58-08

BCT AGENDA

FEBRUARY 17-18, 1998

→ EBS Site Investigation Schedule for Housing, Institutional and Airfield Area

→ Ash Landfill

- Debris Piles
- Cover Effort
- Ground Water/Metals
- Treatment Time

→ Former Special Weapons Area Update

- Source Area Removal
- SEAD 63

→ Decision Tree – Professional Judgement Considerations

BRAC ENVIRONMENTAL FACT SHEET FALL 1997

OFFICE OF THE
DEPUTY UNDER
SECRETARY OF
DEFENSE
(ENVIRONMENTAL
SECURITY)

Using CERCLA ARAR Waivers in BRAC Cleanups

BACKGROUND

The Department of Defense (DoD) is required to conduct cleanups at active and closing installations under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. Neither CERCLA nor its implementing regulation, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), contains cleanup levels or performance standards to use for evaluating and selecting remedial action. CERCLA remedial actions conducted on-site must meet cleanup levels and performance standards provided in applicable or relevant and appropriate requirements (ARAR) of other federal and state environmental laws. However, CERCLA also provides six specific ARAR waivers that may be used, if appropriate, to waive compliance with a requirement deemed to be an ARAR. Base Realignment and Closure (BRAC) environmental coordinators (BECs), in coordination with other members of BRAC cleanup teams (BCTs), must develop a good understanding of ARARs and ARAR waivers in order to expedite the evaluation and proposal of effective remedial actions at BRAC installations.

WHAT IS AN ARAR?

Under Section 121 of CERCLA, any material remaining on-site must reach a level or standard of control equal to that of any other applicable or relevant and appropriate standard or requirement promulgated under any federal or more stringent state environmental statute. The term "promulgated" means that the requirement is generally applicable and legally enforceable. Guidance and advisories are not considered "promulgated" because they do not have general applicability and are not legally enforceable. The ARARs concept is only pertinent to on-site actions; off-site actions must comply with all applicable federal and state requirements. A requirement under other environmental laws may be either "applicable" or "relevant and appropriate" but not both. The first step in identifying ARARs is to determine if a requirement is applicable.

Applicable requirements mean those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site (NCP Section 300.5).

If a requirement is determined not to be applicable, the second step in the ARAR identification process is conducted, determining if the requirement is relevant and appropriate.

Relevant and appropriate requirements mean those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site ("relevant") that their use is well-suited to the particular site ("appropriate") (NCP Section 300.5).

Only those state standards that are identified by the state in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate. In addition, CERCLA remedial actions are exempt from permitting requirements; therefore, only substantive portions of ARARs must be complied with. Administrative requirements (such as permitting and reporting requirements) are not ARARs. ARARs are generally divided into three categories: chemical-specific ARARs relating to the substances present at the site, location-specific ARARs relating to where the site is situated, and action-specific ARARs relating to the type of actions that may be taken to address the problem.

WHAT ARE ARAR WAIVERS?

CERCLA Section 121(d)(4) provides that under certain circumstances an otherwise applicable or relevant and appropriate requirement may be waived. The CERCLA mandate that remedies protect human health and the environment cannot be waived. Use of an ARAR waiver does not mean that a less protective remedy is being selected. In fact, ARAR waivers are sometimes necessary to select and implement the most effective remedial action. The first five ARAR waivers listed in CERCLA can be invoked by BECs, in coordination with other members of the BCT, for the remedial action and are appropriate to use when circumstances at a site meet the criteria for waiving an ARAR.

ARAR WAIVER MISCONCEPTIONS

1 **If ARARs are waived, so is protectiveness:** *Absolutely not!* All CERCLA remedial actions must be protective. Protectiveness is an absolute statutory mandate that cannot be waived.

2 **ARARs are the same as cleanup standards:** *Not necessarily!* ARARs may provide cleanup standards (that is, contaminant-specific concentrations that must be achieved in a media) or they may provide performance standards for certain technologies. Frequently, cleanup standards are derived using risk-based calculations, rather than from ARARs.

- An ARAR that is a cleanup standard: MCL.
- An ARAR that is not a cleanup standard: compaction requirement for a landfill cap
- A cleanup standard that is not an ARAR: heavy metal cleanup level calculated for soil based on a risk level of 10^{-5} under an industrial future use scenario

3 **ARAR waivers are rarely considered:** *Just not so!* EPA and other federal lead agencies have considered and invoked ARAR waivers in CERCLA RODs they have issued. ARAR waivers should be considered and used when it makes sense to use them. In situations where implementation of a remedy is being significantly delayed because of ARAR compliance issues, BECs, in coordination with other members of the BCT, should examine the site circumstances in light of the ARAR waivers to evaluate if a waiver applies to their particular situation.

4 **Determining a requirement is not an ARAR is the same as waiving an ARAR:** *False!* The installation has the responsibility to decide which requirements are ARARs at its sites. For example, if the installation determines that a requirement claimed by a state to be an ARAR is not promulgated, then the requirement is not an ARAR and ARAR waivers do not apply. The installation may also determine that a requirement or portion of a requirement is not an ARAR for the following reasons: (1) the requirement is not applicable and is not relevant and appropriate, (2) the requirement is a state requirement that was not identified in a timely manner, (3) the requirement is a state requirement that is not more stringent than a federal requirement, and (4) the requirement is purely administrative and provides no substantive requirements not already addressed under CERCLA. An ARAR waiver is not necessary for a requirement that is not determined by the installation to be an ARAR.

5 **OSHA requirements are ARARs and can be waived:** *No!* NCP Section 300.150 requires response actions taken under CERCLA to comply with response action worker safety and health regulations in 29 CFR 1910.120. These OSHA regulations cannot be waived.

EXAMPLES OF CIRCUMSTANCES TO WHICH EACH OF THE ARAR WAIVERS CAN BE APPLIED TO BRAC SITES

Interim Measure: BRAC sites may present problems that need to be addressed immediately with stabilization measures while a final action is studied. This is true with some types of groundwater contamination. In some cases it is appropriate to implement an interim groundwater remedial action to contain contaminated groundwater so that it does not migrate further, while continuing to evaluate remedial actions to clean up the groundwater contamination. In this case, chemical-specific cleanup levels for the restoration of the groundwater, such as maximum contaminant levels (MCL) promulgated under the Safe Drinking Water Act, might be waived as cleanup standards to be achieved by the interim action. The final groundwater action would then address the achievement of MCLs. Please note that problems that need to be addressed immediately can also be dealt with through use of CERCLA removal action authority.

Greater Risk: BRAC sites may involve contamination in a wetland or other sensitive ecosystem. For example, a chemical-specific ARAR may require widespread dredging of a wetland to remove contamination to the ARAR level. However, implementation of such dredging will resuspend contamination, causing an unacceptable release to the water and destroying the wetland ecosystem. If these impacts cannot be avoided, invoking this ARAR waiver may be justified. Factors such as the magnitude of the adverse impacts, the duration of adverse impacts, and the reversibility of adverse impacts should be evaluated when considering this waiver.

Technical Impracticability: The term "impracticability" is based on the balance of engineering feasibility and reliability. Cost is a factor in this balance, but not the major factor. This waiver may be used at BRAC sites where attainment of an ARAR requires implementation of a remedy that is inordinately expensive to operate and maintain but cannot be relied upon to attain the ARAR. This waiver is most often used for final groundwater remedies that cannot achieve MCLs because of site-specific hydrogeologic and contaminant conditions. The U.S. Environmental Protection Agency (EPA) has published guidance on the use of this waiver for groundwater remedies and has applied this waiver at non-federal sites.

CERCLA ARAR WAIVERS

Under CERCLA Section 121(d)(4), the President may select a remedial action that does not attain a level or standard of control at least equivalent to a legally applicable or relevant and appropriate standard, requirement, criteria, or limitation if the President finds that:

- **Interim Measure** - CERCLA Section 121(d)(4)(A): the remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed.
- **Greater Risk** - CERCLA Section 121(d)(4)(B): compliance with such requirement at the facility will result in greater risk to human health and the environment than alternative options.
- **Technical Impracticability** - CERCLA Section 121(d)(4)(C): compliance with such requirement is technically impracticable from an engineering perspective.
- **Equivalent Performance** - CERCLA Section 121(d)(4)(D): the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach.
- **Inconsistent Application of State Requirements** - CERCLA Section 121(d)(4)(E): with respect to state standard, requirement, criteria, or limitation, the state has not consistently applied (or demonstrated the intention to consistently apply) the standard, requirement, criteria, or limitation in similar circumstances at other remedial actions.
- **Fund Balancing** - CERCLA Section 121(d)(4)(F): in the case of a remedial action to be undertaken solely under section 104 using the Fund, the remedial action will not provide a balance between the need for protection at that site and availability of the Fund to respond to other sites. This waiver is not available to DoD.

Chemical-specific ARARs (such as state water quality criteria) that establish contaminant levels that are not detectable by current analytical methods can be waived using this waiver.

Equivalent Performance: BRAC sites frequently contain listed hazardous waste. Hazardous waste treatment standards under the Resource Conservation and Recovery Act (RCRA) could be ARARs for treatment of such waste. Some RCRA treatment standards are expressed as treatment technologies while others are expressed as contaminant concentrations to be achieved. RCRA treatment standards that require use of a specific treatment technology can be waived if it can be shown that an alternative technology achieves equivalent or better results.

Inconsistent Application of State Requirements: A state ARAR may be waived for an action at a BRAC site if the requirement has (1) either not been applied by the state at other similar situations and where there is evidence that the state does not intend to apply it, or (2) been variably applied or inconsistently enforced by the state at other similar situations. For example, the state may claim that state hazardous waste landfill closure regulations are ARARs for a closing installation's landfill but may have allowed nonhazardous waste closure requirements to be implemented at other very similar landfills. In this case, the BEC, in consultation with other members of the BCT, could waive the hazardous waste landfill closure requirements if it is demonstrated that the state is inconsistently applying its landfill closure regulations.

ARAR WAIVER QUESTIONS AND ANSWERS

When and where does the closing installation explain that an ARAR is being waived?

The BEC and other members of the BCT need to discuss potentially applicable ARAR waivers when they are recognized. All documents that identify ARARs should also discuss potential waivers that may be invoked. Those documents include the remedial investigation (RI) report, feasibility study (FS), and proposed plan. ARARs waivers are formally documented in the record of decision (ROD), or for removal actions, in the action memorandum.

Can EPA or the state stop the closing installation from waiving an ARAR at an NPL site?

Although BECs have the lead for determining whether ARARs should be waived for removal actions, it is strongly recommended that the BEC closely coordinate with the EPA and state members of the BCT to discuss and jointly agree on ARAR waivers for these actions. For ARAR waivers for remedial actions, BECs are also the lead agency representative. However, EPA does have approval authority for the remedy selection at National Priorities List (NPL) sites, and therefore, at such sites EPA has the power to effectively disapprove all ARAR waivers. State approval of remedial actions is not required by CERCLA but is highly desirable. The state does have the right under CERCLA to seek judicial intervention against DoD and EPA if the state believes DoD and EPA have incorrectly waived or otherwise ignored a state ARAR.

NOTICE:

We welcome and invite your comments on this fact sheet, as we seek ways to improve the information provided. Please send comments to the following address:

OADUSD
(Environmental Cleanup)
Attn: Fast-Track Cleanup
3400 Defense Pentagon
Washington, DC 20301-3400

How are ARAR waivers handled at non-NPL closing installations and sites?

At non-NPL closing installations and sites, state laws concerning removal and remedial actions apply to removal and remedial actions conducted at those installations and sites. However, under Section 120(a)(4), state laws are excluded if they apply more stringent standards and requirements to a federal facility than the standards and requirements applied to facilities not owned by the federal government. In addition, states agree in Defense/State Memorandums of Agreement (DSMOAs) to follow CERCLA authority for response action work at DoD installations. DSMOAs provide states with funding to ensure the state can provide the necessary oversight and technical assistance to DoD for CERCLA response activities at DoD installations. In states with DSMOAs, CERCLA ARAR waivers can be used at non-NPL sites in the same manner they are used at NPL sites.

HINTS TO WAIVE AN ARAR

Here are some ideas for using ARAR waivers successfully at DoD sites:

Widen your own base of knowledge about ARARs and the criteria for invoking ARAR waivers. The preamble to the final NCP published in the *Federal Register* on March 8, 1990 provides helpful insight into EPA's interpretation of the CERCLA ARAR waivers. You can also research existing RODs that have used ARAR waivers to become more familiar with the precedents for using them.

Ask for help from your legal counsel and from your regulatory partners when determining which requirements are ARARs and when evaluating if ARAR waivers are appropriate. Their agreement with your judgment will help eliminate disagreement.

Invite EPA and state representatives to openly discuss ARAR issues, including ARAR waivers. Early and honest discussions will help to solidify the support you will need from EPA and the state if an ARAR waiver is necessary.

Verify that you have developed the proper documentation in the administrative record to support an ARAR waiver. ARAR waivers can be discussed as early in the process as the need for them is recognized. At a minimum, potential ARAR waivers should be discussed in the FS.

Educate your Restoration Advisory Board (RAB) and the community on what ARARs are and what it means to waive an ARAR. Provide them with actual examples of remedial actions where ARARs have been waived. During the remedy selection process, discuss with the RAB and community exactly what impacts waiving an ARAR will have on remedy selection.

USEFUL RESOURCES FOR UNDERSTANDING ARARs AND ARAR WAIVERS

National Contingency Plan (NCP) Subpart E (including preamble), Federal Register, Vol. 55, No. 46, March 8, 1990

CERCLA Compliance With Other Laws Manual, Part I, Office of Solid Waste and Emergency Response (OSWER) Directive 9234.1-01, August 1988

CERCLA Compliance With Other Laws Manual, Part II, OSWER Directive 9234.1-02, August 1989

Compendium of CERCLA ARARs Fact Sheets and Directives, OSWER Directive 9347.3-15, October 1991

ARARs Q's & A's: State Ground-Water and Antidegradation Issues, Fact Sheet, OSWER Directive 9234.2-11/FS, July 1990

CERCLA Compliance With State Requirements, Fact Sheet, OSWER Directive 9234.2-05/FS, December 1989

Superfund Removal Procedures: Guidance on the Consideration of ARARs During Removal Actions, OSWER Directive 9360.3-02, August 1991

Records of Decision System (RODS) Database

Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, OSWER Directive 9234.2-25, September 1993

2 Recommendation 2.2 – Risk Assessment Policy

Summary: The PRT recommended that the future land use scenario used in site risk assessments and remediation goals be based on an approved land reuse plan that reflects reasonable future use. The LRA has provided SEAD an approved reuse plan which will be used to develop future risk scenarios for the site. A statement in SEAD's response (pg. 6, pp. 4 of the recommendations report) indicated that "risk has not been the driving force for any proposed remediation effort to date".
Follow-on question:

a. If risk is not the driving force for remediation, what criteria are being used to decide whether remediation is warranted at a site?
Criteria for remediation have been negotiated on a site by site basis, and have been based on risk.

b. How many sites at SEAD still need to undergo evaluation to determine if remediation is required?
41 sites

c. Please provide the decision tree that specifies the decision criteria that are used to determine if remediation is necessary.
The decision tree is provided in Enclosure 1.

3. Recommendation 2.3 – Develop an Intrinsic Bioremediation Policy for Petroleum Sites

Summary: The PRT recommended that SEAD should develop a process that considers intrinsic bioremediation as a presumptive remedy for petroleum sites, if feasible. SEAD responded the a checklist for determining if intrinsic bioremediation is appropriate for petroleum sites has been developed.

Follow-on questions:

a. Please provide the checklist.
See Enclosure 2.

b. List the sites for which this recommendation will apply.
SEAD-25 (Fire Training and Demonstration Pad)

c. Has intrinsic bioremediation been proposed for any sites at SEAD?
SEAD-25, considered in the Feasibility Study

4. Recommendation 2.4 – TAGMs

Summary: The PRT recommended that SEAD better understand the use of TAGMs. Specifically, the PRT recommended that SEAD use site specific background metals concentrations as a first step screening criteria rather than the concentrations proposed in the TAGM guidance for metals. Additionally, the PRT recommended that SEAD determine whether the arithmetic mean, geometric mean, or upper 90th or 95th percentile of the distribution of sample concentrations is compared to TAGMs.

Follow-on questions:

a. What is the status of this recommendation?
Background concentrations have been developed and the TAGM comparison issue has been resolved.

b. Please describe SEADs current process for screening against TAGMs.
A number by number comparison is used with individual sample results, not means or distributions. This is the procedure used by the state and they have confirmed this in writing.

5. Recommendation 2.5 – Investigation Strategy

Summary: The PRT recommended that SEAD make better use of field screening techniques. The regulators have expressed concerns regarding the use of screening level data in risk assessments.

Follow-on questions:

a. Please briefly describe SEADs current practice regarding use of screening tools and the resulting data.
SEAD has utilized field-sampling methods in its investigations wherever possible to reduce sampling and analytical costs. SEAD has the understanding that a second mobilization may be necessary if the first field efforts do not yield adequate data.

b. How many sites at SEAD still require investigation that may utilize screening tools.
15 *sites*

6. Recommendation 2.6 – Regional Groundwater Strategy

Summary: The PRT recommended that SEAD take a more regional approach to the groundwater investigation. SEAD has implemented this approach when large plumes are identified. However, data indicate that significant groundwater plumes do not exist. SEAD also indicated that this approach was used to combine 26 new sites into 5 sites, based on land use and proximity, that will require investigation.

Follow-on questions

a. Please briefly describe SEADs current groundwater strategy.
This issue is resolved. SEAD has very few plumes that affect more than one site. A regional approach to addressing groundwater will be utilized when appropriate. This approach has been used at the Ash Landfill.

7. Recommendation 2.7 – Site Specific Background

Summary: The PRT recommended that SEAD develop installation wide background concentrations for metals, PAHs, and radiation in soils, and metals and radiation in groundwater. The PRT further recommended that pristine, as well as anthropogenic, background values should be developed for metals and PAHs so that you have an understanding of what baseline contaminant levels are for comparison when making risk management decisions. SEAD 's analysis of data indicates that there does not appear to be regional PAH background level. SEAD requested assistance from the PRT in developing background values. Specific questions on background development are provided on pages 15 and 16 of the Peer Review Report.

Follow-on questions:

a. What is the status of background value development?
Background values have been developed.

b. How were background values developed (e.g. statistical tools used, were data censored so that background represents pristine conditions)?

Background values for groundwater and soil were taken during RI/FS work for several sites on depot. Data was censored in coordination with the EPA comments and calculated by using the arithmetic mean (average). Outliers and groundwater samples with turbidity over 50 NTU (TAGM value) were screened out. Data from duplicate samples was averaged and only counted once.

c. How many sites at SEAD still require screening against background?

41 sites

d. How many sites at SEAD are likely to require further action (either RI or RA) because concentrations exceed background?

24 sites

e. Has have background values been utilized in the development of clean up goals?

Yes

f. Are background values for metals being used in place of TAGMs?

Yes. Sometimes the TAGM number is the background value.

SITE SPECIFIC ISSUES

1. SEAD 59 and 71

a. What is the status of the site? Is implementation of this program impacted by the PRG and TAGM issues?

A portion of the RI has been implemented to determine if a removal action is appropriate and the draft report will be completed this month. This includes geophysical work, limited sampling, and test pit sampling. Portions of the RI that have not been implemented include groundwater sampling, surface water sampling, and risk assessments.

b. Why was a removal action not undertaken?

The BRAC Cleanup team decided there was not enough information to characterize the site for a removal action.

2. SEAD 16/17

a. What is the status of negotiation of clean up goals for lead?

Cleanup goals for lead are still in the process of being established. The negotiated target value for cleanup will be appropriate for an industrial use setting.

b. How much extra cost is incurred by the Army to include the State's request to compare the cost of clean up to background/TAGMs versus clean up to industrial use based clean up goals into the FS? How much extra does this cost per site? How many sites potentially will require this comparison?

This comparison has not been developed, and is currently negotiated on a case by case basis. 36 sites may require this comparison.

c. How has this project been impacted by the TAGM and decision process issues?

Future decisions on whether a threat exists will be addressed with the development of PRGs. For SEAD-17, the cost of conversion and operation of the furnace as an LTTD is being evaluated. The issue that is being reviewed is whether the furnace can be cost effective based on its processing capability and upgrade cost as compared to other technologies. This evaluation is ongoing.

3. **SEAD 25 and 26**

   a. What is the status of this project? How has this project been impacted by the background issue?
   Comments on the RI were received from regulators at the end of March and the RI is currently being revised. So far the background issue has not impacted this project.

   b. What is the status of the FS? What are the results of the revised FS?
   SEAD is awaiting regulatory comments on the FS.

4. **RAD issues**

   a. Please provide an update on the status of the implementation of the FY97 RAD recommendations.
   Partial fieldwork has proceeded as approved which includes soil scanning, geophysical work, and background, surface water, and sediment sampling. The remaining comments on the Work Plan are resolved and the updated version will be submitted in a few weeks. Fieldwork still remaining includes test pitting, soil sampling, groundwater sampling, and scanning buildings.

5. **Ash Landfill**

   a. What is the status of the debris pile removal?
   EPA wants to see the debris piles removed for ecological risk and, safety concerns. The ROD is still being developed.

   b. What is the status of the full scale pilot test of the iron filings wall?
   The study has had the ground water flow modeling report completed. The treatibility study report is being prepared and is being coordinated with EPA to insure the required information is included. The installation of the trench is pending funding.

6. **Munitions Washout Plant**

   a. What is the status of this project? How are the overarching issues concerning investigation strategy, background, TAGMs, PRG development, and risk assessment policy going to be incorporated into this project?
   No funds have been received to begin the phase I RI and details have not been incorporated into the work plan. This effort is pending funding.

   b. What actions are planned for this site?
   Perform RI in FY98, FS/ROD FY99, RD in FY00, and RA in FY01.

7. **As a follow up to the conference call on 2/20/98, SEAD was asked to compare the data that has been collected to date at individual sites for which a decision on remedial actions have not been made, against the preliminary PRGs developed by USACHPPM for SEAD. This comparison was requested so that the peer review team would have a better understanding of the potential future impact of the recommendations on the SEAD program. For example, if the concentrations detected at most sites are much higher than the PRGs then, the development of PRGs may be less important than if the concentrations detected are close to the PRGs.**

   a. Please provide this comparison.
   See Enclosure 3.

BCT AGENDA

MARCH 17-18, 1998
1330 – 1630 March 17, 1998
0830 – 1230 March 18, 1998
NCO CLUB (BLDG 142)

- → Workplan for EBS sites
  - . Comments
  - . Concerns
  - . Issues
- → Risk Assessment
  - . What do we evaluate to?
  - . How do we incorporate future use into risk
- → Peer Review
  - . Final Report for 1997
  - . Questionnaire
  - . Site Review
  - . Attendance

→ Funding FY 99, 2000, 20001
Review Project List

→ Ash Landfill

- Timeframe for Treatment

- Treatability Study

U.S. Army Environmental Peer Review Program
Installation Information Form

Installation:
POC: Phone:
MACOM/SubMACOM:
POC(s): Phone(s):

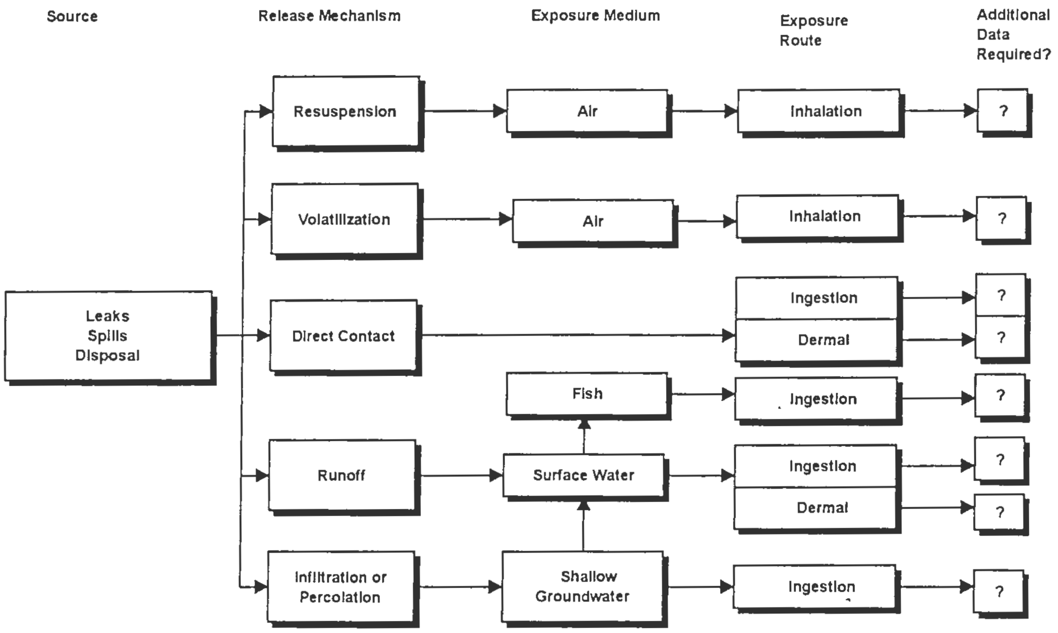
The purpose of this information is to give the Peer Review Technical Assistance Team a general overview of each restoration site to be reviewed. Please answer as briefly as possible without omitting critical information. Additional details will be addressed during the Peer Review.

SITE SUMMARY QUESTIONNAIRE

These are build-on sequence questions. Any questions that are not applicable to the site should allow you to skip ahead to question #9. Review the entire questionnaire, including the attachments section, prior to filling it out. The requested attachments will help in answering the following specific questions.

1. Summarize the basis for environmental concern at this site (i.e. Why was Preliminary Assessment (PA) performed?). Use a site-specific conceptual site model (CSM) similar to the generic example given below, to address the following questions for each contaminant source under investigation at the facility.

Generic Conceptual Site Model



Enclosure 3

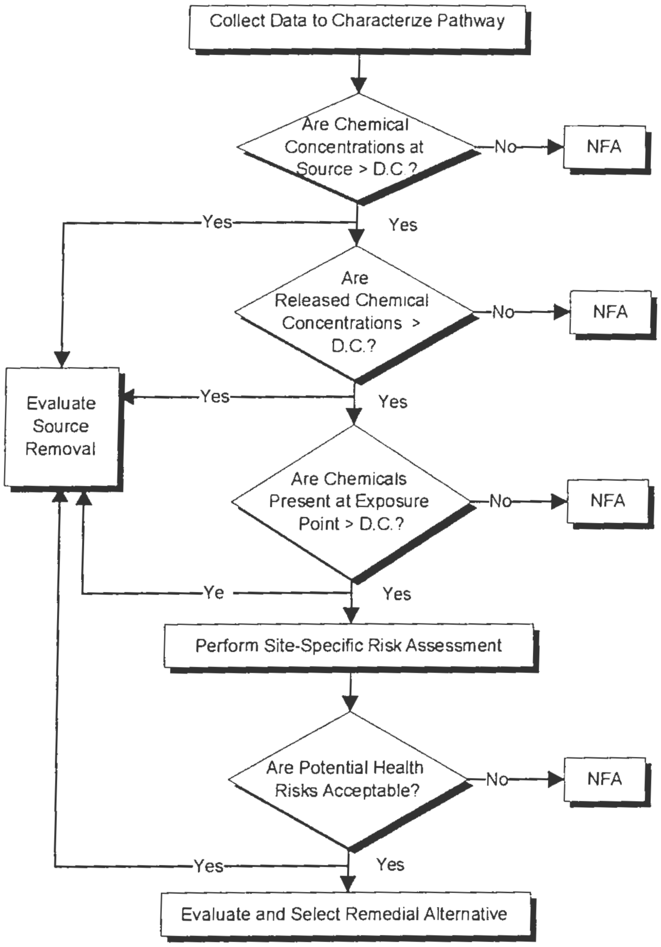
a) Describe the potential sources of contamination at each site that are being evaluated.
   b) Describe the potential migration pathway and receptors for each pathway being evaluated in the CSM. Discuss the release mechanism, the transport media, the potential exposure being evaluated, and the data needed to characterize identified chemical migration pathways, i.e., from the source to the receptor.
   c) Describe the potential contaminants of concern (COCs) for each source and chemical migration pathway.

2. For each identified source, pathway, receptor combination, identify the decisions to be made using the data that have been (will be) collected. For each decision, identify the decision criteria to be used to make the decision. Please identify the specific criteria for making the decisions. Examples of Decision Criteria (D.C.) are shown below:

   a) Risk (human health or ecological)
   b) Applicable, Relevant, or Appropriate Requirements (ARARs)
   c) Technology, or
   d) Other (please specify).

This information can be summarized in a decision diagram. A generic example is provided below for the resuspension pathway shown in the generic conceptual site model:

Generic Resuspension Decision Diagram



3. Has a re-use plan been developed and agreed upon for the site? If so, please attach the plan and a corresponding map. Compare the current use to the planned re-use and explain how the relationship between contaminant sources and chemical transport from these sources was used to develop the planned re-use.

4. What COCs were identified for each source? Were COCs compared to risk-based screening criteria? Was planned reuse used to determine the future land use exposure scenarios for the risk assessment?

5. For each source area, identify the decisions that supported the need for additional investigation. Identify the data used to evaluate the alternative of additional investigation compared to a removal action option. Was this removal action considered? As part of the

decision making process, were COC concentrations compared to risk-based criteria, either site-specific or generic screening level risk-based criteria?

6. Was a site-specific risk assessment performed? Describe the results:

a) Did site-specific current or potential future health risks exceed the acceptable carcinogenic risk range or Hazard Index (HI) level? Define these with respect to the site.

b) If the answer to 6a is yes, please identify the media, pathway(s), and receptor(s) that had potentially unacceptable health risk. Identify any deviations from USEPA risk assessment guidance that were used to estimate potential risk.

7. Was an alternatives analysis performed (i.e. Feasibility Study/Corrective Measures Study (FS/CMS))? If so, describe the analysis and the selected alternative.

8. Identify and discuss the data used to support the decision that remediation to risk-based criteria was practicable.

a) If remediation to risk-based criteria was practicable, was a remedial action (RA) completed? Describe the completed RA and the remedial alternatives considered.

b) If remediation to risk-based criteria was not practicable, was an interim removal action (IRA) completed? Describe the completed IRA and any alternatives considered.

9. What is the current site status? If applicable, provide a discussion of long-term monitoring requirements including frequency of monitoring, list of measured parameters, number of sample locations, and the criteria established to terminate or complete the monitoring program.

Project Funding

1. Provide total past environmental restoration expenditures.
2. Provide total planned environmental restoration expenditures (with schedule).

Attachments

Maps: Location maps, boring maps with data, well maps with data, potentiometric surface maps, geologic maps, etc.

Data Tables: Tabular presentation of data that is considered to be a driver for additional

U.S. ARMY RESTORATION PEER REVIEW CHECKLIST

A. PRE-MEETING

1. Preparation: The Peer Review will be postponed or canceled if adequate information has not been forwarded to AEC in a timely fashion.

a. Provide BCP/IAP, titles of all documents in the administrative record, executive summaries, topographical maps, maps locating potential receptors, a map of all sampling locations (including all monitor wells, soil samples, surface water and sediment samples).

b. AEC will in turn provide BCP/IAP, executive summaries, and DSERTS summary reports for the reviewed sites to the PRT members. Based on their review of these materials, PRT members may request that specific documents be made available at the meeting.

c. Prepare Restoration Program Overview and project presentations for all projects listed in encl 2. Presentations should address the information requested in the site summary questionnaire (encl 3).

2. Notify the Installation Commander of the peer review team presence/meeting. Invite the Commander to give introductory remarks. Offer an out-brief to the Commander.

B. MEETING

1. Agenda:

a. Day 1: Conduct site tour and peer review team meet to review available documents - 1500 until +/-1800hrs. Alternatively, conduct field visits along with site-specific presentations.

b. Day 2-4: PRT meet with BCT, opening remarks regarding purpose of peer review, installation/executor provide general environmental overview including geology/hydrogeology. Gain clarification of work completed and discuss future efforts to be performed. - 0800 until 1800hrs (days 2 through 4).

c. Day 5: PRT meets separately to identify and assign issues to be formulated into recommendations in the Peer Review Recommendations Report. - 0800 until 1130hrs.

d. Breaks: Lunch break - 1200 through 1330hrs. Periodic 20 minute breaks will be taken (one mid-morning, one mid-afternoon) each day.

work, risk, or clean-up.

Meeting minutes

Project: **Base Clean-up Team (BCT) Meeting ; Seneca Army Depot Activity (SEDA)**

Date: January 20 and 21, 1998

Place: Seneca Army Depot Activity (SEDA), Romulus, New York

Attendees: Michael Duchesneau (Parsons), Randall Battaglia (CENAN), Janet Fallow (CENAN), Tom Enroth (CENAN), Robert Scott (NYSDEC), Dan Geraghty (NYSDOH), Steve Absolom (SEDA), John Buck (AEC), Jim Quinn (NYSDEC)

Prepared By: Michael Duchesneau, Parsons

A two day meeting was held at the Non-Commissioned Officers (NCO) Club on January 20 and 21, 1998. The first day of the meeting began at approximately 1:00 PM, January 20, 1998 and ended about 5:00 PM. The meeting on the second day began at 8:00 AM on January 21, 1998 and ended about 12:00 PM. The meeting began by discussing soil background quality at the depot. The EPA and the Huntsville representatives were unable to attend to sickness so it was recognized that final decisions, if any were to be made, were dependent on their approval. Mr. Duchesneau presented a data table that included a compilation of soil samples collected from a variety of sites that have been investigated to date. Background sampling has been performed at locations expected to be unaffected by site conditions or other non-site sources, such as road runoff. Mr. Duchesneau stated that as a result, the sampling locations for the current background database is a biased representation of background conditions, representing pristine conditions rather than what receptors would be exposed to from background exposure. Soil samples from areas around and adjacent to the depot, such as along Route 96 and Route 96a, were intentionally excluded following discussions with the NYSDOH and NYSDEC. The NYSDOH and NYSDEC were against including roadside locations because background should represent conditions prior to disposal activities and should collected from a location adjacent to each site. Mr. Quinn indicated that two samples, SB17-1-1, collected from SEAD-17 and SS16-16, collected from SEAD-16 contained lead at a concentration of 266 mg/kg and 643 mg/kg, receptively. He did not agree that these soil samples represented background compared to other results in the table. Mr. Duchesneau indicated that the data should be considered as a whole not as individual points since the database did not include roadway sampling. Mr. Duchesneau indicated that had roadway samples been included in representing background, that it would have been likely that datapoints elevated in lead and also PAH compounds. He indicated that higher values could be retained to provide a distribution range of the data. Mr. Quinn reiterated that he would not agree that these individual sample points represent background but would agree to consider the data as a whole.

The discussion then focused on how to utilize this data. The use of the data will be two-fold:

Screen sites against background,
Screen the number of samples and the number of compounds from the risk assessment.

