FISCAL YEAR 1990 RECORD OF DECISION FORUM

REGION VIII

JUNE 5, 1990

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF EMERGENCY AND REMEDIAL RESPONSE
OFFICE OF WASTE PROGRAMS ENFORCEMENT
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FY'90 RECORD OF DECISION FORUM AGENDA

1.	INTRODUCTION	9:00 - 9:15
2.	OVERVIEW OF FINAL NCP	9:15 - 10:00
3.	FY'89 ROD ANALYSIS	10:00 - 10:30
	Break	10:30 - 10:45
4.	FY'90 ROD TOOLS	10:45 - 10:50
5.	GROUND WATER ROD LANGUAGE	10:50 - 11:10
6.	ROLE OF BASELINE RISK ASSESSMENT	11:10 - 11:30
7.	LAND DISPOSAL RESTRICTIONS UPDATE	11:30 - 12:00
	Lunch	12:00 - 1:00
8.	REGIONAL MANAGEMENT DISCUSSIONS	1:00 - 3:00

TABLE OF CONTENTS

The 1990 National Contingency Plan

U.S. Environmental Protection Agency
Washington, D.C.

The 1990 National Contingency Plan (NCP):

- o Framework regulation for the Superfund program.
- o Published in the Federal Register on March 8, 1990 (55 FR 8666).
- o Applies to responses to oil spills and hazardous waste releases conducted by EPA, other federal agencies, states, and private parties.

Contents of the NCP:

Subpart A Introduction

Defines key terms and states the purpose, authority, applicability, and scope of the NCP.

Subpart B Responsibility and Organization for Response

Describes the organization and responsibility of federal agencies regarding response activities.

Subpart C Planning and Preparedness

Describes preparedness activities, federal and regional contingency plans, and planning responsibilities of state and local agencies (cross-references Title III planning requirements).

Contents of the NCP (continued):

Subpart D Oil Removal

Sets forth the phases of response to discharges of oil.

Subpart E Hazardous Substance Response

Describes the sequence of activities — site discovery through final cleanup and deletion from the National Priorities List — involved in responding to releases of hazardous substances.

Subpart F State Involvement

Provides for the cooperation and coordination of federal and state agencies during hazardous substance response.

Subpart G Trustees for Natural Resources

Designates the federal officials who shall act on behalf of the public as trustees for natural resources.

Contents of the NCP (continued):

Subpart H Participation by Other Persons

Describes the authorities that allow persons other than the federal government to respond to releases and receive reimbursement of response costs.

More flexible standard for determining "consistency with the NCP:" whether cleanup, when evaluated as a whole, achieves substantial compliance with potentially applicable NCP requirements and results in a "CERCLA-quality" cleanup.

Subpart I Administrative Record

Describes requirements for establishment and maintenance of documents that form the basis for the selection of the response action.

Contents of the NCP (continued):

Subpart J **Use of Dispersants and Other Chemicals**

Describes authorization requirements for use of dispersants, surface collecting agents, biological additives, or miscellaneous oil spill control agents in responding to oil spills in navigable waters.

Subpart K **Federal Facilities [Reserved]**

This subpart will provide a "road map" for how NCP requirements apply to federal facility cleanups.

Effective date:

- The 1990 NCP is effective as of April 9, 1990.

- The NCP requirements apply to on-going projects, except:

  — Administrative record requirements apply to remedial investigations (RI) started after the promulgation date (March 8, 1990).

  — Other response actions (i.e., RIs started before March 8) shall comply with administrative record requirements to the extent practicable.

— NCP section 300.800(d).

Preambles to the proposed and final NCP

- o Preamble to the proposed NCP (53 FR 51394-51474, December 21, 1988) and preamble to the final NCP (55 FR 8666-8813, March 8, 1990) contain important explanations, policies, and guidance. For example:

  — Preamble to proposed NCP explains community relations and administrative record requirements for removal actions (53 FR 51450 and 51469). Preamble to final NCP also discusses administrative record requirements (55 FR 8805).

  — Requirements under RCRA are described in preamble to proposed NCP at 53 FR 51443 and preamble to final NCP at 55 FR 8758.

- o Index to key terms in NCP is being developed.

Removal actions

- o NCP incorporates statutory limits of 12 months and $2 million. NCP section 300.415(b)(5).

- o Exemptions from limits may be obtained:

  — Emergency.

  — Continued response is otherwise appropriate and consistent with the remedial action to be taken.

  — NCP section 300.415(b)(5)(i) and (ii) and 55 FR 8694.

- o Removal actions will comply with ARARs to the extent practicable considering the exigencies of the situation. NCP section 300.415(i).

- o Public participation and administrative record requirements depend upon type of removal action: emergency, time-critical, or non-time-critical.

RI/FS and selection of remedy process

- o PROGRAM GOAL is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste. NCP section 300.430(a)(1)(i) and 55 FR 8702.

- o PROGRAM EXPECTATIONS are also included in the rule, NCP section 300.430(a)(1)(iii) and 55 FR 8702.

  — Treatment will be used to address principal threats, wherever practicable. Principal threats generally are highly toxic, highly mobile waste.

  — Engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat, or where treatment is impracticable.

o PROGRAM EXPECTATIONS (continued)

- Combinations of treatment and engineering controls will be used at most sites.

- Institutional controls may be used during conduct of remedial action and as a component of final remedy. Institutional controls shall not substitute for active measures unless active measures are determined not to be practicable.

- Use of innovative technologies is encouraged where comparable or superior to demonstrated technologies.

- Ground water will be restored to beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site.

o PROGRAM GOAL and EXPECTATIONS can be used as a guide during scoping and when developing a range of alternative approaches for detailed analysis.

RI/FS and selection of remedy process

- <u>PROGRAM MANAGEMENT PRINCIPLES</u>

  — Bias for action when necessary or appropriate to achieve significant risk reduction quickly.

  — Streamlining to tailor investigation, analysis, and documentation to size or complexity of the site problem to be addressed.

  — NCP section 300.430(a)(1)(ii) and 55 FR 8702.

RI/FS and selection of remedy process

- o <u>SCOPING</u>

  — Develop conceptual site model.

  — Identify management strategy, likely response scenarios, and potentially applicable technologies and operable units.

  — Initiate ARARs identification.

  — Identify initial data quality objectives.

  — Prepare project plans.

  — NCP section 300.430(b) and 55 FR 8707.

RI/FS and selection of remedy process

o <u>REMEDIAL INVESTIGATION</u>

— Purpose is to characterize the site in order to develop and evaluate effective remedial alternatives. NCP section 300.430(d) and 55 FR 8708.

— The baseline risk assessment determines the extent to which the site poses a current or potential risk to human health and the environment in the absence of a remedial action. The baseline risk assessment will help establish acceptable exposure levels.

- o Exposure assessment.
- o Toxicity assessment.
- o NCP section 300.430(d)(4) and 55 FR 8709.

RI/FS and selection of remedy process

o <u>REMEDIAL INVESTIGATION/FEASIBILITY STUDY</u>

— Establish remedial action objectives (contaminants and media of concern, potential exposure pathways, and preliminary remediation goals).

— Preliminary remediation goals are desired endpoint concentrations or risk levels and are modified as more information becomes available.

— Final remediation goals are determined when remedy is selected.

— NCP section 300.430(e)(2)(i) and 55 FR 8712.

RI/FS and selection of remedy process

o <u>RISK RANGE AND POINT OF DEPARTURE</u>:

— The 1990 NCP states that generally acceptable levels for carcinogens fall within a range of 10^{-4} to 10^{-6}. This means that an acceptable exposure is when the <u>excess</u> risk to an individual of contracting cancer due to a lifetime exposure to a certain concentration of a carcinogen falls between 10^{-4} to 10^{-6}.

— Risk range is used when ARARs are not available or when cumulative risk due to multiple contaminants or pathways must be determined.

— The point of departure when using the risk range is 10^{-6}. The risk level may be revised based on exposure, uncertainty, or technical factors.

— NCP section 300.430(e)(2)(i)(A)(<u>2</u>) and 55 FR 8715-19.

RI/FS and selection of remedy process

o USE OF MCLGs AND MCLs

- For cleanup of ground water that is or may be used for drinking, maximum contaminant level goals (MCLGs) above zero generally will be cleanup standards where relevant and appropriate.

- When an MCLG equals zero (generally for carcinogens), the corresponding maximum contaminant level (MCL) generally will be used as the cleanup level where relevant and appropriate.

- NCP section 300.430(e)(2)(i)(B) and 55 FR 8750.

RI/FS and selection of remedy process

- o <u>FEASIBILITY STUDY</u>

  — Range of source control options:

  - o Treatment option to eliminate, or minimize to extent feasible, the need for long-term management.
  - o Treatment options which reduce the toxicity, mobility, or volume of wastes as their principal element.
  - o One or more containment options utilizing little or no treatment.
  - o No-action alternative.
  - o NCP section 300.430(e)(3) and 55 FR 8714.

RI/FS and selection of remedy process

- FEASIBILITY STUDY

  — Range of ground-water alternatives should be based on:

    - Remediation level.
    - Restoration time period.
    - Methodologies/approach.
    - NCP section 300.430(e)(4) and 55 FR 8732.

RI/FS and selection of remedy process

- <u>FEASIBILITY STUDY</u>
  - Screening of alternatives:
    - Effectiveness.
    - Implementability.
    - Cost.
    - NCP section 300.430(e)(7) and 55 FR 8714.

RI/FS and selection of remedy process

o FEASIBILITY STUDY

— Nine criteria used objectively to analyze advantages and disadvantages of alternative approaches. NCP section 300.430(e)(9) and 55 FR 8719.

— Functional categories for the nine criteria used when selecting preferred approach. NCP section 300.430(f)(1)(i) and 55 FR 8723.

Threshold

- Protection of human health and the environment.
- Compliance with applicable or relevant and appropriate requirements (ARARs).

RI/FS and selection of remedy process

— Functional categories for the nine criteria (continued)

Primary balancing

- o Long-term effectiveness and permanence.
- o Reduction of toxicity, mobility, or volume through treatment.
- o Short-term effectiveness.
- o Implementability.
- o Cost.

RI/FS and selection of remedy process

— **Functional categories for the nine criteria (continued)**

<u>Modifying criteria</u>

- o **State acceptance.**
- o **Community acceptance.**

RI/FS and selection of remedy process

- <u>CONTENTS OF THE RECORD OF DECISION</u>

  — Facts, analyses, and site-specific policy determinations.

  — How nine criteria were used to select remedy.

  — How CERCLA section 121 mandates are addressed by the remedy.

  — Remediation goals expected to be achieved.

  — Significant changes, if any, from proposed plan and response to comments.

  — Whether five-year review is required.

  — NCP section 300.430(f)(5) and 55 FR 8731.

RI/FS and selection of remedy process

o <u>FIVE-YEAR REVIEW</u>

— Review at least every five years required when hazardous substances will remain on-site above levels that allow for unlimited use and unrestricted exposure. NCP section 300.430(f)(4)(ii).

— Preamble states that generally it may not be appropriate to delete a site before conducting at least one five-year review after completion of the remedial action. 55 FR 8699.

Applicable or relevant and appropriate requirements

o <u>COMPLIANCE WITH LAND DISPOSAL RESTRICTIONS (LDR)</u>

— "Placement" occurs when excavation of RCRA waste is followed by treatment and replacement of residuals on land. Placement may trigger LDR.

— Preamble states that BDAT levels are <u>presumed</u> not to be appropriate for contaminated soil and debris. Accordingly, when LDR is <u>applicable</u> to soil and debris waste, a showing that BDAT is not <u>appropriate</u> is not required to obtain a treatability variance.

— Lead agency need only document in proposed plan and ROD that:

1. Wastes are soil or debris.

2. Compliance with LDRs will be achieved through treatability variance. Alternative level selected should be based on the Superfund LDR guide no. 6A.

— 55 FR 8758.

Applicable or relevant and appropriate requirements

o NEWLY PROMULGATED OR MODIFIED REQUIREMENTS:

— "Freezing" ARARs at the ROD.

— Requirements promulgated or modified after the ROD is signed will be attained (or waived) only when determined to be ARAR and necessary to ensure protectiveness.

— NCP section 300.430(f)(1)(ii)(B)(*1*) and (*2*) and 55 FR 8757.

Applicable or relevant and appropriate requirements

o SUBSTANTIVE VERSUS ADMINISTRATIVE REQUIREMENTS:

— NCP requires compliance with cleanup standards, levels of control, and other substantive environmental protection standards.

— NCP specifically exempts compliance from administrative requirements, including approval of, or consultation with, other programs, agencies, or administrative bodies, issuance of permits, and reporting and recordkeeping. EPA strongly encourages, however, coordination and cooperation with the appropriate other programs or agencies.

— 55 FR 8756.

Applicable or relevant and appropriate requirements

o COMPLIANCE WITH ARARs DURING IMPLEMENTATION:

— NCP requires compliance during the remedial design and remedial action steps, as well as its conclusion.

— The requirements of other laws define how the activity can be implemented in a manner that is protective of health and the environment.

— NCP section 300.435(a)(2) and 55 FR 8755.

Applicable or relevant and appropriate requirements

o <u>INFORMATION TO-BE-CONSIDERED (TBCs)</u>

— Criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in determining what is necessary to be protective or that are otherwise useful in developing Superfund remedies are described as information to-be-considered (TBC).

— Three general categories of TBCs are: (1) health effects information with a high degree of creditability, e.g., reference doses; (2) technical information on how to perform or evaluate site investigations or response actions; and (3) policy, e.g., EPA's ground-water policy.

— NCP section 300.400(g)(3) and 55 FR 8744.

Permit requirements

- o Permits not required for activities conducted entirely on-site.
- o On-site is defined as the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action.
- o NCP section 300.400(e) and 55 FR 8688.

State involvement

- o <u>RESPONSIBILITIES WHEN EPA OR STATE IS LEAD AGENCY</u>:

  — EPA retains ultimate authority to select remedies under CERCLA.

  — State may be lead agency for RI/FS and recommend a remedy to EPA. A state may not issue a proposed plan that EPA has not approved. EPA may assume the lead from the state if agreement cannot be reached. If state disagrees with EPA-lead proposed plan, disagreement must be noted in proposed plan.

  — Timeframes are the same for EPA and state review of each others' documents.

  — NCP section 300.515 and 55 FR 8779.

State involvement

o <u>SUPERFUND MEMORANDUM OF AGREEMENT (SMOA)</u>

— SMOA describes general role and responsibilities of EPA and state for all sites within a state, e.g., ARARs identification and documents review. NCP section 300.505 and 55 FR 8776.

— SMOA not required for state to be designated as lead agency at Fund-financed site or to recommend a remedy to EPA.

State involvement

- OPERATION AND MAINTENANCE

  — In general, state funds cost of operation and maintenance (O&M).

  — However, EPA will fund O&M for up to 10 years for treatment or other measures to restore ground or surface water quality.

  — "Treatment or other measures" does not include:

  - Source control maintenance measures (except if temporary or interim measure, see 55 FR 8738-39), or

  - Measures whose primary purpose is to provide drinking water.

  — NCP section 300.435(f) and 55 FR 8736.

Public participation

- Public participation requirements are integrated into various phases of removal and remedial activities, e.g., NCP sections 300.415(m), 300.430(c), 300.430(f)(3), 300.430(f)(6), and 300.435(c) and 55 FR 8766.

- Minimum 30-day public comment period can be extended an <u>additional</u> 30 days, upon timely request. NCP section 300.430(f)(3)(i)(C).

- At completion of remedial design, lead agency must issue fact sheet and provide opportunity for public briefing. NCP section 300.435(c)(3).

Administrative record

o <u>LOCATION AND AVAILABILITY OF THE RECORD</u>:

— The record must be located at or near the site (in an information repository) and at an office of the lead agency or another central location. The record need not be available at or near the site, however, for emergency removal actions that are concluded within 30 days of initiation. NCP section 300.805 and 55 FR 8803.

— Certain information need not be located at or near the site where it would pose a substantial administrative burden, e.g., sampling and testing data, guidance documents not generated specifically for the site, publicly available technical literature. The index to the record, however, shall indicate the availability of such items. NCP section 300.805 and 55 FR 8803.

— The availability of the record must be announced in a major local newspaper of general circulation. NCP sections 300.815 and 300.820 and 55 FR 8805.

Administrative record

- ADDING DOCUMENTS AFTER THE ROD IS SIGNED:

  — Documents relating to remedy selection issues that the ROD reserves or does not address, explanations of significant differences, and ROD amendments. NCP section 300.825 and 55 FR 8807.

- RESPONDING TO COMMENTS RECEIVED BEFORE COMMENT PERIOD:

  — The lead agency is encouraged, but not required, to respond to significant comments received before start of public comment period. NCP sections 300.815 and 300.820 and 55 FR 8805.

April 1990
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THE REVISED FINAL NCP

INTRODUCTION

Previous final NCP - November 1985
Draft revised NCP published December 21, 1988
Final revised NCP published March 8, 1990 (40 CFR 300, 40 CFR 8666)
- to reflect changes required by SARA
- to reflect how EPA actually does business

The new NCP is very different from the 1985 NCP; not very different from the 1988 draft or existing guidance or the way we currently do business. This handout focuses on changes from the 1988 proposed NCP and/or positions that may affect the way we do business.

Compliance with the NCP:
NCP Section 300.700(c)(i)
- Requires "substantial compliance" with the requirements.
- Immaterial or insubstantial deviations are not important.

Today's topics:

GENERAL ORGANIZATION OF THE NCP

Subpart A - Introduction
300.5 Definitions

Subpart B - Responsibility and Organization for Response

Subpart C - Planning and Preparedness

Subpart D - Operational Response Phases for Oil Removal

Subpart E - Hazardous Substance Response**

Subpart F - State Involvement in Hazardous Substance Response*

Subpart G - Trustees for Natural Resources

Subpart H - Participation by Other Persons*

Subpart I - Administrative Record for Selection of Response Action*

Subpart J - Use of Dispersants and Other Chemicals

Subpart K - Federal Facilities (Reserved)

<u>REMEDIAL PROGRAM EXPECTATIONS AND GOALS</u>

NCP Section 300.430(a)(1) - page 8846
Preamble - pages 8700 - 8703

Program Goal:

- Nothing much new - except that it's in the NCP proper
- "The national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated wastes."
- The nine criteria determine the extent to which this goal is satisfied.

Expectations:

- Now in the NCP proper.
- NOT binding requirements.
- Designed to guide the development of cleanup options.

