other criteria, advisories, and guidance. After an initial planning stage, there are four steps in the baseline risk assessment process: (1) data collection and analysis; (2) exposure assessment; (3) toxicity assessment; and (4) risk characterization.

EPA. 1990. "Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells." PB90-159807. EPA/600/4-89/034. February.

This document presents field-oriented guidance and technology for use in the design, construction, and installation of groundwater monitoring wells in various hydrogeologic settings. Special attention is given

to the criteria that influence groundwater monitoring well design and construction. Topics of discussion follow the monitoring well from the planning stage through installation, development, operation, sampling, maintenance, and abandonment.

EPA. 1991. "Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals (PRG)." Publication 9285.7-01B. On-line address: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part-b

RAGS Part B provides guidance on using EPA toxicity values and exposure information to derive risk-based PRGs for a Superfund site. Initially developed at the scoping phase using readily available information, risk-based PRGs generally are modified based on site-specific data gathered during the RI/FS. This guidance does not discuss the risk management decisions that are necessary at a Superfund site. The potential users of Part B are those involved in the remedy selection and implementation process, including risk assessors, risk assessment reviewers, remedial project managers, and other decision-makers.

EPA. 1991. "Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), Interim." Publication 9285.7-01C. October. On-line address: https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part-c

RAGS Part C provides guidance for evaluations of remedial alternatives in light of human health risk. These evaluations are conducted during the FS, during selection and documentation of a remedy, and during and after remedy implementation. Part C provides general guidance to assist in site-specific risk evaluations and to maintain flexibility in the analysis and decision-making process. This guidance does not discuss the evaluation of ecological effects that takes place during remedy selection and implementation, nor does it discuss the risk management decisions that are necessary at a Superfund site. The potential users of Part C are those involved in the remedy selection and implementation process, including risk assessors, risk assessment reviewers, remedial project managers, and other decision-makers.

EPA. 1991. "Ecological Assessment of Superfund Sites: An Overview." *ECO Update* Intermittent Bulletin. Vol. 1. No. 2. Publication 9345.0-051. December. On-line address: https://www.epa.gov/risk/ecological-assessment-superfund-sites-overview

This bulletin provides background on the Superfund program and the components of ecological assessments, including problem formulation, exposure assessment, ecological effects assessment, and risk characterization. The bulletin also highlights the role of the ecological assessment in the RI/FS and post-RI/FS activities, which support risk-management decision-making.

EPA. 1992. "Guidance for Data Usability in Risk Assessment." Final. Parts A and B. Publications 9285.7-09A, -09B. PB92-963356, -963362. May.

The "Guidance for Data Usability in Risk Assessment" document is designed to provide data users with a nationally consistent basis to determine the minimum quality and quantity of environmental analytical data needed to support Superfund risk assessment decisions. This guidance is appropriate regardless of the party conducting the investigation. Part A provides guidance applicable to most remedial investigation processes. Part B is specific to radioanalytical issues and should always be used in conjunction with Part A.

EPA. 1992. "RCRA Ground-Water Monitoring: Draft Technical Guidance." EPA/530/R-93/001. PB93-139-350. November.

This document provides guidance for implementing RCRA groundwater monitoring regulations for regulated units referred to in 40 CFR Part 264, Subpart F and the permitting standards of 40 CFR Part 270. The document also provides guidance for complying with 40 CFR Part 264, Subparts J (tank systems), K (surface impoundments), L (waste piles), N (landfills), and X (miscellaneous units).

EPA. 1993. "Guidance for Evaluating Technical Impracticability of Ground-Water Restoration." Interim Final. OSWER 9234.2-25. EPA-540-R-93-080. September. On-line address: https://semspub.epa.gov/work/06/9351189.pdf

This guidance clarifies the EPA evaluation and decision-making process regarding technical impracticability of groundwater restoration at Superfund and RCRA sites. The guidance also discusses what alternative measures are necessary to ensure that the final remedy is protective of human health and the environment, should groundwater restoration be determined to be technically impractical. Topics discussed include technical data requirements, evaluation and decision-making criteria, documentation requirements, and alternative remedial strategies.