Screening data from further consideration in the risk assessments is allowed by EPA guidance and has been routinely performed to limit the number of compounds that will be carried through the risk assessment. However, these screening efforts have only been performed to screen metals in soil, not organics, as only metals were included in sufficient numbers the database. This new compilation of data was conducted to include organic compounds in the screening step as well as metals. Parsons had previously reviewed the database for applicability to screen organics, such as the anthropogenic PAH compounds, from the risk assessment but realized that due to the limited number of actual detected values the comparison to site data was questionable. The background database was more indicative of one-half the detection limit rather than the concentration of actual organic compounds found in background soil. This was due to the fact that the sampling locations were in pristine locations rather than background locations. The Peer Review group suggested that this database be reconsidered to formalize the evaluation with the intent of using the data to screen sites against background. It was agreed that screening site data organic compounds against background would be acceptable if the distribution of site datapoints and background were similar, i.e. frequency of detection, maximum concentration and mean.

The background data tables confirms that the detected values for organic compounds are infrequent, typically less than 5% and the concentrations of ogranics that are detected are always much less than the reported detection limit. In this instance, the lab reports the concentrations with a "J" qualifier, meaning the value is only estimated. Discussion ensued regarding why the lab would report a value less than the detection limit if the detection limit defines the lowest level that the analytical methods can detect. Mr. Duchesneau stated that it is a common problem in environmental reporting and results from the methodology that the lab is required to follow. The lab prepares standards, as per the methodology, to compare against the samples. Samples detected below the lowest standard are reported as estimated values due to the uncertainty associated with the quantitation being out the linear range of calibration, regardless if the analytical instrumentation is capable of detecting compounds below levels or not. The analytical protocols were not developed with compliance of ARARs or obtaining low concentration values to ensure a low risk number in mind. Mr. Quinn indicated that he would make inquires within the DEC to determine how this issue has been resolved at other sites. He was surprised to know that analytical methodologies have not been developed to address this issue. Mr. Duchesneau indicated that Parsons is currently working with our laboratory, Intec Testing Services (ITS) to develop modified protocols that will provide lower detection limits for organic compounds in soils to address this issue. This is effort would be similar to what was done for the water protocols. However, modifying analytical protocols involves a significant research effort.

Discussion also included the overall decision process that will be used to determine how sites will be classified. The current process is described in the Federal Facility Agreement (FFA), signed between the Army, the EPA and NYSDEC, however, several questions remain regarding the details such as what are acceptable concentrations of various chemicals that will be used in the decision process. This process was scrutinized by the Peer Review group who recommended that alternative clean-up concentrations to TAGMs be proposed and included in a revised decision process to exclude many of the sites that have low concentrations of compounds from further consideration. Parsons, SEDA, AEC and CHPPM have been pursing this since the Peer Review and have developed a modified decision process. Mr. Duchesneau presented a draft version of the proposed decision tree. The decision tree outlines the key questions that will need to be answered in addressing what the best disposition of each of the numerous sites. Parsons and the CHPPM have proposed alternative soil clean-up concentrations to the NYSDEC Technical Administrative Guidance Memorandum (TAGM) values called Project Remedial Goals (PRG). How these PRGs and the mini-risk assessment efforts are to be used in determining the eventual disposition of each site was discussed. Mr. Quinn indicated that the DEC will not accept PRGs and they believe that TAGMs along with an assessment of risk is appropriate to determine what to do. He indicated that the DEC are comfortable with the existing process as it requires the DEC to apply professional judgment. He described the current process, noting that process does also allow sites with compounds above TAGM concentrations to be eliminated without additional investigation or clean-up. Although details of this decision logic is not written in the TAGM he indicated that if adequate supporting information is provided to the DEC, convincing the DEC that costs are excessive, given the site risks, or the exceedances are slight, that the DEC will apply professional judgment and exclude the site from further consideration. He pointed out that the existing process works but requires data and an evaluation. The DEC does not want to change this process as doing so will limit their involvement and decision making responsibility. Mr. Duchesneau indicated that this would require that a complete remedial investigation and a risk assessment for each of the dozens of sites, leading to a great deal of cost and time. The Army's intent in developing PRGs and the decision tree is to streamline the existing process, transferring the effort and cost from report writing to clean-up. Mr. Duchesneau stated that as an example, the OB Grounds and the Ash Landfill sites, that began in 1991, are only now getting to a Record of Decision stage in the RI/FS process. This process needs to be improved. He indicated that if we had predetermined clean-up levels, i.e. PRGs, along with a decision tree to describe how to use these clean-up numbers, more clean-up to be performed. Mr. Duchesneau indicated that many states, such as Massachusetts and Connecticut, have adopted clean-up numbers similar to the PRGs proposed here. He noted that Massachusetts has developed an soil concentration protective for human health for Dibenz(a,h)anthracene at 700 ug/kg. This value is similar to the proposed PRG value of 784 ug/kg. Both are much higher than the TAGM value that is 14 ug/kg. Screening sites against the higher number would allow the Army to eliminate several of the marginal sites from further investigation and focus on the sites that require clean-up. The Army feels that removal actions, without the RI and FS reports that are currently being done, can be a useful mechanism to streamlining the RI/FS process.

Since many of the sites remaining to be addressed are small sites with identifiable problems, it would seem easy to do removal actions and eliminate these sites from further consideration. Mr. Quinn indicated that doing site clean-up in this manner eliminates an analysis of alternatives. He indicated that this step is essential for determining what the most appropriate option is. During this analysis factors such as implementability, cost, constructability and effectiveness are considered and needs to be performed for each site. If the Army decides to do a removal action to expedite a clean-up action, the Army must then evaluate the conditions of the site, post-removal action, to determine if additional remedial effort has to be done. This will involve an assessment of risk and possibly an additional evaluation of alternatives. If the removal action and subsequent confirmation sampling indicates that clean-up to TAGM values or background has been attained then there would not be a need to do any further evaluation or remediation. However, if groundwater is impacted or the removal action does not removal all areas to TAGM values then additional evaluation or remediation will be necessary. Mr. Quinn felt that the RI/FS process is set-up to accomplish this and the requirements of this process must be adhered to. If the essential steps of the CERCLA RI/FS process are conducted as part of the removal action then he would be satisfied that the removal action addresses the requirements of the DEC. He questioned why it would be necessary to modify a process that is already established and can be made to work more efficiently. The final outcome was that DEC will not accept PRGs, however, Mr. Quinn indicated that the Army could use PRGs for their own decision making efforts. Of course, any final decisions involving the disposition of sites that involve the use of PRGs will require DEC concurrence. DEC will require some supporting information such as a cost analysis or risk analysis to convince them that the site is not a threat.

The use of the deactivation furnace as a soil treatment unit was discussed. The depot has proposed to EPA and the DEC to use an existing APE 1236 deactivation furnace to treat soils contaminated with volatiles and petroleum products. The unit operated by heating munitions within a large steel rotary kiln, causing the munitions to detonate. The off-gases are then swept from the kiln, into an afterburner where the gases are combusted. Air pollution equipment then removes particulates prior to discharge. Since the unit is existing, yet inactive, it has been proposed to utilize this equipment as a possible way to treat soils from a variety of sites within the depot. The process is identical to other soil treatment units and may be a way to eliminate a number of small sites from further consideration. This would expedite the clean-up of sites at the depot and the BRAC closure and transfer of property. We would also utilize the existing unit in a positive way by eliminating sites, limiting off-site disposal costs/remediation costs and keeping SEDA personnel active. The existing deactivation furnace is a Solid Waste Management Unit (SWMU), SEAD-17, and will be investigated and decontaminated under the provisions of CERCLA site. The furnace had operated as a small arms demilitarization unit during various time periods but had not been used since 1989 when air pollution control equipment upgrades were completed. The operation was stopped pending approval from the DEC as a RCRA hazardous waste incinerator. It had operated prior to this, under the interim status provisions of RCRA, but could not continue until full RCRA permit status was granted. Since the unit is considered to be a RCRA hazardous waste incinerator, it must be closed in accordance with RCRA. The question to be addressed involves whether or not the unit must be closed prior to operating the unit as a soil treatment facility. Mr. Duchesneau indicated that since the site is already being addressed as a site under the CERCLA investigation, that it seemed reasonable to operate the unit and close the unit when the CERCLA investigation is completed. In this way both CERCLA and RCRA are addressed once. In the past, when the removal action was performed for decontamination of source soils at the Ash Landfill, using Low Temperature Thermal Desorption (LTTD), the DEC allowed a similar unit to operate as a "process vent". This eliminated the need for the unit to comply with the requirements of RCRA for hazardous waste incinerators. Mr. Duchesneau proposed that the DEC follow a similar path for the permitting of the deactivation furnace. If permitting is not an issue, then the first effort would be to perform a demonstration study. This study would involve some minor modifications to the unit including changing the conveyor feed and discharge systems but would not change any of the existing air pollution control equipment. Data from the demonstration study would then be used to evaluate the system regarding throughput and emissions data. Mr. Quinn agreed in principle that the RCRA closure requirements should be combined with CERCLA, so that the unit could operate as a soil treatment facility. He indicated that he would discuss this issue with the RCRA people and get an answer for the next RAB meeting.

May 12, 1998

Engineering and
Environmental Division

Mr. James A. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road
Room 237
Albany, New York 12233-7010

Dear Mr. Quinn,

Attached are copies of the handouts provided to attendees at the April 21-22 BRAC Cleanup Team meeting.

The Peer Review information form is an update of the last year's prior review recommendations. The other documents will be used to develop and implement decommissioning of radiological commodity storage facilities.

The second document should be reviewed and any concerns or disagreement identified before July 1, 1998.

Should you have any questions, please contact Stephen Absolom at (607) 869-1309.

/S/

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Eng/Env
✓
D/IM

Copies Furnished:

Commander, U.S. Army Industrial Operations Command,
ATTN: AMSIO-EQE (Ed Agy), Rock Island, IL 61299-6000

Commander, U.S. Army Environmental Center,
ATTN: SFIM-AEC-IRP (John Buck), Aberdeen Proving Ground, MD 21010-5410

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333 - 0001

REPLY TO
ATTENTION OF

File
- SEAD 12
CF

SEDA Co
K. Healy
M. Duchesn
K. Hoddino
J. Buck
Mike Le
(SEAD Saf
John Cle
(BTC)

AMCSF/AMCSO (385-11) 17 April 1998

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Radiological Survey Policy for U.S. Army Materiel Command (AMC) Radioactive Commodity Base Realignment and Closure (BRAC) Sites

1. References.

a. Nuclear Regulatory Commission (NRC) Guide (NUREG) CR/5849, June 1992, Draft Manual for Conducting Radiological Surveys in Support of License Termination.

b. NUREG 1575, Joint Publication by the Department of Defense, Department of Energy, U.S. Environmental Protection Agency, and the NRC, Final Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Dec 97.

2. The enclosed policy is for radiological surveys at closing or realigning sites where AMC radioactive commodities were present. This policy was developed by a team of senior AMC and Headquarters, Department of the Army health physicists to ensure survey efforts and expenditures are not excessive, and are commensurate with the design, use, and potential risk of the commodities.

3. This policy has been formulated using the survey guidance contained in reference 1a and 1b. The key elements of the policy were also briefed to the NRC Regions I and III, which licenses the majority of AMC's radioactive commodities. The policy was characterized by the NRC as reasonable, conservative, and commensurate with the design and use of AMC's radioactive commodities.

4. Request your BRAC offices and radioactive commodity license managers ensure this policy is applied beginning immediately, following the coordination discussed in paragraph 3 of the policy.

5. Point of contact for radiation safety issues is Mr. John Manfre, DSN 767-9340, fax DSN 767-9469, e-mail jmanfre@hqamc.army.mil. Point of contact for BRAC programmatic issues is Ms. Jeannie Gillen, DSN 767-9116, e-mail jgillen@hqamc.army.mil.

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333-0001

Radiological Survey Policy for Base Realignment and Closure (BRAC) Sites Where Army Radioactive Commodities Were Present

April 1998

1. BACKGROUND. The history of many BRAC sites includes the storage, and repair of radioactive commodities. Examples of Army radioactive commodities include lensatic compasses, depleted uranium munitions, radioluminescent sights and gauges on tank and mortar muzzles, moisture density gauges, etc. Many of these commodities are used, stored, and repaired under licenses issued to the Army by the Nuclear Regulatory Commission (NRC). This policy is being issued to provide direction on how these commodity sites will be surveyed during the BRAC process to meet NRC requirements and allow release of the commodity areas. It is anticipated that this guidance will also satisfy any concerns of the Environmental Protection Agency, as well as the host states.

2. APPLICABILITY. This policy will be applied to closing or realigning sites where Army radioactive commodities were stored, repaired, or potentially involved in cannibalization, demilitarization, or burial operations, to include Army, Army Reserve, and the National Guard. This policy will not be applied to non-commodity licenses.

3. PURPOSE. This policy is necessary to ensure that radiological close-out survey efforts are commensurate with the use, design, and risk of AMC radioactive commodities. Discussion with the NRC has indicated that this policy is very reasonable and conservative, and commensurate with the design and use of the commodities. Army radioactive commodities are generally designed rugged, with a limited amount of the radionuclide in a non-dispersible form. Commodities are not expected to have contaminated areas where they were present.

4. GENERAL APPROACH. Most surveys of commodity sites will be simple close-out surveys. To help ensure quality, NUREG-CR 5849 (or MARSSIM) will be applied with the limitations, conditions, and modifications specified in this policy.

5. TYPICAL PROCESS. The closing site will obtain Health Physics expertise to execute the radiological BRAC process, steps of which are listed below, in the following order:

(1) historical site assessment (HSA), (2) scoping surveys (if advantageous),(3) classification of areas, (4) formulation of survey plans, (5) coordination of survey plans with host state and EPA, (6) performance of close-out survey.

The additional detailed guidance provided below will be followed during the process.

6. COORDINATION WITH REGULATORS. The key elements of this policy have already been coordinated with the NRC. States and EPA must be briefed on this survey policy and the site survey plan before surveys begin. Although conflicts with the states or EPA are not expected, they will be referred to HQ AMC for resolution if they occur.

7. AREA CLASSIFICATION. An HSA will be conducted to identify structures and/or land areas where radioactive commodities were stored, repaired, cannibalized, or buried. A review of the type of operation, as well as any accident/incident/leak test reports that indicate an accidental release will be considered to classify areas. To eliminate any potential for conflict of interest, the HSA will not be performed by the same organization that will conduct the final close-out surveys. Nor will the organization/contractor performing the HSA and organization/contractor performing the final close-out surveys be paid by the same overall executing agency. Commodity areas will be classified as follows:

a. AFFECTED AREAS (or Class 1 or 2 areas under MARSSIM) - only those areas where historical information indicates: commodity repair, maintenance, or waste operations compromised the non-dispersible design of the commodities; tritium repair/maintenance/waste operations; an accidental release in the past that has not been remediated to present standards; outdoor and/or indoor cannibalization, demilitarization, or disposal operations known to have broken or buried radioactive commodities or dials.

b. UNAFFECTED AREAS (or Class 3 areas under MARSSIM) - Most other indoor and outdoor areas where commodities were repaired, maintained, or stored. Areas where historical information indicates an accidental release occurred but has already been remediated to present day standards for unrestricted release, will also be classified as unaffected (or Class 3 under MARSSIM).

c. "NO SURVEY" STORAGE AREAS (or non-impacted areas under MARSSIM) - The following storage areas will not require any surveys: (1) where individual item activity did not require posting per 10CFR20.1902, (2) where the items were license exempt, (3) when an NRC license condition relieved the posting requirement for bulk storage (example, less than 1000 compasses), and (4) where armored vehicles with intact DU shielding were present.

8. CLASSIFICATION DOWNGRADING. The use of biased scoping surveys/sampling and or probability/risk assessment to downgrade area classification is encouraged. The absence of contamination at the location within a survey unit where it would most likely be expected to exist can be used to reduce or eliminate the need to survey further. The overall Army leak test experience, i.e., the probability that an individual commodity might leak, as well as a risk assessment in the event of a leak, can also provide the basis to downgrade classification. Any planned scoping survey/sampling design and/or probability/risk assessment analysis as well as potential reduction in further survey efforts, must first be coordinated with the NRC, state, and EPA.

9. CLOSE-OUT SURVEYS.

a. AREA SCANNING. Because of the design of the commodities, the limited quantity of radioisotopes within, and the low radiotoxicity of most commodity isotopes, area scanning in unaffected or Class 3 areas is only required in those areas within the survey unit that have the highest probability of being contaminated.

b. DRAINS/VENTS/DUCTS. Surveys are required inside drainage pipes, vents, and ducts only in those areas classified as affected (or Class 1 or 2 under MARSSIM).

c. FURNITURE/FIXTURES. For affected (or Class 1 or 2 under MARSSIM) areas containing assets such as furniture and fixtures that will be transferred with the property, these assets will be surveyed to screen for potential contamination before they are released. Surveying furniture and fixtures is not required in unaffected areas (or Class 3 areas under MARSSIM).

d. RANDOM SAMPLING. For surveying unaffected (or Class 3 under MARSSIM) areas, random sampling will be used to eliminate the need for gridding and moving furniture. "Survey units" will be used to minimize the number of random samples required, with 30 random locations covering up to 1500 square meters of indoor area.

(1) If commodities are known to have been stored in a building classified as unaffected (or Class 3 under MARSSIM), but the specific room or rooms are not known, then the entire building can be considered an unaffected (or Class 3 under MARSSIM) area survey unit, subject to random sampling.

(2) For areas where historical information indicates commodity repair, maintenance, waste, or cannibalization operations compromised the non-dispersible design of the commodities, the historical site assessment and/or walk through should be able to pinpoint the location of such operations. Only those specific areas where such operations were known to have occurred will be classified as affected (or Class 1 or 2 under MARSSIM). All other areas will be classified as an unaffected (or Class 3 under MARSSIM) area survey unit, subject to random sampling.

10. CHARACTERIZATION SURVEYS. Characterization surveys will be performed only on those areas known to have been contaminated by commodities operations. For all other areas, the survey team will proceed directly to the close-out survey or scoping surveys as described in paragraph 5.

11. VERIFICATION SURVEYS. Verification surveys will only be conducted in those areas that exceeded unrestricted area levels and required clean-up.

12. INSTRUMENTATION. Instruments and methods chosen will be capable of detecting 25% of the guidelines for release of buildings, and 50% of the guidelines for release of grounds. Surveys will also be conducted with instruments that offer and apply technology that will minimize the overall survey, recording, and reporting cost (to include consideration of labor, per diem, transportation, etc.)

13. REPORTING. The NRC will be notified of surveys in affected areas (or Class 1 or 2 under MARSSIM) involving NRC licensed commodities, but does not need to be notified of surveys in unaffected (or Class 3 under MARSSIM) areas. Survey results do not need to be provided to the NRC unless requested by the NRC. In the event that contamination attributable to NRC licensed commodities is found that requires extensive clean-up, the NRC will be informed immediately.

14. DEVIATIONS. A deviation from this policy must first be approved by HQ AMC, and will require a risk-cost analysis demonstrating why the deviation is appropriate.

4/20/98

To: Steve Absolom (607) 869-1362

From: Michael Borisky

Steve,

Final AMC policy on commodity area and surveys.

Mike Borisky

(301) 394-6310

DSN 290-6310

U.S. Army Environmental Peer Review Program
REVIEW OF FY97 PEER REVIEW RECOMMENDATIONS INFORMATION FORM

Installation:

POC: Stephen M. Absolom Phone: (607) 869-1309

MACOM/SubMACOM:

POC: Pedro Cunanan, AMC Phone(s): (703) 617-2324

POC: Ed Agy, IOC Phone(s): (309) 782-1124

The purpose of this information form is to give the Peer Review Technical Assistance Team a general overview of the outstanding issues remaining from the FY 97 Peer Review. This information form will be provided to the Peer Review Team along with the FY97 Peer Review Recommendations Report. Please answer the following questions as briefly as possible without omitting critical information. Additional details will be addressed during the Peer Review.

OVERARCHING ISSUES:

1. Recommendation 2.1 - Decision Making Process

Summary: A decision tree, that specifies decision criteria for further action, has been prepared by SEAD and presented to the BCT. The State has agreed that if sampled concentrations are less than TAGM's or background concentrations, then no further action is required at the site. However, the use of PRGs as the next step in the screening process is not recognized by the State of New York. The State is reluctant to agree, up front, to specific numbers that are less conservative than the TAGMs, as the second step in the screening process. Although, the State acknowledges that there are cases where exceedance of TAGMs has resulted in no further action, the State requires that a "mini risk assessment be conducted for each site with exceedances above TAGMs. These sites are to be evaluated individually, leaving room for professional judgement to consider issues that may include, but not be limited to, spatial analysis of contaminants, number/magnitude of exceedences, etc.

Follow-on questions:

a. What is the status of this recommendation?
See Enclosure 1, Decision Criteria Document, which includes the decision tree.

b. What projects are currently impacted by this recommendation (e.g. how many sites require screening?)
41 sites

c. How are these projects impacted by this recommendation?
Removals may be implemented earlier in the CERCLA process due to the decision tree.

2 Recommendation 2.2 – Risk Assessment Policy

Summary: The PRT recommended that the future land use scenario used in site risk assessments and remediation goals be based on an approved land reuse plan that reflects reasonable future use. The LRA has provided SEAD an approved reuse plan which will be used to develop future risk scenarios for the site. A statement in SEAD's response (pg. 6, pp. 4 of the recommendations report) indicated that "risk has not been the driving force for any proposed remediation effort to date".
Follow-on question:

a. If risk is not the driving force for remediation, what criteria are being used to decide whether remediation is warranted at a site?
Criteria for remediation have been negotiated on a site by site basis, and have been based on risk.

b. How many sites at SEAD still need to undergo evaluation to determine if remediation is required?
41 sites

c. Please provide the decision tree that specifies the decision criteria that are used to determine if remediation is necessary.
The decision tree is provided in Enclosure 1.

3. Recommendation 2.3 – Develop an Intrinsic Bioremediation Policy for Petroleum Sites

Summary: The PRT recommended that SEAD should develop a process that considers intrinsic bioremediation as a presumptive remedy for petroleum sites, if feasible. SEAD responded the a checklist for determining if intrinsic bioremediation is appropriate for petroleum sites has been developed.

Follow-on questions:

a. Please provide the checklist.
See Enclosure 2.

b. List the sites for which this recommendation will apply.
SEAD-25 (Fire Training and Demonstration Pad)

c. Has intrinsic bioremediation been proposed for any sites at SEAD?
SEAD-25, considered in the Feasibility Study

4. Recommendation 2.4 – TAGMs

Summary: The PRT recommended that SEAD better understand the use of TAGMs. Specifically, the PRT recommended that SEAD use site specific background metals concentrations as a first step screening criteria rather than the concentrations proposed in the TAGM guidance for metals. Additionally, the PRT recommended that SEAD determine whether the arithmetic mean, geometric mean, or upper 90th or 95th percentile of the distribution of sample concentrations is compared to TAGMs.

Follow-on questions:

a. What is the status of this recommendation?
Background concentrations have been developed and the TAGM comparison issue has been resolved.

b. Please describe SEADs current process for screening against TAGMs.
A number by number comparison is used with individual sample results, not means or distributions. This is the procedure used by the state and they have confirmed this in writing.

5. **Recommendation 2.5 – Investigation Strategy**

Summary: The PRT recommended that SEAD make better use of field screening techniques. The regulators have expressed concerns regarding the use of screening level data in risk assessments.

Follow-on questions:

a. Please briefly describe SEADs current practice regarding use of screening tools and the resulting data.
SEAD has utilized field-sampling methods in its investigations wherever possible to reduce sampling and analytical costs. SEAD has the understanding that a second mobilization may be necessary if the first field efforts do not yield adequate data.

b. How many sites at SEAD still require investigation that may utilize screening tools.
15 *sites*

6. **Recommendation 2.6 – Regional Groundwater Strategy**

Summary: The PRT recommended that SEAD take a more regional approach to the groundwater investigation. SEAD has implemented this approach when large plumes are identified. However, data indicate that significant groundwater plumes do not exist. SEAD also indicated that this approach was used to combine 26 new sites into 5 sites, based on land use and proximity, that will require investigation.

Follow-on questions

a. Please briefly describe SEADs current groundwater strategy.
This issue is resolved. SEAD has very few plumes that affect more than one site. A regional approach to addressing groundwater will be utilized when appropriate. This approach has been used at the Ash Landfill.

7. **Recommendation 2.7 – Site Specific Background**

Summary: The PRT recommended that SEAD develop installation wide background concentrations for metals, PAHs, and radiation in soils, and metals and radiation in groundwater. The PRT further recommended that pristine, as well as anthropogenic, background values should be developed for metals and PAHs so that you have an understanding of what baseline contaminant levels are for comparison when making risk management decisions. SEAD 's analysis of data indicates that there does not appear to be regional PAH background level. SEAD requested assistance from the PRT in developing background values. Specific questions on background development are provided on pages 15 and 16 of the Peer Review Report.

Follow-on questions:

a. What is the status of background value development?
Background values have been developed.

b. How were background values developed (e.g. statistical tools used, were data censored so that background represents pristine conditions)?

Background values for groundwater and soil were taken during RI/FS work for several sites on depot. Data was censored in coordination with the EPA comments and calculated by using the arithmetic mean (average). Outliers and groundwater samples with turbidity over 50 NTU (TAGM value) were screened out. Data from duplicate samples was averaged and only counted once.

c. How many sites at SEAD still require screening against background?

41 sites

d. How many sites at SEAD are likely to require further action (either RI or RA) because concentrations exceed background?

24 sites

e. Has have background values been utilized in the development of clean up goals?

Yes

f. Are background values for metals being used in place of TAGMs?

Yes. Sometimes the TAGM number is the background value.

SITE SPECIFIC ISSUES

1. SEAD 59 and 71

a. What is the status of the site? Is implementation of this program impacted by the PRG and TAGM issues?

A portion of the RI has been implemented to determine if a removal action is appropriate and the draft report will be completed this month. This includes geophysical work, limited sampling, and test pit sampling. Portions of the RI that have not been implemented include groundwater sampling, surface water sampling, and risk assessments.

b. Why was a removal action not undertaken?

The BRAC Cleanup team decided there was not enough information to characterize the site for a removal action.

2. SEAD 16/17

a. What is the status of negotiation of clean up goals for lead?

Cleanup goals for lead are still in the process of being established. The negotiated target value for cleanup will be appropriate for an industrial use setting.

b. How much extra cost is incurred by the Army to include the State's request to compare the cost of clean up to background/TAGMs versus clean up to industrial use based clean up goals into the FS? How much extra does this cost per site? How many sites potentially will require this comparison?

This comparison has not been developed, and is currently negotiated on a case by case basis. 36 sites may require this comparison.

c. How has this project been impacted by the TAGM and decision process issues?

Future decisions on whether a threat exists will be addressed with the development of PRGs. For SEAD-17, the cost of conversion and operation of the furnace as an LTTD is being evaluated. The issue that is being reviewed is whether the furnace can be cost effective based on its processing capability and upgrade cost as compared to other technologies. This evaluation is ongoing.

3. **SEAD 25 and 26**

   a. What is the status of this project? How has this project been impacted by the background issue?
   Comments on the RI were received from regulators at the end of March and the RI is currently being revised. So far the background issue has not impacted this project.

   b. What is the status of the FS? What are the results of the revised FS?
   SEAD is awaiting regulatory comments on the FS.

4. **RAD issues**

   a. Please provide an update on the status of the implementation of the FY97 RAD recommendations.
   Partial fieldwork has proceeded as approved which includes soil scanning, geophysical work, and background, surface water, and sediment sampling. The remaining comments on the Work Plan are resolved and the updated version will be submitted in a few weeks. Fieldwork still remaining includes test pitting, soil sampling, groundwater sampling, and scanning buildings.

5. **Ash Landfill**

   a. What is the status of the debris pile removal?
   EPA wants to see the debris piles removed for ecological risk and, safety concerns. The ROD is still being developed.

   b. What is the status of the full scale pilot test of the iron filings wall?
   The study has had the ground water flow modeling report completed. The treatibility study report is being prepared and is being coordinated with EPA to insure the required information is included. The installation of the trench is pending funding.

6. **Munitions Washout Plant**

   a. What is the status of this project? How are the overarching issues concerning investigation strategy, background, TAGMs, PRG development, and risk assessment policy going to be incorporated into this project?
   No funds have been received to begin the phase I RI and details have not been incorporated into the work plan. This effort is pending funding.

   b. What actions are planned for this site?
   Perform RI in FY98, FS/ROD FY99, RD in FY00, and RA in FY01.

7. **As a follow up to the conference call on 2/20/98, SEAD was asked to compare the data that has been collected to date at individual sites for which a decision on remedial actions have not been made, against the preliminary PRGs developed by USACHPPM for SEAD. This comparison was requested so that the peer review team would have a better understanding of the potential future impact of the recommendations on the SEAD program. For example, if the concentrations detected at most sites are much higher than the PRGs then, the development of PRGs may be less important than if the concentrations detected are close to the PRGs.**

   a. Please provide this comparison.
   See Enclosure 3.

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333-0001

REPLY TO
ATTENTION OF

File
- SEAD 12; 63

CF

SEDA COE
K. Healy
M. Duchesneau
K. Hoddinott
J. Buck
Mike Lewis
(SEAD Safety)
John Cleary
(BTC)

AMCSF/AMCSO (385-11) 17 April 1998

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Radiological Survey Policy for U.S. Army Materiel Command (AMC) Radioactive Commodity Base Realignment and Closure (BRAC) Sites

1. References.

a. Nuclear Regulatory Commission (NRC) Guide (NUREG) CR/5849, June 1992, Draft Manual for Conducting Radiological Surveys in Support of License Termination.

b. NUREG 1575, Joint Publication by the Department of Defense, Department of Energy, U.S. Environmental Protection Agency, and the NRC, Final Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Dec 97.

2. The enclosed policy is for radiological surveys at closing or realigning sites where AMC radioactive commodities were present. This policy was developed by a team of senior AMC and Headquarters, Department of the Army health physicists to ensure survey efforts and expenditures are not excessive, and are commensurate with the design, use, and potential risk of the commodities.

3. This policy has been formulated using the survey guidance contained in reference 1a and 1b. The key elements of the policy were also briefed to the NRC Regions I and III, which licenses the majority of AMC's radioactive commodities. The policy was characterized by the NRC as reasonable, conservative, and commensurate with the design and use of AMC's radioactive commodities.

4. Request your BRAC offices and radioactive commodity license managers ensure this policy is applied beginning immediately, following the coordination discussed in paragraph 3 of the policy.

5. Point of contact for radiation safety issues is Mr. John Manfre, DSN 767-9340, fax DSN 767-9469, e-mail jmanfre@hqamc.army.mil. Point of contact for BRAC programmatic issues is Ms. Jeannie Gillen, DSN 767-9116, e-mail jgillen@hqamc.army.mil.

AMCSF/AMCSO
SUBJECT: Radiological Survey Policy for U.S. Army Materiel Command (AMC) Radioactive Commodity Base Realignment and Closure (BRAC) Sites

6. AMC -- America's Arsenal for the Brave.

FOR THE COMMANDER:

James M Link

Encl
as

JAMES M. LINK
Major General, USA
Chief of Staff

DISTRIBUTION:
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Dr. John W. Lyons, Director, U.S. Army Research Laboratory, Adelphi, MD 20783-1197
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CF:
Colonel Robert Cherry, Army Radiation Safety Officer, Office of the Director of Army Safety, 200 Army Pentagon, Washington, DC 20310-0200
Colonel R. Gary Dinsick, Chief, Army BRAC Office, ACSIM, 600 Army Pentagon, Washington, DC 20310-0600

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE
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Radiological Survey Policy for Base Realignment and Closure (BRAC) Sites Where Army Radioactive Commodities Were Present

April 1998

1. BACKGROUND. The history of many BRAC sites includes the storage, and repair of radioactive commodities. Examples of Army radioactive commodities include lensatic compasses, depleted uranium munitions, radioluminescent sights and gauges on tank and mortar muzzles, moisture density gauges, etc. Many of these commodities are used, stored, and repaired under licenses issued to the Army by the Nuclear Regulatory Commission (NRC). This policy is being issued to provide direction on how these commodity sites will be surveyed during the BRAC process to meet NRC requirements and allow release of the commodity areas. It is anticipated that this guidance will also satisfy any concerns of the Environmental Protection Agency, as well as the host states.

2. APPLICABILITY. This policy will be applied to closing or realigning sites where Army radioactive commodities were stored, repaired, or potentially involved in cannibalization, demilitarization, or burial operations, to include Army, Army Reserve, and the National Guard. This policy will not be applied to non-commodity licenses.

3. PURPOSE. This policy is necessary to ensure that radiological close-out survey efforts are commensurate with the use, design, and risk of AMC radioactive commodities. Discussion with the NRC has indicated that this policy is very reasonable and conservative, and commensurate with the design and use of the commodities. Army radioactive commodities are generally designed rugged, with a limited amount of the radionuclide in a non-dispersible form. Commodities are not expected to have contaminated areas where they were present.

4. GENERAL APPROACH. Most surveys of commodity sites will be simple close-out surveys. To help ensure quality, NUREG-CR 5849 (or MARSSIM) will be applied with the limitations, conditions, and modifications specified in this policy.

5. TYPICAL PROCESS. The closing site will obtain Health Physics expertise to execute the radiological BRAC process, steps of which are listed below, in the following order:

(1) historical site assessment (HSA), (2) scoping surveys (if advantageous), (3) classification of areas, (4) formulation of survey plans, (5) coordination of survey plans with host state and EPA, (6) performance of close-out survey.

The additional detailed guidance provided below will be followed during the process.

6. COORDINATION WITH REGULATORS. The key elements of this policy have already been coordinated with the NRC. States and EPA must be briefed on this survey policy and the site survey plan before surveys begin. Although conflicts with the states or EPA are not expected, they will be referred to HQ AMC for resolution if they occur.

7. AREA CLASSIFICATION. An HSA will be conducted to identify structures and/or land areas where radioactive commodities were stored, repaired, cannibalized, or buried. A review of the type of operation, as well as any accident/incident/leak test reports that indicate an accidental release will be considered to classify areas. To eliminate any potential for conflict of interest, the HSA will not be performed by the same organization that will conduct the final close-out surveys. Nor will the organization/contractor performing the HSA and organization/contractor performing the final close-out surveys be paid by the same overall executing agency. Commodity areas will be classified as follows:

a. AFFECTED AREAS (or Class 1 or 2 areas under MARSSIM) - only those areas where historical information indicates: commodity repair, maintenance, or waste operations compromised the non-dispersible design of the commodities; tritium repair/maintenance/waste operations; an accidental release in the past that has not been remediated to present standards; outdoor and/or indoor cannibalization, demilitarization, or disposal operations known to have broken or buried radioactive commodities or dials.

b. UNAFFECTED AREAS (or Class 3 areas under MARSSIM) - Most other indoor and outdoor areas where commodities were repaired, maintained, or stored. Areas where historical information indicates an accidental release occurred but has already been remediated to present day standards for unrestricted release, will also be classified as unaffected (or Class 3 under MARSSIM).

c. "NO SURVEY" STORAGE AREAS (or non-impacted areas under MARSSIM) - The following storage areas will not require any surveys: (1) where individual item activity did not require posting per 10CFR20.1902, (2) where the items were license exempt, (3) when an NRC license condition relieved the posting requirement for bulk storage (example, less than 1000 compasses), and (4) where armored vehicles with intact DU shielding were present.