There are 6 expectations:

a. Use treatment to address the principal threats wherever practicable. Principal threats for which treatment is most likely to be appropriate include:
   - liquids
   - areas contaminated with high concentrations of toxic compounds
   - highly mobile materials

b. Use engineering controls, such as containment, for waste that poses a relatively low long-term threat (E.g. waste contaminated at low levels) or where treatment is impracticable.
   - Treatment is less likely to be practicable when sites have large volumes of low concentration of hazardous substances, or in wastes with widely varying composition.

c. Combine methods as appropriate.

d. Institutional controls shall not substitute for active response measures as the sole remedy unless such active measures are determined not to be practicable. (See the remedy selection section for a discussion of "practicable.")
   - Use institutional controls to supplement engineering controls during the RI/FS and implementation of the remedy, and where necessary, as a component of the completed action.

e. Innovative technology will considered when:
   - the technology offers the potential for comparable or superior treatment performance or implementability
   - fewer or lesser adverse impact than the alternatives
   - or lower costs for similar level of performance than demonstrated technologies

f. Groundwater

-Usable groundwater will be returned to their beneficial uses wherever practicable, within a timeframe which is reasonable given the site.

-If restoration is not practicable, further migration of the plume will be stopped, exposure to the contaminated groundwater will be prevented

REMEMBER: THESE ARE EXPECTATIONS - NOT RULES. THE GOAL IS FLEXIBLE, SITE-SPECIFIC DECISION-MAKING. THESE EXPECTATIONS DO NOT SUBSTITUTE FOR SITE SPECIFIC ALTERNATIVES DEVELOPMENT AND SCREENING - ONLY ASSIST IT.

HOW TO DO EARLY ACTIONS

Preamble: pages 8703 - 8706

Removals

We have been doing early actions at NPL sites under the removal program since the beginning of the SF program. No major changes.

Remedial Actions

Operable units - nothing much new.

- Use operable units to do early actions when necessary or appropriate; to do phased analysis or response; to deal with the size or complexity of the site; or to speed the cleanup of the site.
- Operable units should not be inconsistent with the expected final remedy

Let the paperwork fit the site and the action.

- All sections in the NCP describing the RI/FS include the phrase "as appropriate."
- Focus on alternatives that show promise in achieving the goals of the SF program.

A streamlined RI/FS may be particularly appropriate when:

- site problems are straightforward with a limited number of ways to address it.
- prompt action is needed
- ARARs limit the range of alternatives
- many alternatives are clearly impracticable
- no further action or only limited action is required (esp. after a removal)

Act as soon as there is sufficient information

YOU DO NOT NEED TO FINISH AN RI/FS TO DO A REMEDIAL ACTION - esp. an interim remedy.

So what do you need (at a minimum) to do an interim action as an operable unit under the remedial program?

- Extract data to support decision from the on-going RI/FS or other source
- Develop few alternatives. (Sometimes only one alternative need be developed.)
- Qualitative risk information to show that the remedial action is necessary.
- Consider ARARs. (Waiver is available.)
- Involve the support agency.
- Involve the public.
- Involve the natural resource trustees.
- Document data and information in a <u>focused feasibility study</u>, or, just in the proposed plan.
- Publish the Proposed plan and respond to public comments.
- Prepare and sign the ROD.

You do NOT need:

- A baseline risk assessment
- A full RI/FS
- A definitive site characterization

For simple, straightforward interim actions, the total documentation could be accomplished in just a few pages.

STATE ROLES IN SUPERFUND

NCP Sections 300.500 - 300.525 - pages 8853-8857
Preamble - pages 8775 - 8786

Cooperation and coordination between agencies are encouraged.

States and Indian Tribes are encouraged to undertake all actions that EPA is allowed to do under Section E.

Exceptions:

Emergencies and time-critical removals cannot be state lead.

EPA must sign the ROD when Fund moneys are involved.

Superfund Memorandum of Agreement (SMOA):

- Voluntary agreements.
- Can establish review and comment periods between lead and support agency. Such periods must be also documented in site-specific cooperative agreements or Superfund state contract.
- SMOAs are no longer a prerequisite for any action.

Review and Response Periods when there is no SMOA:

- These NCP review periods apply to <u>both</u> the state and EPA when they are operating as support agencies. (NCP Section 300.515 (c) and (h))

NPL listing - 30 working days, to the extent feasible
ARAR identification - 30 working days
RI/FS, ROD, RD, ARAR/TBC determinations - 10 to 15 working days
Proposed plan - 5 to 10 working days

Institutional controls:

- State must provide assurances of institutional controls at Fund-financed sites. (NCP section 300.510(c)(1), page 8854; preamble page 8778.)

ROD preparation, concurrences, and selection of remedy:
(preamble 8782-8783)

- Agreements can provide for either agency to prepare the proposed plan and ROD.
- Only EPA can sign the ROD/select the remedy, except when the state is acting under state law instead of CERCLA.
- At Fund-financed sites, EPA can publish a proposed plan without state concurrence; state cannot publish a proposed plan without EPA concurrence.
- EPA approval requires written concurrence.
- At non-Fund financed state-lead sites:
  - EPA is not bound by state action.
  - EPA retains the right to act under its own CERCLA authorities if needed.

SELECTION OF REMEDY

"....A pragmatic and flexible valuation of potential remedies at a site while still protecting human health and the environment."

Development of alternatives

NCP Section 300.430(e) - pages 8848 - 8849
Preamble - pages 8714 - 8715

- Alternatives should be developed, as appropriate for the particular situation at the site.
- Program expectations can help focus this development.
  - If treatment is not practicable for all wastes at the site, then complete treatment need not be included as an alternative.
  - If it is clear that treatment will be part of the remedy, alternatives that rely solely on containment or institutional controls and that do not include treatment need not be considered.

- Innovative technologies - (p. 8714) See "Expectations" section above. Eliminate from consideration only those innovative technologies that have little potential for performing well at specific sites.

Screening of Alternatives

NCP Section 300.430(e)(7), page 8849
Preamble pages 8714 - 8715

- To eliminate those alternatives that are not effective, not implementable or whose costs are grossly excessive for the effectiveness they provide.
- Cost is used in two ways to eliminate alternatives:
  - When alternatives vary significantly in their effectiveness, some alternatives are inordinately costly for the effectiveness. e.g. total treatment of a large municipal landfill.
  - Where two or more alternatives provide similar levels of effectiveness and implementability (using a similar method of treatment or engineering control) but their cost vary significantly.

Detailed Analysis of Alternatives

NCP Section 300.430(e)(9) - pages 8849-8850
Preamble - pages 8719 - 8723

- To present relevant information for the decision-making step.

Nine criteria

NEW - The three categories have been eliminated for purposes of the detailed analysis.

Few changes to the nine criteria themselves:

1. Protection of human health and the environment - draws on the assessments conducted under other evaluation criteria, esp. long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.
2. Compliance with ARARS - Either the PRP or a state may perform the ARAR analysis and recommend the applicability of ARAR waivers, but EPA determines compliance with ARARs (and the applicability of ARAR waivers) when it selects the remedial action. (p.8720)
3. Long-term effectiveness and permanence. Any residual risk site after the response objectives have been met.
   - Permanence is judged along a continuum, with remedies offering greater or lesser degrees of long-term effectiveness and permanence.
4. Reduction of toxicity, mobility or volume through treatment OR RECYCLING.
   - EPA IS ESTABLISHING, AS A GUIDELINE, THAT TREATMENT AS PART OF CERCLA REMEDIES SHOULD GENERALLY ACHIEVE REDUCTIONS OF 90 TO 99 PERCENT IN THE CONCENTRATION OR MOBILITY OF INDIVIDUAL CONTAMINANTS OF CONCERN.
5. Short-term effectiveness
6. Implementability
7. Cost - Evaluates and compares the cost of the alternatives. To include direct and indirect capital and O&M costs, as well as certain replacement costs. DOES NOT MAKE ANY CONCLUSION RE THE COST-EFFECTIVENESS OF THE ALTERNATIVES. COST-EFFECTIVENESS IS DETERMINED AT THE SELECTION OF REMEDY STAGE.
8. State acceptance
9. Community acceptance.

Procedure:

- Assess each alternative individually assessed against the nine criteria.
- Comparative analysis to identify the key tradeoffs (relative advantages and disadvantages) among the alternatives with respect to the nine criteria.

<u>Remedy Selection</u>

NCP Section 300.430(f) - page 8851
Preamble - pages 8723 - 8731

Flexibility: Each SF site presents a different set of circumstances. Many different ways to fulfill each statutory mandate.

Same nine criteria but used differently.

Threshold:

1. Protection of human health and the environment
2. Compliance with ARARS

Primary Balancing:

Balancing is the key concept during the selection of remedy.

3. MORE IMPORTANT: Long-term effectiveness and permanence
4. MORE IMPORTANT: Reduction of toxicity, mobility or volume through treatment or recycling.
5. Short-term effectiveness
6. Implementability
7. Cost (See below)

Modifying:

8. State acceptance
9. Community acceptance.

Modifying criteria: Generally considered in altering an otherwise viable approach rather than in deciding between very different approaches.

Statute, and now NCP, has a bias against off-site land disposal of untreated waste. Neither has a bias for or against off-site remedies involving treatment.

Statutory Determinations and The Role of Cost in Remedy Selection

Cost is considered in making two statutory determinations required for selected remedies: (p. 8728 - 8731)

- That the remedy is cost-effective (i.e. the remedy provides effectiveness proportional to its cost); and
- That the remedy utilizes permanent solutions and treatment to the maximum extent practicable.

COST-EFFECTIVENESS:

- Are costs proportional to the effectiveness achieved?
  - Overall effectiveness includes long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness.

"Proportional" includes:

- the cost and effectiveness of each alternative individually. (What is the relative magnitude of cost to the effectiveness of the alternative?) and,
- the cost and effectiveness of alternatives in

relation to one another. (What is the incremental cost difference in relation to the incremental differences in effectiveness?)
- Best professional judgement is used.
- Strict mathematical proportionality is not intended. Incremental differences is the key.

More than one alternative may be cost-effective.

COST AND PRACTICABILITY:
-Uses the same criteria as cost-effectiveness, plus implementability of the remedy, and state and community acceptance.

The two statutory determinations are separate findings that result from balancing conducted during the remedy selection process.

Changes to the ROD after its adoption
NCP Section 300.435(c) - pages 8852
Preamble pages 8771- 8773
(Also, see section below on post-ROD ARAR changes.)

Three types of changes:
1. Non-significant changes -
    - Examples:
        - changes in the cost or type of materials, equipment, etc.)
    - Document in the post-ROD file.
2. Significant changes - incremental changes to a component of a remedy that do not fundamentally alter the overall remedial approach.
    - Examples: -timing changes
        - cost increases (more volume, cost up 50%)
        - some technology changes (carbon adsorption instead of air stripping)
    - Requires an explanation of significant differences to be published. No formal public comment period required, but comments that present substantial new information must be considered.
3. Fundamental changes - the proposed action, with respect to scope, performance, or cost, is no longer reflective of the selected remedy in the ROD.
    - Example: Innovative technology will not achieve remediation goals, so a different technology will be used.
    - Requires a ROD amendment, including a proposed plan, full public comment period, and response to comments. ROD amendment public comment period can be concurrent with public comment periods on consent decrees.
- ESDs and ROD amendments require consulting with support agencies.

ARAR ISSUES

NCP - Identification of ARARs; Factors to determine relevant and appropriate: Section 300.400(g), page 8841
- Waivers and post-ROD ARAR changes: Section 300.430(f)(1), page 8850

Preamble - pages 8741 -8766

(Also see Groundwater Issues section below.)

General Points

No major changes:

- Federal, state, (and tribal) ARARs must be attained for on-site actions.
- ARARs do not apply to off-site actions. All applicable rules, including obtaining permits, apply to off-site actions.
- ARARs apply to removals "to the extent practicable considering the exigencies of the situation."
- A variance or exemption provision in a regulation can be a potential ARARs as well as the basic standard. (e.g. Treatability variances under LDR for soil and debris.)
- ARARs must be attained during the implementation of the remedial action, where the ARAR is pertinent to the action itself, as well as at the completion of the action.
- In general, state regulations under federally authorized programs are considered federal requirements.
- Need only meet ARARs within the scope of an interim action.

Definition of on-site: the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action. (Section 300.400(e), page 8841)

Relevant and Appropriate Determination:
(Preamble pages 8742 - 8744)

- Eight factors are used. (No major changes.)
- No single factor alone sufficient.
- May find parts of a regulation to be relevant and appropriate.

To be Considered (TBCs):

- Identification of all possible TBCs is not longer necessary.
- TBCs to be identified and used "as appropriate."
- TBC are meant to complement the use of ARARs, not to be in competition with ARARS.

Timely identification of ARARs:

(preamble page 8746-8747)

- When there is a SMOA, the SMOA will identify the deadlines for identifying ARARS.
- When there is no SMOA, potential ARARs must be sent to the lead agency within 30 WORKING DAYS of the receipt of a request from the lead agency.
- ARARs are requested at two steps in the process.

Points of compliance:

Preamble - page 8713

- Air - The selected levels should be established for the maximum exposed individual, considering reasonable expected use of the site and surrounding area.
- Surface water - the selected levels should be attained at the point or points where the release enters the surface water.
- Groundwater - see below.

Soil - silent

<u>Compliance with ARARs during RIs (and pre-remedial work):</u>

NCP Section 300.410(i) - page 8843

Preamble - pages 8755 - 8756

- Studies are removal actions undertaken pursuant to CERCLA section 104(b), but are not subject to the statutory limits on removals.
- Like removals, ARARs need to be complied with during RIs "to the extent practicable, considering the exigencies of the situations."
- Will involve the use of best professional judgement.

<u>ARAR Waivers</u>

NCP Section 300.430(f)(1)(ii)(C) - page 8850

Preamble - pages 8747 - 8750)

Nothing much new, except as noted.

- Interim measures. Interim measure are expected to be followed by remedial actions which attain ARARs within a "reasonable time." Reasonable time is not pre-set, but is a site-specific decision. Factors to consider include funding and priorities.
- Greater risk to health and the environment.
- Technical impracticability. From an engineering perspective. Includes engineering feasibility and reliability. Cost plays a subordinate role.
- Equivalent standard of performance. Not based on a comparison of exposure risk, unless the original standard is risk-based. Based on equivalent degree of protection, level of performance and future reliability.
- Inconsistent application of state requirements. A

standard is presumed to have been consistently applied unless these is evidence to the contrary.
- Fund balancing. New policy. EPA will routinely consider, not necessarily invoke - the Fund-balancing waiver at a threshold point. Threshold point - a single action that would be four times the cost of an average operable unit. Fund balancing could also occur at a lower cost as well, if necessary.

<u>ARARs identified after the ROD is signed:</u>

NCP - Section 300.430(f)(ii), page 8850
Preamble - page 8747 and 8757 - 8758

- ARARs are basically frozen when the ROD is signed.
- Two exceptions:
  1. If a component of a remedy is not identified a the time of ROD signing, requirements in effect when the component is later identified (e.g. during remedial design) will be used to determine ARARS.
  2. Compliance is necessary to necessary to maintain protectiveness. Primarily done as part of the five year review.
- Requirements applicable to off-site actions are never frozen.

RCRA ARARS

Preamble pages 8758 - 8764

Placement:

- The definition of "placement" has not changed.
- Treatment and placement is considered "placement."

CERCLA Area of Contamination (AOC):

- Can include widespread areas of generally dispersed contamination.
- Not identical to a RCRA "unit," but generally analogous.
- Consolidation or movement of material within an AOC not subject to any applicable RCRA regulation.
- Consolidation from different AOCs are subject to applicable RCRA requirements.

LDR Treatability Waivers for soil and debris:

"EPA has determined that, until specific standards for soils and debris are developed, current BDAT standards are generally inappropriate or unachievable for soil and debris from CERCLA response actions and RCRA corrective actions and closures. Instead, EPA presumes that, because contaminated soil and debris is significantly different from the wastes evaluated in establishing the BDAT standards, it cannot be treated in accordance with those standards and thus qualifies for a treatability variance from those standards under 40 CFR 268.44." (page 8760)

- No case-by-case demonstration of inappropriateness or unachievability needed.
- Contaminated soil and debris should meet the percentage reduction out-lined in Superfund LDR Guidance #6A, "Obtaining a Soil and Debris Treatability Variance for Remedial Actions. EPA OSWER Directive 9347.3-06FS, July 1989, to be revised shortly.
- Some exceptions, especially with soils with high levels of combustible organics, and, maybe, soils and debris with dioxin. In these cases, EPA may determine that the existing BDAT standards are appropriate for that particular site and would require such treatment (e.g. combustion.)

NOTE: Even though we have guidance stating so, the NCP never says that the LDR are never relevant and appropriate to soil and debris.

RISK ASSESSMENT AND REMEDIATION GOALS

NCP Section 300.430(e)(2)(i) - page 8848
Preamble - pages 8709 - 8711, 8713, 8715 - 8718

Risk Assessment - Two objectives:

1. Baseline risk - the risks that exist if no remediation or institutional controls are applied to a site.
   ie. Is remediation necessary?
   Which exposure pathways need to be remediated?
2. Help establish acceptable exposure levels

Exposure scenarios:
- Use "reasonable maximum exposure scenario".
- A "part of a lifetime" exposure duration can be used.

Remediation goals:
- A subset of remedial action objectives
- Medium-specific or operable unit specific protective chemical concentrations
- Serve as goals for remedial action.

Preliminary remediation goals:
- Used to focus the development of, and to limit the number of, alternatives, during the RI/FS.
- Developed based on readily available information (e.g. environmental or health based ARARS like MCLs).
- modified, as necessary, during the RI/FS.
- Alternatives that attain other risk levels can be developed.

Final remediation goals:
- Determined when the remedy is selected.
- Based on the balancing of criteria in the remedy selection process.

Remediation goals: risk assessment vs. ARARs:
- EPA will use chemical-specific/health-based ARARs in determining remediation goals for SF sites.
- Exceptions:
  1) ARARs are not sufficiently protective: multiple contaminants or pathways where attainment of chemical-specific ARARs will result in cumulative risk in excess of 10-4(p. 8718, p. 8848),
- 2) No ARARs are available.

In these exceptions, risk assessment will be used when determining the cleanup level.
- 10-6 is the point of departure for establishing preliminary remediation goals.

- Acceptable exposure levels: 10-4 to 10-6 incremental individual lifetime cancer risk, with a preference for the more protective end of the range.
- Cleanups to levels more stringent than 10-6 allowed in exceptional circumstances. (page 8716 and 8717)
- Cleanup level and remedy are selected by balancing site-specific and remedy-specific factors, including:
    - exposure factors
    - assumptions and uncertainty factors
    - technical factors
    - the nine criteria.

Similar approaches are used for non-carcinogens and ecological and environmental effects.
- Non-carcinogens - exposures should present no appreciable risk of significant adverse effects to individuals.
- Environmental evaluations may be necessary where sensitive ecosystems and critical habitats of threatened or endangered species exist.

GROUNDWATER AND SURFACE WATER ISSUES

NCP Section 300.430(e)(2)(i) - page 8848 (MCLs vs. MCLGs)
Preamble - pages 8732 - 8735
MCLs and MCLGs - pages 8750 - 8752
point of compliance - pages 8753 - 8755

Goal: return usable ground waters to their beneficial uses within a timeframe that is reasonable given the particular circumstances of the site.