EPA. 1993. "Solid Waste Disposal Facility Criteria: Technical Manual." EPA 530-R93017. November.

This technical manual was developed as guidance for owners and operators of solid waste landfills seeking to achieve compliance with the revised Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258). This technical manual is not a regulatory document. The technical guidance provided is not mandatory but is intended to assist the owner or operator in achieving compliance.

EPA. 1993. "Wildlife Exposure Factors Handbook." Volumes I and II. EPA/600/R-93/187. December. On-line address: http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default

The "Wildlife Exposure Factors Handbook" was developed to improve wildlife exposure assessments and support risk estimate quantification. The handbook provides a convenient source of information and a consistent analytical framework for exposure and risk assessments for common wildlife species. An appendix containing a literature review database is provided in Volume II. This handbook is a companion document to the "Exposure Factors Handbook," which contains information on quantifying human exposures.

EPA. 1994. "Using Toxicity Tests in Ecological Assessments." *ECO Update* Intermittent Bulletin. Vol. 2. No. 1. Publication 9345.0-051. March. On-line address: https://www.epa.gov/sites/production/files/2015-09/documents/v2no1.pdf

This bulletin provides guidance for using toxicity tests in ecological risk assessments. Toxicity tests are used to expose test organisms to contaminated water, sediment, or soil and evaluate the effects of contamination on the survival, growth, reproduction, behavior, and attributes of these organisms. The bulletin outlines situations where toxicity tests may be appropriate, general guidelines for choosing toxicity tests, and the elements of and measurement endpoints for toxicity tests.

EPA. 1994. "Catalogue of Standard Toxicity Tests for Ecological Risk Assessment." *ECO Update* Intermittent Bulletin. Vol. 2. No. 2. Publication 9345.0-051. March. On-line address: https://www.epa.gov/sites/production/files/2015-09/documents/v2no2.pdf

This bulletin serves as a companion to "Using Toxicity Tests in Ecological Risk Assessments" (*ECO Update* Vol. 2, No. 1) and consists of an annotated list of standardized aquatic, sediment, terrestrial, and microbial toxicity tests currently used at Superfund sites.

EPA. 1994. "Field Studies for Ecological Risk Assessment." *ECO Update* Intermittent Bulletin. Vol. 2. No. 3. Publication 9345.0-051. March. On-line address: https://www.epa.gov/sites/production/files/2015-09/documents/v2no3.pdf

This bulletin discusses ecological field studies, or investigations and comparisons of habitats and biota in contaminated areas versus non-contaminated areas. Topics covered in this bulletin include the ecological components in a field study, the elements of field study design, field methods, and field study contributions to ecological risk assessments.

EPA. 1995. "Land Use in the CERCLA Remedy Selection Process." OSWER Directive No. 9355.7-04. May 25. On-line address: https://www.epa.gov/fedfac/land-use-cercla-remedy-selection-process

This directive presents additional information for considering land use in making remedy selection decisions under CERCLA at NPL sites. EPA believes that early community involvement, with a particular focus on the community's desired future uses of property associated with the CERCLA site, should result in a more democratic decision-making process; greater community support for remedies selected as a result of this process; and more expedited, cost-effective cleanups.

EPA. 1996. "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities." Advance Notice of Proposed Rulemaking. Federal Register, Volume 61, Number 85. May 1. On-line address: https://www.gpo.gov/fdsys/pkg/FR-1996-05-01/pdf/96-9707.pdf

This notice contains highlights of some successful corrective action approaches pioneered by states and EPA regions and a description of program flexibility. EPA's objectives in improving the corrective action program included: creating a consistent, holistic approach to cleanup at RCRA facilities; establishing protective, practical cleanup expectations; shifting more of the responsibilities for achieving cleanup to those responsible for the contamination; streamlining corrective action and reducing costs; and, enhancing opportunities for timely, meaningful public participation.

EPA. 1997. "Expedited Site Assessment Tools for Underground Storage Tank [UST] Sites: A Guide for Regulators." EPA 510-B-97-001. March. On-line address: https://clu-in.org/download/toolkit/510_b-97_001.pdf

The expedited site assessment process allows rapid characterization of UST site conditions in support of corrective action decisions. This guide provides a comprehensive description of expedited site assessment tools, including surface geophysical methods, soil gas surveys, field methods for the analysis of petroleum hydrocarbons, and direct-push technologies such as the Precision Enviro-Core™ sampling system and the Waterloo Groundwater Profiler.