8. CLASSIFICATION DOWNGRADING. The use of biased scoping surveys/sampling and or probability/risk assessment to downgrade area classification is encouraged. The absence of contamination at the location within a survey unit where it would most likely be expected to exist can be used to reduce or eliminate the need to survey further. The overall Army leak test experience, i.e., the probability that an individual commodity might leak, as well as a risk assessment in the event of a leak, can also provide the basis to downgrade classification. Any planned scoping survey/sampling design and/or probability/risk assessment analysis as well as potential reduction in further survey efforts, must first be coordinated with the NRC, state, and EPA.

9. CLOSE-OUT SURVEYS.

a. AREA SCANNING. Because of the design of the commodities, the limited quantity of radioisotopes within, and the low radiotoxicity of most commodity isotopes, area scanning in unaffected or Class 3 areas is only required in those areas within the survey unit that have the highest probability of being contaminated.

b. DRAINS/VENTS/DUCTS. Surveys are required inside drainage pipes, vents, and ducts only in those areas classified as affected (or Class 1 or 2 under MARSSIM).

c. FURNITURE/FIXTURES. For affected (or Class 1 or 2 under MARSSIM) areas containing assets such as furniture and fixtures that will be transferred with the property, these assets will be surveyed to screen for potential contamination before they are released. Surveying furniture and fixtures is not required in unaffected areas (or Class 3 areas under MARSSIM).

d. RANDOM SAMPLING. For surveying unaffected (or Class 3 under MARSSIM) areas, random sampling will be used to eliminate the need for gridding and moving furniture. "Survey units" will be used to minimize the number of random samples required, with 30 random locations covering up to 1500 square meters of indoor area.

(1) If commodities are known to have been stored in a building classified as unaffected (or Class 3 under MARSSIM), but the specific room or rooms are not known, then the entire building can be considered an unaffected (or Class 3 under MARSSIM) area survey unit, subject to random sampling.

(2) For areas where historical information indicates commodity repair, maintenance, waste, or cannibalization operations compromised the non-dispersible design of the commodities, the historical site assessment and/or walk through should be able to pinpoint the location of such operations. Only those specific areas where such operations were known to have occurred will be classified as affected (or Class 1 or 2 under MARSSIM). All other areas will be classified as an unaffected (or Class 3 under MARSSIM) area survey unit, subject to random sampling.

10. CHARACTERIZATION SURVEYS. Characterization surveys will be performed only on those areas known to have been contaminated by commodities operations. For all other areas, the survey team will proceed directly to the close-out survey or scoping surveys as described in paragraph 5.

11. VERIFICATION SURVEYS. Verification surveys will only be conducted in those areas that exceeded unrestricted area levels and required clean-up.

12. INSTRUMENTATION. Instruments and methods chosen will be capable of detecting 25% of the guidelines for release of buildings, and 50% of the guidelines for release of grounds. Surveys will also be conducted with instruments that offer and apply technology that will minimize the overall survey, recording, and reporting cost (to include consideration of labor, per diem, transportation, etc.)

13. REPORTING. The NRC will be notified of surveys in affected areas (or Class 1 or 2 under MARSSIM) involving NRC licensed commodities, but does not need to be notified of surveys in unaffected (or Class 3 under MARSSIM) areas. Survey results do not need to be provided to the NRC unless requested by the NRC. In the event that contamination attributable to NRC licensed commodities is found that requires extensive clean-up, the NRC will be informed immediately.

14. DEVIATIONS. A deviation from this policy must first be approved by HQ AMC, and will require a risk-cost analysis demonstrating why the deviation is appropriate.

To: Steve Absolom (607)869-1362 4/20/98

From: Michael Borisky

Steve,

Final AMC policy on commodity area and surveys.

Mike Borisky
(301) 394-6310
DSN 290-6310

Title: FD / Title 40 · Part 141 · 141.80
Section: 141.80 General Requirements
Date: June 29, 1992
Subject Terms: water | drinking water | standard | lead | applicability | community water system | noncommunity water system | compliance | sampling | monitoring | analysis | reporting | recordkeeping | public water system

Subpart I -- Control of Lead and Copper

§ 141.80 General requirements.

(a) Applicability and effective dates.

(1) The requirements of this subpart I constitute the national primary drinking water regulations for lead and copper. Unless otherwise indicated, each of the provisions of this subpart applies to community water systems and non-transient, non-community water systems (hereinafter referred to as "water systems" or "systems").

(2) The requirements set forth in §§ 141.86 to 141.91 shall take effect on July 7, 1991. The requirements set forth in §§ 141.80 to 141.85 shall take effect on December 7, 1992.

(b) Scope. These regulations establish a treatment technique that includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered, in some cases, by lead and copper action levels measured in samples collected at consumers' taps.

(c) Lead and copper action levels.

(1) The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with § 141.86 is greater than 0.015 mg/L (i.e., if the "90th percentile" lead level is greater than 0.015 mg/L).

(2) The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with § 141.86 is greater than 1.3 mg/L (i.e., if the "90th percentile" copper level is greater than 1.3 mg/L).

(3) The 90th percentile lead and copper levels shall be computed as follows:

(i) The results of all lead or copper samples taken during a monitoring period shall be placed in ascending order from the sample with the lowest concentration to the sample with the highest concentration. Each sampling result shall be assigned a number, ascending by single integers beginning with the number 1 for the sample with the lowest contaminant level. The number assigned to the sample with the highest contaminant level shall be equal to the total number of samples taken.

(ii) The number of samples taken during the monitoring period shall be multiplied by 0.9.

(iii) The contaminant concentration in the numbered sample yielded by the calculation in paragraph (c)(3)(ii) is the 90th percentile contaminant level.

(iv) For water systems serving fewer than 100 people that collect 5 samples per monitoring period, the 90th percentile is computed by taking the average of the highest and second highest concentrations.

(d) Corrosion control treatment requirements.

(1) All water systems shall install and operate optimal corrosion control treatment as defined in § 141.2.

(2) Any water system that complies with the applicable corrosion control treatment requirements specified by the State under §§ 141.81 and 141.82 shall be deemed in compliance with the treatment requirement contained in paragraph (d)(1) of this section.

(e) Source water treatment requirements. Any system exceeding the lead or copper action level shall implement all applicable source water treatment requirements specified by the State under § 141.83.

(f) Lead service line replacement requirements. Any system exceeding the lead action level after implementation of applicable corrosion control and source water treatment requirements shall complete the lead service line replacement requirements contained in § 141.84.

(g) Public education requirements. Any system exceeding the lead action level shall implement the public education requirements contained in § 141.85.

(h) Monitoring and analytical requirements. Tap water monitoring for lead and copper, monitoring for water quality parameters, source water monitoring for lead and copper, and analyses of the monitoring results under this subpart shall be completed in compliance with §§ 141.86, 141.87, 141.88, and 141.89.

(i) Reporting requirements. Systems shall report to the State any information required by the treatment provisions of this subpart and § 141.90.

(j) Recordkeeping requirements. Systems shall maintain records in accordance with § 141.91.

(k) Violation of national primary drinking water regulations. Failure to comply with the applicable requirements of §§ 141.80 - 141.91, including requirements established by the State pursuant to these provisions, shall constitute a violation of the national primary drinking water regulations for lead and/or copper.

[56 FR 26460, June 7, 1991; as amended at 56 FR 32112, July 15, 1991; 57 FR 28785, June 29, 1992]

Title: FD / Title 40 · Part 141 · 141.1
Section: 141.1 Applicability
Date: December 24, 1975
Subject Terms: water | public water system | drinking water | applicability

PART 141 -- NATIONAL PRIMARY DRINKING WATER REGULATIONS

Subpart A -- General

§ 141.1 Applicability.

This part establishes primary drinking water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523); and related regulations applicable to public water systems.

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Title:          FD / Title 40 · Part 141 · 141.2
Section:        141.2 Definitions
Date:           May 14, 1996
Subject Terms:  water | public water system | drinking water | definition
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§ 141.2 Definitions.

As used in this part, the term:

"Act" means the Public Health Service Act, as amended by the Safe Drinking Water Act, Pub. L. 93-523.

"Action level" is the concentration of lead or copper in water specified in § 141.80(c) which determines, in some cases, the treatment requirements contained in subpart I of this part that a water system is required to complete.

"Best available technology" or "BAT" means the best technology, treatment techniques, or other means which the Administrator finds, after examination for efficacy under field conditions and not solely under laboratory conditions, area available (taking cost into consideration). For the purposes of setting MCLs for synthetic organic chemicals, any BAT must be at least as effective as granular activated carbon.

"Coagulation" means a process using coagulant chemicals and mixing by which colloidal and suspended materials are destabilized and agglomerated into flocs.

"Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

"Compliance cycle" means the nine-year calendar year cycle during which public water systems must monitor. Each compliance cycle consists of three three-year compliance periods. The first calendar year cycle begins January 1, 1993 and ends December 31, 2001; the second begins January 1, 2002 and ends December 31, 2010; the third begins January 1, 2011 and ends December 31, 2019.

"Compliance period" means a three-year calendar year period within a compliance cycle. Each compliance cycle has three three-year compliance periods. Within the first compliance cycle, the first compliance period runs from January 1, 1993 to December 31, 1995; the second from January 1, 1996 to December 31, 1998; the third from January 1, 1999 to December 31, 2001.

"Confluent growth" means a continuous bacterial growth covering the entire filtration area of a membrane filter, or a portion thereof, in which bacterial colonies are not discrete.

"Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

"Conventional filtration treatment" means a series of processes including coagulation, flocculation, sedimentation, and filtration resulting in substantial particulate removal.

"Corrosion inhibitor" means a substance capable of reducing the corrosivity of water toward metal plumbing materials, especially lead and copper, by forming a protective film on the interior surface of those materials.

"CT" or "CTcalc" is the product of "residual disinfectant concentration" (C) in mg/1 determined before or at the first customer, and the corresponding "disinfectant contact time" (T) in minutes, i.e., "C" x "T". If a public water system applies disinfectants at more than one point prior to the first customer, it must determine the CT of each disinfectant sequence before or at the first customer to determine the total percent inactivation or "total inactivation ratio." In determining the total inactivation ratio, the public water system must determine the residual disinfectant concentration of each disinfection sequence and corresponding contact time before any subsequent disinfection application point(s).

"CT(99.9)" is the CT value required for 99.9 percent (3-log) inactivation of Giardia lamblia cysts. CT(99.0) for a variety of disinfectants and conditions appear in Tables 1.1 - 1.6, 2.1, and 3.1 of § 141.74(b)(3).

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CTcalc
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CT(99.9)
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is the inactivation ratio. The sum of the inactivation ratios, or total inactivation ratio shown as

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  (CTcalc)
% --------
  (CT(99.9))
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is calculated by adding together the inactivation ratio for each disinfection sequence. A total inactivation ratio equal to or greater than 1.0 is assumed to provide a 3-log inactivation of Giardia lamblia cysts.

"Diatomaceous earth filtration" means a process resulting in substantial particulate removal in which
(1) a precoat cake of diatomaceous earth filter media is deposited on a support membrance (septum), and
(2) while the water is filtered by passing through the cake on the septum, additional filter media known as body feed is continuously added to the feed water to maintain the permeability of the filter cake.

"Direct filtration" means a series of processes including coagulation and filtration but excluding sedimentation resulting in substantial particulate removal.

"Disinfectant" means any oxidant, including but not limited to chlorine, chlorine dioxide, chloramines, and ozone added to water in any part of the treatment or distribution process, that is intended to kill or inactivate pathogenic microorganisms.

"Disinfectant contact time" ("T" in CT calculations) means the time in minutes that it takes for water to move from the point of disinfectant application or the previous point of disinfectant residual measurement to a point before or at the point where residual disinfectant concentration ("C") is measured, "T" is the time in minutes that it takes for water to move from the point of disinfectant application to a point before or at where residual disinfectant concentration ("C") is measured. Where more than one "C" is measured, "T" is
(a) for the first measurement of "C", the time in minutes that it takes for water to move from the first or only point of disinfectant application to a point before or at the point where the first "C" is measured and
(b) for subsequent measurements of "C", the time in minutes that it takes for water to move from the previous "C" measurement point to the "C" measurement point for which the particular "T" is being calculated. Disinfectant contact time in pipelines must be calculated based on

"plug flow" by dividing the internal volume of the pipe by the maximum hourly flow rate through that pipe. Disinfectant contact time within mixing basins and storage reservoirs must be determined by tracer studies or an equivalent demonstration.

"Disinfection" means a process which inactivates pathogenic organisms in water by chemical oxidants or equivalent agents.

"Domestic or other non-distribution system plumbing problem" means a coliform contamination problem in a public water system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken.

"Dose equivalent" means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

"Effective corrosion inhibitor residual" for the purpose of subpart I of this part only, means a concentration sufficient to form a passivating film on the interior walls of a pipe.

"Filtration" means a process for removing particulate matter from water by passage through porous media.

"First draw sample" means a one-liter sample of tap water, collected in accordance with § 141.86(b)(2), that has been standing in plumbing pipes at least 6 hours and is collected without flushing the tap.

"Flocculation" means a process to enhance agglomeration or collection of smaller floc particles into larger, more easily settleable particles through gentle stirring by hydraulic or mechanical means.

"Gross alpha particle activity" means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

"Gross boat particle activity" means the total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

"Ground water under the direct influence of surface water" means any water beneath the surface of the ground with

(1) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as Giardia lamblia, or

(2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the State. The State determination of direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation.

"Halogen" means one of the chemical elements chlorine, bromine or iodine.

"Initial compliance period" means the first full three-year compliance period which begins at least 18 months after promulgation, except for contaminants listed at § 141.61(a)(19) - (21), (c)(19) - (33), and § 141.62(b)(11) - (15), initial compliance period means the first full three-year compliance period after promulgation for systems with 150 or more service connections (January 1993 - December 1995), and first full three-year compliance period after the effective date of the regulation (January 1996 - December 1998) for systems having fewer than 150 service connections.

"Large water system" for the purpose of subpart I of this part only, means a water system that serves more than 50,000 persons.

"Lead service line" means a service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line.

"Legionella" means a genus of bacteria, some species of which have caused a type of pneumonia called Legionnaires Disease.

"Man-made beta particle and photon emitters" means all radionuclides emitting beta particles and/or photons listed in Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure, NBS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

"Maximum contaminant level" means the maximum permissable level of a contaminant in water which is delivered to any user of a public water system.

"Maximum contaminant level goal" or "MCGL" means the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health or persons would occur, and which allows an adequate margin of safety. Maximum contaminant level goals are nonenforceable health goals.

"Maximum Total Trihalomethane Potential (MTP)" means the maximum concentration of total trihalomethanes produced in a given water containing a disinfectant residual after 7 days at a temperature of 25°C or above.

"Medium-size water system" for the purpose of subpart I of this part only, means a water system that serves greater than 3,300 and less than or equal to 50,000 persons.

"Near the first service connection" means at one of the 20 percent of all service connections in the entire system that are nearest the water supply treatment facility, as measured by water transport facility, as measured by water transport time within the distribution system.

"Non-community water system" means a public water system that is not a community water system.

"Non-transient non-community water system or "NTNCWS" means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

"Optimal corrosion control treatment" for the purpose of subpart I of this part only, means the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations.

"Performance evaluation sample" means a reference sample provided to a laboratory for the purpose of demonstrating that the laboratory can successfully analyze the sample within limits of performance specified by the Agency. The true value of the concentration of the reference material is unknown to the laboratory at the time of the analysis.

"Person" means an individual; corporation; company; association; partnership; municipality; or State, Federal, or tribal agency.

"Picocurie (pCi)" means the quantity of radioactive material producing 2.22 nuclear transformations per minute.

"Point of disinfectant application" is the point where the disinfectant is applied and water downstream of that point is not subject to recontamination by surface water runoff.

"Point-of-entry treatment device" is a treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building.

"Point-of-use treatment device" is a treatment device applied to single tap used for the purpose of reducing contaminants in drinking water at that one tap.

"Public water system or PWS" means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes

(1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and

(2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public

water system is either a "community water system" or a "noncommunity water system."

"Rem" means the unit of dosage equivalent from ionizing radiation to the total body or any internal organ or organ system. A "millirem (mrem)" is 1/1000 of a rem.

"Repeat compliance period" means any subsequent compliance period after the initial compliance period.

"Residual disinfectant concentration" ("C" in CT calculations) means the concentration of disinfectant measured in mg/l in a representative sample of water.

"Sanitary survey" means an onsite review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water.

"Sedimentation" means a process for removal of solids before filtration by gravity or separation.

"Service line sample" means a one-liter sample of water collected in accordance with § 141.86(b)(3), that has been standing for at least 6 hours in a service line.

"Single family structure" for the purpose of subpart I of this part only, means a building constructed as a single-family residence that is currently used as either a residence or a place of business.

"Slow sand filtration" means a process involving passage of raw water through a bed of sand at low velocity (generally less than 0.4 m/h) resulting in substantial particulate removal by physical and biological mechanisms.

"Small water system" for the purpose of subpart I of this part only, means a water system that serves 3,300 persons or fewer.

"Standard sample" means the aliquot of finished drinking water that is examined for the presence of coliform bacteria.

"State" means the agency of the State or Tribal government which has jurisdiction over public water systems. During any period when a State or Tribal government does not have primary enforcement responsibility pursuant to section 1413 of the Act, the term "State" means the Regional Administrator, U.S. Environmental Protection Agency.

"Supplier of water" means any person who owns or operates a public water system.

"Surface water" means all water which is open to the atmosphere and subject to surface runoff.

"System with a single service connection" means a system which supplies drinking water to consumers via a single service line.

"Too numerous to count" means that the total number of bacterial colonies exceeds 200 on a 47-mm diameter membrane filter used for coliform detection.

"Total trihalomethanes (TTHM)" means the sum of the concentration in milligrams per liter of the trihalomethane compounds (trichloromethane [chloroform], dibromochloromethane, bromodichloromethane and tribromomethane [bromoform]), rounded to two significant figures.

"Transient non-community water system" or "TWS" means a non-community water system that does not regularly serve at least 25 of the same persons over six months per year.

"Trihalomethane (THM)" means one of the family of organic compounds, named as derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted by a halogen atom in the molecular structure.

"Virus" means a virus of fecal origin which is infectious to humans by waterborne transmission.

"Waterborne disease outbreak" means the significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system which is deficient in treatment, as determined by the appropriate local or State agency.

[40 FR 59570, Dec. 24, 1975, as amended at 41 FR 28403, July 9, 1976; 44 FR 68641, Nov. 29, 1979; 50 FR 46900, Nov. 13, 1985; 51 FR 11410, Apr. 2, 1986; 52 FR 20674, June 2, 1987; 52 FR 25712, July 8, 1987; 53 FR 37410, Sept. 26, 1988; 54 FR 27562, June 29, 1989; 56 FR 3526, Jan. 30, 1991; 56 FR 26460, June 7, 1991; 57 FR 31776, July 17, 1992; 59 FR 32370, June 23, 1994; 59 FR 34320, July 1, 1994; 61 FR 24354, May 14, 1996]

Title: FD / Title 40 · Part 141 · 141.62
Section: 141.62 Maximum Contaminant Levels for Inorganic Contaminants
Date: June 29, 1995
Subject Terms: water | public water system | drinking water | standard | MCL | compliance | list | BAT

§ 141.62 Maximum contaminant levels for inorganic contaminants.

(a) (Reserved).

(b) The maximum contaminant levels for inorganic contaminants specified in paragraphs (b)(2) - (6), (b)(10), and (b)(11) - (15) of this section apply to community water systems and non-transient, non-community water systems. The maximum contaminant level specified in paragraph (b)(1) of this section only applies to community water systems. The maximum contaminant levels specified in (b)(7), (b)(8), and (b)(9) of this section apply to community water systems; non-transient, non-community water systems; and transient non-community water systems.

	Contaminant	MCL (mg/l)
(1)	Fluoride	4.0
(2)	Asbestos	7 Million Fibers/liter (longer than 10 µm).
(3)	Barium	2
(4)	Cadmium	0.005
(5)	Chromium	0.1
(6)	Mercury	0.002
(7)	Nitrate	10 (as Nitrogen)
(8)	Nitrite	1 (as Nitrogen)
(9)	Total Nitrate and Nitrite ..	10 (as Nitrogen)
(10)	Selenium	0.05
(11)	Antimony	0.006
(12)	Beryllium	0.004
(13)	Cyanide (as free Cyanide) ..	0.2
(14)	(Removed and Reserved).	
(15)	Thallium	0.002

(c) The Administrator, pursuant to Section 1412 of the Act, hereby identifies the following as the best technology, treatment technique, or other means available for achieving compliance with the maximum contaminant levels for inorganic contaminants identified in paragraph (b) of this section, except fluoride:

BAT for Inorganic Compounds Listed in Section 141.62(B)

Chemical Name	BAT(s)
Antimony	2,7
Asbestos	2,3,8
Barium	5,6,7,9
Beryllium	1,2,5,6,7
Cadmium	2,5,6,7
Chromium	2,5,6{2},7
Cyanide	5,7,10
Mercury	2{1},4,6{1},7{1}
Nickel	5,6,7
Nitrate	5,7,9
Nitrite	5,7
Selenium	1,2{3},6,7,9
Thallium	1,5

{1} BAT only if influent Hg concentrations > 10 μg/l.

{2} BAT for Chromium III only.

{3} BAT for Selenium IV only.

Key to BATS in Table
1 = Activated Alumina
2 = Coagulation/Filtration
3 = Direct and Diatomite Filtration
4 = Granular Activated Carbon
5 = Ion Exchange
6 = Lime Softening
7 = Reverse Osmosis
8 = Corrosion Control
9 = Electrodialysis
10 = Chlorine
11 = Ultraviolet

[51 FR 11411, Apr. 2, 1986; amended at 56 FR 3526, Jan. 30, 1991; 56 FR 30266, July 1, 1991; 57 FR 31776, July 17, 1992; 60 FR 33926, June 29, 1995]

Title: NY / Title 6 · Chapter IV · Subchapter B · Part 373 · Subpart 373-3 · 373-3. Appendix 27
Section: Appendix 27 EPA Interim Primary Drinking Water Standards
Date: December 2, 1991
Subject Terms: waste | drinking water | interim status | standard | compliance | MCL

APPENDIX 27
(cf. Subpart 373-3)

EPA Interim Primary Drinking Water Standards

Parameter	Maximum level (mg/l)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Fluoride	1.4 - 2.4
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.
Selenium	0.01
Silver	0.05
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4 D	0.1
2,4,5-TP Silver	0.01
Radium	5 pCi/l
Gross Alpha	15 pCi/l
Gross Beta	4 millirem/yr
Turbidity	1/TU
Coliform Bacteria	1/100 ml

Comment: Turbidity is applicable only to surface water supplies.

Title: NY / Title 10 · Chapter I · Part 5 · Subpart 5-1 · 5-1.41
Section: 5-1.41 Lead and Copper Action Levels
Date: December 16, 1992
Subject Terms: water | drinking water | copper | lead | public water system | sampling | monitoring

5-1.41 Lead and copper action levels.

(a) The lead action level is exceeded if the concentration of lead in more than 10 percent of one liter first draw tap water samples collected during any monitoring period exceeds 0.015 milligrams per liter.

(b) The copper action level is exceeded if the concentration of copper in more than 10 percent of one liter first draw tap water samples during any monitoring period exceeds 1.3 milligrams per liter.

(c) The 90th percentile lead and copper action levels shall be computed as follows:

(1) the results of all lead and copper samples taken during a monitoring period shall be placed in ascending order from the sample with the lowest concentration to the sample with the highest concentration. Each sampling result shall be assigned a number, ascending by single integers beginning with the number one for the sample with the lowest contaminant level. The number assigned to the sample with the highest contaminant level shall be equal to the total number of samples taken;

(2) multiply the number of samples taken during the monitoring period by 0.9;

(3) the contaminant concentration of the numbered sample obtained by this calculation is the 90th percentile contaminant level; and

(4) for water systems that are only required to collect five samples per monitoring period, the 90 percentile lead and copper action level is computed by taking the average of the highest and second highest concentrations.

Historical Note

Sec. filed April 6, 1987; repealed, filed Nov. 7, 1988; new filed Dec. 16, 1992 eff. Jan. 6, 1993.

Title: NY / Title 10 · Chapter I · Part 5 · Subpart 5-1 · 5-1.40
Section: 5-1.40 Applicability
Date: December 16, 1992
Subject Terms: water | drinking water | copper | lead | applicability | public water system | community water system | noncommunity water system | compliance | reporting | testing | sampling | monitoring

CONTROL OF COPPER AND LEAD IN DRINKING WATER

5-1.40 Applicability.

Unless otherwise noted all community water systems and nontransient, noncommunity water systems shall provide optimal corrosion control treatment or complete the applicable corrosion control requirements by the deadlines established in sections 5-1.40 through 5-1.49 of this Subpart.

(a) Optimal corrosion control. Any water system is considered by the State to have optimal corrosion control treatment if the water system satisfies one of the following applicable criteria.

(1) Any water system that services 3,300 people or less is considered to have optimal corrosion control treatment if the water system meets the copper and lead action levels during each of two consecutive six month monitoring periods when monitoring is conducted in accordance with section 5-1.42 of this Subpart.

(2) Any water system that has carried out activities equivalent to the corrosion control steps applicable to that size water system in sections 5-1.40 through 5-1.49 of this Subpart can demonstrate optimal corrosion control treatment by submitting to the State a report with the following information:

(i) the results of all test samples collected for each of the water quality parameters in section 5-1.43 of this Subpart;

(ii) a description of the test methods, various treatments tested and the basis for the water systems selection of optimal corrosion control treatment;

(iii) a description of how optimal corrosion control treatment was installed and how It is being maintained and operated; and

(iv) the results of first draw lead and copper tap water samples collected in accordance with section 5-1.42 of this Subpart for two consecutive six month monitoring periods after optimal corrosion control treatment has been installed.

(3) A water system is considered to have optimal corrosion control treatment if it demonstrates that the difference in the results of the 90th percentile first draw lead level and the highest source water lead level is less than 0.005 milligrams per liter for two consecutive six month monitoring periods. The 90th percentile lead level must be calculated in accordance with section 5-1.41 of this Subpart and sampled in accordance with section 5-1.42 of this Subpart. The source water lead level must be sampled in accordance with section 5-1.47 of this Subpart.

(b) A large water system that serves more than 50,000 people that has not demonstrated to the State that it has optimal corrosion control treatment shall complete the following corrosion control treatment steps.

Step 1: The water system shall conduct initial monitoring for first draw lead and copper tap samples in accordance with section 5-1.42 of this Subpart and sampling for water quality parameters in accordance with section 5-1.43 of this Subpart by January 1, 1993. If a water system exceeds the lead action level during the first or second six month monitoring period it shall deliver the public education materials in accordance with section 5-1.44 of this Subpart within 60 days of the end of the monitoring period and begin source water monitoring in accordance with section 5-1.47 of this Subpart.

Step 2: The water system shall complete corrosion control studies in accordance with section 5-1.45 of this Subpart and submit a report to the State by July 1, 1994.

Step 3: After state designation of optimal corrosion control treatment the water system shall install optimal corrosion control treatment by January 1, 1997.

Step 4: After installation of optimal corrosion control treatment the water system shall complete lead, copper and water quality parameter follow-up sampling in accordance with section 5-1.46(e) of this Subpart by January 1, 1998. If follow-up sampling for lead does not meet the action level, the water system must begin replacing lead service lines in accordance with section

5-1.48 of this Subpart.

Step 5: After State specification of water quality parameters for optimal corrosion control treatment, the water system shall operate in compliance with State-specified water quality parameter values in accordance with section 5-1.46(q) of this Subpart; conduct lead and copper first draw tap sampling in accordance with section 5-1.42 of this Subpart and report results to the State within 10 days of the end of each monitoring period.

(c) A water system that serves 50,000 people or less that has not demonstrated to the State that it has optimal corrosion control treatment shall complete the following corrosion control treatment steps.

Step 1: The water system shall conduct initial lead and copper first draw tap sampling in accordance with section 5-1.42 of this Subpart until the water system either exceeds the lead and/or copper action level or becomes eligible for reduced monitoring. Results must be reported to the State within 10 days of the end of each monitoring period.

Step 2: A water system that exceeds the lead or copper action level shall:

(i) deliver public education materials in accordance with section 5-1.44 of this Subpart within 60 days of the end of the monitoring period;

(ii) submit a report to the State in accordance with section 5-1.46(b) of this Subpart recommending optimal corrosion control treatment within six months after it exceeds one of the action levels;

(iii) conduct water quality parameter monitoring in accordance with section 5-1.43 of this Subpart; and

(iv) conduct source water monitoring in accordance with section 5-1.47 of this Subpart.

Step 3: If the State requires a corrosion control study to be conducted, the water system shall conduct the corrosion control study in accordance with section 5-1.45 of this Subpart and submit a report on the results to the State within 18 months of the date the study was required.

Step 4: After State designation of optimal corrosion control treatment, the water system shall install optimal corrosion control treatment in accordance with section 5-1.46(d) of this Subpart within 24 months of the State's designation.

Step 5: After installation of optimal corrosion control treatment, the water system shall conduct lead, copper and water quality parameter follow-up sampling in accordance with section 5-1.46(f) of this Subpart within 36 months after State designation of optimal corrosion control treatment. The results shall be submitted to the State for designation of optimal water quality control parameters within 10 days of the end of the monitoring period. If follow-up sampling for lead does not meet the action level, the water system must begin replacing lead service lines in accordance with section 5-1.48 of this Subpart.

Step 6: After State specification of water quality parameters, for optimal corrosion control treatment the water system shall operate in compliance with state-specified water quality parameters values in accordance with section 5-1.46(h) of this Subpart, conduct lead and copper tap sampling in accordance with section 5-1.42 of this Subpart and report results to the State within 10 days of the end of each monitoring period.

(d) Any community or nontransient noncommunity water system that serves 50,000 or less people and is required to complete the corrosion control steps because of its failure to meet the lead or copper action level may cease completing the treatment steps whenever the water system meets both action levels during each of two consecutive six month monitoring periods. The tion level is exceeded in a later monitoring period the water system must complete the applicable treatment steps.

Historical Note

Sec. filed Aug. 3, 1972; repealed, new filed April 4, 1977; amds. filed: July 5, 1979; April 6, 1987; repealed, filed Nov. 7, 1988; new filed Dec. 16, 1992 eff. Jan. 6, 1993.

Title: NY / Title 10 · Chapter I · Part 5 · Subpart 5-1 · 5-1.51
Section: 5-1.51 Maximum Contaminant Levels
Date: December 15, 1992
Subject Terms: water | public water system | drinking water | compliance | MCL | analysis | monitoring | reporting | exemption | feasibility study | hearing | certification

5-1.51 Maximum contaminant levels.

(a) The maximum contaminant levels are listed in section 5-1.52 tables 1 through 7. In the case where an MCL is exceeded, notwithstanding anything to the contrary contained in section 5-1.12 of this Subpart, the supplier of water will take the necessary steps to comply with this section, to ensure the protection of the public health, including the undertaking of remedial feasibility studies and the installation of a suitable treatment process. Compliance with the MCLs shall be determined by the procedures contained in section 5-1.52, tables 1 through 7 of this Subpart.

(b) The minimum monitoring requirements for each contaminant are listed in section 5-1.52 tables 8A through 12 of this Subpart, except for public water systems with fewer than 15 service connections and which serve fewer than 25 persons, where monitoring will be at State discretion. For this section, State discretion shall mean requiring monitoring when the State has reason to believe an MCL has been violated, the potential exists for an MCL violation or a contaminant may present a risk to public health.

(c) The notification requirements for each contaminant are listed in section 5-1.52 table 13 of this Subpart.

(d) The CT values for inactivation of Giardia lamblia cysts by free chlorine at various pH and temperature levels are listed in section 5-1.52 tables 14A through 14F of this Subpart. The CT values for inactivation of Giardia lamblia cysts by chlorine dioxide and ozone at various temperature levels are listed in section 5-1.52 table 14G of this Subpart.

(e) The alternative disinfection monitoring frequency requirements using grab samples instead of continuous chlorine concentration monitoring is listed in section 5-1.52 table 15 of this Subpart.

(f) Monitoring and reporting frequencies for specific contaminants may be established at State discretion whenever the State believes that a potential exists for an MCL violation or the contaminant may present a risk to public health.

(g) Notwithstanding anything to the contrary in subdivision (a) of this section the commissioner may recommend values lower than the MCL's if sufficient valid information based on commonly accepted scientific standards and principles demonstrates an increased public health concern. Within one year from the date of such recommendation, the State shall hold a public hearing regarding the justification for the lower value, and whether a new MCL is warranted.

(h) Notwithstanding anything to the contrary in section 5-1.52 table 3, of this Subpart, the commissioner may in specific cases except specific organic chemicals from the MCL's for general organic chemicals if the supplier of water can demonstrate that sufficient valid scientific information exists to show that the organic chemical does not pose an unreasonable risk to human health, the organic chemical is present at a level and under circumstances not indicative of contamination, and the cost of compliance is unreasonable in light of the risk to human health.

(i) Notwithstanding anything to the contrary in section 5-1.52 of this Subpart, the commissioner may, based on receipt and review of a justification submitted by the supplier of water, allow a higher MCL for a period of up to 60 days following application of a paint or lining to a potable water structure, if he determines that an unreasonable risk to human health does not exist.

(j) Each public water system must certify annually in writing to the State that when Acrylamide and Epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified as follows:

Acrylamide = 0.05% dosed at 1 ppm (or equivalent)

Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent)

Certification can rely on manufacturers or third parties, as approved by the State.

(k) For microbiological analysis, a standard sample size of 100 milliliters shall be used.

Historical Note

Sec. filed April 4, 1977; amd. filed June 24, 1981; repealed, new filed April 6, 1987; amds. filed: Nov. 7, 1988; Dec. 29, 1989; March 19, 1991 as emergency measure, expired 90 days after filing; June 18, 1991; Feb. 19, 1992; Dec. 15, 1992 eff. Dec. 30, 1992.

5-1.52 Tables.

TABLE 1 -- INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminants	(mg/l{4})	Determination of MCL violation
Asbestos	7.0 million fiber/liter (MFL) (Longer than 10 microns)	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect one more sample from the same sampling point within 12 weeks or as soon as practical. An MCL violation occurs when the average{1} of the two results exceeds the MCL.
Arsenic	0.05	
Barium	2.00	
Cadmium	0.05	
Chromium	0.10	
Mercury	0.002	
Selenium	0.01	
Silver	0.05	

Fluoride	2.2
Chloride	250.0
Iron	0.3{2}
Manganese	0.3{2}
Sodium	No designated limits{3}
Sulfate	250.0
Zinc	5.0
Color	15 Units
Odor	3 Units

{1} Rounded to the same number of significant figures as the MCL for the contaminant in question.

{2} If iron and manganese are present, the total concentration of both should not exceed 0.5 mg/l. Higher levels may be allowed by the State when justified by the supplier of water.