Role of the draft EPA groundwater classification system:
- help set the remediation goal for groundwater restoration, the timeframe for restoration, and most appropriate method to achieve these goals.
- THESE GUIDELINES ARE NOT ARARS, BUT ARE ONLY USED TO HELP DEFINE SITUATIONS FOR WHICH STANDARDS MAY BE APPLICABLE OR RELEVANT AND APPROPRIATE AND HELP SET GOALS FOR GROUNDWATER REMEDIATION.
- State or Indian tribe's classification may supersede.

Restoration timeframes:
-reasonable timeframes may range from very rapid (one to five years) to relatively extended (perhaps several decades.)
- Rapid restoration is preferred for Class I groundwaters or current drinking water sources. If there are alternative drinking water sources, the necessity for rapid restoration of groundwater may be reduced.
- Rapid restoration may also be appropriate when institutional controls are not reliable.

Remediation goals: MAJOR POLICY CHANGE FROM THE PROPOSED NCP.
For class I and II groundwaters:
- If MCLG is above zero, MCLG may be relevant and appropriate. If MCLG is not relevant and appropriate to the circumstances of the release, the corresponding MCL may be relevant and appropriate.
- If MCLG is zero, EPA has determined that the MCLG is not appropriate. The MCL may be relevant and appropriate, considering the circumstances of the release.
- MCLs are never applicable except at the tap.

For class III groundwaters:
-drinking water standards are not ARARs and are not used to set preliminary remediation goals.

For surface water:
- MCLs and non-zero MCLGs will generally be the relevant and appropriate standards for surface water designated as a drinking water supply, unless the state has promulgated water quality standards for the water body that reflects the specific conditions of the water

body.
-The Federal Water Quality Criteria should not be used to substitute for MCLs and non-zero MCLGs, but may be used when there are other uses of the water (e.g. aquatic organism, fishing) or when there are no MCLs.

Alternate concentration limits (ACLs) under CERCLA:
- Use of ACLs is limited under CERCLA.
- In addition to the statutory limitations, the preamble adds the demonstration that cleanup to MCLs or other protective levels is not practicable.
- If a site situation qualifies for an ACL, an additional ARAR waiver of MCLs or MCLGs is not necessary.

Point of Compliance for Groundwater:
- remediation levels should generally be attained throughout the contaminated plume, or at and beyond the edge of the waste management area when waste is left in place.
- alternate points of compliance may be acceptable/protective when:
    - the plume of groundwater contamination is from several distinct sources that are in close geographic proximity. Can then address the problem as a whole, but individual source control actions still required.
    - NEW - A remote site with little likelihood of exposure. However, contaminated groundwater must be controlled from further migration.

Natural attenuation:
Natural attenuation is recommended only when:
- active restoration is not practicable, cost-effective or warranted because of site-specific conditions, or
- where natural attenuation is expected to reduce the concentration of contaminants in the groundwater to the remediation goals in a reasonable timeframe, or in a timeframe comparable to that achieved through active restoration.
- May also be important once pump and treat systems have reached their limit. (E.G. as an alternative to changing the remediation goals.)
- Institutional controls may be necessary.

Remember too the management expectation mentioned above: when groundwater restoration is not practicable, remedial action will focus on plume containment to prevent contaminant migration and further contamination of the groundwater, prevention of exposures, and evaluation of further risk reduction.

At Fund-lead sites, who pays for operating the groundwater and surface water facilities?

- Complex.
- State pays for O&M of source control measures.
- Fund pays 90% for up to 10 years of certain ground and surface water restoration measures.
- Exception: Certain interim measures. EPA will consider interim measures to be "remedial actions" if it is both necessary and desirable in order to control or prevent the further spread of contamination while the lead agency is deciding upon a final remedy for the site. (preamble pages 8736 - 8740)

COMMUNITY RELATIONS

NCP Section 300.415(m) - CR in Removal Actions, page 8842
300.430(c) - CR during the RI/FS, page 8847
300.430(f)(2) and (3) - Proposed plans and CR to support remedy selection, page 8851
300.430(f)(6) - CR when the ROD is signed, page 8852
300.435(c) - CR during RD, RA, and O&M, page 8852
300.700(c)(6) - CR during private party actions, page 8858
Preamble pages 8766 - 8774

- No major changes in the way we do business.
  Exception:
  - Comment periods on time-critical and non-time critical removals are a minimum of 30 days. For non-time critical removals, the lead agency will extent the public comment period by a minimum of 15 days upon timely request.
  - Comment period on the proposed plan, etc, is a minimum of 30 days, with an extension of the public comment period by a minimum of 30 additional days upon timely request.

- Community relations starts at the pre-remedial stage and continues throughout the remedy construction and operation. Community relations does not stop at the ROD.

- Includes sections on PRP involvement, community involvement in technical discussions with PRPs, equal community and PRP access to information on the site.

- If private party actions want to be "consistent with the NCP" for cost-recovery purposes, they must also follow many of these same community relations/public involvement activities. (preamble page 8795)

REMOVALS

NCP Section 300.415 (pages 8842 - 8844)
Preamble pages 8694 - 8698

Very few changes to the removal program in the NCP.

Main changes are:
- Clarifies community relations and administrative record requirements
- ARARs apply to the extent practicable
- Codifies statutory increase of time and dollar limits to 12 months and $2 million.

OUT-OF-STATE-TRANSFER OF CERCLA WASTE

Preamble page 8740
(Not in the NCP proper)

If SF waste is going to be shipped out-of-state, e.g. to a permitted waste management facility, the lead agency should provide written notice to the receiving state prior to shipment of the SF wastes. Notice should be provided for all remedial actions and non-time critical removal actions, including Fund-lead, state lead, federal facility and PRP responses.

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

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QUESTIONS AND ANSWERS REGARDING THE 1990 NCP

INTRODUCTION

What is the National Contingency Plan (NCP)?

- The NCP is the major framework regulation for the federal hazardous substance response program. The NCP includes procedures and standards for how EPA, other federal agencies, states, and private parties respond under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to releases of hazardous substances and under the Clean Water Act to discharges of oil.

What is the purpose of the revisions to the NCP?

- CERCLA, originally enacted in 1980, was amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which mandates that the NCP be revised to implement the requirements of SARA, particularly with regard to procedures and standards for remedial actions.

- The revisions also clarify 1985 NCP language, reorganize the 1985 NCP to describe more accurately the sequence of response actions, and incorporate changes based on program experience since the 1985 revisions to the NCP.

What is the relationship between the revised NCP and the Management Review of the Superfund Program (the 90-day Study)?

- The 1990 (or final) NCP is consistent with, and embodies the spirit of, the 1989 Management Review of the Superfund Program. Both documents describe what the program realistically can accomplish and emphasize the need for taking action -- rather than prolonged investigation and analysis -- at sites. The documents also recognize the importance of increased state participation and public involvement in the Superfund program. The documents differ in that the Management Review focused on EPA's internal management of the program and left certain national policy decisions, e.g., the process of deciding on cleanups, to be addressed in the NCP. EPA believes that together the 1990

NCP and the Management Review provide a firm basis for progress in cleaning up the nation's worst toxic waste problems.

What are the major areas of change from the 1985 NCP to the 1990 NCP?

__Note__: More detail on each of these major changes is provided below.

- __Subpart E__ (Subpart F in the 1985 NCP) which addresses the elements of hazardous substance response is significantly revised. EPA's process implements the requirements of CERCLA 121 and focuses on selection of treatment technologies, uses nine specified criteria when evaluating and selecting remedies, provides for conducting early actions, and encourages streamlining of remedial activities.

- __Subpart F__ on state involvement is a new subpart added to implement the 1986 statutory mandate to promulgate regulations for substantial and meaningful state involvement in CERCLA response actions. The major new concepts are Superfund Memoranda of Agreement (SMOAs) between EPA regions and states and EPA/state concurrence in remedy selection.

- __Subpart I__ is a new subpart added to implement the 1986 statutory requirements for the establishment of an administrative record. The record contains documents that form the basis for the selection of a remedy at a CERCLA site.

What sections from the 1985 NCP have generally remained unchanged?

- __Subpart A__, the introduction, defines key terms and states the purpose, authority, applicability, and scope of the NCP. Some definitions have been added, e.g., "source control maintenance measures," and some definitions have been revised, e.g. "CERCLIS" and "cooperative agreement," but most definitions remain unchanged.

- __Subpart B__ describes the organization and responsibility of federal agencies regarding response activities. For example, roles and responsibilities of the National Response Team (NRT) and the Regional Response Teams (RRT) are described. The revised Subpart B combines the 1985 NCP's Subparts B and C without major revisions.

- Subpart C addresses preparedness activities, federal and regional contingency plans, and planning responsibilities of state and local agencies. The revised Subpart C contains information from the 1985 NCP's Subpart D and adds information on SARA Title III.

- Subpart D sets forth the phases of response to discharges of oil and contains no major revisions from the 1985 NCP.

- Subpart G contains the designations of federal trustees to act on behalf of the President in assessing damages to natural resources from discharges of oil or releases of hazardous substances. Subpart G also outlines in general the responsibilities of trustees under the NCP.

- Subpart H is a new subpart that consolidates 1985 NCP language on participation by other persons in response activities and recovery of their costs. Persons conducting a cleanup may recover their costs from a party liable under CERCLA 107 if they substantially comply with requirements of the NCP and conduct a "CERCLA-quality cleanup."

- Subpart J on use of dispersants for oil spills is similar to the 1985 NCP's Subpart H; only minor clarifying revisions have been made.

Why was the NCP on a court-ordered schedule?

- In the fall of 1988, the Natural Resources Defense Council and several other national environmental groups sued EPA for failure to meet the statutory deadline (April 17, 1988) for revising the NCP. EPA's response indicated that because of the magnitude of the project, the number of interests involved, and the Agency's efforts to achieve consensus among all parties, the process was taking longer than anticipated to complete. To resolve the litigation, the parties agreed to a schedule for completion of revisions to the NCP that would result in the delivery of the 1990 NCP to the Federal Register by February 5, 1990.

How does the Hazard Ranking System (HRS) relate to the NCP?

- The HRS is Appendix A to the NCP (40 CFR Part 300). The HRS is the mechanism used to evaluate whether releases should be listed on the National Priorities List (NPL). The NPL is a list of releases that appear to warrant long-term evaluation and response. EPA proposed revisions to the HRS in a separate rulemaking on December 23, 1988 (53 FR 51962).

What are some of the common abbreviations used in the NCP?

ARARs -- Applicable or relevant and appropriate requirements.
FS -- Feasibility study.
HRS -- Hazard Ranking System.
NPL -- National Priorities List.
OSC -- On-scene coordinator.
O&M -- Operation and maintenance.
PRP -- Potentially responsible party.
RA -- Remedial action.
RD -- Remedial design.
RI -- Remedial investigation.
ROD -- Record of decision.
RPM -- Remedial project manager.
SMOA -- Superfund Memorandum of Agreement.
TBC -- Criteria, advisories or guidance to-be-considered.

REMOVAL PROGRAM

How is the removal program modified under the 1990 NCP?

- The NCP codifies the increase in the statutory time and dollar limits for Fund-financed removal actions from 6 months and $1 million to 12 months and $2 million.

- The NCP also codifies a statutory exemption from these limits: where continued response is otherwise appropriate and consistent with the remedial action to be taken. EPA expects to use the exemption primarily for proposed and final NPL sites, and only rarely for non-NPL sites.

- The NCP confirms EPA's policy that removal actions will comply to the extent practicable with applicable or relevant and appropriate requirements under other federal or state environmental laws

- Requirements relating to community relations and administrative record are discussed in other sections below.

REMEDIAL PROGRAM

What changes does the 1990 NCP make in the remedial response program?

- o The final rule implements the statutory requirements to select remedies that:

  -- Protect human health and the environment.

  -- Comply with applicable or relevant and appropriate requirements (ARARs) under federal environmental or state environmental or facility siting laws (or invoke a waiver).

  -- Are cost-effective.

  -- Use permanent solutions and treatment to the maximum extent practicable.

  -- Satisfy the preference for remedies in which treatment that permanently reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants is a principal element.

What are some of the features of the final remedy selection process?

- o In the remedy selection process, a range of alternatives should be developed, representing distinct, viable approaches to managing the site problem. For source control response actions, a range of alternatives involving treatment as a principal element should be included, as well as containment and no-action alternatives, as appropriate. For ground-water response actions, alternatives should be developed that restore usable ground water to beneficial uses within a timeframe that is reasonable given particular site circumstances.

- o When selecting the preferred approach, the following nine criteria are used to compare relative advantages and disadvantages of the alternatives under consideration:

  Threshold

  1. Overall protection of human health and the environment.

2. Compliance with applicable or relevant and appropriate requirements (or invoke a waiver).

Balancing

3. Long-term effectiveness and permanence.

4. Reduction of toxicity, mobility, or volume through treatment.

5. Short-term effectiveness (e.g., environmental impacts of the cleanup itself).

6. Implementability (e.g., whether technology being considered is available within the necessary timeframe).

7. Cost.

Modifying

8. State acceptance.

9. Community acceptance.

How does EPA intend that these categories of criteria be used?

- An alternative must meet the threshold criteria in order to be selected; these requirements are taken directly from CERCLA and cannot be compromised.

- The balancing and modifying criteria were developed to encompass other CERCLA requirements. One requirement is to use permanent solutions and treatment to the maximum extent practicable. By including practicability, Congress appeared to acknowledge that not all of the waste at a site may be treated and that judgments would be required on whether or to what extent permanent solutions and treatment would be used (and the extent to which waste is left on-site). EPA believes that these judgments are dependent upon site conditions and technological, economic and implementation constraints. By evaluating and comparing the alternatives by means of the balancing and modifying criteria, the decision-maker can make the site-specific judgments necessary to select the most appropriate approach.

- State and community concerns, encompassed by the modifying criteria, generally are considered in altering an otherwise viable approach rather than in deciding between very different approaches, e.g., treatment versus containment.

How does this process differ from the process outlined in the proposed NCP?

- The 1990 NCP process has been revised from what was proposed in order to encourage selection of more treatment remedies (and to comply with the CERCLA preference for remedies that employ treatment as a principal element). The two criteria of "long-term effectiveness and permanence" and "reduction of toxicity, mobility or volume through treatment" are given the most weight in the balancing process.

- Also, the threshold, balancing, and modifying labels have been removed from the discussion of the nine evaluation criteria during the detailed analysis of alternatives. During the detailed analysis, each alternative approach should be evaluated using each of the nine criteria, without assigning greater weight to any of the criteria. The categories of criteria are now part of the remedy selection step.

What is the meaning of a "bias for action" stated in the NCP?

- Bias for action means that actions should be taken, as early as possible, when necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup.

What is "streamlining?"

- Streamlining means tailoring site-specific data needs, the evaluation of alternatives, and the documentation of the selected remedy to reflect the scope and complexity of the specific site problems being addressed. For example, a streamlined RI/FS can be used when site problems are straightforward such that it would be inappropriate to develop a full range of alternatives.

To what extent does EPA intend to clean up ground water?

- The goal of EPA's Superfund ground-water approach is to return usable ground waters to their beneficial uses within a timeframe that is reasonable, given the circumstances at the site.

- EPA intends to restore contaminated ground water that is a current or potential source of drinking water to levels that are safe for drinking. EPA intends to attain such levels throughout the contaminated plume, except directly below any waste that is left in place.

What is a "risk range" and how does it relate to selection of remedial actions?

- Contaminants that are considered carcinogenic are thought to pose a risk at any level of exposure. This risk may be small or large depending on the amount and duration of exposure and the type of carcinogen involved. When Superfund cannot entirely eliminate potential exposure to a carcinogen, it determines that a remedy protects human health when the amount of exposure is reduced so that the risk is very small, i.e., at an acceptable level.

- The 1990 NCP states that generally acceptable levels fall within a range of 10^{-4} to 10^{-6}. This means that an acceptable exposure is when the excess risk to an individual of contracting cancer due to a lifetime exposure to a certain concentration of a carcinogen falls between 10^{-4} to 10^{-6}.

- The proposed revisions to the NCP had included a risk range of 10^{-4} to 10^{-7}. The risk range for Superfund cleanups included in the final rule is consistent with the accepted <u>de minimis</u> level used by other EPA programs and other federal agencies. It also reflects currently available analytical and detection techniques.

- The point of departure when using the risk range is 10^{-6}. The point of departure is the starting point for acceptable exposure levels when analyzing various approaches to cleaning up a site. This 10^{-6} risk level may be revised based on exposure, uncertainty, or technical factors.

What actions are interpreted to fall under the 10-year provision regarding the remediation of ground water?

- CERCLA section 104(c)(6) defines remedial action to include the operation of measures to restore contaminated ground or surface water for a period of up to 10 years after the commencement of operation of such measures. The practical effect is that federal funds will be used to pay 90 percent (or 50 percent for a publicly operated site) of the cost of ground or surface water restoration for up to 10 years. The state will pay the difference. This provision, however, does not apply:

-- To source control maintenance measures initiated to prevent contamination of ground or surface waters.

-- To ground or surface water measures initiated for the primary purpose of providing a drinking water supply, not for the purpose of restoring ground water.

How does EPA define "on-site" for purposes of the CERCLA section 121(e) exemption from obtaining federal, state, or local permits for activities conducted entirely on-site?

o EPA defines "on-site" as the "areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action." Flexibility in defining "on-site" is necessary in order to provide expeditious response to site hazards.

What are the requirements for deleting sites from the NPL?

o Sites may be deleted from or recategorized on the NPL where no further response is appropriate and any of the following criteria has been met:

  -- Responsible parties or other persons have implemented all appropriate response actions required.

  -- All appropriate Fund-financed response under CERCLA has been implemented, and no further response action by responsible parties is appropriate.

  -- The remedial investigation has shown that the release poses no significant threat to public health or the environment and, therefore, taking of remedial measures is not appropriate.

o EPA must obtain state concurrence in order to delete a site from the NPL. Also, EPA must provide the opportunity for public comment on a proposed deletion.

What is the "Construction Completion" category.

- EPA has established a new "category" as part of the NPL, the "Construction Completion" category. Sites may be categorized as "construction complete" only after remedies have been implemented and are operating properly. These may be:

  -- Sites awaiting deletion.

  -- Sites awaiting five-year review and/or deletion (see next question on five-year reviews).

  -- Sites undergoing long-term remedial actions (LTRAs). LTRAs are taken at sites where activities over a relatively long duration are necessary in order to attain cleanup levels identified in the ROD (e.g., pump and treat of ground water for many years).

How does EPA ensure that sites remain safe after the remedial action has been completed?

- The NCP requires a review of a site where waste is left behind at least once every five years to ensure that the site remains safe. No site will be deleted from the National Priorities List (NPL) after completion of the cleanup until at least one five-year review has been conducted.

What contractor conflict of interest requirements are in the 1990 NCP?