EPA. 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments - Interim Final." June. EPA/540/R-97/006. On-line address: https://semspub.epa.gov/work/10/500006184.pdf

This document provides guidance to site managers and Remedial Project Managers who are legally responsible for the management of a site. It shows how to design and conduct technically defensible ecological risk assessments for the Superfund program.

EPA. 1997. "Guidance on Cumulative Risk Assessment: Part 1, Planning and Scoping." July 3. On-line address: https://www.epa.gov/risk/guidance-cumulative-risk-assessment-part-1-planning-and-scoping

This guidance directs EPA offices to take into account cumulative risk issues when scoping and planning major risk assessments. Risk assessments should also consider multiple sources, effects, pathways, stressors, and populations for cumulative risk analyses in all cases for which relevant data are available. This assures a more consistent and scientifically complete approach to cumulative risk assessments and better protection of public health and the environment. As it evolves, this guidance is designed to help risk managers and risk assessors plan and document the scope of risk assessments and to consider appropriate participants (that is, technical, advisory, or stakeholder) or information sources to enrich the risk assessment.

EPA. 1998. "Guidelines for Ecological Risk Assessment." EPA/630/R-95/002F. April. On-line address: https://www.epa.gov/risk/guidelines-ecological-risk-assessment

These EPA guidelines are provided to improve the quality and consistency of ecological risk assessments. As a next step in a continuing process of ecological risk guidance development, the guidelines draw from a wide range of source documents including peer-reviewed issue papers and case studies previously developed by EPA's Risk Assessment Forum. The guidelines expand on and replace the 1992 report "Framework for Ecological Risk Assessment." These guidelines are not regulations and do not impose any new requirement on the regulated community. Rather, the guidelines are internal guidance for EPA and inform the public and the regulated community regarding EPA's approach to ecological risk assessment.

EPA. 1998. "Hazardous Waste Identification Final Rule for Contaminated Media." Final Rule. Federal Register Volume 63, Number 229. November 30. On-line address: https://www.epa.gov/sites/production/files/2016-04/documents/01_12cntdin_1.pdf

As part a 1994 environmental regulatory reform initiative, EPA issued new requirements for RCRA hazardous remediation wastes treated, stored, or disposed of during cleanup actions. These requirements made five major changes:

- Make permits for treating, storing and disposing of remediation wastes faster and easier to obtain
- Provide that obtaining these permits will not subject the owner and/or operator to facility-wide corrective action
- Create a new kind of unit called a "staging pile" that allows more flexibility in storing remediation waste during cleanup
- Exclude dredged materials from RCRA Subtitle C if they are managed under an appropriate permit under the Marine Protection, Research and Sanctuaries Act or the Clean Water Act
- Make it faster and easier for states to receive authorization when they update their RCRA programs to incorporate revisions to the federal RCRA regulations.

EPA. 1999. "Use of Monitored Natural Attenuation [MNA] at Superfund, RCRA Corrective Action, and Underground Storage Tank [UST] Sites." Final Version. OSWER Directive 9200.4-17P. April 21. On-line address: https://semspub.epa.gov/work/HQ/159152.pdf

This directive clarifies the EPA policy regarding the use of MNA for the remediation of contaminated soil and groundwater at sites regulated under OSWER programs. These include programs administered under Superfund, RCRA, OUST, and the Federal Facilities Restoration and Reuse Office. The directive is intended to promote consistency in how MNA remedies are proposed, evaluated, and approved. As a policy document, it does not provide technical guidance on evaluating MNA remedies. It provides guidance to EPA staff, to the public, and to the regulated community on how EPA intends to exercise its discretion in implementing national policy on the use of MNA.