{3} Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.
{4} mg/l = milligrams per liter.

TABLE 2 -- NITRATE, NITRITE, TOTAL NITRATE/NITRITE
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Determination of MCL violation
Nitrate	10 (as Nitrogen){1}	If the results of a monitoring
Nitrite	1 (as Nitrogen)	sample analysis exceed the MCL,

Total Nitrate /Nitrite	10 (as Nitrogen)	the supplier of water shall collect another sample from the same sampling point, within 24 hours of the receipt of results or as soon as practical{2}. An MCL violation occurs when the average of the two results exceeds the MCL.

{1} An MCL of 20 mg/l may be permitted at a noncommunity water system if the supplier of water demonstrates that:

(a) the water will not be available to children under six months of age;

(b) a notice that nitrate levels exceed 10 mg/l and the potential health effects of exposure will be continuously posted in conspicuous places in the area served by the system, within 14 days of the confirmation of an MCL violation;

(c) the State will be notified annually of nitrate levels that exceed 10 mg/l; and

(d) no adverse health effects shall result.

{2} Systems unable to collect an additional sample within 24 hours must issue a public notice to consumers and must collect the additional sample within two weeks of receiving the initial sample results.

TABLE 3 -- ORGANIC CHEMICALS

MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL (mg/l)	Type of water system	Determination of MCL violation
General organic chemicals			
Principal organic contaminant (POC)	0.005	Community, NTNC and Noncommunity	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect one to three more samples from the same sampling point, as soon as practical, but within 30 days. An MCL violation occurs when at least one of the confirming samples is positive and the average of the initial sample and all confirming samples exceeds the MCL.
Unspecified organic contaminant (UOC)	0.05		
Total POCs and UOCs	0.1		
Trihalomethanes{2}			

Total trihalomethanes{1}	0.10	Community	The results of all analyses per quarter must be arithmetically averaged and must be reported to the State within 30 days of the public water system's receipt of the analyses. A violation occurs if the average of the four most recent sets of quarterly samples (12-month running average) exceeds the MCL.
		Noncommunity	Not applicable.

Group I Contaminants	MCL (mg/l)	Type of water system	Determination of MCL violation
Specific Organic Chemicals			
Alachlor	0.002	Community, NTNC and Noncommunity	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect one to three more samples from the same sampling point, as soon as
Aldicarb	0.003		
Aldicarb sulfone	0.002		
Aldicarb sulfoxide	0.004		
Atrazine	0.003		
Carbofuran	0.04		
Chlordane	0.002		
Dibromochloropropane (DPCP)	0.0002		

practical,		
2, 4-D	0.05	but within 30 days.
Endrin	0.0002	An MCL violation
Ethylene dibromaide	0.00005	occurs when at least
(EDB)		one of the
confirming		
Heptachlor	0.0004	samples is positive
Heptachlor epoxide	0.0002	and the average of
Lindane	0.0002	the initial sample
Methoxychlor	0.04	and all confirming
Pentachlorophenol	0.001	samples exceeds the
Polychlorinated	0.0005	MCL.
biphenyls (PCBS)		
Toxaphene	0.003	
2, 4, 5-TP (Silvex)	0.01	
Vinyl Chloride	0.002	

{1} Effective one year after beginning sampling according to the minimum monitoring requirements.

{2} The State may require a supplier of water to monitor for MTP at a frequency specified by the State.

TABLE 4 -- ENTRY POINT TURBIDITY

MAXIMUM CONTAMINANT LEVEL DETERMINATION{1}

Contaminant	MCL	Determination of MCL violation
Entry point turbidity (surface water and ground water directly influenced by surface water){2}	1 NTU{2}{3}{4}{5} (Monthly average)	A violation occurs when the average of all daily entry point analyses for the month exceeds the MCL rounded off to the nearest whole number.
	5 NTU{3}{4}{5}	A violation occurs when the average of two consecutive daily entry point analyses exceeds the MCL rounded off to the nearest whole number.

{1} The requirements of this table apply to unfiltered systems until December 30, 1991, unless the State has determined prior to that date, in writing pursuant to section 5-1.30 of this Subpart, that filtration is required. The requirements of this table apply to filtered systems until June 29, 1993. The requirements of this table apply to unfiltered systems that the State has determined, in writing pursuant to section 5-1.30 of this Subpart, must install filtration, until June 29, 1993, or until filtration is installed, whichever is later.

{2} The commissioner may establish a monthly average entry point turbidity MCL of five NTU based on justification submitted by the supplier of water. Such justification shall demonstrate that the higher turbidity does not:

(a) interfere with disinfection;

(b) prevent maintenance of a minimum of 0.2 mg/l free chlorine residual at representative points within the distribution systems; or

(c) interfere with microbiological determinations, and substantiate why meeting a one NTU is not feasible.

{3} If the daily entry point analysis exceeds one NTU for a system with a monthly average MCL of one NTU or if a daily entry point analysis exceeds five NTU for a system with a monthly average MCL of five NTU, a repeat sample must be taken as soon as practicable and preferably within one hour. If the repeat sample exceeds one NTU for a system with a monthly average MCL of one NTU or five NTU for a system with a monthly average MCL of five NTU, the supplier of water must make State notification. The repeat sample must be used for the monthly average and the two-consecutive-day average. {4} NTU = Nephelometric Turbidity Units.

{5} If the two-consecutive-day average exceeds the MCL, the supplier of water shall analyze for microbiological contamination at a point downstream of the first consumer, but as close to the first consumer as is feasible. The additional microbiological sample should be taken within one hour or as soon as feasible after determining the two-consecutive-day average. The supplier of water shall report the result of this microbiological analysis to the State within 48 hours of obtaining the result. The result of this analysis shall not be used for monitoring purposes.

ENFLEX Note: The following table is wider than your screen. Please scroll right to see the entire table.

TABLE 4A - SURFACE WATER TURBIDITY PERFORMANCE STANDARDS

MAXIMUM CONTAMINANT LEVEL DETERMINATION{1}{2}

Contaminant	Filtration type	Performance standard	MCL	Determination of treatment technique/MCL violation

Filtered water turbidity	Conventional filtration	0.5 NTU {3}{4}	Not applicable	A treatment technique violation occurs if more than five percent of the composite filter effluent measurements taken each month exceed the performance standard values. The turbidity level of representative samples of the filtered water must at no time exceed five NTU.
	Slow sand filtration	1.0 NTU{4}		
	Diatomaceous earth filtration	1.0 NTU{4}		

{1} The standards apply to systems with surface water sources or ground water sources directly influenced by surface water.

{2} The table becomes effective on June 29, 1993.

{3} The performance standard applies to direct filtration and other alternative filtration technologies capable of complying with requirement of section 5-1.30(b) of this Subpart as demonstrated to the department by pilot studies.

{4} NTU = Nephelometric Turbidity Unit.

TABLE 5 -- DISTRIBUTION SYSTEM TURBIDITY

MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Determination of MCL violation
Distribution point turbidity	5 NTU	A violation occurs when the

	(Monthly average)	monthly average of the results of all distribution samples collected in any calendar month exceeds the MCL rounded off to the nearest whole number.

TABLE 6 -- MICROBIOLOGICAL CONTAMINANTS
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL{1}{2}	Determination of MCL violation
Total coliform	Any positive sample.{3}	A violation occurs at systems collecting 40 or more samples per month when more than 5.0 percent of the total coliform samples are positive.
		A violation occurs at systems collecting less than 40 samples per month when two or more samples are total coliform positive.

Escherichia coli (E. coli)	Any positive sample	A violation occurs when a total coliform positive sample is positive for Escherichia coli (E. coli) and a repeat total coliform sample is positive or when a total coliform positive sample is negative for Escherichia coli (E. coli) but a repeat total coliform sample is positive and the sample is also positive for Escherichia coli (E. coli).{4}

{1} Compliance with MCL for total coliform must be made by a public water system for each month the system is required to monitor for total coliform.

{2} All samples collected in accordance with section 5-1.52 table 11 footnotes 1, 2, 4 and 5 of this Subpart and samples collected in accordance with section 5-1.51(f) of this Subpart shall be included in determining compliance with the MCL unless any of the samples have been invalidated by the State.

{3} If any total coliform sample is positive, a set of repeat samples must be collected in accordance with section 5-1.52 table 11 of this Subpart.

{4} For notification purpose, an Escherichia coli (E. coli) MCL violation is a public health hazard.

TABLE 7 -- RADIOLOGICAL

MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Type of water system	Determination of MCL violation
Combined radium-226 and radium-228	5 picocuries per liter	Community	A violation occurs when the annual composite of four quarterly samples or the average of the analysis of four quarterly samples exceeds the MCL.
Gross alpha activity (including radium-226 but excluding radon and uranium)	15 picocuries per liter		
		Noncommunity	Not applicable
Beta particle and photon radioactivity from manmade radionuclides	Four millirems per year as the annual dose equivalent to the total body or any internal organ. The department shall determine the concentration capable of producing four millirems per year.	Community using surface water serving more than 100,000 people	A violation occurs when the annual composite of four quarterly samples or the average of the analyses of four quarterly samples exceeds the MCL.
		Community	Not applicable

	using surface source serving 100,000 or fewer people or community using ground water	
	Noncommunity	Not applicable

ENFLEX Note: The following table is wider than your screen. Please scroll right to see the entire table.

TABLE 8A -- INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS

MINIMUM MONITORING REQUIREMENTS -- FOR ASBESTOS

		Initial Frequency by Source Type{5}		
Contaminant	Type of water system	Ground water only	Surface only or Surface and ground water	Repeat Sampling and Compliance
Asbestos{1}	Community	One sample at	One sample at	

If GT MCL, one

and NTNC entry point by entry point by
sample quarterly{6}{7}

12/31/95{2}{3}{4} 12/31/95{2}{3}{4}
If LT MCL, one

sample every nine

years

GT -- Greater Than LT -- Less Than

{1} If a system is not vulnerable to asbestos contamination, either at its source or due to corrosion of asbestos cement pipe, it is not required to monitor if granted a waiver by the state. The basis for a waiver must include the following:

a. Lack of potential asbestos contamination of the water source

b. No use of asbestos cement pipe for finished water distribution and non-corrosive nature of the water.

{2} If asbestos monitoring data collected after January 1, 1990 are consistent with the requirements of this table, the Department may allow systems to use that data to satisfy the initial monitoring requirement beginning January 1, 1993.

{3} If a system is vulnerable to asbestos contamination due to source water and corrosion of asbestos cement pipe or solely to corrosion of asbestos cement pipe, it shall take one sample at a tap served by asbestos cement pipe and under conditions where asbestos contamination is most likely to occur.

{4} If a system is vulnerable to asbestos contamination due to source water only, monitoring shall be conducted as follows:

Groundwater -- Collect a minimum of one sample at each entry point to the distribution system representative of each well after treatment.

Surface water -- Collect a minimum of one sample at each entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after treatment.

{5} For both types of water sources the system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. If a system draws water from more than one source and the sources are combined before distribution; the system must sample at an entry point to the distribution system during periods of normal operating conditions when water is representative of all sources.

{6} A system which exceeds the MCL for asbestos shall monitor quarterly beginning in the next quarter after the violation occurred.

{7} The Department may decrease the quarterly monitoring requirement to the initial sampling requirement provided that it is determined that the system is reliably and consistently below the MCL on the basis of a minimum of two quarterly groundwater samples and a minimum of four quarterly samples for surface water.

ENFLEX Note: The following table is wider than your screen. Please scroll right to see the entire table.

TABLE 8B -- INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS

MINIMUM MONITORING REQUIREMENTS -- As, Ba, Cd, Cr, Hg, Se, F

		Initial Frequency by Source Type{3}		
Contaminant	Type of water system	Ground water only	Surface only or Surface and ground water	Repeat Sampling{7}
Arsenic	Community and	One sample per	One sample per entry per	If GT MCL, one
Barium	NTNC{1}{2}{6}	entry point	year beginning 1/1/93	sample quarterly{4}{5}
Cadmium		every 3 years		If LT MCL, maintain
Chromium		by 12/31/95		initial frequency
Mercury				
Selenium				
Fluoride{8}	Noncommunity	State	State	State
		Discretion{9}	Discretion{9}	Discretion{9}

GT -- Greater Than

LT -- Less Than

{1} A waiver from the required initial monitoring frequencies may be granted by the State, based upon the following conditions:

a. A minimum of one sample shall be collected while the waiver is effective.

b. Surface water systems must have monitored annually for at least three years and groundwater systems must have conducted a minimum of three rounds of monitoring with at least one sample taken since January 1 1990.

c. All contaminants must be less than the MCLs.

d. New sources are not eligible for a waiver until completion of three rounds of sampling.

e. Waivers issued by the Department shall be made in writing, shall cite the basis for determination and shall not exceed a maximum of nine years.

{2} To determine the appropriate reduced monitoring frequency, the State shall consider:

a. reported concentrations from all previous monitoring.

b. variations in reported concentrations; and

c. other factors which may affect contaminant concentrations such as changes in groundwater pumping rates, changes in the system's configuration, operating procedures, stream flows or other characteristics.

{3} For both types of water sources the system shall take each sample at the sampling point unless conditions make another sampling point more representative of each source or treatment plant. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions when water is representative of all sources.

{4} The Department may decrease the quarterly monitoring requirement to the initial sampling requirement provided that it is determined that the system is reliable and consistently below the MCL on the basis of a minimum of two quarterly groundwater samples and a minimum of four quarterly samples for surface water.

{5} If concentrations of arsenic, barium, cadmium, chromium, fluoride, mercury or selenium exceed the MCL, the Department requires the collection of an additional sample as soon as possible but not to exceed two weeks.

{6} The Department may require or the water system may request more frequent monitoring frequencies than is minimally required. The Department, at its tion, may require confirmation samples for positive and negative results.

{7} The average of the initial and confirmation sample contaminant concentration at each sampling point shall be used to determine compliance with the MCL.

{8} Notification must contain mandatory health effect language.

{9} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

TABLE 8C -- INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS

MINIMUM MONITORING REQUIREMENTS -- NITRATES, NITRITES

Initial Frequency by Source Type{1}{6}

Contaminant	Type of water system	Ground water only	Surface only or Surface and ground water	Repeat Sampling{7}
Nitrate	Community, NTNC and Noncommunity {2}	One sample per entry point per year beginning 1/1/93	One sample per entry point quarterly beginning 1/1/93	For Groundwater: If equal to or GT 50 percent MCL, quarterly for one year{3} For Surface Water: If LT 50 percent MCL, one sample per year{3}{4}
Nitrite	Community, NTNC and Noncommunity	One sample per entry point by 12/31/95	One sample per entry point by 12/31/95	If equal to or GT 50 percent MCL, repeat quarterly for at least one year{3}{4} If LT 50 percent MCL sample frequency at State discretion{5}

GT -- Greater Than

LT -- Less Than

{1} The Department may require, or the water system may request, more frequent monitoring frequencies than is minimally required. The Department, at its discretion may require confirmation samples for positive and negative results.

{2} Noncommunity water systems must sample annually beginning 1/1/93 regardless of the water source.

{3} The frequency may be reduced to annual if the State determines the system's contaminant concentration is consistently and reliably less than the MCL and annual samples are collected during the quarter(s) having the highest analytical results.

{4} A surface water shall return to quarterly monitoring if any one sample is GT 50 percent of MCL.

{5} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

{6} For both types of water sources the system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions when water is representative of all sources.

TABLE 8D -- INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS

MINIMUM MONITORING REQUIREMENTS -- OTHER CHEMICALS

		Initial Frequency by Source Type		
Contaminant	Type of water system	Ground water only	Surface only or Surface and ground water	Repeat Sampling and Compliance
Chloride	Community and NTNC	State Discretion{2}	State Discretion{2}	State Discretion{2}
Iron				
Manganese				
Sodium{1}				
Zinc				
Color				
Odor				
Antimony	Community			

Beryllium	and NTNC	
Nickel		Systems must take one sample at each entry
Sulfate		point and report the results to the State by
Thallium		12/31/95.{3} Cyanide

{1} All community systems with sodium levels exceeding 20 mg/l will be required to sample for sodium analysis.

{2} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

{3} Waiver for Inorganics: The state may grant a waiver if previous analytical results demonstrates that contamination does not occur, provided this data was collected after January 1, 1990.

TABLE 9A -- ORGANIC CHEMICALS -- TRIHALOMETHANES

MINIMUM MONITORING REQUIREMENTS

Contaminant	Type of Water system	Monitoring Frequency

Total Trihalomethanes{1}	Community serving 10,000 or more persons	The supplier of chlorinated water from all source types must collect four samples per quarter per disinfection station.{2}{3}
	Community serving fewer than 10,000 persons	State discretion{4}
	Noncommunity	State discretion{4}

{1} The State may require a supplier of water to monitor for MTP at a frequency specified by the State.

{2} At least 25 percent of the quarterly samples must be obtained at distribution points reflecting maximum residence time; the remaining samples must be taken at representative distribution points. All samples for a quarter must be obtained on the same day.

{3} The State may reduce the TTHM monitoring frequencies at systems which do not exceed the MCL.

{4} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

ENFLEX Note: The following table is wider than your screen. Please scroll right to see the entire table.

TABLE 9B -- ORGANIC CHEMICALS -- POCs, VINYL CHLORIDE, UOCs

MINIMUM MONITORING REQUIREMENTS

Continuing Continuing
requirement Continuing requirement

requirement where not
detected where not detected

Type of Initial where and
vulnerable and invulnerable

Contaminant Water system requirement{1} detected{1}{2} to

				contamination{1}	to contamination{1}
Principal Organic Contaminants listed on Table 9D and Vinyl chloride	Community and Nontransient Noncommunity serving 3300 or more persons	If not sampled between 1/1/88 and January 1, 1992, quarterly sample per source for one year	Quarterly	Annually	Not applicable
	Community and Nontransient Noncommunity serving fewer than 3300 persons	If not sampled between 1/1/88 and January 1, 1992, quarterly sample per source for one year	Quarterly{3}	Annually{3}	Once every six years{4} for ground water sources. State discretion for surface water sources.
	Noncommunity	State discretion{5}	State discretion{5}	State discretion{5}	State discretion{5}
Unspecified organic Contaminants and other POCs not listed on	Community and Noncommunity	State discretion{5}	State discretion{5}	State discretion{5}	State discretion{5}

TABLE 9C

and 9D.

{1} The location for sampling of each ground water source of supply shall be between the individual well and at or before the first service connection and before mixing with other sources, unless otherwise specified by the State to be at the entry point representative of the individual well. Public water systems which rely on a surface water shall sample at points in the distribution system representative of each source or at an entry point or points to the distribution system after any water treatment plant.

{2} The State may decrease the quarterly monitoring requirement to annually provided that the system is reliably and consistently below the MCL based on a minimum of two quarterly samples from a ground water source and four quarterly samples from a surface water source. Systems which monitor annually must monitor during the quarter which previously yielded the highest analytical result.

{3} The State may reduce the frequency of monitoring of a ground water source to once every three years for a public water system which has three consecutive annual samples with no detection of a contaminant.

{4} The State may determine that a public water system is invulnerable to a contaminant or contaminants after evaluating the following factors:

a. Knowledge of previous use (including transport, storage, or disposal) of the contaminant within the watershed or zone of influence of the system. If a determination by the State reveals no previous use of the contaminant within the watershed or zone of influence, a waiver can be granted.

b. If previous use of the contaminant is unknown or it has been used previously, then the following factors shall be used to determine whether a waiver can be granted.

1. Previous analytical results.

2. The proximity of the system to a potential point or non-point source of contamination. Point sources include spills and leaks of chemicals at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities.

3. The environmental persistence and transport of the contaminants.

4. The number of persons served by the public water system and the proximity of a small system to a larger system.

5. How well the water source is protected against contamination, such as whether it is a surface or groundwater system. Groundwater systems must consider factors such as depth of the well, the type of soil, and wellhead protection. Surface water systems must consider watershed protection.

n shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

ENFLEX Note: The following table is wider than your screen. Please scroll right to see the entire table.

TABLE 9C -- ORGANIC CHEMICALS -- PESTICIDES, DIOXIN, PCBs

MINIMUM MONITORING REQUIREMENTS

Contaminant	Type of Water System	Initial requirement{1}{2}	Continuing requirement where detected{2}{3}{10}	Continuing requirement where not detected{2}
Group 1 Chemicals	Community	Quarterly	Quarterly	One sample every
Alachlor	and	sample per		eighteen months
Aldicarb	Nontransient	source, for		per source
Aldicarb sulfoxide	Noncommunity	one year		
Aldicarb sulfone	serving 3300	by 12/31/93{4}		
Atrazine	or more			
Carbofuran	persons{9}			
Chlordane				
Dibromochloropropane				
2, 4-D				
Endrin				
Ethylene dibromide	Community	Quarterly	Quarterly	Once per
Heptachlor	and	samples		entry point
Heptachlor epoxide	Nontransient	per entry		every three
Lindane	Noncommunity	point, for		years{5}{6}{7}
Methoxychlor	serving fewer	one year		
Polychlorinated biphenyls	than 3300	by 12/31/94		
Pentachlorophenol	persons and	{5}{6}{7}		

Toxaphene more than

2, 4, 5-TP (Silvex) 149 service

connections

Group 2 Chemicals

Aldrin

Benzp(a)pyrene

Butachlor

Carbaryl Community Quarterly Quarterly
Once per

Dalapon and samples
entry point

Di(2-ethylhexyl)adipate Nontransient per entry
every

Di(2-ethylhexyl)phthalates Noncommunity point, for
three years

Dicamba serving fewer one year
{5}{6}{7}

Dieldrin than 3300 by 12/31/95

Dinoseb persons and {5}{6}{7}

Diquat{9} fewer than

Endothall{9} 150 service State Quarterly
State

Glyphosate{9} connections discretion{8}
discretion{8}

Hexachlorobenzene applied to
applied to Hexachlorocyclopentadiene
Group 2 Group 2

3-Hydroxycarbofuran

Methomyl

Metolachlor

Metribuzin

Oxamyl (vydate) Noncommunity State State
State

Pichloram discretion{8}
discretion{8} discretion{8}

Propachlor

Simazine

2, 3, 7, 8-TCDD (Dioxin){9}

{1} If monitoring data collected after January 1, 1990 are consistent with the requirements of Appendix 5-C then the State may allow systems to use that data to satisfy the initial requirement.

{2} The location for sampling of each ground water source of supply shall be between the individual well and at or before the first service connection and before mixing with other sources, unless otherwise specified by the State to be at the entry point representative of the individual well. Public water systems which take water from a surface water body or watercourse shall sample at points in the distribution system representative of each source or at entry point or points to the distribution system after any water treatment plant.

{3} The State may decrease the quarterly monitoring requirement to annually provided that system is reliably and consistently below the MCL based on a minimum of two quarterly samples from a ground water source and four quarterly samples from a surface water source. Systems which monitor annually must monitor during the quarter that previously yielded the highest analytical result. Systems serving fewer than 3,300 persons and which have three consecutive annual samples without detection may apply to the State for a waiver in accordance with footnote 6.

{4} The State may allow a system to postpone monitoring for a maximum of two years, if an approved laboratory is not reasonably available to do a required analysis within the scheduled monitoring period.

{5} The State may waive the monitoring requirement for a public water system that submits information every three years to demonstrate that a contaminant or contaminants was not used, transported, stored or disposed within the watershed or zone of influence of the system.

{6} The State may reduce the monitoring requirement for a public water system that submits information every three years to demonstrate that the public water system is invulnerable to contamination. If previous use of the contaminant is unknown or it has been used previously, then the following factors shall be used to determine whether a waiver is granted.

a. Previous analytical results. b. The proximity of the system to a potential point or non-point source of contamination. Point sources include spills and leaks of chemicals at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities. Non-point sources include the use of pesticides to control insect and weed pests on agricultural areas, forest lands, home and gardens, and other land application uses.

c. The environmental persistence and transport of the pesticide or PCBs.

d. How well the water source is protected against contamination due to such factors as depth of the well and the type of soil and the integrity of the well casing.

e. Elevated nitrate levels at the water supply source.

f. Use of PCBs in equipment used in production, storage or distribution of water.

{7} The State may allow systems to composite samples in accordance with the conditions in Appendix 5-C.

{8} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

{9} The State may waive monitoring of this contaminant for public water that meet the conditions of footnote 5.

{10} If a contaminant is detected, repeat analysis must include all analytes contained in the approved analytical method in Appendix 5-C for the detected contaminant.

TABLE 9D -- ORGANIC CHEMICALS -- POCs

MINIMUM MONITORING REQUIREMENTS

Contaminant		Specific Contaminants for Analysis
POC's	benzene{1}	1,1-dichloropropene
	bromobenzene	cis-1,3-dichloropropene
	bromochloromethane	trans-1,3-dichloropropene
	bromomethane	ethylbenzene{1}
	n-butylbenzene	hexachlorobutadiene
	sec-butylbenzene	isopropylbenzene
	tert-butylbenzene	p-isopropyltoluene
	carbon tetrachloride{1}	methylene chloride
	chlorobenzene	n-propylbenzene
	chloroethane	styrene{1}
	chloromethane	1,1,1,2-tetrachloroethane
	2-chlorotoluene	1,1,2,2-tetrachloroethane
	4-chlorotoluene	tetrachloroethene{1}
	dibromomethane	toluene{1}
	1,2-dichlorobenzene{1}	1,2,3-trichlorobenzene
	1,3-dichlorobenzene	1,2,4-trichlorobenzene
	1,4-dichlorobenzene{1}	1,1,1-trichloroethane{1}
	dichlorodifluoromethane	1,1,2-trichloroethane
	1,1-dichloroethane	trichloroethene{1}
	1,2-dichloroethane{1}	trichlorofluoromethane
	1,1-dichloroethane{1}	1,2,3-trichloropropane
	cis-1,2-dichloroethene{1}	1,2,4-trimethylbenzene
	trans-1,2-dichloroethene{1}	1,3,5-trimethylbenzene

1,2-dichloropropane{1}

1,3-dichloropropane

2,2-dichloropropane

m-xylene{1}

o-xylene{1}

p-xylene{1}

{1} Notification must contain mandatory health effect language.

Title: NY / Title 10 · Chapter I · Part 5 · Subpart 5-1 · 5-1.52
Section: 5-1.52 Table 10
Date: December 16, 1992
Subject Terms: water | community water system | noncommunity water system | public water system | drinking water | compliance | notification | MCL | sampling

TABLE 10 -- TURBIDITY

MINIMUM MONITORING REQUIREMENTS{1}

			Source type
Contaminant	Type of water system	Ground water only	Surface only or surface and ground water
Entry point turbidity	Community	State discretion{2}	Collect and analyze one sample per day from each entry point. All results must be recorded to two significant figures.
	Noncommunity	State discretion{2}	Collect and analyze one sample annually.
Monitoring			requirement may be
increased			at State discretion.{2}

Distribution point turbidity	Community	State discretion{2}	Five distribution samples each week unless otherwise determined by the State. No two samples may be obtained on the same day and no two samples are to be collected from the same distribution point during the week. For systems with a five NTU monthly average entry point turbidity MCL, a free chlorine residual must be obtained whenever a turbidity sample is collected.
	Noncommunity	State discretion{2}	State discretion{2}

{1} The requirements of this table apply to unfiltered systems until December 30, 1991, unless the State has determined prior to that date, in writing pursuant to section 5-1.30 of this Subpart, that filtration is required. The requirements of this table apply to filtered systems until June 29, 1993. The requirements of this table apply to unfiltered systems that the State has determined, in writing pursuant to section 5-1.30 of this Subpart, must install filtration, until June 29, 1993, or until filtration is installed, whichever is later.

{2} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

TABLE 10A -- TURBIDITY

MINIMUM MONITORING REQUIREMENTS{1}

Source type

Type of

Contaminant	water system	Ground water	Surface water{2}
Filtered water turbidity	Community and Noncommunity	Not applicable	Every four hours or continuous monitoring for composite filter effluent. Additional monitoring may be required, by the State, for each individual filter to determine compliance with section 5-1.30(b) of this Subpart.{3}
Raw water turbidity	Unfiltered surface: Community and Noncommunity	Not applicable	Every four hours or continuous monitoring {4}
Distribution point turbidity	Community	State discretion {5}	Five distribution samples each week unless otherwise determined by the State. No two samples may be obtained on the same day and no two samples are to be collected from the same distribution point during the week.
	Noncommunity	State discretion {5}	State discretion {5}

{1} The table becomes effective on June 29, 1993 for filtered systems.

{2} Surface water sources or ground water sources directly influenced by surface water.

{3} For systems serving less than 500 people, the State may reduce the monitoring requirements if justification is provided to show that filtration performance is effective.

{4} The State may reduce the monitoring requirement for a system which has developed a specific compliance schedule for installing filtration.

{5} State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

CONCEPTUAL RISK BASED DECISION CRITERIA
FOR SOLID WASTE MANAGEMENT SITES
SENECA ARMY DEPOT
ROMULUS, NEW YORK
AUGUST 1997

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CONCEPTUAL RISK BASED DECISION CRITERIA
FOR SOLID WASTE MANAGEMENT SITES
SENECA ARMY DEPOT
ROMULUS, NEW YORK
AUGUST 1997

I. INTRODUCTION

A. Purpose of Report.

This report outlines a conceptual risk based plan for managing the remediation of solid waste management units at the Seneca Army Depot. The plan is intended to streamline the remedial investigation procedure by allowing site which have little or no risk from chemical exposure to be dropped from further investigation. The plan will additionally identifying those sites which have more than minimal risk and serve as justification for further investigation or excellerated remedial action.

B. Recommendation of the Peer Review.

1. Peer Review is defined as a mechanism through which Army installations can obtain outside, independent technical recommendations and limited technical applications assistance to ensure that there is an adequate level of risk reduction at all sites, while ensuring the efficient and effective use of the Army's environmental restoration funds. The basic objectives are:

- Validate/enhance decision credibility,
- Evaluate rationale to scope and select action,
- Ensure the use of a site-specific risk assessment for chemical contamination,
- Ensure the use of a risk-based approach as the remediation decision tool for chemical contamination,
- Implement the most cost-effective solution which meets clean-up requirements,
- Utilize an "out of the box" thought process, and
- Refine cost estimates for budget submission requirements.

2. On 1-4 April 1997, the projects at the Seneca Army Depot were reviewed by the peer review process. This plan is an attempt to address two of the peer review's findings (outlined below):

1. Recommendation: The technical assistance team recommends that Seneca Army Depot clarify the site decision process through better specification of decision requirements in order to easily recognize, from data collection, when success has been obtained.

Rationale: The current process needs specification of objective decision rules for how site data shall be used in determining the need to move from site screening to a site Remedial Investigation/Feasibility Study and Record of Decision. A process (i.e. removal action) should be implemented to accellerate final decisions so that Army resources may be shifted from studing site problems to expedited resolution and remediation, if appropriate.

2. Recommendation: The technical assistance team recommends that a policy be developed that provides a process for the determination of chemical remediation goals on the basis of risk assessment scenarios utilizing realistic future land use. Past/current land use and technical practicality of remedial activities should be considered when evaluating future reuse of the property. For example, if a site area is currently industrial and envisioned as industrial in its future proposed land use, then using residential risk limits to drive the site screening or TAGM limits may be overly restrictive and unnecessarily costly to the Army.

Rationale: Remediation goals based on anything other than the proposed future use of the property, while recognizing past land use as potentially limiting, are inappropriate, resulting in elevated investigation and remediation costs. The Environmental Protection Agency (EPA) and individual state regulatory agencies no longer require that sites be restored to pristine conditions or to conditions that pose no risk under any risk scenario, including residential. Additionally, the Army has the ability to restrict access and future land use across specific limited areas of the site through deed restrictions or retention of the property of concern.

C. Decision Tree Conceptual Approach.

The approach used in this report involves subjecting the data to several screens based on separate, defendable, risk based evaluations. Each evaluation becoming increasingly more site specific. The goal of this scheme is to provide the installation and the regulatory community with a defendable level of certainty of the health implications of each site, moving the remediation of each site as quickly as possible to conserve the resources of all parties involved. The plan outlined in this report involves screening the site data from the Site Investigation/Preliminary Assessment using the Technical Administrative Guidance Memorandum (TAGMs) values; the Site Background Concentrations a list of calculated Preliminary Remediation Goals (PRGs); and a site specific Risk Assessment.

a. TAGMs. TAGMs are regulatory guidance values, calculated by the State of New York for protection of public health and the environment. They assume worst case exposure assumptions and are thus believed to be very conservative. Such values are compared to the maximum concentrations for each chemical determined to be at the site.

b. Site Background Concentrations. These values are measured concentrations of the pristine environment within the Seneca Army Depot. They consist only of inorganic parameters in samples collected from natural areas believed to have no impact from any depot operations or other incidental human activity.

c. Preliminary Remedial Screening Levels. These values are calculated media concentrations using more accurate assumption of exposure for each land use outlined in the depot's future land use plan. These values assume that a carcinogenic risk of 1E-06 and a non-carcinogenic risk of 1 as the defined points of departure for determining health risk to human receptors. Ecological receptor evaluations uses a risk threshold of 10 as a point of departure. Such values are compared to the maximum concentrations for each chemical determined to be at the site.

d. Miniature Risk Assessment. This is a calculation following the CERCLA Baseline Risk Assessment paradigm. It uses site specific assumptions for exposure and the upper 95th level values for each chemical. The calculated cummulative risk is compared to a non-carcinogenic risk range of 1-10 and a carcinogenic risk range of 1E-04 to 1E-06.

II. COMPARISON OF SITE CONDITIONS TO TAGMs

A. Policy of New York State. The total effective dose of a chemical or combination of chemicals to the maximally exposed individual of the general public shall be as low as reasonably achievable.

B. Procedure. The procedures for using the TAGMs are outlined in the state memorandum, which has been reproduced in Appendix B.

III. COMPARISON TO PRELIMINARY REMEDIAL SCREENING LEVELS (PRSL)

A. Uses and Limitations. The PRSL tables cotain reference doses and carcinogenic potency slopes (obtained from IRIS through April 1, 1996, HEAST through May 1995, the EPA-NCEA Superfund Health Risk Technical Support Center, and other EPA sources) for chemicals commonly found on hazardous waste sites and those most commonly found during investigations at the Seneca Army Depot. These toxicity constants have been combined with exposure scenarios applicable to the reasonably expected for the future development of the Seneca Army Depot. The combination of these factors yields risk based concentrations corresponding to fixed levels of risk(i.e., a hazard quotient of one, or lifetime cancer risk of 1E-06, whichever occurs at a lower concentration) in water, air and soil. These values can be used to screen sites for further action, identify hot spots, or rapidly respond to citizen inquiries.

These PRSL values also have several limitations, most notable is the lack of any consideration of cumulative risk from multiple media or chemicals.