- For Fund-financed remedial design/remedial action (RD/RA) and operation and maintenance (O&M) activities, the NCP requires the lead agency to include appropriate language in solicitations requiring potential prime contractors to submit information about their status, as well as the status of their subcontractors, parent companies, and affiliates, as potentially responsible parties at a site.

- Prior to contract award, the lead agency must evaluate the information to determine if a conflict of interest exists that could significantly impact the performance of the contract or the liability of the prime contractors or subcontractors.

- The purpose of this evaluation is to decide whether more oversight of the performance of the contract is appropriate or whether a contractor has an unresolvable conflict of interest such that it should be declared nonresponsible or ineligible for contract award.

DEFERRAL POLICIES

The preamble to the proposed NCP solicited public comment on the possible expansion of the Agency's policy for deferring the listing of sites on the National Priorities List for response under other authorities. What was EPA's decision on expanding the policy?

- EPA decided not to establish an expanded deferral policy at this time. EPA is still evaluating the complex issues involved and believes that any changes in this policy are best decided within the context of CERCLA reauthorization. Current policies with regard to what sites are appropriate for inclusion on the NPL will remain in effect.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

What are applicable requirements?

- Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

What are relevant and appropriate requirements?

- Relevant and appropriate requirements are cleanup standards, etc. that, while not applicable, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well-suited to the particular site.

How does the 1990 NCP change the role of ARARs?

- Prior to the 1986 amendments, EPA required compliance with all federal ARARs, but only consideration of state requirements. The 1990 NCP incorporates the new statutory requirement that remedies must comply not only with ARARs under federal laws, but also with promulgated standards, requirements, criteria, or limitations under state environmental or facility siting laws that are more stringent than corresponding federal standards. The 1990 NCP defines "promulgated" state requirements as those laws or regulations that are of general applicability and are legally enforceable.

- The 1990 NCP provides that the lead and support agency identify their respective federal and state ARARs in a timely manner. "Timely manner" is defined in Subpart F as sufficient time for the lead agency to consider and incorporate ARARs into the remedy selection process without inordinate delays and duplication of effort.

- The 1986 amendments establish six limited exceptions or waivers to the general mandate that remedial actions attain all ARARs. The NCP specifies the six waivers:

  - The alternative is an interim measure and will become part of a total remedial action that will attain ARARs.

  - Compliance with ARARs will result in greater risk to human health and the environment than other alternatives.

  - Compliance with ARARs is technically impracticable from an engineering perspective.

  - Another alternative that does not comply with the ARAR will result in an equivalent standard of performance.

  - The state ARAR has not been consistently applied in similar circumstances.

  - Attainment of ARARs will not provide a balance between the need for protection of human health and environment at the site and the availability of Fund monies to respond to other sites. The preamble to the 1990 NCP suggests a threshold for routine consideration of this waiver at four times the average cost of an operable unit.

Can non-promulgated criteria, such as advisory levels or guidance, be considered when determining cleanup standards?

- Criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in determining what is necessary to be protective or that are otherwise useful in developing Superfund remedies are described as information to-be-considered (TBC). Three general categories of TBCs are: (1) health effects information with a high degree of creditability, e.g., reference doses; (2) technical information on how to perform or evaluate site investigations or response actions; and (3) policy, e.g., EPA's ground-water policy.

- The proposed NCP's description of TBCs was revised in the 1990 NCP to emphasize that they should be used on an "as appropriate" basis and that TBCs are intended to complement use of ARARs, not to be in competition with ARARs.

When are MCLs or MCLGs considered relevant and appropriate in the selection of ground-water restoration levels?

- Maximum contaminant levels (MCLs) are enforceable standards under the Safe Drinking Water Act for specific contaminants in public water supplies. Maximum contaminant level goals (MCLGs) are non-enforceable goals on which MCLs are based.

- Consistent with CERCLA's direction to use maximum contaminant level goals (MCLGs) as cleanup levels, the NCP states that ground water that is or could be used for drinking generally will be restored to MCLGs that are above zero. When the MCLG equals zero (generally for carcinogens), the corresponding maximum contaminant level (MCLs) generally will be used as the cleanup level.

- The NCP explains that a cleanup level of zero is not appropriate for Superfund because CERCLA does not require the complete elimination of risk and because it is impossible to detect whether "true" zero has actually been attained.

- The proposed NCP had stated that MCLs generally will be used as the cleanup level and stated that MCLGs would be used only in cases where multiple contaminants or pathways posed a risk in excess of 10^{-4}.

Has the role of ARARs changed significantly in going from proposed to final revisions?

- The role of ARARs in the 1990 NCP is essentially the same as in the proposed rule. New language was added to the rule, however, to clarify that requirements that are promulgated or modified after the ROD is signed will be attained only when determined to be ARAR and necessary to ensure that the remedy protects human health and the environment.

- The preamble to the 1990 NCP also states that best demonstrated available technology (BDAT) standards under the RCRA land disposal restrictions (LDR) generally will not be appropriate for contaminated soil and debris at a Superfund site. This revised policy will allow Superfund sites to attain alternative levels of cleanup to those required by the BDAT standards.

COMMUNITY RELATIONS AND ADMINISTRATIVE RECORD

What community relations activities are specified in the 1990 NCP?

- In the 1985 NCP, all community relations requirements were set forth in section 300.67. In the 1990 NCP, community relations requirements are incorporated into each of the sections relating to the different phases of response, i.e., removal actions, remedial investigation and feasibility study (RI/FS) and selection of remedy, and remedial design and remedial action (RD/RA). Further, in the 1990 NCP, new community relations requirements are added to implement 1986 CERCLA requirements under sections 113 (administrative record) and 117 (public participation).

1. Removal Actions

What are the administrative record and public participation requirements for removal actions?

- These requirements depend upon the type of removal action conducted. The three categories of removal actions are:

  -- Emergency, which generally refers to a release or threat of release that requires that removal activities begin on site within hours of the lead agency's determination that a removal action is appropriate.

  -- Time-critical, where based on the site evaluation, the lead agency determines that a removal action is appropriate and that there is a period of less than six months available before removal activities must begin on site.

  -- Non-time-critical, where based on the site evaluation, the lead agency determines that a removal action is appropriate and that there is a planning period of more than six months before on-site removal activities must begin.

What are the primary public participation requirements that apply to all types of removal actions?

- The lead agency shall designate a spokesperson to provide information and to respond to inquiries regarding the action.

What are the primary administrative record and public participation requirements that apply to: (1) emergency and (2) time-critical removal actions? (<u>"New" indicates a requirement not stated in the 1985 NCP</u>):

- (New) The administrative record shall be made available to the public no later than 60 days after initiation of on-site removal activities. The notice of availability shall be published in a major local newspaper of general circulation. The record shall be available at the office of the lead agency or other central location and at or near the site. The record for emergency cleanups lasting less than 30 days need only be available at the central location.

- (New) The lead agency shall, as appropriate, provide a 30-day public comment period to begin at the time the administrative record is made available to the public and respond to comments received.

What are the primary administrative record and public participation requirements that apply to: (1) all non-time-critical actions and (2) time-critical actions where on-site removal activities are expected to last longer than 120 calendar days?

- (New) Conduct interviews with state and local officials, residents, public interest groups, or other interested or affected parties, as appropriate.

- Develop a community relations plan specifying the community relations activities that the lead agency expects to undertake.

- (New) Establish at least one information repository at or near the site to contain items made available for public inspection. The administrative record shall be available in at least one of the repositories.

What additional administrative record and public participation requirements apply to non-time-critical actions?

- o (New) Publish a notice of availability and brief description of the decision document, i.e., the engineering evaluation/cost analysis (EE/CA).
- o (New) At the same time, make the administrative record available for public inspection.
- o (New) Provide a public comment period on the EE/CA and the administrative record of not less than 30 days after the EE/CA is made available. Upon timely request, the lead agency will extend the comment period by a minimum of 15 days.
- o (New) Prepare a written response to significant comments.

2. Remedial Actions

What are the primary administrative record and public participation requirements for remedial actions?

- o (New) Conduct interviews with state and local officials, residents, public interest groups, or other interested or affected parties, as appropriate.
- o Develop a community relations plan (CRP) specifying the community relations activities that the lead agency expects to undertake.
  - -- In a revision to the proposed NCP, the 1990 NCP more clearly states that the purpose of developing the CRP is to provide the public opportunities to participate in decision-making at the site and to learn about the site.
- o (New) Establish information repositories at a central location and at or near the site and inform the public of its availability.
- o (New) Inform the community of the availability of technical assistance grants.
- o (New) Make the administrative record available for public inspection when the remedial investigation (RI) starts

(generally when the RI/FS workplan is available) and publish a notice of availability.

- (New) Prepare a proposed plan that briefly describes the remedial alternatives analyzed, proposes a preferred remedial action alternative, and summarizes the information relied upon to select the preferred alternative.

- (New) Publish a notice of availability of the proposed plan and RI/FS in a newspaper of general circulation.

- (New) Make the proposed plan and supporting analyses and information available in the administrative record.

- (New) Provide a comment period of not less than 30 days for submission of written and oral comments (comment period in the 1985 NCP is 21 days).

  -- In a change from the proposed NCP, the 1990 NCP states that, upon timely request, the comment period may be extended a minimum of 30 days.

- Provide the opportunity for a public meeting during the public comment period.

- (New) Keep a transcript of the public meeting.

- Prepare a response to comments, to be a part of the record of decision (ROD).

- (New) Include in the ROD a discussion of any significant changes from the proposed plan with respect to scope, performance, or cost.

- (New) Solicit additional public comment on a revised proposed plan if the significant changes from the proposed plan could not have been reasonably anticipated based on existing information.

- (New) Publish a notice of availability of the ROD and make the ROD available for public inspection and copying.

- (New) Prior to remedial design, review the community relations plan and, when appropriate, revise the community relations plan to describe public involvement opportunities during remedial design/remedial action.

- (New) If, after adoption of the ROD, the remedial action differs significantly from the ROD with respect to scope, performance, or cost, publish and make available an explanation of significant differences. If the changes fundamentally alter the ROD, propose an amendment to the ROD, issue a public notice, solicit public comment, and comply with other community relations requirements, such as public meetings, transcripts, comment response summaries, etc.

- (New) Issue a final engineering design fact sheet and provide, as appropriate, a public briefing prior to the initiation of the remedial action.

How does a significant change to a remedy differ from a fundamental change?

- Significant changes are generally incremental changes to a component of a remedy that do not fundamentally alter the overall remedial approach selected in the ROD (e.g., compliance with a newly promulgated requirement so that the remedy remain protective but that does not change the selected technology). A significant change requires an explanation of significant differences. Fundamental changes alter the ROD with respect to scope, performance, or cost in such a manner that the proposed action, is no longer reflective of the selected remedy in the ROD (e.g., a change from an innovative technology to a more conventional one). Fundamental changes require ROD amendments.

What changes were made in response to public comments on the proposed NCP's community relations requirements?

- The purpose of developing the community relations plan is to provide the public opportunities to participate in decision-making at the site and to learn about the site.

- Upon timely request, the public comment period will be extended a minimum of 30 days for remedial actions. For non-time critical removal actions, the comment period will be extended a minimum of 15 days, upon timely request.

- Prior to remedial design, the lead agency is <u>required</u> to review the CRP to determine if it should be revised. The proposed NCP provided for revision of the CRP in cases where community concerns were not already addressed.

- Before initiation of remedial action, a fact sheet on the final engineering design will be distributed and an opportunity for a public briefing will be provided, as appropriate.

- The preamble to the 1990 NCP describes other public participation activities in addition to the minimum requirements that may be implemented at a site.

What is a technical assistance grant (TAG)?

- SARA section 117(e) provides that technical assistance grants of up to $50,000 may be made available to community groups that may be affected by a release or threatened release at a site listed on the NPL. The grants must be used to obtain assistance in interpreting technical material related to site cleanups.

What changes were made in the 1990 NCP in response to public comments about TAGs?

- The 1990 NCP requires the community to be informed of the availability of TAGs and that information about the TAG application process be placed in the information repository located at or near the site.

<u>ADMINISTRATIVE RECORD REQUIREMENTS</u>

What is the purpose of the administrative record?

- The two primary purposes of the record are to:
  - Serve as the record for judicial review concerning the adequacy of a response action.
  - Provide interested parties, including potentially responsible parties (PRPs), an opportunity to participate in selection of the response through review of and comment on documents in the record.

What documents typically are included in the administrative record?

- All documents which form the basis for the selection of a response action. Such documents typically include: factual information/data; analysis of factual information; policy and guidance documents; public participation documents, including public comments; decision documents and responses to public comments; and some enforcement documents.

Where must the administrative record be located and how will the public be notified of its availability?

- o The record must be located at or near the site (in an information repository) and at an office of the lead agency or another central location. The record need not be available at or near the site, however, for emergency removal actions that are concluded within 30 days of initiation.

- o Certain information need not be located at or near the site where it would pose a substantial administrative burden, e.g., sampling and testing data, guidance documents not generated specifically for the site, publicly available technical literature. The index to the record, however, shall indicate the availability of such items.

- o The availability of the record must be announced in a major local newspaper of general circulation.

What documents may be added to the administrative record after the ROD is signed?

- o Documents relating to remedy selection issues that the ROD reserves or does not address, explanations of significant differences, and ROD amendments.

How does the administrative record differ from the information repository?

- o Information repositories include documents that relate to a Superfund site and to the Superfund program in general, such as documents on site activities, information about the site location, and background program and policy guides. The administrative record is the body of documents that forms the basis of the Agency's selection of a particular response at a site, such as site-specific data and public comments. Documents in the administrative record may overlap with those found in the information repository.

STATE INVOLVEMENT

Which NCP requirements apply to state-lead response actions?

- o The NCP applies to federal agencies and states that take response actions pursuant to the authorities under CERCLA and section 311 of the Clean Water Act.

How does the 1990 NCP implement the new CERCLA requirement to provide for substantial and meaningful state involvement in remedial planning and remedial actions?

- The 1990 NCP introduces the Superfund Memorandum of Agreement (SMOA) and the process of EPA/state concurrence in remedy selection. SMOAs are voluntary agreements that are intended to ensure equitable relationships between EPA and states and to reduce misunderstandings by clarifying the expectations of both parties. The SMOA may be used to establish the general framework for the EPA/state working relationship, to define the roles and responsibilities of the lead and support agencies, and to provide general requirements for EPA oversight.

- The NCP provides that the state may be the lead agency for a Fund-financed site. This allows the state to conduct the investigation and analysis leading up to selecting the remedy. The state may also conduct the remedial design/remedial action phases of the response.

- The process of concurrence, which reflects the evolution of the EPA/state partnership in recent years, enables a state that demonstrates certain capabilities to prepare the proposed plan and recommend the remedy for EPA adoption for Fund-financed actions. EPA retains the authority to select Fund-financed remedies and sign the record of decision (ROD), with the state's concurrence.

  - Also under the concept of concurrence, a state will select the remedy and may request EPA concurrence for state enforcement actions <u>not</u> using the Superfund (i.e., non-Fund-financed actions).

  - One advantage to concurrence by EPA and a state on a remedy is that it results in a unified position when EPA and the state negotiate with PRPs.

- A state may recommend a remedy for EPA concurrence even when no SMOA is established. EPA anticipates that the concurrence process will increase EPA involvement in state enforcement actions and provide for greater state involvement in the selection of remedial actions at Fund-financed sites.

What happens if a SMOA is not established?

- The 1990 NCP sets forth minimum requirements in the absence of a SMOA regarding annual EPA/state consultations, review by the support agency of lead agency documents, and identification of ARARs.

FEDERAL FACILITIES

Which NCP requirements apply to federal facility response actions?

- Requirements of the NCP apply to federal agency response actions at NPL and non-NPL sites, except where specifically noted that the requirements apply only to Fund-financed activities. The requirement for joint selection of remedy by a federal agency and EPA applies only at NPL sites.

- Subpart K of the 1990 NCP is specifically reserved for federal facilities. EPA is currently drafting Subpart K, which will provide a roadmap of the NCP requirements that apply to federal facility response actions.

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

FEB 5 1990

OFFICE OF
THE ADMINISTRATOR

Honorable Frank Lautenberg
United States Senate
Washington, D.C. 20510

Dear Senator Lautenberg:

At your hearing last June on EPA's 90-Day Superfund Management Review, you requested my personal attention to three issues being addressed in revisions to the National Contingency Plan (NCP). Your views on these issues were explained in detail in the Lautenberg-Durenberger report, "Cleaning Up the Nation's Cleanup Program." Now that the NCP is final and will be formally announced tomorrow, I would like to report to you how I considered your recommendations and resolved these issues, which relate to cleanup standards for ground water, role of cost in remedy selection, and cleanup selection criteria.

First, you asked me to reconsider EPA's policy on use of Maximum Contaminant Levels (MCLs) instead of Maximum Contaminant Level Goals (MCLGs) as cleanup standards for contaminated ground water. Under the NCP as revised, the Agency expects that MCLGs above zero will generally be used as the cleanup level for ground water that is or may be used for drinking water; where the MCLG is set at zero (as it is for carcinogens), the relevant MCL will generally be used as the cleanup standard.

We believe this revised policy better reflects the statutory intent of CERCLA section 121, while also recognizing the practical difficulties inherent in attaining MCLGs set at zero. The NCP explains that the use of zero is not appropriate in setting actual cleanup levels to be attained under Superfund. CERCLA requires the achievement of protective remedies, not the complete elimination of risk; in fact, it is not scientifically possible to determine whether a level of zero contamination has been attained.

The second issue you flagged for my personal attention concerns the role of cost in selecting remedial actions under CERCLA. You have argued that cleanup levels for a site should be set first, and then a remedy should be selected to attain those levels, without consideration of cost; cost comes into play only in determining the most cost-effective method for implementing a selected remedy.

We agree that this is the appropriate approach in those situations where a specific applicable or relevant and appropriate requirement (ARAR) defines the cleanup level that must be achieved at the site (e.g., an MCLG above zero where there is drinking water contamination). Where ARARs are not available for the specific contaminants of concern, however, the Agency defines protectiveness in terms of a risk range (consistent with that used in other EPA programs), and several alternative remedial technologies may be capable of achieving protection within that range. Under such circumstances, cost may be one factor to consider in choosing among the available technologies.

It is important to note that the consideration of cost and other factors may only distinguish among alternatives found to protect human health and the environment. The NCP has been revised to establish, as threshold criteria, that remedial alternatives must be protective, and that they comply with Federal and State ARARs (or justify a waiver); cost cannot be used to compromise these threshold requirements.

Rather, cost is one of the five criteria that are used to weigh protective, ARAR-compliant remedial alternatives. Moreover, even within that balancing, cost is not the primary criterion. The final NCP provides that the factors of "long-term effectiveness" and "reduction in mobility, toxicity, or volume" should be emphasized in the evaluation, in accordance with the statutory preference for permanence and treatment.