EPA. 2000. "Assessing Contractor Capabilities for Streamlined Site Investigations." EPA 542-R-00-001. January. On-line address: http://www.brownfieldstsc.org/pdfs/ContractorCap.pdf

This document promotes the use of innovative methods in brownfields projects, when conducting site characterization, assessing contractors' capabilities, or suggesting additional considerations for contractors conducting their activities. In CERCLA and RCRA investigations, innovative technologies have been demonstrated to improve project cost, schedule, and effectiveness.

EPA. 2000. "Data Quality Objectives Process for Hazardous Waste Site Investigations." EPA/600/R-00/007. January. On-line address: https://clu-in.org/download/toolkit/thirdednew/epa_600-r-00-007.pdf

This guidance document is based upon the principles and steps developed in "Guidance for the Data Quality Objectives Process (QA/G-4)," but is specific to hazardous waste site investigations. This document is also consistent with "Data Quality Objectives Process for Superfund: Interim Final Guidance" and "Soil Screening Guidance: User's Guide." The document focuses on applications for CERCLA and RCRA sites, and is applicable to programs at the state and local level.

EPA. 2001. "EPA Requirements for Quality Assurance Project Plans [QAPP] (EPA QA/R-5)." EPA/240/B-01/003. March. On-line address: https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans

The QAPP is a tool for project managers and planners to use to document the type and quality of data needed for environmental decisions and to describe the methods for collecting and assessing those data.

EPA. 2003. "Using Dynamic Field Activities for On-Site Decision Making." May. EPA/540/F-03/011

This Superfund document provides guidance on the use dynamic field activities, with the goal of streamlining hazardous waste site activities with real-time data and real-time decisions.

EPA. 2004. "Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action." EPA/530/R-04/030. April. On-line address: https://www.epa.gov/sites/production/files/2017-02/documents/gwhb041404.pdf

This document contains the EPA's latest interpretation of policies on such topics as cleanup goals, the role of groundwater use, point of compliance, source control, and monitored natural attenuation. It emphasizes a phased, results-based approach to cleaning up contaminated groundwater.

EPA. 2004. "Risk Assessment Guidance for Superfund [RAGS], Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment Final." EPA/540/R/99/005. July. On-line address: http://epa-prgs.ornl.gov/chemicals/help/documents/RAGS_E_EPA540R99005.pdf

This guidance is intended to assist risk assessors and others in addressing concerns resulting from the evaluation of dermal exposure risk assessment pathways. It proposes a consistent methodology for assessing the exposures from the dermal pathway for Superfund human risk assessments. RAGS Part E focuses on dermal contact with soil and water, and it does not provide guidance on quantifying dermal absorption of chemicals from exposure to vapors.

EPA. 2011. "Health Effects Assessment Summary Tables for Superfund (HEAST)." December. On-line address: https://epa-heast.ornl.gov/

HEAST tables are for use at both Superfund and RCRA sites. These tables provide a comprehensive listing of provisional risk assessment information relative to oral and inhalation routes of exposure for chemicals. Slope factors are calculated by EPA to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. HEAST numbers are no longer being developed; therefore, the user should use more recent data where available. HEAST tables do not contain standards.

EPA. 2015. "EPA Series: A Citizen's Guide to Cleanup Methods." January 2015. On-line address: https://clu-in.org/products/citguide/

EPA encourages the selection of innovative treatment technologies for site remedies because they have the potential to be more cost-effective and to provide better and more efficient cleanups. In addition, they are often more acceptable to surrounding communities than established treatment technologies. This document presents a broad overview of approaches for cleanup. It also refers to other citizens' guides for specific technologies.

EPA. 2018. "Contaminated Site Clean-up Information" On-line address: https://www.clu-in.org

The EPA Clu-in website contains information, internet seminars, and guidance on innovative technologies for site characterization, monitoring, and remediation. It also contains case studies, and success stories for sites that have used particular innovative approaches to site cleanup.

EPA. 2018. "Brownfields Road Map to Understanding Options for Site Investigation and Cleanup, Sixth Edition." EPA 542-R-17-003. January. On-line address: https://www.epa.gov/brownfields/brownfields-road-map

This document provides resources to assist in identifying and selecting site characterization and cleanup technologies for brownfields redevelopment, as well as an outline of the general steps required for the

characterization and cleanup of a site slated for redevelopment. This document is applicable regardless whether the brownfield sites are public projects, private developments, or public-private partnerships.