B. Development of PRSLs

1. General. Separate carcinogenic and non-carcinogenic PRSLs were calculated for each compound, pathway and exposure scenario. The controlling concentration in the final tables are the lower of the two for each exposure scenario. The controlling concentration can be found in bold type. The following terms and values were used in the calculations:

Table 1. General Exposure Variables

Exposure Variable	Value	Symbol
Carcinogenic Potency Slope Oral(risk per mg/kg/d)		CPSo
Carcinogenic Potency Slope Inhaled(risk per mg/kg/d)		CPSi
Reference Dose Oral (mg/kg/d)		RfDo
Reference Dose Inhaled (mg/kg/d)		RfDi
Target Cancer Risk	1E-06	TR
Target Hazard Quotient	1	THQ
Body Weight, Adult (kg)	70	BWa
Body Weight, Child (kg)	15	BWc
Averaging Time, Carcinogens (d)	25550	ATc
Averaging Time, Non-carcinogens (d)	ED*365	ATn
Inhalation, Adult (m3/d)	20	IRAa
Inhalation, Child (m3/d)	12	IRAc
Inhalation Factor, age adjusted (m3-y/kg-d)	11.66	IFAadj
Tap Water Ingestion, Adult (L/d)	2	IRWa
Tap Water Ingestion, Child (L/d)	1	IRWc
Tap Water Ingestion Factor, age adjusted(L-y/kg-d)	1.09	IFWadj
Soil Ingestion, Adult (mg/d)	100	IRSa
Soil Ingestion, Child (mg/d)	200	IRSc
Soil Ingestion, Construction Worker (mg/d)	480	IRSw

Table 2. Scenario Specific Exposure Variables

Exposure Variable	Value	Symbol
Industrial		
Exposure Frequency (d/y)	250	EFo
Exposure Duration (y)	25	EDo
Fraction of Contaminated Soil Ingested (unitless)	0.5	FCo
Recreational/Tresspasser		
Exposure Frequency (d/y)	50	EFrec
Exposure Duration (y)	5	EDrec
Fraction of Contaminated Soil Ingested	1	FCr
Surface Water Ingestion, Adult (L/d)	0.08	IRSWa
Surface Water Ingestion, Child (L/d)	0.05	IRSWc

2. Age-Adjusted Factors. Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks for the residential setting during the first 30 years of life are usually calculated using age-adjusted factors. These factors approximated the intergrated exposure from birth to age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age -adjusted factors were not used for soil or ambient air exposures in this evaluation since none of the sites at the Seneca Army Depot are in the areas designated for residential development. Therefore, the residential exposure scenario is not expected for any of the remediation sites. However, age-adjusted factors were used in the tap water exposure (including the exposure to chemicals volatilized from the tap water) since groundwater contaminants may be mobile. These values are provided to evaluate the off-post residential groundwater exposure, if it is applicable to any site.

Air Inhalation:

$$IFAadj\ \frac{m3*y}{kg*d} = \frac{EDc*IRAc}{BWc} + \frac{(EDtot-EDc)*IRAa}{BWa}$$

Tap Water Ingestion:

$$IFWadj\ \frac{L*y}{kg*d} = \frac{EDc*IRWc}{BWc} + \frac{(EDtot-EDc)*IRWa}{BWa}$$

3. Residential Water. Volatilization terms were calculated only for compounds with Henry's Law constants greater than 1E-05. The equations and the volatilization factor (K) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds. PRSLs for carciogens were based on combined childhood and adult exposure; for non-carcinogens PRSLs were based on adult exposure.

Carcinogens:

$$PRSL\ \frac{ug}{L} = \frac{TR*ATc*1000ug/mg}{EFr*([K*IFAadj*CPSi]+[IFWadj*CPSo])}$$

Non-carcinogens:

$$ug \qquad THQ*BWa*ATn*1000ug/mg$$

$$\text{PRSL}\frac{}{\text{L}} = \frac{}{\text{EFr*EDtot*(([K*IRAa]/RfDi)+(IRWa/RfDo))}}$$

4. Ambient Air. PRSLs for carcinogens were based on combined childhood and adult exposure; for non-carcinogen PRSLs were based on adult exposure.

Carcinogens:

$$\text{PRSL}\frac{\text{ug}}{\text{m3}} = \frac{\text{TR*ATc*1000ug/mg}}{\text{EFr*IFAadj*CPSi}}$$

Non-carcinogens:

$$\text{PRSL}\frac{\text{ug}}{\text{m3}} = \frac{\text{THQ*RfDi*BWa*ATn*1000ug/mg}}{\text{EFr*EDtot*IRAa}}$$

5. Commercial/Industrial Soil Ingestion. PSLs were based on adult occupational exposure, including anassumption that only 50% of total soil ingestion is work-related.

Carcinogens:

$$\text{PRSL}\frac{\text{mg}}{\text{kg}} = \frac{\text{TR*ATc*BWa}}{\text{EFo*EDo*(IRSa/1E-06)*FC*CPSo}}$$

Non-carcinogens:

$$\text{PRSL}\frac{\text{mg}}{\text{kg}} = \frac{\text{THQ*RfDo*ATn*BWa}}{\text{EFo*EDo*(IRSa/1E-06)*FC}}$$

6. Residential Soil. PRSLs for the residential exposure were not calculated since sites at the Seneca Army Depot do not exist in the areas scheduled for residential development.

7. Recreational Soil. PRSLs for carcinogens were based on adult exposure; for non-carcinogen PRSLs were based on childhood exposure.
Carcinogens:

$$\text{PRSL}\frac{\text{mg}}{\text{kg}} = \frac{\text{TR*ATc*BWa}}{\text{EFrec*EDrec*(IRSa/1E-06)*FCr*CPSo}}$$

Non-carcinogens:

$$\text{PRSL}\frac{\text{mg}}{\text{kg}} = \frac{THQ*RfDo*ATn*BWc}{EFrec*EDc*(IRSc/1E\text{-}06)}$$

8. Recreational Surface Water. These values are based on the incidental ingestion of surface water. PRSLs for carcinogens were based on adult exposure; for non-carcinogen PRSLs were based on childhood exposure.

Carcinogens:

$$\text{PRSL}\frac{\text{ug}}{\text{L}} = \frac{TR*ATc*BWa}{EFrec*EDrec*(IRSWa/1E\text{-}06)*FCr*CPSo}$$

Non-carcinogens:

$$\text{PRSL}\frac{\text{ug}}{\text{L}} = \frac{THQ*RfDo*ATn*BWc}{EFrec*EDc*(IRSWc/1E\text{-}06)}$$

9. Ecological Receptor. Ecological PRGs were calculated based on the toxicological response of the field mouse to chemicals in the soil. The route of exposure was assumed to be ingestion with the mouses diet being chemical containing plants, insects, and soil. The mouse is further assumed to have its entire range wholly contained in the site. The evaluation was conducted using a hazard quotient approach, similar to the non-carcinogenic calculations performed for the human health evaluation. Hazard quotients (HQ), quantative expression of risk, were calculated by chemical for the receptors of concern. The HQ assumed for this evaluation was 10. The equations used for calculating the threshold soil concentration were:

$$CS= [(TRV)(HQ)(BW)]/[(SUF)((IS)+(IP*SP)+(IA*BAF))]$$

Where:
HQ = Quantification of risk to a species
TRV = Toxicity reference value
SFF = Site foraging factor (unitless)
CS = Concentration in soil (mg/kg)
IS = Ingestion rate of soil (mg soil/day)
BW = Body weight of organism
IP = Ingestion rate of plant material(mg plant material/day)
SP = Soil to plant transfer ratio for a specific chemical (unitless)
IA = Ingestion rate of animal/insect material(mg animal tissue/day)
BAP = Bioaccumulation Factor for a specific chemical (unitless).

IV. MINIATURE RISK ASSESSMENT
  A. Uses and Limitations
  B. Methodology of the Risk Assessment
    1. Exposure Assumptions
    .
    .
    .
    ? Uncertainty

V. REFERENCES

APPENDIX A
Preliminary Remediation Goals

APPENDIX B
New York State Technical and Administrative Guidance Memorandum

TO: Regional Haz. Waste Remediation Engineers, Bureau Dir. & Section Chiefs
FROM: Michael J. O'Toole, Jr., Director, Div. Of Hazardous Waste Remediation
SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM: DETERMINATION OF SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS.
DATE: Jan 24, 1994

The cleanup goal of the Department is to restore inactive hazardous waste sites to predisposal conditions, to the extent feasible and authorized by law. However, it is recognized that restoration to predisposal conditions will not always be feasible.

1. INTRODUCTION:

This TAGM provides a basis and procedure to determine soil cleanup levels at individual Federal Superfund, State Superfund, 1986 EQBA Title 3 and Responsible Party (RP) sites, when the Director of the DHWR determines that cleanup of a site to predisposal conditions is not possible or feasible.

The process starts with development of soil cleanup objectives by the Technology Section for the contaminants indentified by the Project Managers. The Technology Section uses the procedure described in this TAGM to develop soil cleanup objectives. Attainment of these generic soil cleanup objectives will, at a minimum, eliminate all significant threats to human health and/or the environment posed by the inactive hazardous waste site. Project Managers should use these cleanup objectives in selecting alternatives in the Feasibility Study (FS). Based on the proposed selected remedial technology (outcome of FS), final site specific soil cleanup levels are established in the Record of Decision (ROD) for these sites.

It should be noted that even after soil cleanup levels are established in the ROD, these levels may prove to be unattainable when remedial construction begins. In that event, alternative remedial actions or instutional controls may be necessary to protect the environment.

2. BASIS FOR SOIL CLEANUP OBJECTIVES:

The following alternative bases are used to determine soil cleanup objectives:

(A) Human health based levels that correspond to excess lifetime cancer risks of one in a million for Class A1 and B2 carcinogens, or one in 100,000 for Class C3 carcinogens. These levels are contained in USEPA'S Health Effects Assessment Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances

Regulation;

(B) Human health based levels for systemic toxicants, calculated from Reference Douses (RfDs). RfDs are an estimate of the daily exposure an individual (Including sensitive individuals) can experience without appreciable risk of health effects during a lifetime. An average scenario of exposure in which children ages one to six (who exhibit the greatest tendency to ingest soil) is assumed. An intake rate of 0.2 gram /day for a five-year exposure period for a 16-kg child is assumed. These levels are contained in USEPA's Health Effects Assessments Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation;

© Environmental concentrations which are protective of groundwater/ drinking water quality;based on promulgated or proposed New York State Standards;

(D) Background values for contaminants; and

(E) Detection limits.

A recommendation on the appropriate cleanup objective is based on the criterion that produces the most stringent cleanup level using criteria a, b, and c for organic chemicals, and criteria a, b, and d for heavy metals. If criteria a and/or b are below criterion d for a contaminant, its background value should be used as the cleanup objective. However, cleanup objectives developed using this approach must be, at a minimum, above the method detection limit (MDL) and it is preferable to have the soil cleanup objectives above the Contract Required Quantitation Limit (CRQL) as defined by NYSDEC. If the cleanup objective of a compound is "non-detectable", it should mean that it is not detected at the MDL. Efforts should be made to obtain the best MDL detection possible when selecting a laboratory and analytical protocol.

The water/soil partitioning theory is used to determine cleanup objectives which would be protective of groundwater/drinking water quality for its best use. This theory is conservative in nature and assumes that contaminated soil and groundwater are in direct contact. This theory is based upon the ability of organic matter in soil to absorb organic chemicals. The approach predicts the maximum amount of contamination that may remain in soil so that leachate from the contaminated soil will not violate groundwater and/or drinking water standards.

(1) Class A are proved human carcinogens
(2) Class B are probable human carcinogens
(3) Class C are possible human carcinogens

This approach is not used for heavy metals, which do not partition appreciably into soil organic matter. For heavy metals, eastern USA or New York State soil background values may be used as soil cleanup objectives. A list of values that have been tabulated is attached. Soil background data near the site, if available, is preferable and should be used as the cleanup objective for such metals. Background samples should be free from the influences of this site and any other source of contaminants. Ideal background samples may be obtained from uncontaminated up gradient and upwing locations.

3. DETERMINATION OF SOIL CLEANUP GOALS FOR ORGANICS IN SOIL FOR PROTECTION OF WATER QUALITY

Protection of water quality from contaminated soil is a two-part problem. The first is predicting the amount of contamination that will leave the contaminated media as leachate. The second part of the problem is to determine how much of that contamination will actually contribute to a violation of groundwater standards upon reaching and dispersing into groundwater. Some of the contamination which initially leaches out of soil will be absorbed by other soil before it reaches groundwater. Some portion will be reduced through natural attenuation or other mechanism.

PART A: PARTITION THEORY MODEL

There are many test and theoretical models which are used to predict leachate quality given a known value of soil contamination. The Water-Soil Equilibrium Partition Theory is used as a basis to determine soil standard or contamination limit for protection of water quality by most of the models currently in use. It is based on the ability of organic carbon in soil to adsorb contamination. Using a water quality value which may not be exceeded in leachate and the partition coefficient method, the equilibrium concentration (Cs) will be expressed in the same units as the water standards. The following expression is used:

Allowable Soil Concentration $Cs = f \times Koc \times Cw$........(1)

Where: f = fraction of organic carbon of the natural soil medium.

Koc = partition coefficient between water and soil media. Koc can be estimated by the following equation:

$\log Koc = 3.64 - 0.55 \log S$

S = water solubility in ppm
Cw = appropriate water quality value from TOGS 1.1.1

Most Doc and S values are listed in the Exhibit A-1 of the USEPA Superfund Public Health Evaluation Manual (EPA/540/1-86/060). The Koc values listed in the manual should be used for the purpose. If the Koc value for a contaminant is not listed, it should be estimated using the above mentioned equation.

PART B: PROCEDURE FOR DETERMINATION OF SOIL CLEANUP OBJECTIVES

When the contaminated soil is in the unsaturated zone above the water table, many mechanisms are at work that prevent all of the contamination that would leave the contaminated soil from impacting groundwater. These mechanisms occur during transport and may work simultaneously. They include the following: (1) volatility, (2) sorption and desorption, (3) leaching and diffusion, (4) transformation and degradation, and (5) change in concentration of contaminants after reaching and/or mixing with the groundwater surface. To account for these mechanisms, a correction factor of 100 is used to establish soil cleanup objectives. This value of 100 for the correction is consistent with the logic used by EPA in its Dilution Attenuation Factor (DAF) approach for EP Toxicity and TCLP. (Federal Register/Vaol. 55, No. 61, March 29, 1990/Pages 11826-27). Soil cleanup objectives are calculated by multiplying the allowable soil concentration by the correction factor. If the contaminated soil is very close (3' - 5') to the groundwater table or in the groundwater, extreme caution should be excerised when using the correction factor of 100 (one hundred) as this may not give conservative cleanup objectives. For such situations the Technology Section should be consulted for site-specific cleanup objectives.

Soil cleanup objectives are limited to the following maximum values. These values are consistent with the approach promulgated by the States of Washington and Michigan.

1) Total VOCs $\leq$ 10 ppm.
2) Total Semi VOCs $\leq$ 500 ppm.
3) Individual Semi VOCs $\leq$ 50 ppm.
4) Total Pesticides $\leq$ 10 ppm.

One concern regarding the semi-volatile compounds is that some of these compounds are so insoluble that their Cs values are fairly large. Experience (Draft TOGS on Petroleum Contaminated Soil Guidance) has shown that soil containing some of these insoluble substances at high concentrations can exhibit a distinct odor even though the substance with not leach from the soil. Hence any time soil exhibits a discernible odor nuisance, it shall not be considered clean even if it has met the numerical criteria.

4. DETERMINATION OF FINAL CLEANUP LEVELS:

Recommended soil cleanup objectives should be utilized in the development of final cleanup levels through the Feasibility Study (FS) process. During the FS, various alternative remedial actions developed during the Remedial Investigation (RI) are initially screened and narrowed down to the list of potential alternative remedial actions that will be evaluated in detail. These alternative remedial actions are evaluated using the criteria discussed in TAGM 4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites, revised May 15, 1990, and the preferred remedial action must be established. Remedy selection, which will include final cleanup levels, is the subject of TAGM 4030.

Recommenced soil cleanup objectives that have been calculated by the Technology Section are presented in Appendix A. These objectives are based on a soil organic carbon content of 1% (0.01) and should be adjusted for the actual organic carbon content if it is known. For determining soil organic carbon content, use attached USEPA method (Appendix B). Please contact the Technology Section, Bureau of Program Management for soil cleanup objectives not included in Appendix A.

Attachments

TOTAL ORGANIC CARBON (TOC)

USE AND LIMITATIONS

Total organic carbon is a measure of the total amount of nonvolatile, volatile, partially volatile, and particulate organic compounds in a sample. Total organic carbon is independent of the oxidation state of the organic compounds and is not a measure of the organically bound and inorganic elements that can contribute to the biochemical and chemical oxygen demand tests.

Because inorganic carbon (e.g. carbonates, bicarbonates, free CO2) will interfere with total organic carbon determinations, samples should be treated to remove inorganic carbon before being analyzed.

FIELD PROCEDURES

Collection

Samples can be collected in glass or plastic containers. A minimum sample size of 25g is recommended. If unrepresentative material is to be removed from the sample, it should be removed in the field under the supervision of the chief scientist and noted on the field log sheet.

Processing

Samples should be stored frozen and can be held for up to 6 mo. under that condition. Excessive temperatures should not be used to thaw samples.

LABORATORY PROCEDURES

Analytical Procedures

Equipment

Induction furnace	E.g. Leco WR-12, Dohrmann DC-50, Coleman CH analyzer, Perkin Elmar 240 elemental analyzer, Carlo-Erba 1106
Analytical balance	0.1 mg accuracy
Desiccator	
Combustion boats	
10 percent hydrochloric acid	
Cupric oxide fines (or equivalent material)	
Benzoic acid or other carbon source as a standard.	

Equipment preparation

-Clean combustion boats by placing them in the induction furnace at 950 degrees C. After being cleaned, combustion boats should not be touched with bare hands.

-Cool boats to room temperature in a desiccator.

-Weigh each boat to the nearest 0.1 mg.

Sample Preparation

-Allow frozen samples to warm to room temperature.

-Homogenize each sample mechanically, incorporating any overlying water.

-Transfer a representative aliquot (5-10 g) to a clean container.

Analytical procedures

-Dry samples to constant weight at 70 ± 2 degrees C. The drying temperature is relatively low to minimize loss of volatile organic compounds.

-Cool dried samples to room temperature in a desiccator.

-Grind sample using a mortar and pestle to break up aggregates.

-Transfer a representative aliquot (0.2-0.5 g) to a clean, preweighed combustion boat.

-Determine sample weight to the nearest 0.1 mg.

-Add several drops of Hcl to the dried sample to remove carbonates. Wait until the effervescing is completed and add more acid. Continue this process until the incremental addition of acid causes no further effervescence. Do not add too much acid at one time as this may cause loss of sample due to frothing. Exposure of small samples (i.e., 1-10 mg) having less than 50 percent carbonate to an Hcl atmosphere for 24-48 h has been shown to be an effective means of removing carbonates (Hedges and Stern 1984). If this method is used for sample sizes greater than 10 mg, its effectiveness should be demonstrated by the user.

-Dry the Hcl-treated sample to constant weight at 70 ± 2 degrees C.

-Cool to room temperature in a desiccator.

-Add previously ashed cupric oxide fines or equivalent material (e.g. alumina oxide) to the sample in the combustion boat.

-Combust the sample in an induction furnace at a minimum temperature of 950± 10 degrees C.

Calculations

-If an ascarita-filled tube is used to capture CO2, the carbon content of the sample can be Calculated as follows:

$$\text{Percent Carbon}=\frac{A(0.2729)(100)}{B}$$

Where:

A= the weight (g) of CO2 determined by weighing the ascarite tube before and after combustion

B= dry weight (g) of the unacidified sample in the combustion boat

0.2729= the ratio of the molecular weight of carbon to the molecular weight of carbon dioxide

A silica gel trap should be placed before the ascarite tube to catch any moisture driven off during sample combustion. Additional silica gel should be placed at the exit end of the ascarite tube to trap any water that might be formed by reaction of the trapped Co2 with the NaOH in the ascarite.

-If an elemental analyzer is used, the amount of Co2 will be measured by a thermal conductivity detector. The instrument should be calibrated daily by using an empty boat blank as the zero point and at least two standards. Standards should bracket the expected range of carbon concentrations in the samples.

QA/QC Procedures

It is critical that each sample be throughly homogenized in the laboratory before a subsample is taken for analysis. Laboratory homogenization should be completed even if samples were homogenized in the field.

Dried samples should be cooled in a desiccator and held there until they are weighed. If a desiccator is not used, the sediment will accumulate ambient moisture and the sample weight will be overestimated. A color-indicating desiccant is recommended so that spent desiccant can be detected easily. Also, the seal on the desiccator should be checked periodically and, if necessary, the ground glass rims should be greased or the "O" rings should be replaced.

It is recommenced that triplicate analyses be conducted on one of every 20 samples, or on one sample per batch if less than 20 samples are analyzed. A method blank should be analyzed at the same frequency as the triplicate analyses. The analytical balance should be inspected daily and calibrated at least once for each major survey.

DATA REPORTING REQUIREMENTS

Total organic carbon should be reported as a percentage of the dry weight of the unacidified sample to the nearest 0.1 unit. The laboratory should report the results of all samples (including QA replicates,method blanks, and standard reference measurements) and should note any problems that may have influenced sample quality. The laboratory should also provide a summary of the calibration procedure and results (e.g., range covered, regression equation, coefficient of determination).

TABLE
CALCULATED ECOOLOGICAL
PRELIMINARY SCREENING VALUES

Parameter	Toxicological Reference Value (mg/kg/day)	SP (2)	ref	BAF (3)	ref	Soil Concentration (mg/kg)
Volatiles						
1,1,1-Trichloroethane	14.987	1.41E+00	5	1.24E-04	5	9.57E+02
1,2-Dichloroethene (total)	0	4.92E-02	5	4.11E-02	5	0.00E+00
2-Butanone	124.88	2.74E+01	5	7.31E-07	5	4.21E+02
Acetone	20	5.33E+01	5	6.90E-01	13	3.43E+01
Benzene	6.267	2.31E+00	5	5.30E-05	5	2.47E+02
Carbon Disulfide	1.571	2.70E+00	5	4.02E-05	5	5.30E+01
Chloroform	6	2.81E+00	5	3.75E-05	5	1.95E+02
Ethylbenzene	11.64	5.85E-01	5	5.68E-04	5	1.72E+03
Methylene Chloride	10.52	7.34E+00	5	7.15E-06	5	1.32E+02
Tetrachloroethene	2.84					6.45E+03
Toluene	17.84	1.02E+00	5	2.16E-04	5	1.55E+03
Trichloroethene		1.63E+00	5	9.64E-05	5	0.00E+00
Xylene (total)	33.333	5.06E-01	5	7.31E-04	5	5.64E+03
Semivolatiles						
1,2,4-Trichlorobenzene	2.144	1.27E-01	5	8.02E-03	5	1.13E+03
1,4-Dichlorobenzene		3.87E+01	5	4.02E-07	5	0.00E+00
2,4-Dinitrotoluene	0.15	2.70E+00	5	4.02E-05	5	5.06E+00
2-Chlorophenol	2	2.19E+00	5	5.81E-05	5	8.32E+01
2-Methylnaphthalene	2.173	1.63E-01	5	5.18E-03	5	9.63E+02
4-Chloro-3-methylphenol		2.97E+00	5	3.42E-05	5	0.00E+00
4-Nitrophenol	0.623	3.05E+00	5	3.27E-05	5	1.87E+01
Acenaphthene	14	1.89E-01	5	3.42E-01	8,9	2.27E+03
Acenaphthylene	0.24	2.81E-01	5	3.42E-01	8,9	3.35E+01
Anthracene	2.68	1.04E-01	5	5.11E-02	8	1.27E+03
Benzo(a)anthracene	3	2.25E-02	5	1.25E-01	8	1.48E+03

	Benzo(a)pyrene	2.4	1.22E-02	5	3.42E-01	8	5.63E+02		
	Benzo(b)fluoranthene	0.24	1.22E-02	5	3.19E-01	8	5.98E+01		
	Benzo(g,h,i)perylene	0.24	6.69E-03	5	2.44E-01	8	7.63E+01		
	Benzo(k)fluoranthene	0.24	1.22E-02	5	2.53E-01	8	7.26E+01		
	Di-n-butylphthalate	41.667					9.47E+04		
	Diethylphthalate	3.373					7.67E+03		
	Carbazole						0.00E+00		
	Chrysene	0.24	2.25E-02	5	1.75E-01	8	9.33E+01		
	Dibenz(a,h)anthracene	0.24	5.26E-03	5	3.68E-01	8	5.37E+01		
	Fluoranthene	15	5.70E-02	5	7.92E-02	8	7.85E+03		
	Fluorene	10	1.45E-01	5	3.42E-01	8,9	1.76E+03		
	Indeno(1,2,3-cd)pyrene	0.24	6.78E-03	5	4.19E-01	8	4.76E+01		
	N-Nitroso-di-n-propylamine	0.64					1.45E+03		
	N-Nitrosodiphenylamine (1)						0.00E+00		
	Naphthalene	0.711	3.98E-01	5	1.11E-03	5	1.50E+02		
	Pentachlorophenol	2	4.99E-02	5	4.02E-02	5	1.42E+03		
	Phenanthrene	0.933	1.02E-01	5	1.22E-01	8	3.26E+02		
	Phenol	4.8	5.55E+00	5	1.16E-05	5	7.95E+01		
	Pyrene	5	5.85E-02	5	9.20E-02	8	2.42E+03		
	bis(2-Ethylhexyl)phthalate	5.2	1.94E-01	5	1.20E+01	11	3.94E+01		
	Pesticides								
	4,4'-DDD	6.5	1.01E-02	5	6.37E-01	5	8.75E+02		
	4,4'-DDE	3.8	3.48E-03	5	4.02E+00	5	8.66E+01		
	4,4'-DDT	0.867	1.01E-02	5	9.00E+00	6	8.87E+00		
	Aroclor 1242	5.667	0		0		1.29E+04		
	Aroclor 1254	1.727					3.93E+03		
	Aroclor 1260	1					2.27E+03		
	Aldrin	0.167	3.35E-02	5	5.55E+00	12	2.75E+00		
	Endosulfan I	0.058					1.32E+02		
	Endosulfan sulfate	0.058	2.97E-01	5	1.84E-03	5	1.58E+01		
	Endrin	0.106					2.41E+02		
	Endrin aldehyde	0.011	3.17E-02	17	8.79E-02	5	6.35E+00		
	Endrin ketone	0.011	3.17E-02	17	8.79E-02	5	6.35E+00		
	Heptachlor	0.05	1.11E-01	5	1.01E-02	5	2.86E+01		
	Heptachlor epoxide	0.001	1.07E+00	5	1.00E+01	16	8.34E-03		
	alpha-Chlordane	0.78	4.67E-01	5	8.40E-04	5	1.42E+02		

	beta-BHC	0.031	2.16E-01	5	3.19E-03	5	1.11E+01		
	gamma-Chlordane	0.26	4.67E-01	5	8.40E-04	5	4.74E+01		
	Herbicides								
	Dicamba	5	2.04E+01	5	1.21E-06	5	2.26E+01		
	MCPP	0.36					8.18E+02		
	Metals								
	Aluminum						0.00E+00		
	Antimony	9.333	1.30E-04	14	6.00E-03	15	1.84E+04		
	Arsenic	2.2	4.00E-02	14	8.30E-01	15	2.24E+02		
	Barium	0.19	1.50E-01	14	8.10E-04	15	9.18E+01		
	Beryllium	0.032	1.00E-02	14	4.00E-01	15	6.57E+00		
	Cadmium	11.4	5.50E-01	14	8.40E-01	15	7.38E+02		
	Calcium		3.50E+00	14	4.40E-02	15	0.00E+00		
	Chromium	2.28	7.50E-03	14	2.00E-01	15	8.50E+02		
	Cobalt		8.10E-02	14	5.00E-01	15	0.00E+00		
	Copper	8.5	4.00E-01	14	5.10E-01	15	8.28E+02		
	Cyanide	6					1.36E+04		
	Iron		4.00E-03	14	1.50E+00	15	0.00E+00		
	Lead	0.56	4.50E-02	14	2.00E-01	15	1.81E+02		
	Magnesium		1.00E+00	14	3.00E-03	15	0.00E+00		
	Manganese	62	5.60E-01	14	5.00E-02	15	8.82E+03		
	Mercury	0.022	9.00E-01	14	2.50E-01	15	1.71E+00		
	Nickel	10	2.80E-01	14	6.00E-03	15	2.83E+03		
	Potassium		1.00E+00	14	4.00E-01	15	0.00E+00		
	Selenium	17.867	2.50E-02	14	8.50E+00	15	1.93E+02		
	Silver		2.70E-04	14	5.00E-01	15	0.00E+00		
	Sodium		7.50E-02	14	5.50E-02	15	0.00E+00		
	Thallium		6.60E-03	14	4.00E-03	15	0.00E+00		
	Vanadium						0.00E+00		
	Zinc		1.40E+00	14	6.50E+00	15	0.00E+00		
	(1) Log Kow values obtained from Karickhoff a		(5) Source: Travis and Arms, 1988.						
	(2) SP: soil-to-plant uptake factor.		(6) Source: Baes et al., 1984.						
	(3) BAF: bioaccumulation factor.		(7) Substituted value for 2,3,7,8-TCDD.						
	(4) Oldfield mouse exposure calculated as		(8) Source: Marquenie et al., 1987 from Beyer, 1990.						

ED = [(Cd * SP * Ip) + (Cd * BAF * Ia) + (Cd

Where, ED = exposure dose

Cd = RME conc in sediment (mg/kg)

SP = soil-to-plant uptake factor

Ip = plant-matter intake rate (kg/day, s

BAF = bioaccumulation factor (unitless

Ia = animal-matter intake rate (kg/day, see Table 4.24)

Is = incidental sediment intake rate (kg/day, see Table 4.24)

SFF = site foraging factor (unitless, see Table 4.24)

BW = body weight (kg, see Table 4.24)

(9) Substituted value for benzo(a)pyrene.

(10) Default where no experimental data available, no evidence of bioconcentration.

(11) Source: USEPA, 1994.

(12) Source: Ma, 1983.