The final NCP has also been revised to narrow the circumstances under which cost may be considered when screening alternatives at the start of the evaluation process. Specifically, the final rule provides that a given alternative may be eliminated during screening if it is determined that the cost of the alternative is "grossly excessive" compared to its effectiveness. This provision will allow the Agency to avoid the need to conduct resource-intensive analyses of extreme and unrealistic options, while at the same time not allowing cost to compromise consideration of viable options that may simply be more expensive than other alternatives.

I believe that the role given to cost, and the selection process itself, are consistent with the mandates of CERCLA and the guidelines in the Conference Report to SARA.

Finally, you also asked me to consider how to structure the remedy selection process to ensure that remedies consistently fulfill statutory mandates. I believe we have made some significant improvements in finalizing the NCP to establish clearer guidelines for selecting remedies.

The NCP explains in greater detail how each of the nine evaluation criteria are to be used to meet the CERCLA requirements for remedy selection. As I mentioned above, the requirements that all remedies be protective and achieve compliance with other laws are ensured by defining them as "threshold" criteria, which every serious alternative must fulfill. The statutory requirements that selected remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, as well as be cost-effective, are met based on a site-specific review of the "balancing" criteria set out in the rule. For example, the cost-effectiveness mandate is fulfilled by examining the criteria of long- and short-term effectiveness; reduction of mobility, toxicity, or volume; and cost, and by ensuring that cost is in proportion to the overall effectiveness afforded by the remedy.

The preference for permanence and treatment is implemented by providing special emphasis in the rule on the factors of "long-term effectiveness" and "reduction in mobility, toxicity or volume." The modifying criteria of State and public acceptance are also considered as part of the process.

For your information, the Superfund program is doing some other things to improve the remedy selection process and promote greater consistency in decision-making. For example, we are training staff in EPA's regions on implementing the process; we are working with our Regions to promote uniformity and consistency to ensure that similar remedies are selected for similar sites, to the extent possible; and we are analyzing decisions to alert management to potential problems.

I hope that this information addresses some of the concerns you expressed at the hearing and in the "Cleaning Up the Nation's Cleanup Program" report. I want to assure you that we have given extensive consideration to the appropriate role of cost in remedy selection; we have carefully weighed your views along with the language of the Conference Report to SARA and the numerous public comments to the proposal in arriving at our position. I will continue to keep your positions in mind as we move toward implementation of the NCP.

Please let me know if there is anything further you would like to discuss about the final NCP.

Sincerely yours,

William K. Reilly

William K. Reilly

2

FY'89 RECORD OF DECISION ANALYSIS

Region VIII

Office of Emergency and Remedial Response
Office of Waste Programs Enforcement

March 1990

FY'89 ROD ANALYSIS

A. Overview of FY'89 ROD Analysis

B. National Findings

C. Regional vs. National Comparison

D. Major Recommendations for FY'90 RODs

A. OVERVIEW OF FY'89 ROD ANALYSIS PURPOSE

- Centerpiece of HQ QA/QC Program for RODs
- Tool to gauge performance trends, identify strengths and areas for improvement

APPROACH

- Total RODs Reviewed: 131
  - Includes all RODs in CERCLIS minus 4 RODs not received
  - RODs for multiple sites counted as one document

- RODS divided into 5 categories; used separate evaluation form for each category
  - Final Source Control: 85
  - Interim Source Control: 9
  - Final Ground Water: 54
  - Interim Ground Water: 10
  - No Action: 12

APPROACH
(Continued)

- Review conducted January 29-31, 1990
- FY'89 ROD Review team comprised of HSCD and OWPE Regional Coordinators and Representatives from:
  - Toxics Integration Branch, HSED
  - Guidance and Oversight Branch, OWPE
  - Technology Innovation Office, OSWER
  - Office of General Counsel
  - Region III
  - State of New Jersey
- Focus of Analysis

  New - Consistency of remedies selected with program expectations outlined in the NCP

  FY'88 and FY'89 - Quality of ROD Documentation

B: NATIONAL FINDINGS: PROGRAM EXPECTATIONS

Program Goal: select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste

Summary of Program Expectations:

- Treatment is most likely to be appropriate for materials that comprise the principal threats posed by a site (i.e., highly toxic, highly mobile waste)
- Engineering controls are most likely to be appropriate for materials that pose a low-level threat, or where treatment is impracticable
- Institutional controls are expected to be used to mitigate short-term impacts and/or as a supplement to engineering controls to aid in long-term management
- Innovative technologies are to be evaluated closely where there is a reasonable belief that they may perform as well as or better than conventional technologies
- Ground water is to be returned to its beneficial uses within a reasonable time frame

NATIONAL FINDINGS: CONSISTENCY WITH PROGRAM EXPECTATIONS

Source Control (final actions only)

- 73% (69/95) of final source control RODs involve treatment*
  - 54% (37/69) of treatment RODs selected innovative technologies*
- Principal threats will be treated in all cases where principal threats were clearly identified
- Low-level waste will clearly be treated in 33% (24/72) of the cases involving low-level threats; these RODs also are treating principal threats
- Low-level waste will clearly be contained in 67% (48/72) of the cases involving low-level threats
- Institutional controls often used as a supplementary control (58% source control, 72% ground water)

Ground Water (final actions only)

- 97% (62/64) of ground water remedies intend to restore ground water to its beneficial uses within a reasonable time frame*
  - 8% (5/62) of pump and treat remedies used innovative technologies*

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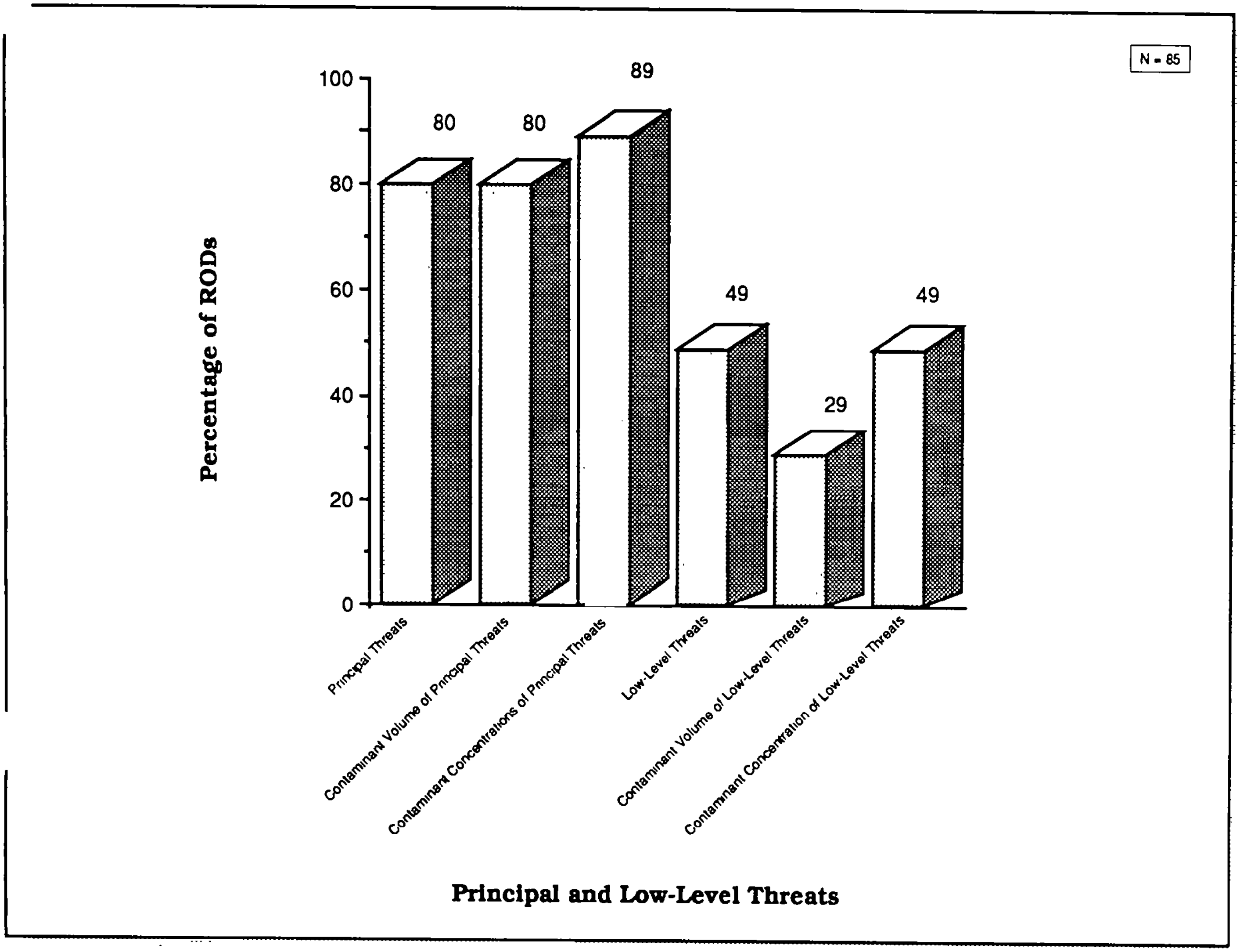
* Data summarized from the ROD Annual Report.

FY'89 RECORD OF DECISION ANALYSIS DATA SUMMARY
Exhibit 1. Documentation of Threats at Final Source Control RODs



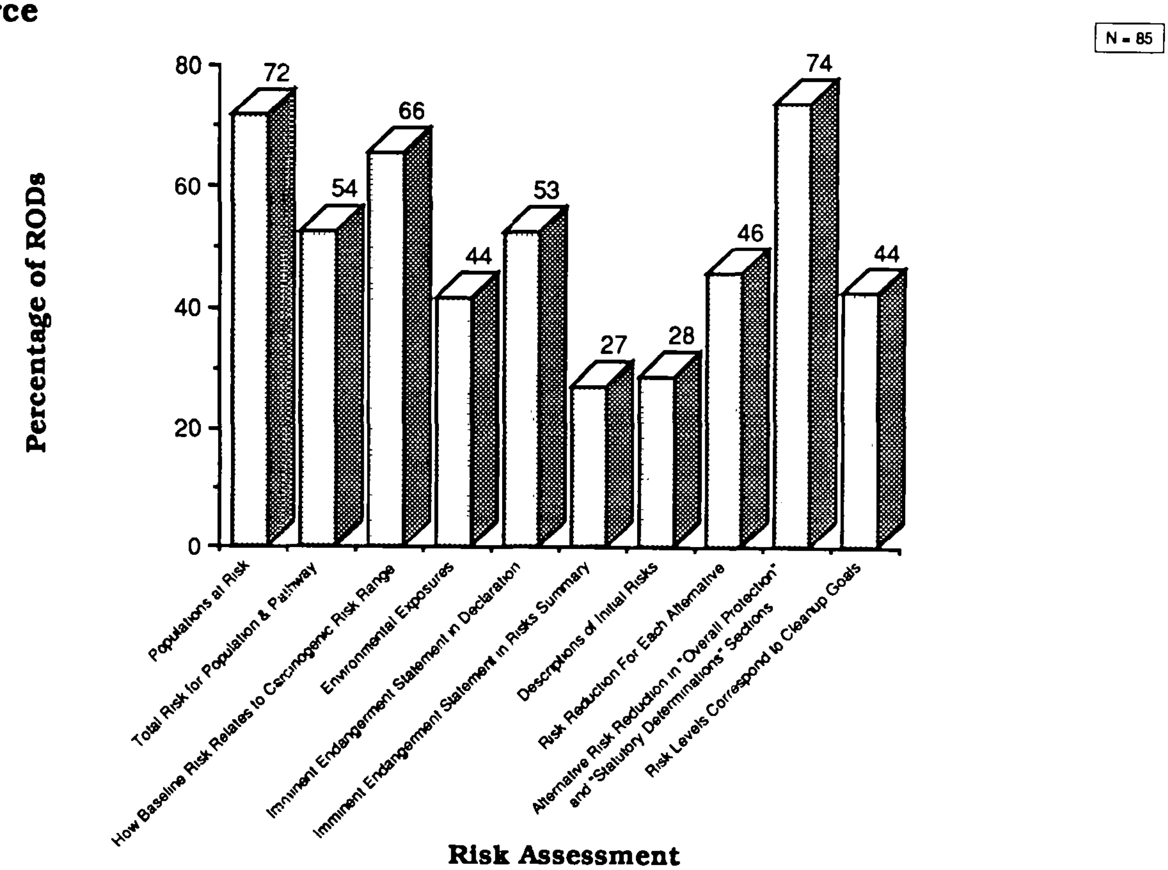
NATIONAL FINDINGS:
ROD DOCUMENTATION

Defining Site Threats (see Exhibit 1)

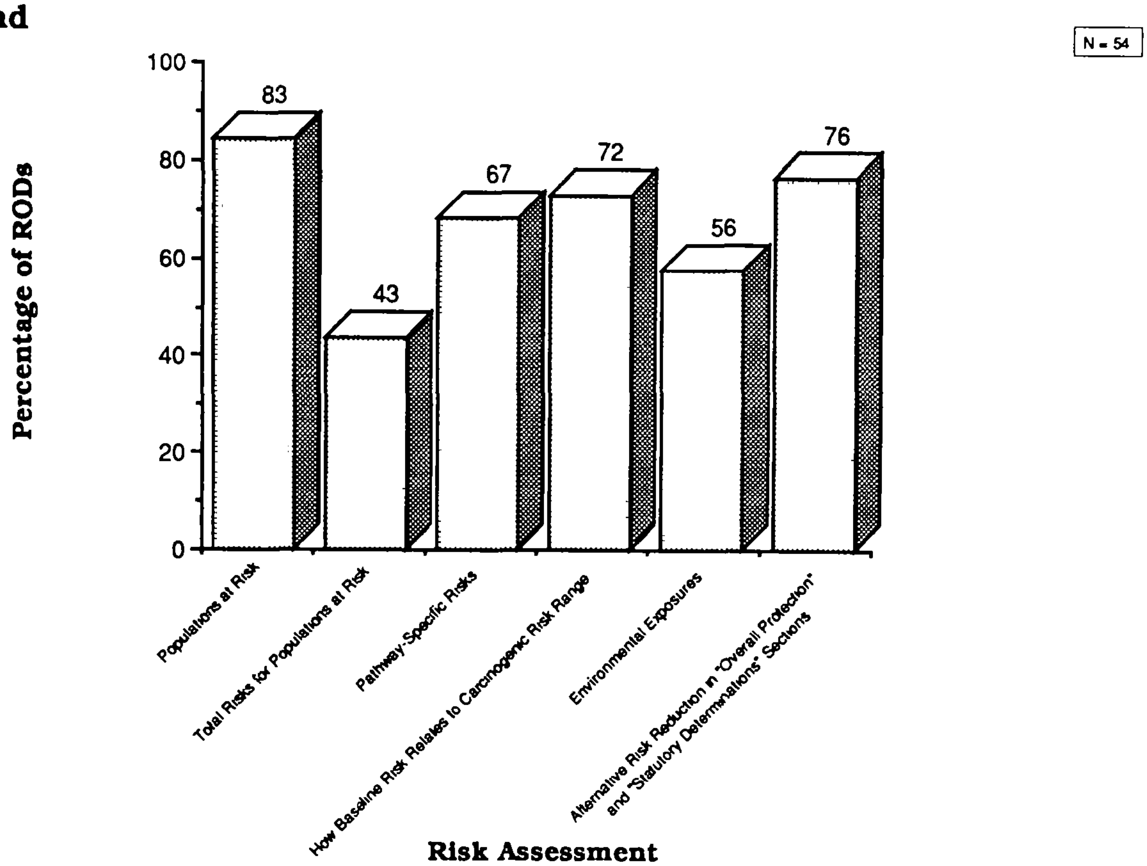
- Principal threats generally are defined clearly
- Low-level threat material clearly defined less than half of the time
  - Location and volume of contaminants often missing

FY'89 RECORD OF DECISION ANALYSIS DATA SUMMARY
Exhibit 2. Documentation of Risks at Final Source and Final Ground Water RODs

Final Source Control:



Final Ground Water:



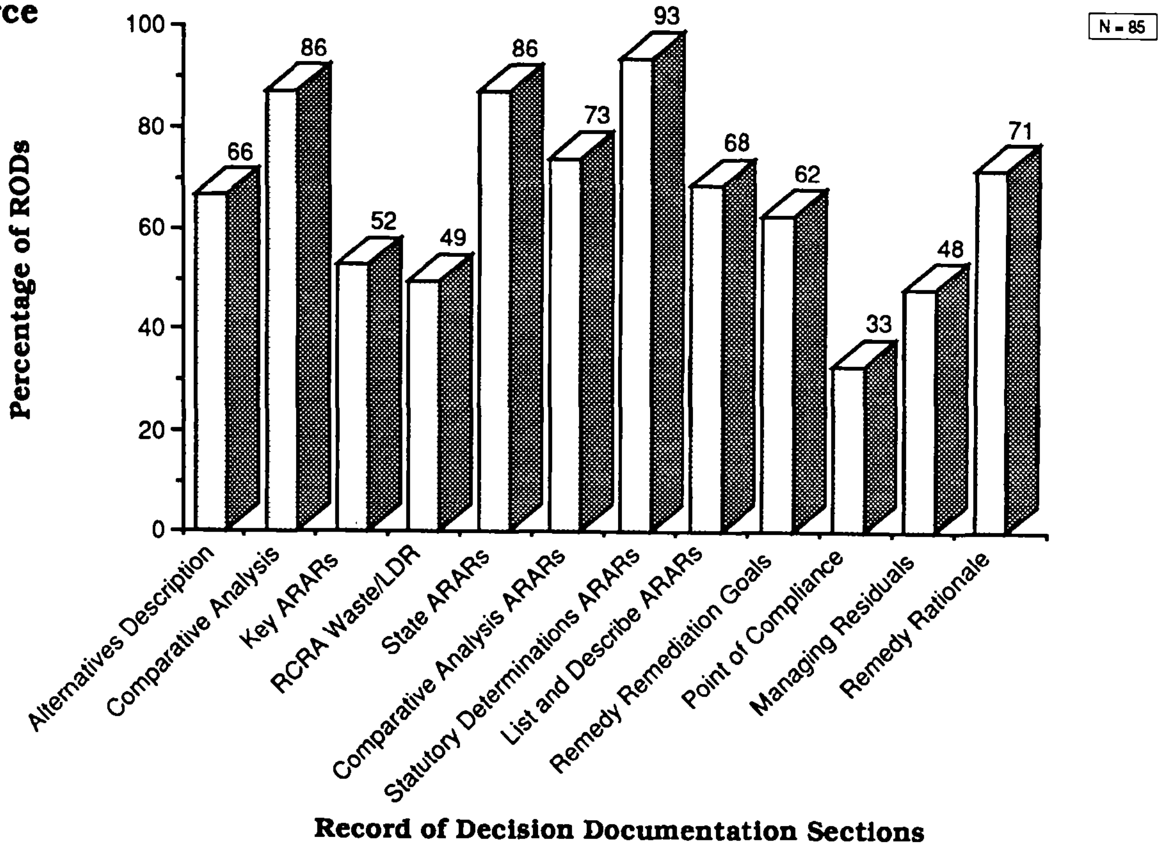
NATIONAL FINDINGS: ROD DOCUMENTATION (continued)