EPA. 2018. 2018 Edition of the Drinking Water Standards and Health Advisories Tables." March. EPA 822-F-18-001 On-line address: https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf

Drinking Water Standards and Health Advisory summary tables contain drinking water standards in the form of Maximum Contaminant Level Goals, Maximum Contaminant Levels (MCLs), and non-enforceable health advisories. MCLs are the maximum permissible level of a contaminant in water delivered to users of a public water system. Health Advisories (HA) provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. HAs are guidance values based on non-cancer health effects for different durations of exposure (for example, one-day, ten-day, and lifetime). They provide technical guidance to EPA regional offices, state governments, and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

EPA. 2018. "National Oil and Hazardous Substances Pollution Contingency Plan [NCP] Overview." April. On-line address: https://www.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview

This website presents an overview of the NCP, which is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The actual federal register publication contains a preamble that serves as a valuable resource in interpreting EPA's intent behind the regulations. The NCP Overview website contains links to information on the following related topics:

- National Response Team
- Regional Response Teams
- Clean Water Act of 1972
- CERCLA of 1980
- Emergency removal actions
- Oil Pollution Act of 1990

EPA. 2018. "Regional Screening Levels (RSLs)-Generic Tables." May. On-line address: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

This website includes information about PRGs maintained by EPA. PRGs are risk-based concentrations derived from standardized equations that combine exposure information assumptions and EPA toxicity data. From this website, the user can access background information, which includes all relevant calculations, PRG tables for a range of contaminants and media, and links to other toxicological and risk assessment information.

EPA. 2018. "Institutional Controls." June. On-line address: http://www.epa.gov/superfund/superfund-institutional-controls

Institutional controls are non-engineered instruments, such as administrative or legal controls, that help minimize the potential for human exposure to contamination and protect the integrity of a remedy by limiting land or resource use. Although it is EPA's expectation that treatment or engineering controls will be used to address principle threat wastes and that groundwater will be returned to its beneficial use whenever practicable, institutional controls play an important role in remedies. Institutional controls are

used when contamination is first discovered, when remedies are ongoing, and when residual contamination remains onsite at a level that does not allow for unrestricted use and unlimited exposure after cleanup. The NCP emphasizes that institutional controls are meant to supplement engineering controls and that institutional controls will rarely be the sole remedy at a site.

EPA. 2018. "Lead at Superfund Sites: Software and Users' Manuals." June. On-line address: https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals

The IEUBK Model for Lead in Children allows users to predict the blood lead levels of children using information on their multimedia exposure to environmental lead. The model is based on a number of other studies, including lead biokinetics, contact rates of children with contaminated media, and data on the presence and behavior of environmental lead. The model provides a central tendency estimate and a probability distribution to characterize predicted blood lead levels. Downloads of the IEUBK Model for Lead in Children (multiple versions) and accompanying reference manuals are available at the link above.

EPA. 2018. "Superfund Soil Screening Guidance." June. On-line address: https://www.epa.gov/superfund/superfund-soil-screening-guidance

The EPA website provides guidance to help standardize and accelerate the evaluation and cleanup of contaminated soils at sites on the NPL if future residential land use is anticipated. The User's Guide provides a simple step-by-step methodology for environmental science/engineering professionals to calculate risk-based, site-specific SSLs for contaminants, which may be used to identify areas needing further investigation. The technical background document provides for the development of methodologies described in the "Soil Screening Guidance: User's Guide", along with additional information useful for soil screening. Together, these documents define the framework and methodology to develop soil screening levels (SSL) for chemicals commonly found at Superfund sites.