(13) Source HSDB, 1995

PRG Calculations		
Assumptions	Value	Units
Target Cancer Risk	0.000001	
Target Hazard Quotient	1	
Adult Body Weight	70	kg
Child Body Weight	15	kg
Cancer averaging time	25550	days
non-cancer averaging time	ED*365	days
Adult inhalation	20	m3/d
Child inhalation	12	m3/d
adjusted inhalation	11.66	m3/d
Adult water ingestion	2	L/d
Child water ingestion	1	L/d
adjusted water ingestion	1.09	L/d
Adult soil ingestion	100	mg/d
Child soil ingestion	200	mg/d
adjusted soil ingestion	114.29	mg/d
Construction soil ingestion	480	mg/d
Residential		
Exposure frequency	350	d/y
Exposure duration, total	30	years
Exposure duration, child	6	years
Volatilization factor	0.5	L/m3
Occupational		
Exposure frequency	250	d/y
Exposure duration	25	years
Fraction ingested from sour	0.5	
Recreational		
Exposure frequency	52	d/y
Exposure duration	10	years
Fraction ingested from sour	0.5	
Surface Water		
Adult Ingestion rate	0.08	L/d
Child Ingestion rate	0.05	L/d
Construction Worker		
Exposure duration	1	year

Adjusted air		11.657143	m3*y/kg*d						
Adjusted water		1.0857143	L*y/kg*d						
Adjusted soil		114.28571	mg*y/kg*d						
Calculations									
		Drinking			Soil Ingestion				
Chemicals		Water	Ambient Air	Industrial	Recreational	Construction	SurfaceWater	RfDo/CPSo	RfDi/CPSi
		ug/L	ug/m3	mg/kg	mg/kg	mg/kg	ug/L		
Acetaldehyde	n	18.761	9.3805	0	0	0	0	0	0.00257
	c	1.6265597	0.8132799	0	0	0	0	0	0.0077
Acetone	n	3650	0	52560	105288.462	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Acetone cyanohydrin	n	138.10811	73	36792	73701.9231	95812.5	1.47E+08	0.07	0.02
	c	0	0	0	0	0	0	0	0
Acetonitrile	n	70.693002	52.195	3153.6	6317.30769	8212.5	12634615	0.006	0.0143
	c	0	0	0	0	0	0	0	0
Acetophenone	n	0.0416825	0.0208415	52560	105288.462	136875	2.11E+08	0.1	5.71E-06
	c	0	0	0	0	0	0	0	0
Acrylic acid	n	2.0875612	1.0439	262800	526442.308	684375	1.05E+09	0.5	0.000286
	c	0	0	0	0	0	0	0	0
Acrylonitrile	n	3.7410698	2.08415	525.6	1052.88462	1368.75	2105769	0.001	0.000571
	c	0.0369904	0.026312	10.598519	127.38604	27.6003086	79616.27	0.54	0.238
Aldrin	n	1.095	0	15.768	31.5865385	41.0625	63173.08	0.00003	0
	c	0.000618	0.0003662	0.3366588	4.04638009	0.87671569	2528.988	17	17.1
Aluminum	n	36500	0	525600	1052884.62	1368750	2.11E+09	1	0
	c	0	0	0	0	0	0	0	0
Aluminum phosphide	n	14.6	0	210.24	421.153846	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0
m-Aminophenol	n	2555	0	36792	73701.9231	95812.5	1.47E+08	0.07	0
	c	0	0	0	0	0	0	0	0
4-Aminopyridine	n	0.73	0	10.512	21.0576923	27.375	42115.38	0.00002	0
	c	0	0	0	0	0	0	0	0
Antimony	n	14.6	0	210.24	421.153846	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0

Antimony pentoxide	n	**18.25**	0	**262.8**	**526.442308**	**684.375**	**1052885**					0.0005		0
	c	0	0	0	0	0	0					0		0
Antimony potassium tartr	n	**32.85**	0	**473.04**	**947.596154**	**1231.875**	**1895192**					0.0009		0
	c	0	0	0	0	0	0					0		0
Antimony tetroxide	n	**14.6**	0	**210.24**	**421.153846**	**547.5**	**842307.7**					0.0004		0
	c	0	0	0	0	0	0					0		0
Antimony trioxide	n	**14.6**	0	**210.24**	**421.153846**	**547.5**	**842307.7**					0.0004		0
	c	0	0	0	0	0	0					0		0
Arsenic	n	10.95	0	157.68	315.865385	410.625	631730.8					0.0003		0
	c	0.0069992	**0.0041472**	**3.8154667**	**45.8589744**	**9.93611111**	**28661.86**					1.5		1.51
Arsine	n	**0.10439**	**0.052195**	0	0	0	0					0		1.43E-05
	c	0	0	0	0	0	0					0		0
Barium	n	**1.0434737**	**0.52195**	**36792**	**73701.9231**	**95812.5**	**1.47E+08**					0.07		0.000143
	c	0	0	0	0	0	0					0		0
Benzene	n	12.483	6.2415	0	0	0	0					0		0.00171
	c	**0.3640638**	**0.2159398**	**197.35172**	**2372.01592**	**513.936782**	**1482510**					0.029		0.029
Benzidine	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	**4.508E-05**	**2.665E-05**	**0.0248835**	**0.29908027**	**0.06480072**	**186.9252**					230		235
Benzoic acid	n	**146000**	0	**2102400**	**4211538.46**	**5475000**	**8.42E+09**					4		0
	c	0	0	0	0	0	0					0		0
Beryllium	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	**0.0013612**	**0.0007455**	**1.3309767**	**15.9973166**	**3.46608527**	**9998.323**					4.3		8.4
Bis(2-chloroethyl)ether	n	0	0	0	0	0	0					0		0
	c	**0.0091761**	**0.0053985**	**5.2029091**	**62.534965**	**13.5492424**	**39084.35**					1.1		1.16
Bis(2-chloroisopropyl)eth	n	1460	0	21024	42115.3846	54750	84230769					0.04		0
	c	**0.2607143**	**0.1789216**	**81.76**	**982.692308**	**212.916667**	**614182.7**					0.07		0.035
Bis(chloromethyl)ether	n	0	0	0	0	0	0					0		0
	c	**4.855E-05**	**2.886E-05**	**0.0260145**	**0.31267483**	**0.06774621**	**195.4218**					220		217
Bis(2-chloro-1-methyleth	n	0	0	0	0	0	0					0		0
	c	**0.1508264**	**0.0894608**	**81.76**	**982.692308**	**212.916667**	**614182.7**					0.07		0.07
Bis(2-ethylhexyl)phthalat	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	**4.8026316**	0	**408.8**	**4913.46154**	**1064.58333**	**3070913**					0.014		0
Boron	n	**41.160716**	**20.8415**	**47304**	**94759.6154**	**123187.5**	**1.9E+08**					0.09		0.00571
	c	0	0	0	0	0	0					0		0
Boron trifluoride	n	**1.46**	**0.73**	0	0	0	0					0		0.0002
	c	0	0	0	0	0	0					0		0
Bromodichloromethane	n	730	0	10512	21057.6923	27375	42115385					0.02		0

	c	**1.0844652**	0	**92.309677**	**1109.49132**	**240.389785**	**693432.1**					0.062		0
Bromoethene	n	0	0	0	0	0	0					0		0
	c	**0.1138592**	**0.0569296**	0	0	0	0					0		0.11
Bromoform	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	**2.3535372**	**1.6265597**	**724.4557**	**8707.40019**	**1886.60338**	**5442125**					0.0079		0.00385
Bromomethane	n	**8.6991667**	**5.2195**	**751.608**	**1505.625**	**1957.3125**	**3011250**					0.00143		0.00143
	c	0	0	0	0	0	0					0		0
4-Bromophenyl phenyl et	n	**2117**	0	**30484.8**	**61067.3077**	**79387.5**	**1.22E+08**					0.058		0
	c	0	0	0	0	0	0					0		0
1,3-Butadiene	n	0	0	0	0	0	0					0		0
	c	**0.0127801**	**0.0063901**	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!					0		0.98
1-Butanol	n	**3650**	0	**52560**	**105288.462**	**136875**	**2.11E+08**					0.1		0
	c	0	0	0	0	0	0					0		0
Butyl benzyl phthalate	n	**7300**	0	**105120**	**210576.923**	**273750**	**4.21E+08**					0.2		0
	c	0	0	0	0	0	0					0		0
sec-Butylbenzene	n	**365**	0	**5256**	**10528.8462**	**13687.5**	**21057692**					0.01		0
	c	0	0	0	0	0	0					0		0
tert-Butylbenzene	n	**365**	0	**5256**	**10528.8462**	**13687.5**	**21057692**					0.01		0
	c	0	0	0	0	0	0					0		0
Butylphthalyl butylglycola	n	**36500**	0	**525600**	**1052884.62**	**1368750**	**2.11E+09**					1		0
	c	0	0	0	0	0	0					0		0
Cadmium	n	0.4075222	0.208415	**262.8**	**526.442308**	**684.375**	**1052885**					0.0005		5.71E-05
	c	**0.001988**	**0.000994**	0	0	0	0					0		6.3
Carbofuran	n	**182.5**	0	**2628**	**5264.42308**	**6843.75**	**10528846**					0.005		0
	c	0	0	0	0	0	0					0		0
Carbon disulfide	n	**1042.8571**	**730**	**52560**	**105288.462**	**136875**	**2.11E+08**					0.1		0.2
	c	0	0	0	0	0	0					0		0
Carbon tetrachloride	n	3.5836527	2.08415	367.92	737.019231	958.125	1474038					0.0007		0.000571
	c	**0.1632588**	**0.119281**	**44.024615**	**529.142012**	**114.647436**	**330713.8**					0.13		0.0525
Chlordane	n	2.19	0	31.536	63.1730769	82.125	126346.2					0.00006		0
	c	**0.0081744**	**0.0048545**	**4.4024615**	**52.9142012**	**11.4647436**	**33071.38**					1.3		1.29
Chlorimuron-ethyl	n	**730**	0	**10512**	**21057.6923**	**27375**	**42115385**					0.02		0
	c	0	0	0	0	0	0					0		0
Chloroacetaldehyde	n	**251.85**	0	**3626.64**	**7264.90385**	**9444.375**	**14529808**					0.0069		0
	c	0	0	0	0	0	0					0		0
Chloroacetic acid	n	**73**	0	**1051.2**	**2105.76923**	**2737.5**	**4211538**					0.002		0
	c	0	0	0	0	0	0					0		0

2-Chloroacetophenone	n	0.062561	0.0312805	0	0	0	0					0	8.57E-06
	c	0	0	0	0	0	0					0	0
4-Chloroaniline	n	146	0	2102.4	4211.53846	5475	8423077					0.004	0
	c	0	0	0	0	0	0					0	0
Chlorobenzene	n	39.431463	20.8415	10512	21057.6923	27375	42115385					0.02	0.00571
	c	0	0	0	0	0	0					0	0
2-Chloro-1,3-butadiene	n	14.313725	7.3	10512	21057.6923	27375	42115385					0.02	0.002
	c	0	0	0	0	0	0					0	0
1-Chlorobutane	n	14600	0	210240	421153.846	547500	8.42E+08					0.4	0
	c	0	0	0	0	0	0					0	0
Chlorodibromomethane	n	730	0	10512	21057.6923	27375	42115385					0.02	0
	c	0.8004386	0	68.133333	818.910256	177.430556	511818.9					0.084	0
1-Chloro-1,1-difluoroetha	n	104390	52195	0	0	0	0					0	14.3
	c	0	0	0	0	0	0					0	0
Chlorodifluoromethane	n	104390	52195	0	0	0	0					0	14.3
	c	0	0	0	0	0	0					0	0
Chloroethane	n	8591.7695	10439	210240	421153.846	547500	8.42E+08					0.4	2.86
	c	0	0	0	0	0	0					0	0
2-Chloroethyl vinyl ether	n	912.5	0	13140	26322.1154	34218.75	52644231					0.025	0
	c	0	0	0	0	0	0					0	0
Chloroform	n	365	0	5256	10528.8462	13687.5	21057692					0.01	0
	c	0.1534184	0.077792	938.22951	11276.797	2443.30601	7047998					0.0061	0.0805
Chloromethane	n	0	0	0	0	0	0					0	0
	c	1.4360387	0.9940087	440.24615	5291.42012	1146.47436	3307138					0.013	0.0063
4-Chloro-2,2-methylanilin	n	0	0	0	0	0	0					0	0
	c	0.146167	0	12.441739	149.540134	32.4003623	93462.58					0.46	0
4-Chloro-2-methylaniline	n	0	0	0	0	0	0					0	0
	c	0.1159256	0	9.8675862	118.600796	25.6968391	74125.5					0.58	0
beta-Chloronaphthalene	n	2920	0	42048	84230.7692	109500	1.68E+08					0.08	0
	c	0	0	0	0	0	0					0	0
o-Chloronitrobenzene	n	0	0	0	0	0	0					0	0
	c	2.6894737	0	228.928	2751.53846	596.166667	1719712					0.025	0
p-Chloronitrobenzene	n	0	0	0	0	0	0					0	0
	c	3.7353801	0	317.95556	3821.5812	828.009259	2388488					0.018	0
2-Chlorophenol	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005	0
	c	0	0	0	0	0	0					0	0
2-Chloropropane	n	208.78	104.39	0	0	0	0					0	0.0286

	c	0	0	0	0	0	0					0		0
o-Chlorotoluene	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
Chromium III	n	0.0041683	0.0020842	525600	1052884.62	1368750	2.11E+09					1		5.71E-07
	c	0	0	0	0	0	0					0		0
Chromium VI	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0.0002982	0.0001491	0	0	0	0					0		42
Cobalt	n	2190	0	31536	63173.0769	82125	1.26E+08					0.06		0
	c	0	0	0	0	0	0					0		0
Copper	n	1460	0	21024	42115.3846	54750	84230769					0.04		0
	c	0	0	0	0	0	0					0		0
Barium cyanide	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
Calcium cyanide	n	1460	0	21024	42115.3846	54750	84230769					0.04		0
	c	0	0	0	0	0	0					0		0
Chlorine cyanide	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
Copper cyanide	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0	0	0	0	0	0					0		0
Free cyanide	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
Hydrogen cyanide	n	6.2029408	3.12805	10512	21057.6923	27375	42115385					0.02		0.000857
	c	0	0	0	0	0	0					0		0
Potassium cyanide	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
Potassium silver cyanide	n	7300	0	105120	210576.923	273750	4.21E+08					0.2		0
	c	0	0	0	0	0	0					0		0
Silver cyanide	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
Sodium cyanide	n	1460	0	21024	42115.3846	54750	84230769					0.04		0
	c	0	0	0	0	0	0					0		0
Zinc cyanide	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
Cyclohexanone	n	182500	0	2628000	5264423.08	6843750	1.05E+10					5		0
	c	0	0	0	0	0	0					0		0
Cyclohexlamine	n	7300	0	105120	210576.923	273750	4.21E+08					0.2		0
	c	0	0	0	0	0	0					0		0

DDD	n	0	0	0	0	0	0					0		0
	c	0.2801535	0	23.846667	286.61859	62.1006944	179136.6					0.24		0
DDE	n	0	0	0	0	0	0					0		0
	c	0.1977554	0	16.832941	202.319005	43.8357843	126449.4					0.34		0
DDT	n	18.25	0	262.8	526.442308	684.375	1052885					0.0005		0
	c	0.0310525	0.0184184	16.832941	202.319005	43.8357843	126449.4					0.34		0.34
Decabromodiphenyl ethe	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
Dibenzofuran	n	146	0	2102.4	4211.53846	5475	8423077					0.004		0
	c	0	0	0	0	0	0					0		0
1,4-Dibromobenzene	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
1,2-Dibromo-3-chloropro	n	0.41683	0.208415	0	0	0	0					0		5.71E-05
	c	0.0475847	2.5877086	4.088	49.1346154	10.6458333	30709.13					1.4		0.00242
1,2-Dibromoethane	n	0.41683	0.208415	0	0	0	0					0		5.71E-05
	c	0.0007543	0.0081328	0.0673318	0.80927602	0.17534314	505.7975					85		0.77
Dibutyl phthalate	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
1,2-Dichlorobenzene	n	268.16327	146	47304	94759.6154	123187.5	1.9E+08					0.09		0.04
	c	0	0	0	0	0	0					0		0
1,3-Dichlorobenzene	n	3248.5	0	46778.4	93706.7308	121818.75	1.87E+08					0.089		0
	c	0	0	0	0	0	0					0		0
1,4-Dichlorobenzene	n	1671.7	835.85	0	0	0	0					0		0.229
	c	2.8015351	0	238.46667	2866.1859	621.006944	1791366					0.024		0
3,3-Dichlorobenzidine	n	0	0	0	0	0	0					0		0
	c	0.1494152	0	12.718222	152.863248	33.1203704	95539.53					0.45		0
1,4-Dichloro-2-butene	n	0	0	0	0	0	0					0		0
	c	0.0013467	0.0006734	0	0	0	0					0		9.3
Dichlorodifluoromethane	n	394.31463	208.415	105120	210576.923	273750	4.21E+08					0.2		0.0571
	c	0	0	0	0	0	0					0		0
1,1-Dichloroethane	n	811.74184	521.95	52560	105288.462	136875	2.11E+08					0.1		0.143
	c	0	0	0	0	0	0					0		0
1,2-Dichloroethane(EDC)	n	20.878	10.439	0	0	0	0					0		0.00286
	c	0.1160203	0.068816	62.892308	755.91716	163.782051	472448.2					0.091		0.091
1,1-Dichloroethylene	n	328.5	0	4730.4	9475.96154	12318.75	18951923					0.009		0
	c	0.0436752	0.0357843	9.5386667	114.647436	24.8402778	71654.65					0.6		0.175
1,2-Dichloroethylene(cis)	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0

	c	0	0	0	0	0	0					0		0
1,2-Dichloroethylene(tran	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
1,2-Dichloroethylene(mix	n	328.5	0	4730.4	9475.96154	12318.75	18951923					0.009		0
	c	0	0	0	0	0	0					0		0
2,4-Dichlorophenol	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
2,4-Dichlorophenoxyaceti	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
4-(2,3-Dichlorophenoxy)b	n	292	0	4204.8	8423.07692	10950	16846154					0.008		0
	c	0	0	0	0	0	0					0		0
1,2-Dichloropropane	n	8.322	4.161	0	0	0	0					0		0.00114
	c	0.9887771	0	84.164706	1011.59502	219.178922	632246.9					0.068		0
2,3-Dichloropropanol	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
1,3-Dichloropropene	n	8.671914	20.8415	157.68	315.865385	410.625	631730.8					0.0003		0.00571
	c	0.0770274	0.0481712	32.704	393.076923	85.1666667	245673.1					0.175		0.13
Dieldrin	n	1.825	0	26.28	52.6442308	68.4375	105288.5					0.00005		0
	c	0.0006564	0.000389	0.3577	4.29927885	0.93151042	2687.049					16		16.1
Diethyl phthalate	n	29200	0	420480	842307.692	1095000	1.68E+09					0.8		0
	c	0	0	0	0	0	0					0		0
Diethylene glycol,monob	n	41.683	20.8415	0	0	0	0					0		0.00571
	c	0	0	0	0	0	0					0		0
Diethylene glycol, monoe	n	73000	0	1051200	2105769.23	2737500	4.21E+09					2		0
	c	0	0	0	0	0	0					0		0
Diethylformide	n	401.5	0	5781.6	11581.7308	15056.25	23163462					0.011		0
	c	0	0	0	0	0	0					0		0
Di(2-ethylhexyl)adipate	n	21900	0	315360	631730.769	821250	1.26E+09					0.6		0
	c	56.030702	0	4769.3333	57323.7179	12420.1389	35827324					0.0012		0
Diethylstilbestrol	n	0	0	0	0	0	0					0		0
	c	0.0001431	0	0.012177	0.14635843	0.03171099	91.47402					470		0
Diflubenzuron	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
1,1-Difluoroethane	n	83220	41610	0	0	0	0					0		11.4
	c	0	0	0	0	0	0					0		0
Diisopropyl methylphosp	n	2920	0	42048	84230.7692	109500	1.68E+08					0.08		0
	c	0	0	0	0	0	0					0		0

3,3-Dimethoxybenzidine	n	0	0	0	0	0	0					0		0
	c	4.8026316	0	408.8	4913.46154	1064.58333	3070913					0.014		0
Dimethylamine	n	0.041683	0.0208415	0	0	0	0					0		5.71E-06
	c	0	0	0	0	0	0					0		0
2,4-Dimethylaniline hydr	n	0	0	0	0	0	0					0		0
	c	0.1159256	0	9.8675862	118.600796	25.6968391	74125.5					0.58		0
2,4-Dimethylaniline	n	0	0	0	0	0	0					0		0
	c	0.0896491	0	7.6309333	91.7179487	19.8722222	57323.72					0.75		0
n-n-Dimethylaniline	n	73	0	1051.2	2105.76923	2737.5	4211538					0.002		0
	c	0	0	0	0	0	0					0		0
3,3-Dimethylbenzidine	n	0	0	0	0	0	0					0		0
	c	0.0073084	0	0.622087	7.47700669	1.62001812	4673.129					9.2		0
n,n-Dimethylformamide	n	61.506774	31.2805	52560	105288.462	136875	2.11E+08					0.1		0.00857
	c	0	0	0	0	0	0					0		0
1,1-Dimethylhydrazine	n	0	0	0	0	0	0					0		0
	c	0.0031435	0.0017892	2.2012308	26.4571006	5.73237179	16535.69					2.6		3.5
1,2-Dimethylhydrazine	n	0	0	0	0	0	0					0		0
	c	0.0002853	0.0001693	0.1546811	1.85914761	0.40281532	1161.967					37		37
2,4-Dimethylphenol	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
2,6-Dimethylphenol	n	21.9	0	315.36	631.730769	821.25	1263462					0.0006		0
	c	0	0	0	0	0	0					0		0
3,4-Dimethylphenol	n	36.5	0	525.6	1052.88462	1368.75	2105769					0.001		0
	c	0	0	0	0	0	0					0		0
Dimethyl phthalate	n	365000	0	5256000	10528846.2	13687500	2.11E+10					10		0
	c	0	0	0	0	0	0					0		0
Dimethyl terephthalate	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
1,2-Dinitrobenzene	n	14.6	0	210.24	421.153846	547.5	842307.7					0.0004		0
	c	0	0	0	0	0	0					0		0
1,3-Dinitrobenzene	n	3.65	0	52.56	105.288462	136.875	210576.9					0.0001		0
	c	0	0	0	0	0	0					0		0
1,4-Dinitrobenzene	n	14.6	0	210.24	421.153846	547.5	842307.7					0.0004		0
	c	0	0	0	0	0	0					0		0
4,6-Dinitro-o-cyclohexyl	n	73	0	1051.2	2105.76923	2737.5	4211538					0.002		0
	c	0	0	0	0	0	0					0		0
2,4-Dinitrophenol	n	73	0	1051.2	2105.76923	2737.5	4211538					0.002		0

	c	0	0	0	0	0	0					0		0
Dinitrotoluene mixture	n	0	0	0	0	0	0					0		0
	c	**0.0988777**	0	**8.4164706**	**101.159502**	**21.9178922**	**63224.69**					0.68		0
2,4-Dinitrotoluene	n	**73**	0	**1051.2**	**2105.76923**	**2737.5**	**4211538**					0.002		0
	c	0	0	0	0	0	0					0		0
2,6-Dinitrotoluene	n	**36.5**	0	**525.6**	**1052.88462**	**1368.75**	**2105769**					0.001		0
	c	0	0	0	0	0	0					0		0
Di-n-octyl phthalate	n	**730**	0	**10512**	**21057.6923**	**27375**	**42115385**					0.02		0
	c	0	0	0	0	0	0					0		0
1,4-Dioxane	n	0	0	0	0	0	0					0		0
	c	**6.1124402**	0	**520.29091**	**6253.4965**	**1354.92424**	**3908435**					0.011		0
Diphenylamine	n	**912.5**	0	**13140**	**26322.1154**	**34218.75**	**52644231**					0.025		0
	c	0	0	0	0	0	0					0		0
1,2-Diphenylhydrazine	n	0	0	0	0	0	0					0		0
	c	**0.0136281**	**0.0081328**	**7.154**	**85.9855769**	**18.6302083**	**53740.99**					0.8		0.77
Endosulfan	n	**219**	0	**3153.6**	**6317.30769**	**8212.5**	**12634615**					0.006		0
	c	0	0	0	0	0	0					0		0
Endrin	n	**10.95**	0	**157.68**	**315.865385**	**410.625**	**631730.8**					0.0003		0
	c	0	0	0	0	0	0					0		0
Epichlorohydrin	n	**2.0297492**	1.0439	**1051.2**	**2105.76923**	2737.5	**4211538**					0.002		0.000286
	c	2.0721817	**1.4910131**	578.10101	6948.32945	**1505.47138**	4342706					0.0099		0.0042
1,2-Epoxybutane	n	**41.683**	**20.8415**	0	0	0	0					0		0.00571
	c	0	0	0	0	0	0					0		0
2-Ethoxyethanol acetate	n	**10950**	0	**157680**	**315865.385**	**410625**	**6.32E+08**					0.3		0
	c	0	0	0	0	0	0					0		0
2-Ethoxyethanol	n	**405.25983**	**208.415**	**210240**	**421153.846**	**547500**	**8.42E+08**					0.4		0.0571
	c	0	0	0	0	0	0					0		0
Ethyl acrylate	n	0	0	0	0	0	0					0		0
	c	**1.4007675**	0	**119.23333**	**1433.09295**	**310.503472**	**895683.1**					0.048		0
EPTC (S-Ethyl dipropylth	n	**912.5**	0	**13140**	**26322.1154**	**34218.75**	**52644231**					0.025		0
	c	0	0	0	0	0	0					0		0
Ethyl acetate	n	**32850**	0	**473040**	**947596.154**	**1231875**	**1.9E+09**					0.9		0
	c	0	0	0	0	0	0					0		0
Ethylbenzene	n	**1328.117**	**1043.9**	**52560**	**105288.462**	**136875**	**2.11E+08**					0.1		0.286
	c	0	0	0	0	0	0					0		0
Ethylene cyanohydrin	n	**10950**	0	**157680**	**315865.385**	**410625**	**6.32E+08**					0.3		0
	c	0	0	0	0	0	0					0		0

Ethylene diamine	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
Ethylene glycol	n	73000	0	1051200	2105769.23	2737500	4.21E+09					2		0
	c	0	0	0	0	0	0					0		0
Ethylene glycol, monobut	n	41.683	20.8415	0	0	0	0					0		0.00571
	c	0	0	0	0	0	0					0		0
Ethylene oxide	n	0	0	0	0	0	0					0		0
	c	0.0231935	0.0178922	5.6109804	67.4396682	14.6119281	42149.79					1.02		0.35
Ethylene thiourea (ETU)	n	2.92	0	42.048	84.2307692	109.5	168461.5					0.00008		0
	c	0.5650155	0	48.094118	578.054299	125.245098	361283.9					0.119		0
Ethyl ether	n	7300	0	105120	210576.923	273750	4.21E+08					0.2		0
	c	0	0	0	0	0	0					0		0
Ethyl methacrylate	n	3285	0	47304	94759.6154	123187.5	1.9E+08					0.09		0
	c	0	0	0	0	0	0					0		0
Ethyl p-nitrophenyl pheny	n	0.365	0	5.256	10.5288462	13.6875	21057.69					0.00001		0
	c	0	0	0	0	0	0					0		0
Ethylnitosourea	n	0	0	0	0	0	0					0		0
	c	0.0004803	0	0.04088	0.49134615	0.10645833	307.0913					140		0
Ethylphthalyl ethyl glycol	n	109500	0	1576800	3158653.85	4106250	6.32E+09					3		0
	c	0	0	0	0	0	0					0		0
Fluoride	n	2190	0	31536	63173.0769	82125	1.26E+08					0.06		0
	c	0	0	0	0	0	0					0		0
Fluoridone	n	2920	0	42048	84230.7692	109500	1.68E+08					0.08		0
	c	0	0	0	0	0	0					0		0
Formaldihyde	n	7300	0	105120	210576.923	273750	4.21E+08					0.2		0
	c	0.275264	0.137632	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!					0		0.0455
Formic acid	n	73000	0	1051200	2105769.23	2737500	4.21E+09					2		0
	c	0	0	0	0	0	0					0		0
Fosetyl-al	n	109500	0	1576800	3158653.85	4106250	6.32E+09					3		0
	c	0	0	0	0	0	0					0		0
Furan	n	36.5	0	525.6	1052.88462	1368.75	2105769					0.001		0
	c	0	0	0	0	0	0					0		0
Furazolidone	n	0	0	0	0	0	0					0		0
	c	0.0176939	0	1.5061053	18.1022267	3.92214912	11313.89					3.8		0
HCH(alpha)	n	0	0	0	0	0	0					0		0
	c	0.0016758	0.000994	0.9084444	10.9188034	2.36574074	6824.252					6.3		6.3
HCH(beta)	n	0	0	0	0	0	0					0		0

	c	**0.0058655**	**0.003479**	**3.1795556**	**38.215812**	**8.28009259**	**23884.88**					1.8		1.8
HCH(gamma) Lindane	n	10.95	0	157.68	315.865385	410.625	631730.8					0.0003		0
	c	**0.0517206**	#DIV/0!	**4.4024615**	**52.9142012**	**11.4647436**	**33071.38**					1.3		0
HCH-technical	n	0	0	0	0	0	0					0		0
	c	**0.0058931**	**0.0034985**	**3.1795556**	**38.215812**	**8.28009259**	**23884.88**					1.8		1.79
Heptachlor	n	18.25	0	262.8	526.442308	684.375	1052885					0.0005		0
	c	**0.0023244**	**0.0013763**	**1.2718222**	**15.2863248**	**3.31203704**	**9553.953**					4.5		4.55
Heptachlor epoxide	n	0.4745	0	6.8328	13.6875	17.79375	27375					0.000013		0
	c	**0.0011602**	**0.0006882**	**0.6289231**	**7.5591716**	**1.63782051**	**4724.482**					9.1		9.1
Hexabromobenzene	n	**73**	0	**1051.2**	**2105.76923**	**2737.5**	**4211538**					0.002		0
	c	0	0	0	0	0	0					0		0
Hexachlorobenzene	n	29.2	0	420.48	842.307692	1095	1684615					0.0008		0
	c	**0.0065641**	**0.0038896**	**3.577**	**42.9927885**	**9.31510417**	**26870.49**					1.6		1.61
Hexachlorobutadiene	n	7.3	0	105.12	**210.576923**	273.75	**421153.8**					0.0002		0
	c	**0.1368359**	**0.081328**	**73.374359**	881.903353	**191.07906**	551189.6					0.078		0.077
Hexachlorocyclopentadie	n	**0.1459166**	**0.073**	**3679.2**	**7370.19231**	**9581.25**	**14740385**					0.007		0.00002
	c	0	0	0	0	0	0					0		0
Hexachlorodibenzo-p-dio	n	0	0	0	0	0	0					0		0
	c	**2.188E-06**	**1.376E-06**	**0.0009084**	**0.0109188**	**0.00236574**	**6.824252**					6300		4550
Hexachloroethane	n	36.5	0	525.6	**1052.88462**	1368.75	**2105769**					0.001		0
	c	**0.7541322**	**0.4473039**	**408.8**	4913.46154	**1064.58333**	3070913					0.014		0.014
Hexachlorophene	n	**10.95**	0	**157.68**	**315.865385**	**410.625**	**631730.8**					0.0003		0
	c	0	0	0	0	0	0					0		0
Hexahydro-1,3,5-trinitro-	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	**0.611244**	0	**52.029091**	**625.34965**	**135.492424**	**390843.5**					0.11		0
1,6-Hexamethylene diiso	n	**0.020878**	**0.010439**	0	0	0	0					0		2.86E-06
	c	0	0	0	0	0	0					0		0
n-Hexane	n	**350.17922**	**208.415**	**31536**	**63173.0769**	**82125**	**1.26E+08**					0.06		0.0571
	c	0	0	0	0	0	0					0		0
Hexazinone	n	**1204.5**	0	**17344.8**	**34745.1923**	**45168.75**	**69490385**					0.033		0
	c	0	0	0	0	0	0					0		0
Hydrazine, hydrazine sulf	n	0	0	0	0	0	0					0		0
	c	**0.0007092**	**0.0003662**	**1.9077333**	**22.9294872**	**4.96805556**	**14330.93**					3		17.1
Hydrogen chloride	n	**41.683**	**20.8415**	0	0	0	0					0		0.00571
	c	0	0	0	0	0	0					0		0
Hydrogen sulfide	n	**2.0417076**	**1.04025**	**1576.8**	**3158.65385**	**4106.25**	**6317308**					0.003		0.000285
	c	0	0	0	0	0	0					0		0

Iron	n	**10950**	0	**157680**	**315865.385**	**410625**	**6.32E+08**					0.3		0
	c	0	0	0	0	0	0					0		0
Isobutanol	n	**10950**	0	**157680**	**315865.385**	**410625**	**6.32E+08**					0.3		0
	c	0	0	0	0	0	0					0		0
Isopropalin	n	**547.5**	0	**7884**	**15793.2692**	**20531.25**	**31586538**					0.015		0
	c	0	0	0	0	0	0					0		0
Isopropyl methyl phosph	n	**3650**	0	**52560**	**105288.462**	**136875**	**2.11E+08**					0.1		0
	c	0	0	0	0	0	0					0		0
Kepone	n	0	0	0	0	0	0					0		0
	c	**0.0037354**	0	**0.3179556**	**3.8215812**	**0.82800926**	**2388.488**					18		0
Lithium	n	**730**	0	**10512**	**21057.6923**	**27375**	**42115385**					0.02		0
	c	0	0	0	0	0	0					0		0
Malathion	n	**730**	0	**10512**	**21057.6923**	**27375**	**42115385**					0.02		0
	c	0	0	0	0	0	0					0		0
Manganese	n	**0.104377**	**0.052195**	**12088.8**	**24216.3462**	**31481.25**	**48432692**					0.023		1.43E-05
	c	0	0	0	0	0	0					0		0
Mercuric chloride	n	**10.95**	0	**157.68**	**315.865385**	**410.625**	**631730.8**					0.0003		0
	c	0	0	0	0	0	0					0		0
Mercury	n	**0.5917986**	**0.312805**	**157.68**	**315.865385**	**410.625**	**631730.8**					0.0003		8.57E-05
	c	0	0	0	0	0	0					0		0
Methyl mercury	n	**3.65**	0	**52.56**	**105.288462**	**136.875**	**210576.9**					0.0001		0
	c	0	0	0	0	0	0					0		0
Methanol	n	**18250**	0	**262800**	**526442.308**	**684375**	**1.05E+09**					0.5		0
	c	0	0	0	0	0	0					0		0
Methoxychlor	n	**182.5**	0	**2628**	**5264.42308**	**6843.75**	**10528846**					0.005		0
	c	0	0	0	0	0	0					0		0
2-Methoxyethanol acetat	n	**73**	0	**1051.2**	**2105.76923**	**2737.5**	**4211538**					0.002		0
	c	0	0	0	0	0	0					0		0
2-Methoxyethanol	n	**19.459851**	**20.8415**	**525.6**	**1052.88462**	**1368.75**	**2105769**					0.001		0.00571
	c	0	0	0	0	0	0					0		0
2-Methoxy-5-nitroaniline	n	0	0	0	0	0	0					0		0
	c	**1.4616705**	0	**124.41739**	**1495.40134**	**324.003623**	**934625.8**					0.046		0
Methyl acetate	n	**36500**	0	**525600**	**1052884.62**	**1368750**	**2.11E+09**					1		0
	c	0	0	0	0	0	0					0		0
Methyl acrylate	n	**1095**	0	**15768**	**31586.5385**	**41062.5**	**63173077**					0.03		0
	c	0	0	0	0	0	0					0		0
2-Methylaniline hydrochl	n	0	0	0	0	0	0					0		0

	c	0.373538	0	31.795556	382.15812	82.8009259	238848.8					0.18		0
2-Methylaniline	n	0	0	0	0	0	0					0		0
	c	0.2801535	0	23.846667	286.61859	62.1006944	179136.6					0.24		0
Methyl chlorocarbonate	n	36500	0	525600	1052884.62	1368750	2.11E+09					1		0
	c	0	0	0	0	0	0					0		0
4-(2-Methyl-4-chlorophen	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
2-Methyl-4-chlorophenox	n	18.25	0	262.8	526.442308	684.375	1052885					0.0005		0
	c	0	0	0	0	0	0					0		0
2-(2-Methyl-14-chlorophe	n	36.5	0	525.6	1052.88462	1368.75	2105769					0.001		0
	c	0	0	0	0	0	0					0		0
Methylcyclohexane	n	6256.1	3128.05	0	0	0	0					0		0.857
	c	0	0	0	0	0	0					0		0
Methylene bromide	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
Methylene chloride	n	1622.1521	3128.05	31536	63173.0769	82125	1.26E+08					0.06		0.857
	c	4.1238944	3.8184481	763.09333	9171.79487	1987.22222	5732372					0.0075		0.00164
4,4-Methylene bis(2-chlor	n	25.55	0	367.92	737.019231	958.125	1474038					0.0007		0
	c	0.0812142	0.0481712	44.024615	529.142012	114.647436	330713.8					0.13		0.13
4,4-Methylenebisbenzen	n	0	0	0	0	0	0					0		0
	c	0.2689474	0	22.8928	275.153846	59.6166667	171971.2					0.25		0
4,4-Methylene bis(N,N-di	n	0	0	0	0	0	0					0		0
	c	1.4616705	0	124.41739	1495.40134	324.003623	934625.8					0.046		0
4,4-Methylenediphenyl is	n	0.041683	0.0208415	0	0	0	0					0		5.71E-06
	c	0	0	0	0	0	0					0		0
Methyl ethyl ketone	n	1906.0864	1043.9	315360	631730.769	821250	1.26E+09					0.6		0.286
	c	0	0	0	0	0	0					0		0
Methyl hydrazine	n	0	0	0	0	0	0					0		0
	c	0.0611244	0	5.2029091	62.534965	13.5492424	39084.35					1.1		0
Methyl isobutyl ketone	n	158.11776	83.585	42048	84230.7692	109500	1.68E+08					0.08		0.0229
	c	0	0	0	0	0	0					0		0
2-Methyl-5-nitroaniline	n	0	0	0	0	0	0					0		0
	c	2.0374801	0	173.4303	2084.49883	451.641414	1302812					0.033		0
Methyl parathion	n	9.125	0	131.4	263.221154	342.1875	526442.3					0.00025		0
	c	0	0	0	0	0	0					0		0
2-Methylphenol(o-cresol)	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0