<ins>Documenting Site Risks</ins> (see Exhibit 2)

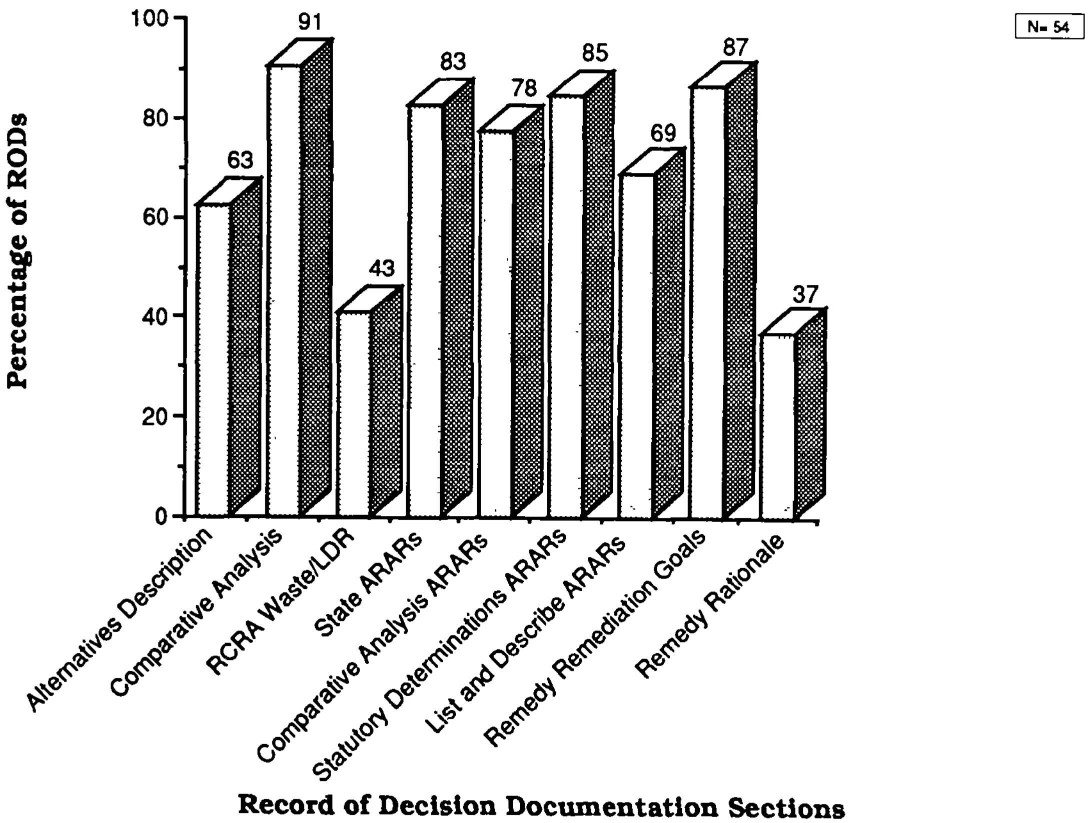
- Priority area for improvement
- In "Summary of Site Risks" section, pathway-specific and population risks or hazard indices were provided about half the time
- About 2/3 of the RODs clearly explained the relationship of the baseline risk to the risk range
- Environmental exposures addressed in 44% of final source control RODs and 56% of final ground water RODs
- "Imminent and Substantial Endangerment" language appeared in 53% of the declarations and 27% of the texts
- In "Description of Alternatives" section, 28% of the final source control RODs included a description of initial risks for a pathway or population and 46% provided the risk reduction
- In "Overall Protection" discussion and "Protection of Human Health and the Environment" determination, 75% of the RODs provided risk reduction
- In "Selected Remedy" section, 44% of the final source control RODs provided risk levels corresponding to remediation goals

FY'89 RECORD OF DECISION ANALYSIS DATA SUMMARY
Exhibit 3. Documentation Findings at Final Source and Final Ground Water RODs

Final Source Control:



Final Ground Water:



NATIONAL FINDINGS:
ROD DOCUMENTATION (continued)

<u>Alternatives Description and Analysis</u> (see Exhibit 3)

- Only 2/3 of final RODs provided a complete description of the alternatives; management of residuals is often missing
- Comparative analysis correctly used 9 evaluation criteria in 86% of final source control RODs and 91% of final ground water RODs (an improvement over FY'88 in which 80% of final RODs included an adequate comparative analysis)

NATIONAL FINDINGS: ROD DOCUMENTATION (continued)

ARARs (see Exhibit 3)

- Incorporation of key ARARs into the description of alternatives has declined since last year (70% in FY'88 vs. 52% in FY'89)
- The presence of RCRA waste and LDRs as ARARs was addressed in only 1/2 of final source control RODs and 43% of final ground water RODs
- RCRA closure requirements were identified as ARARs for close to half of remedies involving containment
- State ARARs were addressed in 86% and 83% of the final source control and final ground water RODs, respectively
- In the "Comparative Analysis" discussion, 73% and 78% of the final source control and final ground water RODs, respectively, highlighted that each alternative meets ARARs
- ARARs determination is almost always made as a statutory finding
- 31% of final RODs a did not list and describe ARARs to be attained by the selected remedy

NATIONAL FINDINGS: ROD DOCUMENTATION (continued)

Selected Remedy (see Exhibit 3)

- Final remediation goals not provided in 1/3 of final source control RODs; points of compliance missing in 2/3
- 87% of final ground water RODs provided remediation goals
- Less than half of the final source control RODs documented the method for managing residuals

Statutory Determinations/Rationale (see Exhibit 3)

- Documentation of remedy selection rationale in final source control RODs has improved over last year (50% in FY'88 vs. 71% in FY'89)
- Rationale for remedy selection in terms of balancing of the five primary criteria was provided in 37% of the final ground water RODs

NATIONAL FINDINGS: SUMMARY OF ROD DOCUMENTATION

- Improvement over FY'89 in presentation of the 9 criteria analysis and remedy selection rationale

- Improvements need to be made in documenting:
  - Site Threats
  - Site Risks
  - ARARs, particularly LDRs
  - Points of compliance and remediation goals for the selected remedy

C. REGIONAL VS. NATIONAL COMPARISON

- ROD evaluation form responses were tallied for nearly every question
- Tables that follow reflect statistics from ROD Analysis, which were compiled for each Region based on final source control and final ground water RODs (interim action and no action RODs were excluded)

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 1. Definition of Principal and Low-level Threats in Final Source Control RODs

	Regional (percent)	National (percent)
Principal Threats		
RODs clearly defining principal threats	60	80
RODs providing volumes of the contaminants	60	80
RODs providing concentrations of the contaminants	80	89
Low-level Threats		
RODs clearly defining low, but significant, long-term threat	50	49
RODs providing volumes of the contaminants	25	29
RODs providing concentrations of the contaminants	50	49

Table 2. Documentation of Site Risks in Final Source Control RODs

	Regional (percent)	National (percent)
RODs identifying populations at risk	80	72
RODs identifying current land use	100	91
RODs identifying future land use	40	38
RODs providing carcinogenic risk or hazard indices for the pathway-specific risk	40	54
RODs providing carcinogenic risk or hazard indices for the population groups at risk	60	49
RODs identifying reasonable exposure pathways	100	89
RODs identifying basic toxicity information	20	44
RODs documenting how the baseline risk relates to the risk range	60	66
RODs documenting environmental exposures	60	44
RODs providing statement on imminent and substantial endangerment in summary of site risk section	0	27
RODs including description of the initial risks for a pathway or population in description of alternatives section	60	28
RODs providing risk reduction for each alternative	40	46
RODs providing risk levels corresponding to cleanup goals in the description of the selected remedy	80	44

ımber of Region VIII FY'89 Final Source Control RODs = 5
ı otal number of FY'89 Final Source Control RODs = 85

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 3. Alternatives Description and Comparative Analysis in Final Source Control RODs

	Regional (percent)	National (percent)
RODs fully tracking all identified wastes, including residuals	80	66
RODs providing a comparative analysis that uses the nine criteria consistent with NCP definitions	80	86

Table 4. ARARs Identification (LDR, RCRA Waste, Closure, Endangered Species Act, State ARARs) in Final Source Control RODs

	Regional (percent)	National (percent)
RODs documenting key ARARs	40	52
RODs documenting whether the waste is RCRA waste	60	49
RODs providing a determination of LDR as an ARAR	60	51
RODs documenting RCRA closure requirements for actions that involve capping, excavation, or disposal	40	55
RODs identifying the Endangered Species Act as an ARAR at sites where endangered species may be encountered	0	25
RODs addressing State ARARs	80	86
RODs highlighting that each alternative meets ARARs in the comparative analysis of alternatives	60	73
RODs documenting that the selected remedy complies with ARARs in the statutory determinations.	100	93
RODs listing and describing the ARARs that will be attained	60	68

mber of Region VIII FY'89 Final Source Control RODs = 5
. otal number of FY'89 Final Source Control RODs = 85

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 5. Description of Selected Remedy in Final Source Control RODs

	Regional (percent)	National (percent)
RODs providing remediation goals	60	62
RODs providing points of compliance for each medium	60	33
RODs documenting the method for managing residuals	60	48
RODs providing the rationale for remedy selection in terms of the five primary balancing criteria	0	71

Table 6. Consistency with Program Expectations in Final Source Control RODs

	Regional (percent)	National (percent)
RODs documenting treatment of principal threats	100	100
RODs documenting use of engineering controls for low-level waste	50	67
RODs documenting use of engineering controls as the primary component of the remedy	0	24
RODs including institutional controls in the remedy	40	58
RODs using institutional controls as the primary component of the remedy	0	0
RODs selecting a combination of treatment with engineering controls and institutional controls	80	41
RODs selecting innovative treatment technologies*	75	54

mber of Region VIII FY'89 Final Source Control RODs = 5
. otal number of FY'89 Final Source Control RODs = 85
* Total number of FY'89 Final Source Control Treatment RODs = 69; information obtained from FY'89 Annual Report

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 1. Documentation of Site Risks in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs providing current use of water	100	100
RODs providing potential beneficial use of water	100	96
RODs identifying populations at risk	100	83
RODs identifying the reasonable exposure pathways affecting each population group identified	100	91
RODs identifying the CDI factors	0	20
RODs identifying the exposure assumptions	0	35
RODs identifying the basic toxicity information	100	44
RODs identifying the pathway-specific cancer risk or HI	50	67
RODs identifying the population risk or HI	50	43
RODs documenting how the baseline risk relates to the risk range	100	72
RODs documenting consideration of environmental exposures	100	56

Table 2. Alternatives Description and Comparative Analysis in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs identifying the ground water classification	0	46
RODs identifying remediation goals to be achieved in the ground water	100	76
RODs identifying the timeframe for restoration	100	76
RODs providing for monitoring the ground water after the system is shut off	100	47
RODs identifying the area of attainment	50	56
RODs fully describing the waste movement to final destination	50	63
RODs using the nine criteria consistent with NCP definitions	100	91

mber of Region VIII FY'89 Final Ground Water RODs = 2
, otal number of FY'89 Final Ground Water RODs = 54

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 3. ARARs in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs identifying State ARARs	100	83
RODs identifying whether the waste is a RCRA waste	100	41
RODs documenting a determination of LDR as an ARAR	100	44
RODs highlighting whether each alternative meets ARARs in the comparative analysis	100	78
RODs documenting that the selected remedy complies with ARARs in the statutory determinations	100	85
RODs listing and describing ARARs that will be attained	100	69

Table 4. Selected Remedy in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs providing the treatment level for the extracted ground water	100	100
RODs providing the remediation goal for the selected remedy	100	87

..mber of Region VIII FY'89 Final Ground Water RODs = 2
. otal number of FY'89 Final Ground Water RODs = 54

FY'89 Record of Decision Analysis
Region VIII Comparison

Table 5. Statutory Determinations in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs stating the rationale for remedy selection in terms of the nine criteria	50	37

Table 6. Consistency With Program Expectations in Final Ground Water RODs

	Regional (percent)	National (percent)
RODs documenting use of institutional controls as part of the remedy	100	72
RODs documenting use of institutional controls as the primary component of the remedy	0	2
RODs discussing the expectation to restore ground water to its beneficial uses within a reasonable period of time	100	57
RODs discussing the uncertainty related to ground water restoration timeframes and cleanup levels	100	57
RODs selecting innovative treatment technologies*	0	8

ımber of Region VIII FY'89 Final Ground Water RODs = 2
ı otal number of FY'89 Final Ground Water RODs = 54
* Total number of FY'89 Final Ground Water treatment RODs = 62; information obtained from FY'89 ROD Annual Report

D. MAJOR RECOMMENDATIONS FOR FY'90 RODs

1. Keep up good work on 9 criteria analysis and remedy selection rationale
2. Clearly define site threats
3. Improve documentation of ARARs, particularly LDRs
4. Effectively summarize site risks
5. Provide remediation goals/cleanup levels and points of compliance for the selected remedy

FY'90 RECOMMENDATIONS

Clearly define site threats

- In "Summary of Site Characteristics" Section: Identify locations, volumes and concentrations for contaminants to delineate principal and low-level threats

- In "Description of Alternatives," "Selected Remedy," and "Statutory Determinations" Sections: Ensure that descriptions of remedies convey how a particular cleanup option addresses principal vs. low-level threats

FY'90 RECOMMENDATIONS
(Continued)

Improve ARARs Documentation

- Include listing of all ARARs for the selected remedy
- Address presence/absence of RCRA waste and LDRs in all RODs
- Use treatability variances for soil and debris contaminated with RCRA restricted waste

FY'90 RECOMMENDATIONS
(Continued)

Effectively Summarize Site Risks
Summarize in text or tables pertinent information from baseline risk assessment

<u>Human Health</u>

- Contaminants of concern: contaminants, media, concentrations
- Exposure: pathways, populations, current and future land uses, data, assumptions
- Toxicity: cancer potency factors, reference doses, explanations
- Risk Characterization:
  - Carcinogenic risk of each contaminant: by medium, by pathway, total by population
  - Noncarcinogenic effects: hazard index
  - Explanation of measuring uncertainty, other conclusions

DESCRIPTION OF ALTERNATIVES

All of the drums and approximately 40 cubic yards of contaminated surficial soil and debris have been removed from the site. The levels of subsurface soil contamination on-site, with the possible exception of inorganics located in Source Area 3, present risk levels which are within EPA's acceptable range. However, contaminants remaining at the site have contaminated the underlying groundwater, exceeding federal and state groundwater quality standards. Specifically, Source Area 1 and Source Area 2 are releasing organic contaminants into the groundwater through infiltration of precipitation. The two plumes exceed ARARs and pose a risk of off-site migration of contaminants to the nearby Oak Orchard Creek. There does not appear to be a groundwater contaminant plume emanating from Source Area 3. The alternatives described below address the remaining subsurface soil contamination at the site and the contamination in the groundwater underlying the site.

A total of eight alternatives were evaluated in detail for remediating the site. Five remedial alternatives address the contaminated subsurface soils that contribute to groundwater contamination at the Byron Barrel and Drum site. In addition, six alternatives address the contamination in the groundwater beneath the site. These alternatives are as follows:

ALTERNATIVE 1 - NO ACTION WITH MONITORING

The Superfund program requires that the "no-action" alternative be considered at every site. Under this alternative, EPA would take no further action to control the source of contamination. However, long-term monitoring of the site would be necessary to monitor contaminant migration. Monitoring can be implemented by using previously-installed monitoring wells and residential wells.

Because this alternative would result in contaminants remaining on-site, CERCLA requires that the site be reviewed every five years. If justified by the review, remedial actions would be implemented at that time to remove or treat the wastes.

The present worth cost of this alternative for a 20-year period is approximately $265,000. The time to implement this alternative is two months.

ALTERNATIVE 2 - DEED AND GROUNDWATER-USE RESTRICTIONS

This alternative would not require implementation of remedial actions to address groundwater or subsurface soil contamination. Deed restrictions would be imposed to prevent excavation in areas of contamination. Groundwater-use restrictions would be implemented in the affected area to prevent the use of contaminated groundwater for drinking or irrigation purposes. These institutional controls would also alert future property owners to potential site-related risks. A long-term monitoring program would also be implemented. Deed and groundwater restrictions can be implemented by state and local officials. Groundwater monitoring can be performed using previously-installed monitoring wells and residential wells.

The present worth cost of this alternative, for a 20-year period, is approximately $279,000. The time to implement this alternative would be 2 months.

ALTERNATIVE 3 - DEED RESTRICTIONS AND GROUNDWATER PUMPING, TREATMENT, AND DISCHARGE TO SURFACE WATER

This alternative would not require implementation of remedial actions to address subsurface soil contamination. Deed restrictions would be imposed to prevent excavation in areas of subsurface soil contamination. Groundwater would be collected using a series of extraction wells and pumped to an on-site treatment system.

To treat the volatile organic contaminants (VOCs) in the extracted groundwater, an air stripping column and activated carbon adsorber would be constructed at the site. The air and VOC mixture exiting the air stripper would be treated by a vapor phase carbon adsorption unit. The clean air would be emitted to the atmosphere. It is anticipated that a carbon adsorption unit would be necessary for the removal of the MEK, since air stripping would not remove this contaminant from the groundwater. In addition, inorganic contaminants in the groundwater would be removed by precipitation prior to air stripping. Discharge piping would be installed to pump the treated water to the drainage ditch located north of the onion field or to Oak Orchard Creek. All air and surface water discharges would comply with state and federal standards.

Environmental monitoring would be required during the life of the treatment process. In addition, monitoring of the groundwater at the site and its environs would continue for at least five years after the completion of the remediation to ensure that the goals of the remedial action have been met. Pre-construction, construction and post-construction air monitoring would also be performed.

The present worth cost of this alternative is approximately $4,874,000. The time to reduce the groundwater contaminant concentrations to levels based on ARARs is estimated to be 20 years.

ALTERNATIVE 4 - SOIL CAPPING AND GROUNDWATER PUMPING, TREATMENT, AND DISCHARGE TO SURFACE WATER

This alternative is similar to Alternative 3, except that synthetic membrane caps would be installed over the areas of soil contamination.

Under this alternative, the maintenance building would be dismantled, and decontaminated if necessary, and disposed of off-site. Prior to capping, the areas would be graded to control surface water runoff and erosion. A protective soil cover would be placed over the synthetic membrane, topsoil would be spread, and the capped areas would be revegetated.

The groundwater pumping, treatment, and discharge scenario would be the same as that discussed for Alternative 3. Monitoring would be the same as in Alternative 3.

The present worth cost of this alternative is approximately $5,143,000. Two months would be required to construct the cap. The time to reduce the groundwater contaminant concentrations to levels based on ARARs is estimated to be 20 years.