EPA. 2018. "Technology Innovation Office [TIO]." June. On-line address: http://www.epa.gov/tio/

TIO's website provides information about characterization and treatment technologies for the hazardous waste remediation community. It offers technology selection tools and describes programs, organizations, and publications for a variety of stakeholders. Publication topics include:

- Remediation
- Characterization and monitoring
- Initiatives and partnerships
- Vendor
- Regulatory information

EPA. 2018. "Exposure Factors Handbook." July. On-line address: https://www.epa.gov/expobox/about-exposure-factors-handbook

The "Exposure Factors Handbook" provides a summary of the available statistical data on various factors used in assessing human exposure. The handbook is addressed to all exposure assessors, including those outside EPA, who need to obtain data on standard factors to calculate human exposure to toxic chemicals. These factors include: drinking water consumption; soil ingestion; inhalation rates; dermal factors including skin area and soil adherence factors; consumption of fruits and vegetables, fish, meats, dairy products, homegrown foods, and breast milk; human activity factors; consumer product use; and

residential characteristics. Recommended values are provided for the general population and also for various segments of the population who may have characteristics different from the general population.

EPA. 2018. "Superfund Chemical Data Matrix (SCDM)." July. On-line address: http://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm

The SCDM is a source for factor and benchmark values to be used when evaluating potential NPL sites using the Hazard Ranking System (HRS). Factor values are part of the HRS mathematical equation that determines the relative threat posed by a hazardous waste site and reflect hazardous substance characteristics, such as toxicity and persistence in the environment, substance mobility, and potential for bioaccumulation. Benchmarks are environment- or health-based concentration limits developed by or used in other EPA regulatory programs. SCDM contains HRS factor and benchmark values for hazardous substances that are frequently found at sites evaluated using the HRS, as well as the physical, chemical, and radiological data used to calculate those values. The report also describes how data are selected or calculated for inclusion in SCDM.

EPA. 2018. "The SW-846 Compendium." SW-846. July. On-line address: https://www.epa.gov/hw-sw846/sw-846-compendium

SW-846 provides a unified source of information on sampling and analysis related to compliance with RCRA regulations. This manual provides methodologies for collecting and testing representative samples of waste and other materials to be monitored.

EPA. 2018. "Integrated Risk Information System (IRIS)." August. On-line address: https://www.epa.gov/iris/

IRIS is a database of human health effects that may result from exposure to various substances found in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. The information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences.

EPA. 2018. "Learn About Corrective Action." September. On-line address: https://www.epa.gov/hw/learn-about-corrective-action

This website provides an overview and general resources that pertain to the cleanup of hazardous waste at RCRA corrective action sites.

EPA. 2018. "Superfund Program." September. On-line address: https://www.epa.gov/superfund

This website contains information on the Superfund program's policies and guidance on the following topics:

- Superfund remedy decisions
- Risk assessment
- Groundwater
- Remedy selection
- Reportable quantities
- Soil screening

- Redeveloping Superfund sites
- Contract management

EPA. 2018. "Brownfields." October. On-line address: http://www.epa.gov/brownfields/

Brownfields are properties for which expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. EPA encourages states and municipalities to streamline the process by which these sites can be cleaned up and returned to economic, ecologic, or recreational usefulness. This website provides links to information about brownfields tax incentive and development grants, investigation and remediation technologies and techniques, and redevelopment success stories. Discussion topics include:

- Pilots and grants
- Liability and cleanup
- Partnerships and outreach
- Workforce development
- Brownfields tax incentive
- Insurance and redevelopment
- Laws and regulations
- RCRA brownfields prevention initiative
- State voluntary cleanup programs (VCP)
- Underground storage tank (UST) initiative
- Publications

Federal Remediation Technologies Roundtable (FRTR). 2003. "FRTR Homepage." February 12. On-line address: http://www.frtr.gov

The FRTR is an interagency working group seeking to build a more collaborative atmosphere among federal agencies involved in hazardous waste site remediation. Members represent agencies that develop and use these technologies, including U.S. Department of Defense, EPA, DOE, U.S. Department of the Interior, and National Aeronautics and Space Administration. In addition to remediation technology updates and FRTR meeting information, this website contains the following tools and references:

- Technology screening tools (http://www.frtr.gov/scrntools.htm), including the "Remediation Technologies Screening Matrix" and the "Field Sampling and Analysis Technologies Matrix"
- Technology cost and performance information (http://www.frtr.gov/costperf.htm)
- Publications (http://www.frtr.gov/publib.htm)

Freeze, R.A., and J.A. Cherry. 1979. *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall Publishing Company.