2-Methylphenol(m-cresol	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
2-Methylphenol(p-cresol)	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0	0	0	0	0	0					0		0
Molybdenum	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0	0	0	0	0	0					0		0
2-Naphthylamine	n	0	0	0	0	0	0					0		0
	c	0.0005172	0	0.0440246	0.52914201	0.11464744	330.7138					130		0
Nickel	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0
Nickel subsulfide	n	0	0	0	0	0	0					0		0
	c	0	0.0036837	0	0	0	0					0		1.7
Nitrate	n	58400	0	840960	1684615.38	2190000	3.37E+09					1.6		0
	c	0	0	0	0	0	0					0		0
Nitric oxide	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
Nitrite	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
2-Nitroaniline	n	0.3501792	0.208415	31.536	63.1730769	82.125	126346.2					0.00006		5.71E-05
	c	0	0	0	0	0	0					0		0
3-Nitroaniline	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
4-Nitroaniline	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
Nitrobenzene	n	3.3932758	2.08415	262.8	526.442308	684.375	1052885					0.0005		0.000571
	c	0	0	0	0	0	0					0		0
Nitrogen dioxide	n	36500	0	525600	1052884.62	1368750	2.11E+09					1		0
	c	0	0	0	0	0	0					0		0
Nitroguanidine	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
4-Nitrophenol	n	2190	0	31536	63173.0769	82125	1.26E+08					0.06		0
	c	0	0	0	0	0	0					0		0
2-Nitropropane	n	41.683	20.8415	0	0	0	0					0		0.00571
	c	0.0013324	0.0006662	0	0	0	0					0		9.4
N-Nitrosodi-n-butylamine	n	0	0	0	0	0	0					0		0
	c	0.001896	0.0011183	1.0598519	12.738604	2.76003086	7961.627					5.4		5.6
N-Nitrosodiethanolamine	n	0	0	0	0	0	0					0		0

	c	0.0240132	0	2.044	24.5673077	5.32291667	15354.57					2.8		0
N-Nitrosodiethylamine	n	0	0	0	0	0	0					0		0
	c	6.999E-05	4.147E-05	0.0381547	0.45858974	0.09936111	286.6186					150		151
N-Nitrosodimethylamine	n	0	0	0	0	0	0					0		0
	c	0.0002141	0.0001278	0.1122196	1.34879336	0.29223856	842.9959					51		49
N-Nitrosodiphenylamine	n	0	0	0	0	0	0					0		0
	c	13.721805	#DIV/0!	1168	14038.4615	3041.66667	8774038					0.0049		0
N-Nitroso di-n-propylami	n	0	0	0	0	0	0					0		0
	c	0.0096053	#DIV/0!	0.8176	9.82692308	2.12916667	6141.827					7		0
N-Nitroso-N-methylethyla	n	0	0	0	0	0	0					0		0
	c	0.0030562	#DIV/0!	0.2601455	3.12674825	0.67746212	1954.218					22		0
N-Nitrosopyrrolidine	n	0	0	0	0	0	0					0		0
	c	0.0049677	0.00294	2.7253333	32.7564103	7.09722222	20472.76					2.1		2.13
m-Nitrotoluene	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
o-Nitrotoluene	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
p-Nitrotoluene	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
Octabromodiphenyl ether	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
Octamethylpyrophosphor	n	73	0	1051.2	2105.76923	2737.5	4211538					0.002		0
	c	0	0	0	0	0	0					0		0
Pentachlorobenzene	n	29.2	0	420.48	842.307692	1095	1684615					0.0008		0
	c	0	0	0	0	0	0					0		0
Pentachloronitrobenzene	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0.2586032	0	22.012308	264.571006	57.3237179	165356.9					0.26		0
Pentachlorophenol	n	1095	0	15768	31586.5385	41062.5	63173077					0.03		0
	c	0.560307	0	47.693333	573.237179	124.201389	358273.2					0.12		0
Phenol	n	21900	0	315360	631730.769	821250	1.26E+09					0.6		0
	c	0	0	0	0	0	0					0		0
Phosphoric acid	n	20.878	10.439	0	0	0	0					0		0.00286
	c	0	0	0	0	0	0					0		0
Phosphorus (white)	n	0.73	0	10.512	21.0576923	27.375	42115.38					0.00002		0
	c	0	0	0	0	0	0					0		0
Picloram	n	2555	0	36792	73701.9231	95812.5	1.47E+08					0.07		0
	c	0	0	0	0	0	0					0		0

Polybromated biphenyls	n	0.2555	0	3.6792	7.37019231	9.58125	14740.38				0.000007		0
	c	0.0075547	0	0.6430562	7.72904062	1.67462547	4830.65				8.9		0
Polychloronated biphenyl	n	0	0	0	0	0	0				0		0
	c	0.0087321	0	0.7432727	8.93356643	1.93560606	5583.479				7.7		0
Aroclor 1016	n	2.555	0	36.792	73.7019231	95.8125	147403.8				0.00007		0
	c	0	0	0	0	0	0				0		0
Aroclor 1254	n	0.73	0	10.512	21.0576923	27.375	42115.38				0.00002		0
	c	0	0	0	0	0	0				0		0
Polynuclear aromatic hyd	n	0	0	0	0	0	0				0		0
	c	0	0	0	0	0	0				0		0
Acenaphthalene	n	2190	0	31536	63173.0769	82125	1.26E+08				0.06		0
	c	0	0	0	0	0	0				0		0
Anthracene	n	10950	0	157680	315865.385	410625	6.32E+08				0.3		0
	c	0	0	0	0	0	0				0		0
Benz[a]anthracene	n	0	0	0	0	0	0				0		0
	c	0.0167893	0.010266	7.84	94.2307692	20.4166667	58894.23				0.73		0.61
Benzo[b]fluoranthene	n	0	0	0	0	0	0				0		0
	c	0.0167893	0.010266	7.84	94.2307692	20.4166667	58894.23				0.73		0.61
Benzo[k]fluoranthene	n	0	0	0	0	0	0				0		0
	c	0.1678933	0.1026599	78.4	942.307692	204.166667	588942.3				0.073		0.061
Benzo[a]pyrene	n	0	0	0	0	0	0				0		0
	c	0.0016789	0.0010266	0.784	9.42307692	2.04166667	5889.423				7.3		6.1
Carbazole	n	0	0	0	0	0	0				0		0
	c	3.3618421	0	286.16	3439.42308	745.208333	2149639				0.02		0
Chrysene	n	0	0	0	0	0	0				0		0
	c	1.6789328	1.0265992	784	9423.07692	2041.66667	5889423				0.0073		0.0061
Dibenz{ah}anthracene	n	0	0	0	0	0	0				0		0
	c	0.0016789	0.0010266	0.784	9.42307692	2.04166667	5889.423				7.3		6.1
Fluoranthene	n	1460	0	21024	42115.3846	54750	84230769				0.04		0
	c	0	0	0	0	0	0				0		0
Fluorene	n	1460	0	21024	42115.3846	54750	84230769				0.04		0
	c	0	0	0	0	0	0				0		0
Indeno[1,2,3-cd]pyrene	n	0	0	0	0	0	0				0		0
	c	0.0167893	0.010266	7.84	94.2307692	20.4166667	58894.23				0.73		0.61
Naphthalene	n	1460	0	21024	42115.3846	54750	84230769				0.04		0
	c	0	0	0	0	0	0				0		0
Pyrene	n	1095	0	15768	31586.5385	41062.5	63173077				0.03		0

	c	0	0	0	0	0	0				0	0
Rotenone	n	146	0	2102.4	4211.53846	5475	8423077				0.004	0
	c	0	0	0	0	0	0				0	0
Selenium	n	182.5	0	2628	5264.42308	6843.75	10528846				0.005	0
	c	0	0	0	0	0	0				0	0
Silver	n	182.5	0	2628	5264.42308	6843.75	10528846				0.005	0
	c	0	0	0	0	0	0				0	0
Sodium diethyldithiocarb	n	1095	0	15768	31586.5385	41062.5	63173077				0.03	0
	c	0.2490253	0	21.197037	254.77208	55.2006173	159232.5				0.27	0
Sodium fluoroacetate	n	0.73	0	10.512	21.0576923	27.375	42115.38				0.00002	0
	c	0	0	0	0	0	0				0	0
Strontium	n	21900	0	315360	631730.769	821250	1.26E+09				0.6	0
	c	0	0	0	0	0	0				0	0
2,3,7,8-TCDD(dioxin)	n	0	0	0	0	0	0				0	0
	c	8.634E-08	5.398E-08	3.669E-05	0.00044095	9.554E-05	0.275595				156000	116000
1,2,4,5-Tetrachlorobenze	n	10.95	0	157.68	315.865385	410.625	631730.8				0.0003	0
	c	0	0	0	0	0	0				0	0
1,1,1,2-Tetrachloroethan	n	1095	0	15768	31586.5385	41062.5	63173077				0.03	0
	c	0.4073921	0.2417859	220.12308	2645.71006	573.237179	1653569				0.026	0.0259
1,1,2,2-Tetrachloroethan	n	0	0	0	0	0	0				0	0
	c	0.5213009	0.3084855	286.16	3439.42308	745.208333	2149639				0.02	0.0203
Tetrachloroethylene(PCE	n	365	0	5256	10528.8462	13687.5	21057692				0.01	0
	c	1.068984	3.0848546	110.06154	1322.85503	286.61859	826784.4				0.052	0.00203
2,3,4,6-Tetrachloropheno	n	1095	0	15768	31586.5385	41062.5	63173077				0.03	0
	c	0	0	0	0	0	0				0	0
p,a,a,a-Tetrachlorotoluen	n	0	0	0	0	0	0				0	0
	c	0.0033618	0	0.28616	3.43942308	0.74520833	2149.639				20	0
Tetraethyldithiopyrophos	n	18.25	0	262.8	526.442308	684.375	1052885				0.0005	0
	c	0	0	0	0	0	0				0	0
Tetraethyl lead	n	0.00365	0	0.05256	0.10528846	0.136875	210.5769				1E-07	0
	c	0	0	0	0	0	0				0	0
1,1,1,2-Tetrafluoroethane	n	0	83585	0	0	0	0				0	22.9
	c	0	0	0	0	0	0				0	0
Thallium	n	0	0	0	0	0	0				0	0
	c	0	0	0	0	0	0				0	0
Thallium acetate	n	3.285	0	47.304	94.7596154	123.1875	189519.2				0.00009	0
	c	0	0	0	0	0	0				0	0

Thallium carbonate	n	**2.92**	0	**42.048**	**84.2307692**	**109.5**	**168461.5**				0.00008		0
	c	0	0	0	0	0	0				0		0
Thallium chloride	n	**2.92**	0	**42.048**	**84.2307692**	**109.5**	**168461.5**				0.00008		0
	c	0	0	0	0	0	0				0		0
Thallium nitrate	n	**3.285**	0	**47.304**	**94.7596154**	**123.1875**	**189519.2**				0.00009		0
	c	0	0	0	0	0	0				0		0
Thallium selenite	n	**3.285**	0	**47.304**	**94.7596154**	**123.1875**	**189519.2**				0.00009		0
	c	0	0	0	0	0	0				0		0
Thallium sulfate	n	**2.92**	0	**42.048**	**84.2307692**	**109.5**	**168461.5**				0.00008		0
	c	0	0	0	0	0	0				0		0
2-(Thiocyanomethylthio)-	n	**1095**	0	**15768**	**31586.5385**	**41062.5**	**63173077**				0.03		0
	c	0	0	0	0	0	0				0		0
Tin	n	**21900**	0	**315360**	**631730.769**	**821250**	**1.26E+09**				0.6		0
	c	0	0	0	0	0	0				0		0
Toluene	n	**747.0377**	**416.1**	**105120**	**210576.923**	**273750**	4.21E+08				0.2		0.114
	c	0	0	0	0	0	0				0		0
Toluene-2,4-diamine	n	0	0	0	0	0	0				0		0
	c	**0.0210115**	0	**1.7885**	**21.4963942**	**4.65755208**	**13435.25**				3.2		0
Toluene-2,5-diamine	n	**21900**	0	**315360**	**631730.769**	**821250**	**1.26E+09**				0.6		0
	c	0	0	0	0	0	0				0		0
Toluene-2,6-diamine	n	**7300**	0	**105120**	**210576.923**	**273750**	**4.21E+08**				0.2		0
	c	0	0	0	0	0	0				0		0
p-Toluidine	n	0	0	0	0	0	0				0		0
	c	**0.3538781**	0	**30.122105**	**362.044534**	**78.4429825**	**226277.8**				0.19		0
1,2,4-Tribromobenzene	n	**182.5**	0	**2628**	**5264.42308**	**6843.75**	**10528846**				0.005		0
	c	0	0	0	0	0	0				0		0
2,4,6-Trichloroaniline hyd	n	0	0	0	0	0	0				0		0
	c	**2.3185118**	0	**197.35172**	**2372.01592**	**513.936782**	**1482510**				0.029		0
2,4,6-Trichloroaniline	n	0	0	0	0	0	0				0		0
	c	**1.9775542**	0	**168.32941**	**2023.19005**	**438.357843**	**1264494**				0.034		0
1,2,4-Trichlorobenzene	n	**194.59851**	**208.415**	**5256**	**10528.8462**	**13687.5**	**21057692**				0.01		0.0571
	c	0	0	0	0	0	0				0		0
1,1,1-Trichloroethane	n	**792.54881**	**1043.9**	**18396**	**36850.9615**	**47906.25**	**73701923**				0.035		0.286
	c	0	0	0	0	0	0				0		0
1,1,2-Trichloroethane	n	146	0	2102.4	4211.53846	5475	8423077				0.004		0
	c	**0.1880059**	**0.111826**	**100.40702**	**1206.81511**	**261.476608**	**754259.4**				0.057		0.056
Trichloroethylene(TCE)	n	219	0	3153.6	6317.30769	8212.5	12634615				0.006		0

	c	1.5560292	1.0437092	520.29091	6253.4965	1354.92424	3908435					0.011		0.006
Trichlorofluoromethane	n	1288.2353	730	157680	315865.385	410625	6.32E+08					0.3		0.2
	c	0	0	0	0	0	0					0		0
2,4,5-Trichlorophenol	n	3650	0	52560	105288.462	136875	2.11E+08					0.1		0
	c	0	0	0	0	0	0					0		0
2,4,6-Trichlorophenol	n	0	0	0	0	0	0					0		0
	c	0.9672168	0.5745188	520.29091	6253.4965	1354.92424	3908435					0.011		0.0109
2,4,5-Trichlorophenoxyac	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
2-(2,4,5-Trichlorophenox	n	292	0	4204.8	8423.07692	10950	16846154					0.008		0
	c	0	0	0	0	0	0					0		0
1,1,2-Trichloropropane	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0	0	0	0	0	0					0		0
1,2,3-Trichloropropane	n	219	0	3153.6	6317.30769	8212.5	12634615					0.006		0
	c	0.0096053	0	0.8176	9.82692308	2.12916667	6141.827					7		0
1,2,3-Trichloropropene	n	182.5	0	2628	5264.42308	6843.75	10528846					0.005		0
	c	0	0	0	0	0	0					0		0
1,1,2-Trichloro-1,2,2-trifl	n	59179.857	31280.5	15768000	31586538.5	41062500	6.32E+10					30		8.57
	c	0	0	0	0	0	0					0		0
1,2,4-Trimethylbenzene	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
1,3,5-Trimethylbenzene	n	1825	0	26280	52644.2308	68437.5	1.05E+08					0.05		0
	c	0	0	0	0	0	0					0		0
1,3,5-Trinitrobenzene	n	1.825	0	26.28	52.6442308	68.4375	105288.5					0.00005		0
	c	0	0	0	0	0	0					0		0
trinitrophenylmethylnitra	n	365	0	5256	10528.8462	13687.5	21057692					0.01		0
	c	0	0	0	0	0	0					0		0
2,4,6-Trinitrotoluene	n	18.25	0	262.8	526.442308	684.375	1052885					0.0005		0
	c	2.2412281	0	190.77333	2292.94872	496.805556	1433093					0.03		0
Uranium	n	109.5	0	1576.8	3158.65385	4106.25	6317308					0.003		0
	c	0	0	0	0	0	0					0		0
Vanadium	n	255.5	0	3679.2	7370.19231	9581.25	14740385					0.007		0
	c	0	0	0	0	0	0					0		0
Vanadium pentoxide	n	328.5	0	4730.4	9475.96154	12318.75	18951923					0.009		0
	c	0	0	0	0	0	0					0		0
Vanadium sulfate	n	730	0	10512	21057.6923	27375	42115385					0.02		0
	c	0	0	0	0	0	0					0		0

Vinyl acetate	n	**412.12355**	**208.415**	**525600**	**1052884.62**	**1368750**	**2.11E+09**					1		0.0571
	c	0	0	0	0	0	0					0		0
Vinyl bromide	n	**6.2561**	**3.12805**	0	0	0	0					0		0.000857
	c	0	0	0	0	0	0					0		0
Vinyl chloride	n	0	0	0	0	0	0					0		0
	c	**0.0191529**	**0.0208742**	**3.0122105**	**36.2044534**	**7.84429825**	**22627.78**					1.9		0.3
m-Xylene	n	**1431.3725**	**730**	**1051200**	**2105769.23**	**2737500**	**4.21E+09**					2		0.2
	c	0	0	0	0	0	0					0		0
o-Xylene	n	**1431.3725**	**730**	**1051200**	**2105769.23**	**2737500**	**4.21E+09**					2		0.2
	c	0	0	0	0	0	0					0		0
p-Xylene	n	**625.61**	**312.805**	0	0	0	0					0		0.0857
	c	0	0	0	0	0	0					0		0
Xylene (mixed)	n	**73000**	0	**1051200**	**2105769.23**	**2737500**	**4.21E+09**					2		0
	c	0	0	0	0	0	0					0		0
Zinc	n	**10950**	0	**157680**	**315865.385**	**410625**	**6.32E+08**					0.3		0
	c	0	0	0	0	0	0					0		0
Zinc phosphide	n	**10.95**	0	**157.68**	**315.865385**	**410.625**	**631730.8**					0.0003		0
	c	0	0	0	0	0	0					0		0

PRG Calculations		
Assumptions	Value	Units
Target Cancer Risk	0.000001	
Target Hazard Quotient	1	
Adult Body Weight	70	kg
Child Body Weight	15	kg
Cancer averaging time	25550	days
non-cancer averaging time	ED*365	days
Adult inhalation	20	m3/d
Child inhalation	12	m3/d
adjusted inhalation	11.66	m3/d
Adult water ingestion	2	L/d
Child water ingestion	1	L/d
adjusted water ingestion	1.09	L/d
Adult soil ingestion	100	mg/d
Child soil ingestion	200	mg/d
adjusted soil ingestion	114.29	mg/d
Construction soil ingestion	480	mg/d
Residential		
Exposure frequency	350	d/y
Exposure duration, total	30	years
Exposure duration, child	6	years
Volatilization factor	0.5	L/m3
Occupational		
Exposure frequency	250	d/y
Exposure duration	25	years
Fraction ingested from sour	0.5	
Recreational		
Exposure frequency	52	d/y
Exposure duration	10	years
Fraction ingested from sour	0.5	
Surface Water		
Adult Ingestion rate	0.08	L/d
Child Ingestion rate	0.05	L/d
Construction Worker		
Exposure duration	1	year

Adjusted air		11.657143	m3*y/kg*d						
Adjusted water		1.0857143	L*y/kg*d						
Adjusted soil		114.28571	mg*y/kg*d						
Calculations									
				Soil Ingestion					
Chemicals		Drinking Water	Ambient Air	Industrial	Recreational	Construction	SurfaceWater	RfDo/CPSo	RfDi/CPSi
		ug/L	ug/m3	mg/kg	mg/kg	mg/kg	ug/L		
Acetaldehyde	n	18.761	9.3805	0	0	0	0	0	0.00257
	c	1.6265597	0.8132799	0	0	0	0	0	0.0077
Acetone	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Acetone cyanohydrin	n	138.10811	73	36792	73701.923	95812.5	1.47E+08	0.07	0.02
	c	0	0	0	0	0	0	0	0
Acetonitrile	n	70.693002	52.195	3153.6	6317.3077	8212.5	12634615	0.006	0.0143
	c	0	0	0	0	0	0	0	0
Acetophenone	n	0.0416825	0.0208415	52560	105288.46	136875	2.11E+08	0.1	5.71E-06
	c	0	0	0	0	0	0	0	0
Acrylic acid	n	2.0875612	1.0439	262800	526442.31	684375	1.05E+09	0.5	0.000286
	c	0	0	0	0	0	0	0	0
Acrylonitrile	n	3.7410698	2.08415	525.6	1052.8846	1368.75	2105769	0.001	0.000571
	c	0.0369904	0.026312	10.598519	127.38604	27.60031	79616.27	0.54	0.238
Aldrin	n	1.095	0	15.768	31.586538	41.0625	63173.08	0.00003	0
	c	0.000618	0.0003662	0.3366588	4.0463801	0.876716	2528.988	17	17.1
Aluminum	n	36500	0	525600	1052884.6	1368750	2.11E+09	1	0
	c	0	0	0	0	0	0	0	0
Aluminum phosphide	n	14.6	0	210.24	421.15385	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0
m-Aminophenol	n	2555	0	36792	73701.923	95812.5	1.47E+08	0.07	0
	c	0	0	0	0	0	0	0	0
4-Aminopyridine	n	0.73	0	10.512	21.057692	27.375	42115.38	0.00002	0
	c	0	0	0	0	0	0	0	0
Antimony	n	14.6	0	210.24	421.15385	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0

Antimony pentoxide	n	18.25	0	262.8	526.44231	684.375	1052885	0.0005	0
	c	0	0	0	0	0	0	0	0
Antimony potassium tartr	n	32.85	0	473.04	947.59615	1231.875	1895192	0.0009	0
	c	0	0	0	0	0	0	0	0
Antimony tetroxide	n	14.6	0	210.24	421.15385	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0
Antimony trioxide	n	14.6	0	210.24	421.15385	547.5	842307.7	0.0004	0
	c	0	0	0	0	0	0	0	0
Arsenic	n	10.95	0	157.68	315.86538	410.625	631730.8	0.0003	0
	c	0.0069992	0.0041472	3.8154667	45.858974	9.936111	28661.86	1.5	1.51
Arsine	n	0.10439	0.052195	0	0	0	0	0	1.43E-05
	c	0	0	0	0	0	0	0	0
Barium	n	1.0434737	0.52195	36792	73701.923	95812.5	1.47E+08	0.07	0.000143
	c	0	0	0	0	0	0	0	0
Benzene	n	12.483	6.2415	0	0	0	0	0	0.00171
	c	0.3640638	0.2159398	197.35172	2372.0159	513.9368	1482510	0.029	0.029
Benzidine	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	4.508E-05	2.665E-05	0.0248835	0.2990803	0.064801	186.9252	230	235
Benzoic acid	n	146000	0	2102400	4211538.5	5475000	8.42E+09	4	0
	c	0	0	0	0	0	0	0	0
Beryllium	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0.0013612	0.0007455	1.3309767	15.997317	3.466085	9998.323	4.3	8.4
Bis(2-chloroethyl)ether	n	0	0	0	0	0	0	0	0
	c	0.0091761	0.0053985	5.2029091	62.534965	13.54924	39084.35	1.1	1.16
Bis(2-chloroisopropyl)eth	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0.2607143	0.1789216	81.76	982.69231	212.9167	614182.7	0.07	0.035
Bis(chloromethyl)ether	n	0	0	0	0	0	0	0	0
	c	4.855E-05	2.886E-05	0.0260145	0.3126748	0.067746	195.4218	220	217
Bis(2-chloro-1-methyleth	n	0	0	0	0	0	0	0	0
	c	0.1508264	0.0894608	81.76	982.69231	212.9167	614182.7	0.07	0.07
Bis(2-ethylhexyl)phthalat	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	4.8026316	0	408.8	4913.4615	1064.583	3070913	0.014	0
Boron	n	41.160716	20.8415	47304	94759.615	123187.5	1.9E+08	0.09	0.00571
	c	0	0	0	0	0	0	0	0
Boron trifluoride	n	1.46	0.73	0	0	0	0	0	0.0002
	c	0	0	0	0	0	0	0	0
Bromodichloromethane	n	730	0	10512	21057.692	27375	42115385	0.02	0

	c	1.0844652	0	92.309677	1109.4913	240.3898	693432.1	0.062	0
Bromoethene	n	0	0	0	0	0	0	0	0
	c	0.1138592	0.0569296	0	0	0	0	0	0.11
Bromoform	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	2.3535372	1.6265597	724.4557	8707.4002	1886.603	5442125	0.0079	0.00385
Bromomethane	n	8.6991667	5.2195	751.608	1505.625	1957.313	3011250	0.00143	0.00143
	c	0	0	0	0	0	0	0	0
4-Bromophenyl phenyl et	n	2117	0	30484.8	61067.308	79387.5	1.22E+08	0.058	0
	c	0	0	0	0	0	0	0	0
1,3-Butadiene	n	0	0	0	0	0	0	0	0
	c	0.0127801	0.0063901	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0.98
1-Butanol	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Butyl benzyl phthalate	n	7300	0	105120	210576.92	273750	4.21E+08	0.2	0
	c	0	0	0	0	0	0	0	0
sec-Butylbenzene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
tert-Butylbenzene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
Butylphthalyl butylglycola	n	36500	0	525600	1052884.6	1368750	2.11E+09	1	0
	c	0	0	0	0	0	0	0	0
Cadmium	n	0.4075222	0.208415	262.8	526.44231	684.375	1052885	0.0005	5.71E-05
	c	0.001988	0.000994	0	0	0	0	0	6.3
Carbofuran	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
Carbon disulfide	n	1042.8571	730	52560	105288.46	136875	2.11E+08	0.1	0.2
	c	0	0	0	0	0	0	0	0
Carbon tetrachloride	n	3.5836527	2.08415	367.92	737.01923	958.125	1474038	0.0007	0.000571
	c	0.1632588	0.119281	44.024615	529.14201	114.6474	330713.8	0.13	0.0525
Chlordane	n	2.19	0	31.536	63.173077	82.125	126346.2	0.00006	0
	c	0.0081744	0.0048545	4.4024615	52.914201	11.46474	33071.38	1.3	1.29
Chlorimuron-ethyl	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
Chloroacetaldehyde	n	251.85	0	3626.64	7264.9038	9444.375	14529808	0.0069	0
	c	0	0	0	0	0	0	0	0
Chloroacetic acid	n	73	0	1051.2	2105.7692	2737.5	4211538	0.002	0
	c	0	0	0	0	0	0	0	0

2-Chloroacetophenone	n	0.062561	0.0312805	0	0	0	0					0	8.57E-06
	c	0	0	0	0	0	0					0	0
4-Chloroaniline	n	146	0	2102.4	4211.5385	5475	8423077					0.004	0
	c	0	0	0	0	0	0					0	0
Chlorobenzene	n	39.431463	20.8415	10512	21057.692	27375	42115385					0.02	0.00571
	c	0	0	0	0	0	0					0	0
2-Chloro-1,3-butadiene	n	14.313725	7.3	10512	21057.692	27375	42115385					0.02	0.002
	c	0	0	0	0	0	0					0	0
1-Chlorobutane	n	14600	0	210240	421153.85	547500	8.42E+08					0.4	0
	c	0	0	0	0	0	0					0	0
Chlorodibromomethane	n	730	0	10512	21057.692	27375	42115385					0.02	0
	c	0.8004386	0	68.133333	818.91026	177.4306	511818.9					0.084	0
1-Chloro-1,1-difluoroetha	n	104390	52195	0	0	0	0					0	14.3
	c	0	0	0	0	0	0					0	0
Chlorodifluoromethane	n	104390	52195	0	0	0	0					0	14.3
	c	0	0	0	0	0	0					0	0
Chloroethane	n	8591.7695	10439	210240	421153.85	547500	8.42E+08					0.4	2.86
	c	0	0	0	0	0	0					0	0
2-Chloroethyl vinyl ether	n	912.5	0	13140	26322.115	34218.75	52644231					0.025	0
	c	0	0	0	0	0	0					0	0
Chloroform	n	365	0	5256	10528.846	13687.5	21057692					0.01	0
	c	0.1534184	0.077792	938.22951	11276.797	2443.306	7047998					0.0061	0.0805
Chloromethane	n	0	0	0	0	0	0					0	0
	c	1.4360387	0.9940087	440.24615	5291.4201	1146.474	3307138					0.013	0.0063
4-Chloro-2,2-methylanilin	n	0	0	0	0	0	0					0	0
	c	0.146167	0	12.441739	149.54013	32.40036	93462.58					0.46	0
4-Chloro-2-methylaniline	n	0	0	0	0	0	0					0	0
	c	0.1159256	0	9.8675862	118.6008	25.69684	74125.5					0.58	0
beta-Chloronaphthalene	n	2920	0	42048	84230.769	109500	1.68E+08					0.08	0
	c	0	0	0	0	0	0					0	0
o-Chloronitrobenzene	n	0	0	0	0	0	0					0	0
	c	2.6894737	0	228.928	2751.5385	596.1667	1719712					0.025	0
p-Chloronitrobenzene	n	0	0	0	0	0	0					0	0
	c	3.7353801	0	317.95556	3821.5812	828.0093	2388488					0.018	0
2-Chlorophenol	n	182.5	0	2628	5264.4231	6843.75	10528846					0.005	0
	c	0	0	0	0	0	0					0	0
2-Chloropropane	n	208.78	104.39	0	0	0	0					0	0.0286

	c	0	0	0	0	0	0	0	0
o-Chlorotoluene	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
Chromium III	n	0.0041683	0.0020842	525600	1052884.6	1368750	2.11E+09	1	5.71E-07
	c	0	0	0	0	0	0	0	0
Chromium VI	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0.0002982	0.0001491	0	0	0	0	0	42
Cobalt	n	2190	0	31536	63173.077	82125	1.26E+08	0.06	0
	c	0	0	0	0	0	0	0	0
Copper	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Barium cyanide	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Calcium cyanide	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Chlorine cyanide	n	1825	0	26280	52644.231	68437.5	1.05E+08	0.05	0
	c	0	0	0	0	0	0	0	0
Copper cyanide	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
Free cyanide	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
Hydrogen cyanide	n	6.2029408	3.12805	10512	21057.692	27375	42115385	0.02	0.000857
	c	0	0	0	0	0	0	0	0
Potassium cyanide	n	1825	0	26280	52644.231	68437.5	1.05E+08	0.05	0
	c	0	0	0	0	0	0	0	0
Potassium silver cyanide	n	7300	0	105120	210576.92	273750	4.21E+08	0.2	0
	c	0	0	0	0	0	0	0	0
Silver cyanide	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Sodium cyanide	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Zinc cyanide	n	1825	0	26280	52644.231	68437.5	1.05E+08	0.05	0
	c	0	0	0	0	0	0	0	0
Cyclohexanone	n	182500	0	2628000	5264423.1	6843750	1.05E+10	5	0
	c	0	0	0	0	0	0	0	0
Cyclohexlamine	n	7300	0	105120	210576.92	273750	4.21E+08	0.2	0
	c	0	0	0	0	0	0	0	0

DDD	n	0	0	0	0	0	0	0	0
	c	0.2801535	0	23.846667	286.61859	62.10069	179136.6	0.24	0
DDE	n	0	0	0	0	0	0	0	0
	c	0.1977554	0	16.832941	202.319	43.83578	126449.4	0.34	0
DDT	n	18.25	0	262.8	526.44231	684.375	1052885	0.0005	0
	c	0.0310525	0.0184184	16.832941	202.319	43.83578	126449.4	0.34	0.34
Decabromodiphenyl ethe	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
Dibenzofuran	n	146	0	2102.4	4211.5385	5475	8423077	0.004	0
	c	0	0	0	0	0	0	0	0
1,4-Dibromobenzene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
1,2-Dibromo-3-chloropro	n	0.41683	0.208415	0	0	0	0	0	5.71E-05
	c	0.0475847	2.5877086	4.088	49.134615	10.64583	30709.13	1.4	0.00242
1,2-Dibromoethane	n	0.41683	0.208415	0	0	0	0	0	5.71E-05
	c	0.0007543	0.0081328	0.0673318	0.809276	0.175343	505.7975	85	0.77
Dibutyl phthalate	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
1,2-Dichlorobenzene	n	268.16327	146	47304	94759.615	123187.5	1.9E+08	0.09	0.04
	c	0	0	0	0	0	0	0	0
1,3-Dichlorobenzene	n	3248.5	0	46778.4	93706.731	121818.8	1.87E+08	0.089	0
	c	0	0	0	0	0	0	0	0
1,4-Dichlorobenzene	n	1671.7	835.85	0	0	0	0	0	0.229
	c	2.8015351	0	238.46667	2866.1859	621.0069	1791366	0.024	0
3,3-Dichlorobenzidine	n	0	0	0	0	0	0	0	0
	c	0.1494152	0	12.718222	152.86325	33.12037	95539.53	0.45	0
1,4-Dichloro-2-butene	n	0	0	0	0	0	0	0	0
	c	0.0013467	0.0006734	0	0	0	0	0	9.3
Dichlorodifluoromethane	n	394.31463	208.415	105120	210576.92	273750	4.21E+08	0.2	0.0571
	c	0	0	0	0	0	0	0	0
1,1-Dichloroethane	n	811.74184	521.95	52560	105288.46	136875	2.11E+08	0.1	0.143
	c	0	0	0	0	0	0	0	0
1,2-Dichloroethane(EDC)	n	20.878	10.439	0	0	0	0	0	0.00286
	c	0.1160203	0.068816	62.892308	755.91716	163.7821	472448.2	0.091	0.091
1,1-Dichloroethylene	n	328.5	0	4730.4	9475.9615	12318.75	18951923	0.009	0
	c	0.0436752	0.0357843	9.5386667	114.64744	24.84028	71654.65	0.6	0.175
1,2-Dichloroethylene(cis)	n	365	0	5256	10528.846	13687.5	21057692	0.01	0

	c	0	0	0	0	0	0	0	0
1,2-Dichloroethylene(tran	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
1,2-Dichloroethylene(mix	n	328.5	0	4730.4	9475.9615	12318.75	18951923	0.009	0
	c	0	0	0	0	0	0	0	0
2,4-Dichlorophenol	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0	0	0	0	0	0	0	0
2,4-Dichlorophenoxyaceti	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
4-(2,3-Dichlorophenoxy)b	n	292	0	4204.8	8423.0769	10950	16846154	0.008	0
	c	0	0	0	0	0	0	0	0
1,2-Dichloropropane	n	8.322	4.161	0	0	0	0	0	0.00114
	c	0.9887771	0	84.164706	1011.595	219.1789	632246.9	0.068	0
2,3-Dichloropropanol	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0	0	0	0	0	0	0	0
1,3-Dichloropropene	n	8.671914	20.8415	157.68	315.86538	410.625	631730.8	0.0003	0.00571
	c	0.0770274	0.0481712	32.704	393.07692	85.16667	245673.1	0.175	0.13
Dieldrin	n	1.825	0	26.28	52.644231	68.4375	105288.5	0.00005	0
	c	0.0006564	0.000389	0.3577	4.2992788	0.93151	2687.049	16	16.1
Diethyl phthalate	n	29200	0	420480	842307.69	1095000	1.68E+09	0.8	0
	c	0	0	0	0	0	0	0	0
Diethylene glycol,monob	n	41.683	20.8415	0	0	0	0	0	0.00571
	c	0	0	0	0	0	0	0	0
Diethylene glycol, monoe	n	73000	0	1051200	2105769.2	2737500	4.21E+09	2	0
	c	0	0	0	0	0	0	0	0
Diethylformide	n	401.5	0	5781.6	11581.731	15056.25	23163462	0.011	0
	c	0	0	0	0	0	0	0	0
Di(2-ethylhexyl)adipate	n	21900	0	315360	631730.77	821250	1.26E+09	0.6	0
	c	56.030702	0	4769.3333	57323.718	12420.14	35827324	0.0012	0
Diethylstilbestrol	n	0	0	0	0	0	0	0	0
	c	0.0001431	0	0.012177	0.1463584	0.031711	91.47402	470	0
Diflubenzuron	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
1,1-Difluoroethane	n	83220	41610	0	0	0	0	0	11.4
	c	0	0	0	0	0	0	0	0
Diisopropyl methylphosp	n	2920	0	42048	84230.769	109500	1.68E+08	0.08	0
	c	0	0	0	0	0	0	0	0