ALTERNATIVE 5 - SOIL EXCAVATION AND OFF-SITE DISPOSAL AND GROUNDWATER PUMPING, TREATMENT, AND DISCHARGE TO SURFACE WATER

This alternative is similar to Alternatives 3 and 4, except that contaminated soil would be excavated and hauled to an off-site Resource Conservation and Recovery Act (RCRA) landfill for disposal.

Under this alternative, the maintenance building would be dismantled and decontaminated if necessary, and disposed of off-site. Contaminated subsurface soil would be excavated, loaded into trucks, and hauled to an approved off-site RCRA landfill for disposal. (So as to comply with RCRA land disposal requirements, treatment of the contaminated soil might be required prior to disposal.) The excavations would be backfilled with clean fill material from an off-site source. These areas would be covered with a layer of topsoil and revegetated.

The groundwater pumping, treatment, and discharge scenario would be the same as for Alternative 3. Monitoring would be the same as Alternative 3.

The present worth cost of this alternative is approximately $7,929,000. Two months will be required to remove the contaminated soil. The time to reduce groundwater contaminant concentrations to levels based on ARARs is 20 years.

ALTERNATIVE 6 - SOIL EXCAVATION AND THERMAL DESORPTION AND GROUNDWATER PUMPING, TREATMENT, AND DISCHARGE TO SURFACE WATER

This alternative is similar to Alternatives 3, 4, and 5, except that contaminated subsurface soil would be excavated and treated on-site using low-temperature thermal desorption to remove volatile organic contaminants.

Under this alternative, the maintenance building would be dismantled, and decontaminated if necessary, and disposed of off-site. Contaminated soil would be excavated and hauled to a mobile thermal desorption unit that would be set up at the site. Treated soil would be used to backfill the excavations. The areas would be covered with a layer of topsoil and revegetated. Because of the presence of inorganic constituents in the soil, which thermal desorption would not remove, treatment of the residual by chemical fixation might be necessary before backfilling to comply with RCRA land disposal requirements.

The groundwater pumping, treatment, and discharge scenario would be the same as for Alternative 3. Monitoring would be the same as in Alternative 3.

The present worth cost of this alternative is approximately $6,899,000. Two months would be required to complete soil treatment. The time to reduce groundwater contaminant concentrations to levels based on ARARs is estimated to be 20 years.

ALTERNATIVE 7 - IN-SITU SOIL VAPOR EXTRACTION AND GROUNDWATER PUMPING, TREATMENT, AND DISCHARGE TO SURFACE WATER

This alternative is similar to Alternatives 3, 4, 5, and 6, except that contaminated subsurface soil would be treated by in-situ vapor extraction using air extraction and injection wells.

Under this alternative, the maintenance building would be dismantled and decontaminated if necessary, and disposed of off-site. Vapor extraction wells would be installed at the centers of Source Area 1 and 2. Air injection wells would be installed around the perimeters of the Source Areas 1 and 2. A vacuum would be induced and the air that would be collected would be treated using vapor-phase carbon adsorption. A synthetic membrane would be used to prevent air leakage from the soil surface between the air extraction and injection wells.

The groundwater pumping, treatment, and discharge scenario would be the same as for Alternative 3. Monitoring would be the same as Alternative 3.

The present worth cost of this alternative is approximately $5,200,000. Six months would be required to reduce soil contaminants to levles that would achieve groundwater ARARs. The time to reduce groundwater contaminant concentrations to levels based on ARARs would be 20 years.

ALTERNATIVE 8 - IN-SITU SOIL FLUSHING AND GROUNDWATER PUMPING, TREATMENT, AND RECHARGE

This alternative is similar to Alternative 3, except that a portion of the treated groundwater would be recharged to the aquifer in the areas of subsurface soil contamination. This alternative would attempt to restore groundwater quality and flush the residual contaminants from the subsurface soil.

The maintenance building would be dismantled, and decontaminated if necessary, and disposed of off-site.

Monitoring would be the same as for Alternative 3.

The present worth cost of this alternative is approximately $5,572,000. The time to reduce soil contaminant concentrations to levels that would achieve groundwater ARARs is estimated to be in 10 years. The time to reduce groundwater contaminant concentrations to levels based on ARARs is 20 years.

DESCRIPTION OF ALTERNATIVES

The goal of the remedial actions is to prevent, reduce, or control the contaminants leaving the landfill and entering the groundwater. Technically applicable technologies were identified in the FS for each of the units. Most of the remedial actions that passed the screening process for one of the landfill solid waste units (refuse, skimmings, old burn, or sewage sludge) passed for all of the other three. The aquifer unit includes different technologies that deal with the migration of the contaminants in groundwater and not the material in the refuse. The description of the treatment alternatives is divided into those for the landfill units and those for the aquifer unit.

Landfill Units

Remediation of the landfill units must control, as far as possible, the leaching of contaminants into the groundwater. This may be done by either:

a) capping the landfill to eliminate leaching;
b) diverting stormwater so that it does not generate leachate; or
c) excavating the landfill and removing the contaminated waste.

If it proves impracticable to control leachate, administrative restrictions may be enacted to reduce exposure to contaminants. Another alternative considered is to take no action.

a) Capping. The cap system would consist of multiple layers, including topsoil, soil cover, drainage layers, and bedding/protection layers, in conjunction with a low permeability, barrier layer to control infiltration. Around the perimeter of the cap, collection ditches would be installed to intercept stormwater runoff and convey it to appropriate points of discharge. Three different types of cap systems were considered: synthetic membrane, synthetic membrane and clay, and soil/bentonite.

The cap would utilize proven technologies. Its main advantage is that it restricts the amount of leachate that can enter the aquifer unit by reducing the infiltration of precipitation into the landfill. Precipitation is the principal source of leachate generation for the landfill because it is located above the identified groundwater tables. Therefore, if precipitation, run-on, and any lateral flows from the hillside can be kept from entering the waste, the health and environmental hazards associated with leachate generation and contamination of the aquifer unit would be significantly reduced.

Disadvantages of capping include the waste of concern remaining onsite, the potential for the cap to leak and generate additional leachate, and the magnitude of grading and covering 345 acres of land. Leakage of the cap is a concern because of the potential for future leachate generation. The design and installation of the cap would need to be carefully done, and a maintenance program would be necessary to reduce the risk of leaks developing in the system over time. Environmental impacts of the cap installation are considered temporary because the existing surface topography would not change significantly and vegetation would be reestablished.

Capping, of course, presupposes the closure of the landfill. Three of the units--old burn, sewage sludge, and skimmings--are no longer in use and could be capped at any time, but the refuse unit currently is scheduled to remain in use until December 31, 1991, when the waste-to-energy treatment system becomes operational. Any refuse taken to the Northside site after December 31, 1991, will be required to be placed into a new disposal unit which meets the state's Minimum Functional Standards (MFS) requirements.

ARARs

The closure and capping alternative include action-specific applicable or relevant and appropriate requirements (ARARs). The primary ARAR is the Washington State Minimum Functional Standards for Performance (MFS) (WAC 173-304-460). The MFS are applicable to landfills that institute closure after November 27, 1989. The Northside Landfill will be operating beyond 1989.

The MFS include requirements for the final cover, groundwater monitoring, landfill gas monitoring and control, runoff and leachate control, a closure plan, and a closure cost estimate.

The wastes in the landfill are not currently classified as hazardous wastes under RCRA because the only sources identified are small quantity generators. Since closure and capping do not include the placement of RCRA hazardous wastes, those RCRA regulations would not apply.

There are no chemical-specific or location-specific ARARs identified for this alternative.

b) Surface Water Diversion and Collection Systems. These systems are designed to divert and collect stormwater runoff and keep it from infiltrating the landfilled wastes, thereby reducing the potential for leachate generation. The diversion and collection systems would consist of ditches, culverts, and pipelines that collect runoff from flow concentration areas and convey it to an appropriate point of discharge. The ditches would be lined to ensure that infiltration would be minimized.

This alternative's chief advantages are that it would consistently help reduce leachate-generating precipitation from entering the landfill, and it is low in cost. The disadvantage is that it does not address infiltration by precipitation that falls within the landfill boundaries.

In the final analysis of alternatives, surface water diversion is not considered a separate alternative, but rather a component of capping, and is included as part of that alternative.

c) Excavation and Offsite Disposal. One additional remedy passed screening for the Skimmings Unit only. It was rejected for the refuse unit because of high cost and EPA preference for onsite remedies (the old burn and sewage sludge units have low contaminant levels and disproportionately higher costs). This alternative entails total removal of grease skimmings (though not any contaminated soil) which would then be disposed of offsite at a permitted hazardous waste landfill. As this is an offsite activity, such disposal must comply with all applicable hazardous and solid waste disposal requirements. These include RCRA and the state Dangerous Waste and solid waste regulations.

d) <u>Excavation and Onsite Treatment</u>. Treatment onsite is either through land treatment or incineration. Land treatment is described as biological treatment of the waste done onsite but not <u>in-situ</u>. This meets EPA's preference for onsite treatment.

The chief advantages of this alternative are its permanent elimination of one potential contaminant source, its elimination of the health hazard for this area of the site, and the fact that it restores the area for possible future use. No administrative restrictions would be necessary after excavation and treatment were completed.

Disadvantages of this alternative include health and safety impacts associated with excavation, environmental concerns (e.g., worker exposure to contaminants during excavation and treatment), demonstrated effectiveness, and cost.

<u>ARARs</u>

Several action-specific ARARs are identified for excavation and treatment alternatives evaluated for the Skimmings Unit area within the landfill.

The skimmings originated from the city's wastewater treatment plant and are not RCRA hazardous wastes or state dangerous wastes either by definition or by characteristic.

Any contaminated soils not excavated can be treated as a non-disturbed solid waste unit (not hazardous) and capped according to applicable regulations.

Excavation of the skimmings could also be expected to result in the release of some quantity of volatile organics. There are currently no standards for PERC emissions, so any requirements would be determined by risk assessments which are not ARARs, but are "to be considered" in design of the remedial action.

Excavation and onsite treatment of the skimmings includes two treatment options. Both options include the excavation of the grease skimmings followed by treatment and placement back onsite. Land treatment of the skimmings has no applicable regulations. However, the disposal of any hazardous wastes generated as a result of the treatment process would be required to meet the RCRA disposal requirements, which would be applicable to this new waste's disposal.

The incineration of the skimmings has relevant and appropriate RCRA requirements for the operation and disposal of the waste streams. Although the incoming waste is not RCRA regulated, the RCRA ash and air emissions requirements for incineration would be relevant and appropriate because of the PERC concentrations in the waste.

There were no chemical-specific or location-specific ARARs identified for the excavation alternatives

For the excavation with offsite disposal alternative, the RCRA hazardous waste regulations are not applicable because the skimmings are not a RCRA waste. However, offsite activities, such as disposal, will be regulated by applicable laws and regulations, and are not subject to ARAR analysis. For example, the transportation and packaging of the skimmings as a hazardous solid waste because of the PERC content is regulated by the U.S. Department of Transportation.

d) Administrative Restrictions. This would involve restricting land use with respect to future onsite excavation and construction.

The chief advantages of this alternative are its low cost and ease of implementation. Public health would be protected by reducing exposure to the contaminants at the site.

The primary disadvantage is that administrative restrictions would not be effective in eliminating or reducing public health concerns offsite. Infiltration would not be reduced nor surface water or groundwater flow controlled; thus the leachate would continue to be produced. The MFS, which is an ARAR and requires landfill capping, would not be met.

e) No Action. The landfill would be left in its current condition without any remedial action being taken. There would be no cost, but public health would not be protected. ARARs would not be met.

Aquifer Unit

For this unit, the remedial objective is to reduce health risks from the contaminants in the groundwater. Alternatives include:

a) extracting and treating the contaminated water;
b) monitoring;
c) administrative restrictions;
d) providing an alternate water supply; and
e) no action.

a) Collection Wells, Treatment, and Discharge. The purpose of the extraction and treatment system is to reduce and control the release of contaminants into the aquifer downgradient from the landfill. The aquifer unit alternative includes six variations using two extraction options for the contaminated groundwater and three treatment levels for each extraction design.

The two extraction (pump) options are extracting the entire contaminated plume (total plume capture) and extracting only a portion of the contaminated plume (partial plume capture). The total plume capture system uses extraction wells across the entire width of the contaminated plume and would be designed to extract groundwater with any amount of contamination for treatment. This would include pumping large volumes of groundwater that is currently contaminated at levels below the protective requirements. The partial capture system would extract only that groundwater that is contaminated at concentrations greater than existing standards. This would reduce the amount of water that would need to be pumped and subsequently the volume that would be treated

The difference between the two capture options, besides the amount of water pumped, is the amount of control over the release of contaminants downgradient from the system. This would have an impact on the time needed for recovery of the contaminated plume downgradient. Both options would control releases downgradient of the extraction system so that they would meet drinking water ARARs and protectiveness requirements in the aquifer. The design of the extraction system will determine where the actual extraction wells will be located.

The extracted contaminated groundwater would then be treated or discharged into the city's wastewater treatment plant for treatment and then discharged into the Spokane River. Three levels of treatment have been identified in the FS, which are: no treatment, treatment to drinking water levels and Ambient Water Quality Criteria (AWQC) levels, or treatment to background levels.

All of the pump and treat alternatives would also require groundwater monitoring, administrative restrictions, and an alternative drinking water supply. There would be minimal environmental impact during well construction and few anticipated health or safety concerns for the surrounding community.

ARARs.

The ARARS are essentially the same for the two extraction alternatives. The major regulations that contribute to the list of potential chemical-specific ARARs are the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and the Water Quality Standards for the State of Washington (WAC-173-201) (90.48 RCW). The acts are under the jurisdiction of and are enforced by the Washington State Department of Health Services, the Washington State Department of Ecology (Ecology), and EPA.

The SDWA Maximum Contaminant Level (MCL) standards are enforceable standards that are applicable to surface water or groundwater that can be classified as a source or potential source of drinking water. The MCLs are applicable to any action that affects the concentration of contaminants in groundwater which is a source of drinking water, such as the SVRPA.

The discharge of extracted water to the Spokane River is considered to be offsite and is therefore not subject to ARARS analysis. Compliance with the applicable laws, regulations, and permit requirements is necessary. Some discussion of the discharge requirements is included since treatment may be done onsite.

The CWA Ambient Water Quality Criteria (AWQC) are designed to protect aquatic life and human health. The state of Washington adopts the AWQC by reference into their water quality standards, so the AWQC are requirements for surface water discharges. Table 5 presents chemical-specific potential ARARs for water. The table is arranged by chemical compound.

TABLE 5
CHEMICAL-SPECIFIC ARARS AND TBCS FOR ORGANIC CONTAMINANTS
FOUND AT THE NORTH LANDFILL

Compound	Safe Drinking Water Act		Clean Water Act				Reference-Dose Based Criteria
					Consumption of		
	MCL	MCLG	Acute Toxicity	Chronic Toxicity	Fish and Water	Fish Only	
Chloroform	100[a]	-	28,900[b]	1,240[b]	0.19	15.7	350
1,1-Dichloroethane	-	-	-	-	0.94[c]	243[c]	4,500
1,2-(Trans)Dichloroethylene	-	-	11,600[b]	-	0.33[d]	1.85[d]	350
Tetrachloroethylene	-	0[e]	5,280[b]	450[b]	0.8	8.85	10
1,1,1-Trichloroethane	200	-	-	-	18,400	1,030,000	1,000
Trichloroethylene	5	-	45,000[b]	-	2.7	80.7	260
Vinyl Chloride	2	0	-	-	2.0	525	46[f] (13[f])

All units in µg/l.

[a]Criterion for total trihalomethanes (sum of chloroform, bromodichloromethane, dibromochloromethane, and bromoform).

[b]Lowest observed effect level.

[c]Criterion for chlorinated ethanes based on toxicity of 1,2-dichloroethane.

[d]Criterion for dichloroethylenes based on carcinogenicity of 1,1-dichloroethylene.

[e]Proposed October 1986.

[f]Longer term Health Advisory for adult and 10 kg child is the 46 and 13 µg/l, respectively. Lifetime Health Advisory not calculated.

Minimum treatment of the extracted groundwater with ultimate discharge to the Spokane River must comply with Ambient Water Quality Criteria (AWQC)(see Table 5). The quality of the untreated groundwater would not be expected to satisfy the AWQC for fresh water due to VOC concentrations. An NPDES permit would have to be obtained from Ecology prior to initiating the discharge. Discharges to the river will be required to comply with the phosphorus discharge limits established for the Spokane River. The alternative would also have to be analyzed for its effect on fish, wildlife, and habitat in and around the Spokane River as required by the Fish and Wildlife Coordination Act. No other location-specific natural resource ARARs were identified.

The extracted groundwater will be treated to meet drinking water standards for metals and volatile organic compounds or meet NPDES and AWQC requirements, whichever is more stringent, prior to discharge to the Spokane River. There would be some level of contamination remaining in the treated water discharged to the Spokane River.

The cost for the extraction and treatment alternatives would be moderate to high, depending on the number of wells and the specific treatment process selected.

b) Monitoring. The existing groundwater monitoring system would continue to be used until the long-term monitoring plan is developed and approved by EPA. This existing system consists of wells both on- and offsite which were installed at various depths to indicate the level of contamination.

Monitoring would be low in cost and easily implemented, since it could largely utilize an existing system which could be supplemented if the existing wells are determined to be inadequate. It would provide a means for measuring the effectiveness of other response actions. However, it would not in itself protect public health.

Groundwater monitoring for the purpose of early detection of contaminants beyond the existing plume area does not satisfy ARARs because the existing groundwater contaminant levels would continue to exceed drinking water MCLs within the plume.

c) Administrative Restrictions. Under this alternative, the city would prevent the installation of wells in the contaminated portion of the aquifer. Though all affected residences are now connected to the city water system, there are currently no regulations to make future residences connect with this system or prevent existing contaminated wells from being used.

This alternative would protect public health by limiting exposure to contaminated groundwater; it would be low in cost to implement. It would not reduce contamination, and ensuring compliance could be difficult.

Administrative restrictions to prevent use of the contaminated groundwater in the area of the plume do not satisfy ARARs because groundwater contaminant levels would continue to exceed drinking water MCLs for decades.

d) Alternative Water Supply. All new residences in the area of contamination would be connected with the municipal water system, as existing residences already are. It would be technically feasible since there are nearby water lines, though some new service laterals might have to be constructed. Public health would be protected and cost would be low, but the groundwater would remain contaminated. There were no environmental receptors of the contaminated groundwater identified in the FS.

An alternate source of drinking water for residents located in the local area of the contaminated plume does not satisfy ARARs. Groundwater contaminant levels would continue to exceed drinking water MCLs until natural recovery reduces the contaminants below the MCLs. This alternative would help in the interim to protect public health, but contamination would not be reduced to MCLs; therefore, it would not satisfy ARARs.

e) No Action. No remedial measures would be implemented, beyond those already in place (i.e., providing alternative water to existing residences). There would be no cost, no change in the level of protection of public health, and no reduction of contamination in the aquifer. Water quality and Safe Drinking Water Act ARARs would not be met.