Groundwater provides a detailed and comprehensive presentation of hydrogeology, integrating chemistry, physics, geology, and calculus. Specific attention is given to transport processes, groundwater contamination, well hydraulics, aquifer yield, and analog and numerical modeling. Theoretical concepts are applied to real-world case studies. Mathematical derivations are presented in the appendices.

Interstate Technology and Regulatory Council (ITRC). 2018. On-line address: http://www.itrcweb.org

This website is the homepage for ITRC, a state-led coalition of states, federal agencies, industry participants, and other stakeholders. It works to break down barriers and reduce compliance costs, making it easier to use new technologies and maximize resources. ITRC technical teams develop guidance documents and training courses to meet the information needs of regulatory staff, technology vendors, and environmental consultants. State regulators lead ITRC technical teams, which rely on broad-based participation from federal agencies, industry, academia, and other stakeholders in building collective knowledge and collaborative products. Topics for which guidance documents are available include, but are not limited to:

- Accelerated site characterization
- Dense non-aqueous phase liquids
- Diffusion samplers
- Enhanced in situ biodenitrification
- In situ remediation
- In situ chemical oxidation
- Metals in soils
- Permeable reactive barriers (walls)
- Phytotechnologies
- Plasma technologies
- Policy
- Radionuclides
- Technology acceptance and reciprocity partnership
- Thermal desorption
- Unexploded ordnance
- Verification

NDEQ. 2018. "Rules and Regulations Homepage." On-line address: http://www.dee.state.ne.us/RuleandR.nsf/Pages/Rules

This Rules and Regulations website provides links to current rules and regulations under NDEQ, as well as proposed rules and regulations. Information provided includes the title name and number, the effective date of the last title revision, and a link to the title table of contents and chapter text. Current titles included on the website include Titles 114-136 and 194-200.

NDEQ. 2016. "Title 132 – Integrated Solid Waste Management Regulations." May. On-line address: http://dee.ne.gov/RuleAndR.nsf/Title_132.xsp

Title 132 provides the Nebraska integrated solid waste management regulations. Requirements for permits, application procedures, and hearings are provided. Criteria and variances also are provided for municipal solid waste, delisted waste, industrial waste disposal areas, and land application units for repeated disposal or treatment of special wastes. Additional criteria are provided for fossil fuel combustion ash disposal areas, construction and demolition waste disposal areas, solid waste processing facilities, transfer stations, materials recovery facilities, solid waste compost sites, and other processing facilities. Financial assurance criteria, fees, rebates are discussed, as are junk accumulation, plastic container markings, and other general provisions. Appendices provide constituents for detection

monitoring, lists of hazardous inorganic and organic constituents, and concentration values at the relevant point of compliance.

NDEQ. 2009. "Risk-Based Corrective Action (RBCA) at Petroleum Release Sites: Tier 1/Tier 2 Assessments and Reports." 01-082. May. On-line address: http://www.dee.state.ne.us/Publica.nsf/780613fa1854e3b906256ab60068778a/66fdec793aefc4b286256a93005b8db8?OpenDocument

RBCA is a consistent decision-making process used to assess potential human or environmental exposure risks to petroleum releases. RBCA is also used to determine the remedial actions appropriate in response to such releases. RBCA was developed by the Leaking Underground Storage Tank/Release Assessment Section of NDEQ and is intended to apply to petroleum release sites potentially eligible for reimbursement under Nebraska Title 200, Rules and Regulations for Petroleum Release Remedial Action Reimbursement Fund; however, portions of this document may be applicable to other petroleum releases, as determined by NDEQ.

NDEQ. 2016. "Title 128 – Nebraska Hazardous Waste Regulations." July. On-line address: http://dee.ne.gov/RuleAndR.nsf/Title_128.xsp

Title 128 provides the Nebraska hazardous waste regulations. Criteria and variances are provided for identifying solid wastes and for identifying and listing hazardous wastes. Hazardous waste generator requirements are outlined for determination, notification, reporting, and record keeping. Requirements are provided for recyclable materials, specific hazardous wastes, large quantity generators, conditionally exempt small quantity hazardous waste generators, and transporters of hazardous waste.