3,3-Dimethoxybenzidine	n	0		0		0		0		0		0					0		0
	c	4.8026316		0		408.8		4913.4615		1064.583		3070913					0.014		0
Dimethylamine	n	0.041683		0.0208415		0		0		0		0					0		5.71E-06
	c	0		0		0		0		0		0					0		0
2,4-Dimethylaniline hydr	n	0		0		0		0		0		0					0		0
	c	0.1159256		0		9.8675862		118.6008		25.69684		74125.5					0.58		0
2,4-Dimethylaniline	n	0		0		0		0		0		0					0		0
	c	0.0896491		0		7.6309333		91.717949		19.87222		57323.72					0.75		0
n-n-Dimethylaniline	n	73		0		1051.2		2105.7692		2737.5		4211538					0.002		0
	c	0		0		0		0		0		0					0		0
3,3-Dimethylbenzidine	n	0		0		0		0		0		0					0		0
	c	0.0073084		0		0.622087		7.4770067		1.620018		4673.129					9.2		0
n,n-Dimethylformamide	n	61.506774		31.2805		52560		105288.46		136875		2.11E+08					0.1		0.00857
	c	0		0		0		0		0		0					0		0
1,1-Dimethylhydrazine	n	0		0		0		0		0		0					0		0
	c	0.0031435		0.0017892		2.2012308		26.457101		5.732372		16535.69					2.6		3.5
1,2-Dimethylhydrazine	n	0		0		0		0		0		0					0		0
	c	0.0002853		0.0001693		0.1546811		1.8591476		0.402815		1161.967					37		37
2,4-Dimethylphenol	n	730		0		10512		21057.692		27375		42115385					0.02		0
	c	0		0		0		0		0		0					0		0
2,6-Dimethylphenol	n	21.9		0		315.36		631.73077		821.25		1263462					0.0006		0
	c	0		0		0		0		0		0					0		0
3,4-Dimethylphenol	n	36.5		0		525.6		1052.8846		1368.75		2105769					0.001		0
	c	0		0		0		0		0		0					0		0
Dimethyl phthalate	n	365000		0		5256000		10528846		13687500		2.11E+10					10		0
	c	0		0		0		0		0		0					0		0
Dimethyl terephthalate	n	3650		0		52560		105288.46		136875		2.11E+08					0.1		0
	c	0		0		0		0		0		0					0		0
1,2-Dinitrobenzene	n	14.6		0		210.24		421.15385		547.5		842307.7					0.0004		0
	c	0		0		0		0		0		0					0		0
1,3-Dinitrobenzene	n	3.65		0		52.56		105.28846		136.875		210576.9					0.0001		0
	c	0		0		0		0		0		0					0		0
1,4-Dinitrobenzene	n	14.6		0		210.24		421.15385		547.5		842307.7					0.0004		0
	c	0		0		0		0		0		0					0		0
4,6-Dinitro-o-cyclohexyl	n	73		0		1051.2		2105.7692		2737.5		4211538					0.002		0
	c	0		0		0		0		0		0					0		0
2,4-Dinitrophenol	n	73		0		1051.2		2105.7692		2737.5		4211538					0.002		0

	c	0	0	0	0	0	0				0	0
Dinitrotoluene mixture	n	0	0	0	0	0	0				0	0
	c	0.0988777	0	8.4164706	101.1595	21.91789	63224.69				0.68	0
2,4-Dinitrotoluene	n	73	0	1051.2	2105.7692	2737.5	4211538				0.002	0
	c	0	0	0	0	0	0				0	0
2,6-Dinitrotoluene	n	36.5	0	525.6	1052.8846	1368.75	2105769				0.001	0
	c	0	0	0	0	0	0				0	0
Di-n-octyl phthalate	n	730	0	10512	21057.692	27375	42115385				0.02	0
	c	0	0	0	0	0	0				0	0
1,4-Dioxane	n	0	0	0	0	0	0				0	0
	c	6.1124402	0	520.29091	6253.4965	1354.924	3908435				0.011	0
Diphenylamine	n	912.5	0	13140	26322.115	34218.75	52644231				0.025	0
	c	0	0	0	0	0	0				0	0
1,2-Diphenylhydrazine	n	0	0	0	0	0	0				0	0
	c	0.0136281	0.0081328	7.154	85.985577	18.63021	53740.99				0.8	0.77
Endosulfan	n	219	0	3153.6	6317.3077	8212.5	12634615				0.006	0
	c	0	0	0	0	0	0				0	0
Endrin	n	10.95	0	157.68	315.86538	410.625	631730.8				0.0003	0
	c	0	0	0	0	0	0				0	0
Epichlorohydrin	n	2.0297492	1.0439	1051.2	2105.7692	2737.5	4211538				0.002	0.000286
	c	2.0721817	1.4910131	578.10101	6948.3294	1505.471	4342706				0.0099	0.0042
1,2-Epoxybutane	n	41.683	20.8415	0	0	0	0				0	0.00571
	c	0	0	0	0	0	0				0	0
2-Ethoxyethanol acetate	n	10950	0	157680	315865.38	410625	6.32E+08				0.3	0
	c	0	0	0	0	0	0				0	0
2-Ethoxyethanol	n	405.25983	208.415	210240	421153.85	547500	8.42E+08				0.4	0.0571
	c	0	0	0	0	0	0				0	0
Ethyl acrylate	n	0	0	0	0	0	0				0	0
	c	1.4007675	0	119.23333	1433.0929	310.5035	895683.1				0.048	0
EPTC (S-Ethyl dipropylth	n	912.5	0	13140	26322.115	34218.75	52644231				0.025	0
	c	0	0	0	0	0	0				0	0
Ethyl acetate	n	32850	0	473040	947596.15	1231875	1.9E+09				0.9	0
	c	0	0	0	0	0	0				0	0
Ethylbenzene	n	1328.117	1043.9	52560	105288.46	136875	2.11E+08				0.1	0.286
	c	0	0	0	0	0	0				0	0
Ethylene cyanohydrin	n	10950	0	157680	315865.38	410625	6.32E+08				0.3	0
	c	0	0	0	0	0	0				0	0

Ethylene diamine	n	730	0	10512	21057.692	27375	42115385				0.02	0
	c	0	0	0	0	0	0				0	0
Ethylene glycol	n	73000	0	1051200	2105769.2	2737500	4.21E+09				2	0
	c	0	0	0	0	0	0				0	0
Ethylene glycol, monobut	n	41.683	20.8415	0	0	0	0				0	0.00571
	c	0	0	0	0	0	0				0	0
Ethylene oxide	n	0	0	0	0	0	0				0	0
	c	0.0231935	0.0178922	5.6109804	67.439668	14.61193	42149.79				1.02	0.35
Ethylene thiourea (ETU)	n	2.92	0	42.048	84.230769	109.5	168461.5				0.00008	0
	c	0.5650155	0	48.094118	578.0543	125.2451	361283.9				0.119	0
Ethyl ether	n	7300	0	105120	210576.92	273750	4.21E+08				0.2	0
	c	0	0	0	0	0	0				0	0
Ethyl methacrylate	n	3285	0	47304	94759.615	123187.5	1.9E+08				0.09	0
	c	0	0	0	0	0	0				0	0
Ethyl p-nitrophenyl pheny	n	0.365	0	5.256	10.528846	13.6875	21057.69				0.00001	0
	c	0	0	0	0	0	0				0	0
Ethylnitosourea	n	0	0	0	0	0	0				0	0
	c	0.0004803	0	0.04088	0.4913462	0.106458	307.0913				140	0
Ethylphthalyl ethyl glycol	n	109500	0	1576800	3158653.8	4106250	6.32E+09				3	0
	c	0	0	0	0	0	0				0	0
Fluoride	n	2190	0	31536	63173.077	82125	1.26E+08				0.06	0
	c	0	0	0	0	0	0				0	0
Fluoridone	n	2920	0	42048	84230.769	109500	1.68E+08				0.08	0
	c	0	0	0	0	0	0				0	0
Formaldihyde	n	7300	0	105120	210576.92	273750	4.21E+08				0.2	0
	c	0.275264	0.137632	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				0	0.0455
Formic acid	n	73000	0	1051200	2105769.2	2737500	4.21E+09				2	0
	c	0	0	0	0	0	0				0	0
Fosetyl-al	n	109500	0	1576800	3158653.8	4106250	6.32E+09				3	0
	c	0	0	0	0	0	0				0	0
Furan	n	36.5	0	525.6	1052.8846	1368.75	2105769				0.001	0
	c	0	0	0	0	0	0				0	0
Furazolidone	n	0	0	0	0	0	0				0	0
	c	0.0176939	0	1.5061053	18.102227	3.922149	11313.89				3.8	0
HCH(alpha)	n	0	0	0	0	0	0				0	0
	c	0.0016758	0.000994	0.9084444	10.918803	2.365741	6824.252				6.3	6.3
HCH(beta)	n	0	0	0	0	0	0				0	0

	c	0.0058655	0.003479	3.1795556	38.215812	8.280093	23884.88				1.8	1.8
HCH(gamma) Lindane	n	10.95	0	157.68	315.86538	410.625	631730.8				0.0003	0
	c	0.0517206	#DIV/0!	4.4024615	52.914201	11.46474	33071.38				1.3	0
HCH-technical	n	0	0	0	0	0	0				0	0
	c	0.0058931	0.0034985	3.1795556	38.215812	8.280093	23884.88				1.8	1.79
Heptachlor	n	18.25	0	262.8	526.44231	684.375	1052885				0.0005	0
	c	0.0023244	0.0013763	1.2718222	15.286325	3.312037	9553.953				4.5	4.55
Heptachlor epoxide	n	0.4745	0	6.8328	13.6875	17.79375	27375				0.000013	0
	c	0.0011602	0.0006882	0.6289231	7.5591716	1.637821	4724.482				9.1	9.1
Hexabromobenzene	n	73	0	1051.2	2105.7692	2737.5	4211538				0.002	0
	c	0	0	0	0	0	0				0	0
Hexachlorobenzene	n	29.2	0	420.48	842.30769	1095	1684615				0.0008	0
	c	0.0065641	0.0038896	3.577	42.992788	9.315104	26870.49				1.6	1.61
Hexachlorobutadiene	n	7.3	0	105.12	210.57692	273.75	421153.8				0.0002	0
	c	0.1368359	0.081328	73.374359	881.90335	191.0791	551189.6				0.078	0.077
Hexachlorocyclopentadie	n	0.1459166	0.073	3679.2	7370.1923	9581.25	14740385				0.007	0.00002
	c	0	0	0	0	0	0				0	0
Hexachlorodibenzo-p-dio	n	0	0	0	0	0	0				0	0
	c	2.188E-06	1.376E-06	0.0009084	0.0109188	0.002366	6.824252				6300	4550
Hexachloroethane	n	36.5	0	525.6	1052.8846	1368.75	2105769				0.001	0
	c	0.7541322	0.4473039	408.8	4913.4615	1064.583	3070913				0.014	0.014
Hexachlorophene	n	10.95	0	157.68	315.86538	410.625	631730.8				0.0003	0
	c	0	0	0	0	0	0				0	0
Hexahydro-1,3,5-trinitro-	n	109.5	0	1576.8	3158.6538	4106.25	6317308				0.003	0
	c	0.611244	0	52.029091	625.34965	135.4924	390843.5				0.11	0
1,6-Hexamethylene diiso	n	0.020878	0.010439	0	0	0	0				0	2.86E-06
	c	0	0	0	0	0	0				0	0
n-Hexane	n	350.17922	208.415	31536	63173.077	82125	1.26E+08				0.06	0.0571
	c	0	0	0	0	0	0				0	0
Hexazinone	n	1204.5	0	17344.8	34745.192	45168.75	69490385				0.033	0
	c	0	0	0	0	0	0				0	0
Hydrazine, hydrazine sulf	n	0	0	0	0	0	0				0	0
	c	0.0007092	0.0003662	1.9077333	22.929487	4.968056	14330.93				3	17.1
Hydrogen chloride	n	41.683	20.8415	0	0	0	0				0	0.00571
	c	0	0	0	0	0	0				0	0
Hydrogen sulfide	n	2.0417076	1.04025	1576.8	3158.6538	4106.25	6317308				0.003	0.000285
	c	0	0	0	0	0	0				0	0

Iron	n	10950		0		157680		315865.38		410625		6.32E+08				0.3		0
	c	0		0		0		0		0		0				0		0
Isobutanol	n	10950		0		157680		315865.38		410625		6.32E+08				0.3		0
	c	0		0		0		0		0		0				0		0
Isopropalin	n	547.5		0		7884		15793.269		20531.25		31586538				0.015		0
	c	0		0		0		0		0		0				0		0
Isopropyl methyl phosph	n	3650		0		52560		105288.46		136875		2.11E+08				0.1		0
	c	0		0		0		0		0		0				0		0
Kepone	n	0		0		0		0		0		0				0		0
	c	0.0037354		0		0.3179556		3.8215812		0.828009		2388.488				18		0
Lithium	n	730		0		10512		21057.692		27375		42115385				0.02		0
	c	0		0		0		0		0		0				0		0
Malathion	n	730		0		10512		21057.692		27375		42115385				0.02		0
	c	0		0		0		0		0		0				0		0
Manganese	n	0.104377		0.052195		12088.8		24216.346		31481.25		48432692				0.023		1.43E-05
	c	0		0		0		0		0		0				0		0
Mercuric chloride	n	10.95		0		157.68		315.86538		410.625		631730.8				0.0003		0
	c	0		0		0		0		0		0				0		0
Mercury	n	0.5917986		0.312805		157.68		315.86538		410.625		631730.8				0.0003		8.57E-05
	c	0		0		0		0		0		0				0		0
Methyl mercury	n	3.65		0		52.56		105.28846		136.875		210576.9				0.0001		0
	c	0		0		0		0		0		0				0		0
Methanol	n	18250		0		262800		526442.31		684375		1.05E+09				0.5		0
	c	0		0		0		0		0		0				0		0
Methoxychlor	n	182.5		0		2628		5264.4231		6843.75		10528846				0.005		0
	c	0		0		0		0		0		0				0		0
2-Methoxyethanol acetat	n	73		0		1051.2		2105.7692		2737.5		4211538				0.002		0
	c	0		0		0		0		0		0				0		0
2-Methoxyethanol	n	19.459851		20.8415		525.6		1052.8846		1368.75		2105769				0.001		0.00571
	c	0		0		0		0		0		0				0		0
2-Methoxy-5-nitroaniline	n	0		0		0		0		0		0				0		0
	c	1.4616705		0		124.41739		1495.4013		324.0036		934625.8				0.046		0
Methyl acetate	n	36500		0		525600		1052884.6		1368750		2.11E+09				1		0
	c	0		0		0		0		0		0				0		0
Methyl acrylate	n	1095		0		15768		31586.538		41062.5		63173077				0.03		0
	c	0		0		0		0		0		0				0		0
2-Methylaniline hydrochl	n	0		0		0		0		0		0				0		0

	c	0.373538	0	31.795556	382.15812	82.80093	238848.8	0.18	0
2-Methylaniline	n	0	0	0	0	0	0	0	0
	c	0.2801535	0	23.846667	286.61859	62.10069	179136.6	0.24	0
Methyl chlorocarbonate	n	36500	0	525600	1052884.6	1368750	2.11E+09	1	0
	c	0	0	0	0	0	0	0	0
4-(2-Methyl-4-chlorophen	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
2-Methyl-4-chlorophenox	n	18.25	0	262.8	526.44231	684.375	1052885	0.0005	0
	c	0	0	0	0	0	0	0	0
2-(2-Methyl-14-chlorophe	n	36.5	0	525.6	1052.8846	1368.75	2105769	0.001	0
	c	0	0	0	0	0	0	0	0
Methylcyclohexane	n	6256.1	3128.05	0	0	0	0	0	0.857
	c	0	0	0	0	0	0	0	0
Methylene bromide	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
Methylene chloride	n	1622.1521	3128.05	31536	63173.077	82125	1.26E+08	0.06	0.857
	c	4.1238944	3.8184481	763.09333	9171.7949	1987.222	5732372	0.0075	0.00164
4,4-Methylene bis(2-chlor	n	25.55	0	367.92	737.01923	958.125	1474038	0.0007	0
	c	0.0812142	0.0481712	44.024615	529.14201	114.6474	330713.8	0.13	0.13
4,4-Methylenebisbenzen	n	0	0	0	0	0	0	0	0
	c	0.2689474	0	22.8928	275.15385	59.61667	171971.2	0.25	0
4,4-Methylene bis(N,N-di	n	0	0	0	0	0	0	0	0
	c	1.4616705	0	124.41739	1495.4013	324.0036	934625.8	0.046	0
4,4-Methylenediphenyl is	n	0.041683	0.0208415	0	0	0	0	0	5.71E-06
	c	0	0	0	0	0	0	0	0
Methyl ethyl ketone	n	1906.0864	1043.9	315360	631730.77	821250	1.26E+09	0.6	0.286
	c	0	0	0	0	0	0	0	0
Methyl hydrazine	n	0	0	0	0	0	0	0	0
	c	0.0611244	0	5.2029091	62.534965	13.54924	39084.35	1.1	0
Methyl isobutyl ketone	n	158.11776	83.585	42048	84230.769	109500	1.68E+08	0.08	0.0229
	c	0	0	0	0	0	0	0	0
2-Methyl-5-nitroaniline	n	0	0	0	0	0	0	0	0
	c	2.0374801	0	173.4303	2084.4988	451.6414	1302812	0.033	0
Methyl parathion	n	9.125	0	131.4	263.22115	342.1875	526442.3	0.00025	0
	c	0	0	0	0	0	0	0	0
2-Methylphenol(o-cresol)	n	1825	0	26280	52644.231	68437.5	1.05E+08	0.05	0
	c	0	0	0	0	0	0	0	0

2-Methylphenol(m-cresol	n	1825	0	26280	52644.231	68437.5	1.05E+08	0.05	0
	c	0	0	0	0	0	0	0	0
2-Methylphenol(p-cresol)	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
Molybdenum	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
2-Naphthylamine	n	0	0	0	0	0	0	0	0
	c	0.0005172	0	0.0440246	0.529142	0.114647	330.7138	130	0
Nickel	n	730	0	10512	21057.692	27375	42115385	0.02	0
	c	0	0	0	0	0	0	0	0
Nickel subsulfide	n	0	0	0	0	0	0	0	0
	c	0	0.0036837	0	0	0	0	0	1.7
Nitrate	n	58400	0	840960	1684615.4	2190000	3.37E+09	1.6	0
	c	0	0	0	0	0	0	0	0
Nitric oxide	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
Nitrite	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
2-Nitroaniline	n	0.3501792	0.208415	31.536	63.173077	82.125	126346.2	0.00006	5.71E-05
	c	0	0	0	0	0	0	0	0
3-Nitroaniline	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0	0	0	0	0	0	0	0
4-Nitroaniline	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0	0	0	0	0	0	0	0
Nitrobenzene	n	3.3932758	2.08415	262.8	526.44231	684.375	1052885	0.0005	0.000571
	c	0	0	0	0	0	0	0	0
Nitrogen dioxide	n	36500	0	525600	1052884.6	1368750	2.11E+09	1	0
	c	0	0	0	0	0	0	0	0
Nitroguanidine	n	3650	0	52560	105288.46	136875	2.11E+08	0.1	0
	c	0	0	0	0	0	0	0	0
4-Nitrophenol	n	2190	0	31536	63173.077	82125	1.26E+08	0.06	0
	c	0	0	0	0	0	0	0	0
2-Nitropropane	n	41.683	20.8415	0	0	0	0	0	0.00571
	c	0.0013324	0.0006662	0	0	0	0	0	9.4
N-Nitrosodi-n-butylamine	n	0	0	0	0	0	0	0	0
	c	0.001896	0.0011183	1.0598519	12.738604	2.760031	7961.627	5.4	5.6
N-Nitrosodiethanolamine	n	0	0	0	0	0	0	0	0

	c	0.0240132	0	2.044	24.567308	5.322917	15354.57	2.8	0
N-Nitrosodiethylamine	n	0	0	0	0	0	0	0	0
	c	6.999E-05	4.147E-05	0.0381547	0.4585897	0.099361	286.6186	150	151
N-Nitrosodimethylamine	n	0	0	0	0	0	0	0	0
	c	0.0002141	0.0001278	0.1122196	1.3487934	0.292239	842.9959	51	49
N-Nitrosodiphenylamine	n	0	0	0	0	0	0	0	0
	c	13.721805	#DIV/0!	1168	14038.462	3041.667	8774038	0.0049	0
N-Nitroso di-n-propylami	n	0	0	0	0	0	0	0	0
	c	0.0096053	#DIV/0!	0.8176	9.8269231	2.129167	6141.827	7	0
N-Nitroso-N-methylethyla	n	0	0	0	0	0	0	0	0
	c	0.0030562	#DIV/0!	0.2601455	3.1267483	0.677462	1954.218	22	0
N-Nitrosopyrrolidine	n	0	0	0	0	0	0	0	0
	c	0.0049677	0.00294	2.7253333	32.75641	7.097222	20472.76	2.1	2.13
m-Nitrotoluene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
o-Nitrotoluene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
p-Nitrotoluene	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	0	0	0	0	0	0	0	0
Octabromodiphenyl ether	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0	0	0	0	0	0	0	0
Octamethylpyrophosphor	n	73	0	1051.2	2105.7692	2737.5	4211538	0.002	0
	c	0	0	0	0	0	0	0	0
Pentachlorobenzene	n	29.2	0	420.48	842.30769	1095	1684615	0.0008	0
	c	0	0	0	0	0	0	0	0
Pentachloronitrobenzene	n	109.5	0	1576.8	3158.6538	4106.25	6317308	0.003	0
	c	0.2586032	0	22.012308	264.57101	57.32372	165356.9	0.26	0
Pentachlorophenol	n	1095	0	15768	31586.538	41062.5	63173077	0.03	0
	c	0.560307	0	47.693333	573.23718	124.2014	358273.2	0.12	0
Phenol	n	21900	0	315360	631730.77	821250	1.26E+09	0.6	0
	c	0	0	0	0	0	0	0	0
Phosphoric acid	n	20.878	10.439	0	0	0	0	0	0.00286
	c	0	0	0	0	0	0	0	0
Phosphorus (white)	n	0.73	0	10.512	21.057692	27.375	42115.38	0.00002	0
	c	0	0	0	0	0	0	0	0
Picloram	n	2555	0	36792	73701.923	95812.5	1.47E+08	0.07	0
	c	0	0	0	0	0	0	0	0

Polybromated biphenyls	n	0.2555	0	3.6792	7.3701923	9.58125	14740.38	0.000007	0
	c	0.0075547	0	0.6430562	7.7290406	1.674625	4830.65	8.9	0
Polychloronated biphenyl	n	0	0	0	0	0	0	0	0
	c	0.0087321	0	0.7432727	8.9335664	1.935606	5583.479	7.7	0
Aroclor 1016	n	2.555	0	36.792	73.701923	95.8125	147403.8	0.00007	0
	c	0	0	0	0	0	0	0	0
Aroclor 1254	n	0.73	0	10.512	21.057692	27.375	42115.38	0.00002	0
	c	0	0	0	0	0	0	0	0
Polynuclear aromatic hyd	n	0	0	0	0	0	0	0	0
	c	0	0	0	0	0	0	0	0
Acenaphthalene	n	2190	0	31536	63173.077	82125	1.26E+08	0.06	0
	c	0	0	0	0	0	0	0	0
Anthracene	n	10950	0	157680	315865.38	410625	6.32E+08	0.3	0
	c	0	0	0	0	0	0	0	0
Benz[a]anthracene	n	0	0	0	0	0	0	0	0
	c	0.0167893	0.010266	7.84	94.230769	20.41667	58894.23	0.73	0.61
Benzo[b]fluoranthene	n	0	0	0	0	0	0	0	0
	c	0.0167893	0.010266	7.84	94.230769	20.41667	58894.23	0.73	0.61
Benzo[k]fluoranthene	n	0	0	0	0	0	0	0	0
	c	0.1678933	0.1026599	78.4	942.30769	204.1667	588942.3	0.073	0.061
Benzo[a]pyrene	n	0	0	0	0	0	0	0	0
	c	0.0016789	0.0010266	0.784	9.4230769	2.041667	5889.423	7.3	6.1
Carbazole	n	0	0	0	0	0	0	0	0
	c	3.3618421	0	286.16	3439.4231	745.2083	2149639	0.02	0
Chrysene	n	0	0	0	0	0	0	0	0
	c	1.6789328	1.0265992	784	9423.0769	2041.667	5889423	0.0073	0.0061
Dibenz{ah}anthracene	n	0	0	0	0	0	0	0	0
	c	0.0016789	0.0010266	0.784	9.4230769	2.041667	5889.423	7.3	6.1
Fluoranthene	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Fluorene	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Indeno[1,2,3-cd]pyrene	n	0	0	0	0	0	0	0	0
	c	0.0167893	0.010266	7.84	94.230769	20.41667	58894.23	0.73	0.61
Naphthalene	n	1460	0	21024	42115.385	54750	84230769	0.04	0
	c	0	0	0	0	0	0	0	0
Pyrene	n	1095	0	15768	31586.538	41062.5	63173077	0.03	0

	c	0	0	0	0	0	0	0	0
Rotenone	n	146	0	2102.4	4211.5385	5475	8423077	0.004	0
	c	0	0	0	0	0	0	0	0
Selenium	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
Silver	n	182.5	0	2628	5264.4231	6843.75	10528846	0.005	0
	c	0	0	0	0	0	0	0	0
Sodium diethyldithiocarb	n	1095	0	15768	31586.538	41062.5	63173077	0.03	0
	c	0.2490253	0	21.197037	254.77208	55.20062	159232.5	0.27	0
Sodium fluoroacetate	n	0.73	0	10.512	21.057692	27.375	42115.38	0.00002	0
	c	0	0	0	0	0	0	0	0
Strontium	n	21900	0	315360	631730.77	821250	1.26E+09	0.6	0
	c	0	0	0	0	0	0	0	0
2,3,7,8-TCDD(dioxin)	n	0	0	0	0	0	0	0	0
	c	8.634E-08	5.398E-08	3.669E-05	0.000441	9.55E-05	0.275595	156000	116000
1,2,4,5-Tetrachlorobenze	n	10.95	0	157.68	315.86538	410.625	631730.8	0.0003	0
	c	0	0	0	0	0	0	0	0
1,1,1,2-Tetrachloroethan	n	1095	0	15768	31586.538	41062.5	63173077	0.03	0
	c	0.4073921	0.2417859	220.12308	2645.7101	573.2372	1653569	0.026	0.0259
1,1,2,2-Tetrachloroethan	n	0	0	0	0	0	0	0	0
	c	0.5213009	0.3084855	286.16	3439.4231	745.2083	2149639	0.02	0.0203
Tetrachloroethylene(PCE	n	365	0	5256	10528.846	13687.5	21057692	0.01	0
	c	1.068984	3.0848546	110.06154	1322.855	286.6186	826784.4	0.052	0.00203
2,3,4,6-Tetrachloropheno	n	1095	0	15768	31586.538	41062.5	63173077	0.03	0
	c	0	0	0	0	0	0	0	0
p,a,a,a-Tetrachlorotoluen	n	0	0	0	0	0	0	0	0
	c	0.0033618	0	0.28616	3.4394231	0.745208	2149.639	20	0
Tetraethyldithiopyrophos	n	18.25	0	262.8	526.44231	684.375	1052885	0.0005	0
	c	0	0	0	0	0	0	0	0
Tetraethyl lead	n	0.00365	0	0.05256	0.1052885	0.136875	210.5769	1E-07	0
	c	0	0	0	0	0	0	0	0
1,1,1,2-Tetrafluoroethane	n	0	83585	0	0	0	0	0	22.9
	c	0	0	0	0	0	0	0	0
Thallium	n	0	0	0	0	0	0	0	0
	c	0	0	0	0	0	0	0	0
Thallium acetate	n	3.285	0	47.304	94.759615	123.1875	189519.2	0.00009	0
	c	0	0	0	0	0	0	0	0

Thallium carbonate	n	2.92	0	42.048	84.230769	109.5	168461.5				0.00008	0
	c	0	0	0	0	0	0				0	0
Thallium chloride	n	2.92	0	42.048	84.230769	109.5	168461.5				0.00008	0
	c	0	0	0	0	0	0				0	0
Thallium nitrate	n	3.285	0	47.304	94.759615	123.1875	189519.2				0.00009	0
	c	0	0	0	0	0	0				0	0
Thallium selenite	n	3.285	0	47.304	94.759615	123.1875	189519.2				0.00009	0
	c	0	0	0	0	0	0				0	0
Thallium sulfate	n	2.92	0	42.048	84.230769	109.5	168461.5				0.00008	0
	c	0	0	0	0	0	0				0	0
2-(Thiocyanomethylthio)-	n	1095	0	15768	31586.538	41062.5	63173077				0.03	0
	c	0	0	0	0	0	0				0	0
Tin	n	21900	0	315360	631730.77	821250	1.26E+09				0.6	0
	c	0	0	0	0	0	0				0	0
Toluene	n	747.0377	416.1	105120	210576.92	273750	4.21E+08				0.2	0.114
	c	0	0	0	0	0	0				0	0
Toluene-2,4-diamine	n	0	0	0	0	0	0				0	0
	c	0.0210115	0	1.7885	21.496394	4.657552	13435.25				3.2	0
Toluene-2,5-diamine	n	21900	0	315360	631730.77	821250	1.26E+09				0.6	0
	c	0	0	0	0	0	0				0	0
Toluene-2,6-diamine	n	7300	0	105120	210576.92	273750	4.21E+08				0.2	0
	c	0	0	0	0	0	0				0	0
p-Toluidine	n	0	0	0	0	0	0				0	0
	c	0.3538781	0	30.122105	362.04453	78.44298	226277.8				0.19	0
1,2,4-Tribromobenzene	n	182.5	0	2628	5264.4231	6843.75	10528846				0.005	0
	c	0	0	0	0	0	0				0	0
2,4,6-Trichloroaniline hyd	n	0	0	0	0	0	0				0	0
	c	2.3185118	0	197.35172	2372.0159	513.9368	1482510				0.029	0
2,4,6-Trichloroaniline	n	0	0	0	0	0	0				0	0
	c	1.9775542	0	168.32941	2023.19	438.3578	1264494				0.034	0
1,2,4-Trichlorobenzene	n	194.59851	208.415	5256	10528.846	13687.5	21057692				0.01	0.0571
	c	0	0	0	0	0	0				0	0
1,1,1-Trichloroethane	n	792.54881	1043.9	18396	36850.962	47906.25	73701923				0.035	0.286
	c	0	0	0	0	0	0				0	0
1,1,2-Trichloroethane	n	146	0	2102.4	4211.5385	5475	8423077				0.004	0
	c	0.1880059	0.111826	100.40702	1206.8151	261.4766	754259.4				0.057	0.056
Trichloroethylene(TCE)	n	219	0	3153.6	6317.3077	8212.5	12634615				0.006	0

	c	1.5560292		1.0437092		520.29091		6253.4965		1354.924		3908435					0.011		0.006
Trichlorofluoromethane	n	1288.2353		730		157680		315865.38		410625		6.32E+08					0.3		0.2
	c	0		0		0		0		0		0					0		0
2,4,5-Trichlorophenol	n	3650		0		52560		105288.46		136875		2.11E+08					0.1		0
	c	0		0		0		0		0		0					0		0
2,4,6-Trichlorophenol	n	0		0		0		0		0		0					0		0
	c	0.9672168		0.5745188		520.29091		6253.4965		1354.924		3908435					0.011		0.0109
2,4,5-Trichlorophenoxyac	n	365		0		5256		10528.846		13687.5		21057692					0.01		0
	c	0		0		0		0		0		0					0		0
2-(2,4,5-Trichlorophenox	n	292		0		4204.8		8423.0769		10950		16846154					0.008		0
	c	0		0		0		0		0		0					0		0
1,1,2-Trichloropropane	n	182.5		0		2628		5264.4231		6843.75		10528846					0.005		0
	c	0		0		0		0		0		0					0		0
1,2,3-Trichloropropane	n	219		0		3153.6		6317.3077		8212.5		12634615					0.006		0
	c	0.0096053		0		0.8176		9.8269231		2.129167		6141.827					7		0
1,2,3-Trichloropropene	n	182.5		0		2628		5264.4231		6843.75		10528846					0.005		0
	c	0		0		0		0		0		0					0		0
1,1,2-Trichloro-1,2,2-trifl	n	59179.857		31280.5		15768000		31586538		41062500		6.32E+10					30		8.57
	c	0		0		0		0		0		0					0		0
1,2,4-Trimethylbenzene	n	1825		0		26280		52644.231		68437.5		1.05E+08					0.05		0
	c	0		0		0		0		0		0					0		0
1,3,5-Trimethylbenzene	n	1825		0		26280		52644.231		68437.5		1.05E+08					0.05		0
	c	0		0		0		0		0		0					0		0
1,3,5-Trinitrobenzene	n	1.825		0		26.28		52.644231		68.4375		105288.5					0.00005		0
	c	0		0		0		0		0		0					0		0
trinitrophenylmethylnitra	n	365		0		5256		10528.846		13687.5		21057692					0.01		0
	c	0		0		0		0		0		0					0		0
2,4,6-Trinitrotoluene	n	18.25		0		262.8		526.44231		684.375		1052885					0.0005		0
	c	2.2412281		0		190.77333		2292.9487		496.8056		1433093					0.03		0
Uranium	n	109.5		0		1576.8		3158.6538		4106.25		6317308					0.003		0
	c	0		0		0		0		0		0					0		0
Vanadium	n	255.5		0		3679.2		7370.1923		9581.25		14740385					0.007		0
	c	0		0		0		0		0		0					0		0
Vanadium pentoxide	n	328.5		0		4730.4		9475.9615		12318.75		18951923					0.009		0
	c	0		0		0		0		0		0					0		0
Vanadium sulfate	n	730		0		10512		21057.692		27375		42115385					0.02		0
	c	0		0		0		0		0		0					0		0

Vinyl acetate	n	412.12355	208.415	525600	1052884.6	1368750	2.11E+09	1	0.0571
	c	0	0	0	0	0	0	0	0
Vinyl bromide	n	6.2561	3.12805	0	0	0	0	0	0.000857
	c	0	0	0	0	0	0	0	0
Vinyl chloride	n	0	0	0	0	0	0	0	0
	c	0.0191529	0.0208742	3.0122105	36.204453	7.844298	22627.78	1.9	0.3
m-Xylene	n	1431.3725	730	1051200	2105769.2	2737500	4.21E+09	2	0.2
	c	0	0	0	0	0	0	0	0
o-Xylene	n	1431.3725	730	1051200	2105769.2	2737500	4.21E+09	2	0.2
	c	0	0	0	0	0	0	0	0
p-Xylene	n	625.61	312.805	0	0	0	0	0	0.0857
	c	0	0	0	0	0	0	0	0
Xylene (mixed)	n	73000	0	1051200	2105769.2	2737500	4.21E+09	2	0
	c	0	0	0	0	0	0	0	0
Zinc	n	10950	0	157680	315865.38	410625	6.32E+08	0.3	0
	c	0	0	0	0	0	0	0	0
Zinc phosphide	n	10.95	0	157.68	315.86538	410.625	631730.8	0.0003	0
	c	0	0	0	0	0	0	0	0