NDEQ. 2006. "Title 118 – Groundwater Quality Standards and Use Classification." March. On-line address: http://dee.ne.gov/RuleAndR.nsf/Title_118.xsp

Title 118 provides the NDEQ groundwater quality standards and use classification and defines their applicability to state groundwater and regulatory programs. The groundwater standards and classifications are intended to provide a foundation for other groundwater regulatory programs and are to be used in conjunction with such programs, where they exist.

NDEQ. 2004. "Title 115 – Rules of Practice and Procedure." June. On-line address: http://dee.ne.gov/RuleAndR.nsf/Title_115.xsp

Title 115 provides the NDEQ rules of practice and procedure. Rules and definitions are provided for filings and correspondence, public records availability and confidentiality, public hearings, voluntary compliance, contested cases, emergency proceedings, declaratory rulings, rule making, and variances. A copy of the Certificate of Service before the NDEQ is provided as an appendix.

Nebraska Department of Health and Human Services (NDHHS). 2011. "Title 178 – Environmental Health, Chapter 10 – *Licensure Under the Water Well Standards and Contractors' Practice Act.*" June 7. On-line address: http://dhhs.ne.gov/Pages/reg_t178.aspx

Chapter 10 of Title 178 provides the Nebraska regulations governing licensure of water well and pump installation contractors and certification of water well drilling, pump installation, and water well monitoring supervisors, as administered by the NHHSS Department of Regulation and Licensure, Public Health Assurance Division. Topics covered include issuance of licenses and certificates; disciplinary

action and other sanctions; reinstatement of licenses and certificates; and examination of applicants for licensure and certification.

NDHHS. 2014. "Title 178 – Environmental Health, Chapter 12 – *Water Well Construction, Pump Installation, and Water Well Decommissioning Standards*." August 26. On-line address: http://dhhs.ne.gov/Pages/reg_t178.aspx

Chapter 12 of Title 178 provides the Nebraska regulations governing water well construction, pump installation and water well decommissioning standards, as administered by the NHHSS Department of Regulation and Licensure, Public Health Assurance Division. Topics covered include general requirements, domestic wells, irrigation and industrial wells, dewatering wells, groundwater monitoring wells and recovery wells, observation wells, test holes, groundwater heat pump wells, installation of pumps and pumping equipment, and water well decommissioning.

Puls, R.W. and M.J. Barcelona. 1996. "Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures." *EPA Ground Water Issue.* EPA/540/S-95/504. April.

This document provides background information on the development of low-flow groundwater sampling procedures in the support of site assessments and remedial performance monitoring objectives. This document also discusses the application of low-flow sampling procedures under a variety of hydrogeologic settings.

42 U.S. Code (USC), Chapter 82, Sections 6901 et seq. 1976. Resource Conservation and Recovery Act (RCRA). On-line address: https://www.law.cornell.edu/uscode/text/42/chapter-82

RCRA provided federal agencies with the authority to control hazardous waste from generation through transportation, treatment, storage, and disposal. RCRA also provided a framework for managing non-hazardous wastes. Amendments to RCRA in 1984 and 1986, respectively, required phasing out land disposal of hazardous waste and allowed EPA to address environmental issues related to the storage of petroleum products and other hazardous substances in underground storage tanks. RCRA focuses on active and future facilities. Of particular interest within the Act are Subtitles C, "Hazardous Waste Management," and D, "State or Regional Solid Waste Plans."

An overview of RCRA is available at https://www.epa.gov/rcra

42 USC, Chapter 103, Sections 9601 et seq. 1980. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). December 11. On-line address: http://www4.law.cornell.edu/uscode/42/ch103.html

CERCLA, commonly known as Superfund, provided federal agencies with the authority to respond directly to releases or threatened releases of hazardous substances capable of endangering human health and the environment. CERCLA also created a tax on the chemical and petroleum industries, which went to a trust fund for cleaning up abandoned, historical, or uncontrolled hazardous waste sites. The Superfund Amendments and Reauthorization Act (SARA) of 1986 reauthorized CERCLA cleanup activities and added technical requirements, enforcement authorities, site-specific amendments, and definition clarifications.

An overview of CERCLA is available at http://www.epa.gov/superfund/policy/cercla.htm.