7. COMPARASION OF ALTERNATIVES

This section summarizes the relative performance of the alternatives by highlighting the key differences among the alternatives in relation to the nine evaluation criteria. It is recommended that this be presented in a series of paragraphs headed by each criterion. Under each criterion, the alternative that performs best in that category may be discussed first, with other options discussed in sequence.

EXAMPLE: HEDBLUM INDUSTRIES, MI

This comparative Analysis includes a helpful introductory sentence under each criterion that identifies the purpose of that particular comparison. The discussions under Compliance with ARARs, Short-term Effectiveness, Cost, and State Acceptance are particularly good. This Comparative Analysis does not address the nine criteria in the standard sequence established in the ROD guidance. The Overall Protection discussion inappropriately refers to the different "degrees of protection" provided by the alternatives. Since Overall Protection of Human Health and the Environment is a threshold criterion, alternatives should be designated protective or not.

EXAMPLE: CROSS BROTHERS PAIL, IL

This example addresses the nine criteria in the appropriate sequence. The Long-term Effectiveness and Permanence discussion is very good, appropriately conveying the relative degrees of long-term effectiveness afforded by the options. This ROD also identifies up front how remedies are comparable so the subsequent discussion is focused only on significant differences between options. The alternatives are generally discussed in order of best to worst under each criterion, which allows for a quick understanding of results.

EXAMPLE: NORTHSIDE LANDFILL, WA

This example effectively summarizes State and Community Acceptance.

COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the six alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria These nine criteria are: 1) overall protection of human health and the environment, 2) compliance with applicable or relevant and appropriate requirements (ARARs), 3) short-term effectiveness, 4) long-term effectiveness and permanence, 5) cost, 6) reduction of toxicity, mobility and volume, 7) implementability, 8) State acceptance, and 9) community acceptance.

Overall Protection of Public Health and the Environment

Evaluation of the overall protectiveness of each alternative focuses on how the alternative achieves protection over time and how the risks are eliminated, reduced and controlled through treatment, engineering controls or institutional controls. Alternative 5, which treats contamination in the groundwater and soils would provide the highest degree of protection to the public health and the environment. Pumping and treating contaminated groundwater should reduce the levels of VOC contamination in the aquifer to those required by Michigan Act 399 of 1976. Excavating and treating contaminated soils on-site will remove this possible source of groundwater contamination though exposure to this source was not positively identified as a potential health risk in the public health assessment. Alternative 3 treats the contaminated groundwater as in Alternative 5, to levels required by Act 399 of 1976 and is protective of public health and the environment. Alternative 4 treats the contaminated on-site soils but since the residential wells directly east of the site do not show elevated levels of VOC and indicate that the soils are not an on-going source of contamination, this alternative will have minimal protective effect on human heal- Alternative 2 will eliminate ingestion of and incidental contact w contaminated groundwater for those residents connected to the water main but it does not treat contamination in the environment and therefore is not protective of future well users or the environment. Alternatives 1 and 6 are not protective of public health and the environment because they do not treat contamination in the environment.

Compliance with ARARs

Each alternative is evaluated for compliance with ARARs, including chemical-specific, action-specific and location specific ARARs. These ARARs are presented in Table 11 with the alternatives to which they apply. All of the alternatives, except the no action alternative, will meet their respective ARARs with the following exception: Alternatives 1, 2, and 4 do not comply with the Safe Drinking Water Act of 1987 and Act 399 of 1976 which set primary drinking water standards.

Short-Term Effectiveness

This evaluation focuses on the effects on human health and the environment which may occur while the alternative is being implemented and until the remedial objectives are met. The following factors were used to evaluate the short-term effectiveness of each alternative: protection of the community during remedial actions, protection of workers during remedial actions, environmental impacts from implementation of alternatives, and time until remedial objectives are met.

With respect to protection of the community, Alternatives 1 through 5 will not pose risks to the local community, though there may be temporary inconveniences. Alternatives 4 and 5 which involve excavation may result in increased dust generation but this can be controlled through conventional dust suppression techniques.

Risks to workers during remedial action in Alternatives 1 through 5 can be controlled with safe working practices. Alternatives 4 and 5 may expose workers to VOCs from excavated soils but the levels should be within applicable PELs and TLVs.

With respect to environmental impacts, Alternatives 1, 2, 3, and 6 will have continued migration of contaminated groundwater at the site and under the subdivision as they do not address groundwater contamination. Alternatives 3, 4, and 5 will result in a temporary change in groundwater flow from extraction and pit dewatering and a temporary increase in the flow rate in the bayou from the discharged groundwater. Alternatives 4 and 5 could result in the release of low levels of VOC to the air from the soils excavation.

Evaluation of the time until protection is achieved reveals the following estimates: Alternative 2 should take a few weeks to a few months, Alternative 4 should take 5-6 months, and Alternatives 3 and 5 should take 4-5 years. Alternatives 1 and 6 will not achieve protection.

Long - Term Effectiveness and Permanence

This evaluation focuses on the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. The following factors are addressed for each alternative: magnitude of remaining risk, adequacy and reliability of controls.

The primary risk identified at the site by the public health/environmental risk assessment is from the ingestion of contaminated groundwater. Alternatives 3 and 5 offer the greatest degree of permanence as they minimize the risks from ingestion of and incidental contact with contaminated groundwater by removing the contaminants with treatment. Alternative 5 also treats subsurface soils on-site. However, the soils were not found to pose an unacceptable risk. Alternative 2 eliminates the risks from ingestion and incidental contact with contaminated groundwater by supplying residents connected to the water main with a clean source of potable water. However, the contaminated groundwater would still persist with this alternative. Alternative 4 reduces the risks from contact with subsurface soils but also does not address the contamination of the groundwater. Alternatives 1 and 6 will not mitigate any of the risks presently associated with the site.

With respect to adequacy and reliability of controls, Alternatives 3 and 5 both use a reliable method to reduce and possibly eliminate groundwater contamination. Total elimination of VOC contamination will depend on its distribution in the aquifer. If the system components mechanically fail, they may be replaced or repaired without much impact on the residences. The excavation and treatment of on-site soils in Alternatives 4 and 5 should remove this possible source of groundwater contamination. If the excavation or treatment system mechanically fail, they may be replaced or repaired with no exposure of the local community to contaminants. Alternative 2 uses connections to the water main to eliminate risks from groundwater which has a low potential for failure.

Cost

This evaluation examines the estimated costs for implementing the remedial alternatives. Capital and annual O&M costs are used to calculate estimated present worth costs for each alternative. Alternative 3, pumping and treating contaminated groundwater, has a moderate capital cost and high annual cost which results in an estimated present worth of $1,379,000. Alternative 4, excavating and treating on-site soils has a high capital cost but since there is a short implementation time, annual costs are low. This results in an estimated present worth cost of $724,800. Alternative 5, which combines Alternatives 3 and 4, has the highest capital and annual cost. Estimated present worth costs total $1,914,000 for Alternative 5. The remaining 3 alternatives which provide less overall protection of public health and the environment cost less than the already mentioned alternatives. Alternative 6, no action, is considered to have no associated costs. Alternative 1, continued monitoring at the site and subdivision, has low capital and annual costs. The estimated present worth costs is $132,400. Alternative 2, connecting affected residents to the Oscoda water main and site monitoring, also has low capital and annual worth costs total $170,250.

Reduction of Toxicity, Mobility and Volume

This evaluation addresses the statutory preference for selecting remedial actions that employ treatment technologies which permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

For Alternatives 3 and 5, the volume of contaminants in the groundwater will be irreversibly reduced by extraction and treatment. The contaminant plume mobility will be affected during treatment but any remaining residual contamination will have the same mobility once pumping and treating has stopped. Alternatives 4 and 5 will eliminate the toxicity, volume, and mobility of contaminants in the soil. However, the on-site soil contamination does not appear to be an on-going cause of groundwater contamination under the subdivision. Each of these three alternatives will treat some groundwater, extraction from the aquifer in Alternatives 3 and 5 and dewatering the excavation pit in Alternatives 4 and 5. The resulting effluent water would meet discharge criteria and will be monitored to verify this. The water treatment process will generate spent carbon that may be considered hazardous waste and must be handled accordingly (by the carbon supplier and regenerator). The other three alternatives, 1, 2, and 6, provide no treatment, and thus, do nothing to affect toxicity, mobility or volume.

Implementability

This evaluation addresses the technical and administrative feasibility of implementing the alternatives and the availability of the various services and materials required during its implementation.

Technically, the placement of the extraction well system in Alternatives 3 and 5 is dependent on the location of objects and structures in the subdivision and the residents' willingness to have a well placed on their property. Otherwise, the system can be readily constructed or leased and operated. The excavation in Alternatives 4 and 5 can be accomplished with conventional techniques but this may be difficult due to the close proximity of the plant and the railroad tracks. The treatment unit can be easily constructed or leased and operated. For both the groundwater extraction and the soil treatment, a pre-design study will be needed to verify system performance. The connection to a water main in Alternative 2 is a common technology proven to be reliable. Alternative 1 only requires installing a monitoring well and Alternative 6 has no actions.

Administratively, Alternative 2 will require tap-in fees to connect to the Oscoda water main.

For all alternatives which include some type of action, all equipment, services and specialists are available locally or from national vendors.

State Acceptance

The Michigan Department of Natural Resources (MDNR) does not concur with the U.S. EPA's selection of Alternative 3 as the preferred remedial alternative for the Hedblum Industries site as presented in the next section. The MDNR agrees with the technology selected in Alternative 3, but does not agree with the targeted cleanup level for TCE. The MDNR wants a lower cleanup level for TCE, 1 ug/l, than that indicated in the preferred remedial alternative, 5 ug/l. Since the groundwater will be cleaned so as not to exceed an excess risk level of 1×10^{-6} and the groundwater will meet all maximum contaminant limits (MCLs), this remedy has been determined to be protective of human health and the environment (see Reduction of Site Risks below).

Community Acceptance

Community response to the alternatives is presented in the responsiveness summary which addresses comments received during the public comment period.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives developed during the Cross Brothers Pail Recycling site FS were evaluated by U.S. EPA and IEPA using the following 9 criteria. The advantages and disadvantages of each alternative were then compared to identify the alternative providing the best balance among these 9 criteria.

1. **Overall Protection of Human Health and the Environment** addresses whether or not an alternative provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment and engineering or institutional controls.

2. **Compliance with Applicable or Relevent and Appropriate Requirements (ARARs)** addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements or provide grounds for invoking a waiver.

3. **Long-term Effectiveness and Permanence** refers to the ability of an alternative to maintain reliable protection of human health and the environment, over time, once cleanup objectives have been met.

4. **Reduction of Toxicity, Mobility or Volume** is the anticipated performance of the treatment technologies an alternative may employ.

5. **Short-term Effectiveness** involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup objectives are achieved.

6. **Implementability** is the technical and administrative feasibility of an alternative, including the availability of goods and services needed to implement the solution.

7. **Cost** includes capital costs, as well as operation and maintenance costs.

8. **Agency Acceptance** indicates whether, based on its review of the HS/FS and Proposed Plan, U.S. EPA and IEPA agree on the preferred alternative.

9. **Community Acceptance** indicates the public support of a given alternative. This criteria is discussed in the Responsiveness Summary.

A matrix summarizing the comparative analysis of alternatives on a criteria by criteria basis is presented in Table 10.

The following discussion expounds on the information provided in Table 10.

A. Overall Protection of Human Health and the Environment

All of the remedial alternatives considered for the Cross Brothers Pail Recycling site, except for the no action alternative, are protective of human health and the environment by eliminating, reducing or controlling risks through various combinations of treatment and engineering controls and/or institutional controls. As the no action alternative does not provide protection of human health and the environment, it is not eligible for selection and shall not be discussed further in this document.

All of the alternatives reduce the risks associated with groundwater contamination by pumping and treating contaminated groundwater. A groundwater monitoring program will also be implemented to evaluate the effectiveness of the groundwater remediation activities. In addition, all of the alternatives utilize access restrictions (i.e. fence and deed notification).

Alternative 3A does, however, include the removal of soil contaminants through soil flushing. The treated groundwater will be utilized as the flushing agent. In addition, a 6 inch vegetative cover will be placed over the non-flushed areas to stablize the soils on-site. Alternative 2 includes the same basic remedial components as Alternative 3A, less the vegetative soil cover.

Alternative 3B does not include the soil flushing system. Treated groundwater would be returned to the aquifer through a series of re-injection wells. Alternative 3B also includes a 6 inch vegetative cover over the entire site area. The use of this cover type will result in passive flushing of the soils through natural infiltration.

Alternative 4A is very similar to Alternative 3B. The treated groundwater will be re-injected into the aquifer. Rather than a 6 inch vegetative cover, Alternative 4A utilizes a small multi-layer cap over the most heavily contaminated soil area to prevent the infiltration of precipitation. Alternative 4B is identical to Alternative 4A except the multi-layer cap will cover the entire site area.

PCB Soil Removal - Option 1 requires removal of the localized PCB-contaminated soil area and incineration at a TSCA approved incinerator. PCB Soil Removal - Option 2 requires removal of the localized PCB-contaminated soil area and landfilling of the soils at a TSCA approved landfill.

B. ARARs Compliance

SARA requires that remedial actions meet legally applicable or relevant and appropriate requirements (ARARs) of other environmental laws. These laws may include: the Toxic Substances Control Act, the Safe Drinking Water Act, the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, and any state law which has stricter requirements than the corresponding federal law.

A "legally applicable" requirement is one which would legally apply to the response action if that action were not taken pursuant to Sections 104, 106 or 122 of CERCLA. A "relevant and appropriate" requirement is one that, while not "applicable", is designed to apply to problems sufficiently similar that their application is appropriate.

All of the alternatives proposed for the Cross Brothers Pail Recycling site meet or exceed ARARs.

C. Long-term Effectiveness and Permanence

The alternatives considered for the Cross Brothers Pail Recycling site vary in their ability to provide long-term effectiveness and permanence.

Each of the alternatives considered includes a groundwater pump and treat component. By eliminating the contaminants present in groundwater each of the alternatives achieves a certain degree of long-term effectiveness and permanence. The difference between the alternatives with regard to long-term effectiveness and permanence is directly related to how each alternative addresses soil contamination at the site.

Alternative 3A provides the greatest degree of permanence. The heavily contaminated soil area is flushed, removing any leachable materials from the soil. A 6 inch vegetative cover is placed over the site's non-flushed area stabilizing the soils on-site. Alternative 2 follows Alternative 3A in degree of permanence. Alternative 2 does not include the 6 inch vegetative cover. As such, soils in the non-flushed areas will be subject to wind and water erosion. Alternative 3B, which includes pump and treat with re-injection of the treated groundwater, provides the least amount of long-term effectiveness and permanence.

Alternative 3B does not actively address the contamination in the soil. The presence of only a 6 inch vegetative cover will allow passive flushing of the soil contaminants. Thus recontamination of the groundwater due to leaching of the contaminated soils is likely. Alternatives 4A and 4B, while not removing the contaminants present in the soil, do offer greater long-term effectiveness than Alternative 3B by containing the contaminants. Both of these alternatives include a multi-layer cap that will limit the infiltration of precipitation through the soils and preclude the leaching of contaminants into the groundwater.

The long-term effectiveness and permanence differ greatly with respect to the PCB Soil Removal Options. Option 1, removal and incineration, provides far greater permanence than Option 2 - removal and landfilling. Under Option 1, the PCBs present in the soils will be permanently destroyed. Option 2, however, only displaces the contamination to a new location.

D. Reduction of Toxicity, Mobility or Volume through Treatment

All of the alternatives include a component which reduces the toxicity, mobility and volume of the contaminants present in the groundwater at the site through treatment. The difference between alternatives is most noted with regard to the contaminants present in the soils at the site.

Alternatives 2 and 3A provide for the greatest reduction in the toxicity, mobility and volume of the contaminated soils. Both of these alternatives require the soils to be continually flushed during the groundwater remediation activities. Upon completion of the groundwater remediation activities (estimated 15 years), any leachable contaminants will be removed from the soils. Alternatives 4A and 4B reduce only the mobility of the soil contaminants through the use of a multi-layer cap. The multi-layer cap will limit the infiltration of precipitation, and preclude the leaching of soil contaminants into the groundwater. Alternative 3B does not actively address the contaminated soils at the site. Therefore, Alternative 3B does not provide a significant reduction in the toxicity, mobility or volume of the soil contaminants.

PCB Soil Removal - Option 1 significantly reduces the toxicity, mobility and volume of the PCB contaminated soils by thermally destroying the PCBs. Option 2, however, only reduces the mobility of the PCBs by landfilling the soil in a TSCA landfill.

E. Short-term Effectiveness

All of the alternatives considered have similar impacts on short-term effectiveness resulting from a groundwater treatment system being utilized. The alternatives differ, however, with respect to the other remedial components used, as well as the length of time required to remediate the site. These factors present varying potential short-term risks across all the alternatives. It is not obvious however, that any one alternative presents lower overall short-term risks than the others.

The use of the soil flushing under Alternatives 2 and 3A presents a potential short-term risk to the environment by temporarily increasing the mobility of the contaminants within the soils. This increased risk, however, will be controlled through the proper placement of the groundwater pumping system. In addition, the groundwater monitoring program will assess any changes in aquifer conditions. The use of soil flushing in these alternatives lengthens the estimated period required to meet the site's cleanup objectives. The remedial action time estimated for Alternatives 2 and 3A is 15 years, compared with the 11 years estimated for Alternative 3B and the 10 years estimated for Alternatives 4A and 4B.

Alternatives 3A, 3B, 4A and 4B which utilize a vegetative cover or a multi-layer cap will involve the grading of surface soils which may create a temporary dust problem. Conventional dust control measures will be employed however, to limit any fugitive dust emissions that may occur during grading activities.

The PCB Soil Removal Options are similar in the area of short-term effectiveness. Both options require the excavation and off-site transport of the contaminated sub-soils. Short-term exposure risks to workers and the community may result. One potential difference between the options is the length of time necessary to complete the remedial action if a larger quantity of soil needs to be removed. Option 1 will take longer than Option 2 due to capacity restraints of the licensed TSCA incinerators. The projected volume of soil to be excavated under either option, however, is expected to be small enough that no problems would arise with either incineration or landfilling.

F. Implementability

While all of the alternatives considered are implementable, some alternatives are technically easier to implement than others, based on their design and complexity.

Alternative 3B is the easiest alternative to implement as the remaining alternatives involve modifying this design. Next in implementability would be Alternative 2, which involves installing flushing equipment at the site. Alternative 3A is next and is similar to Alternative 2 with the addition of the 6 inch vegetative cover. Alternatives 4A and 4B would be next, respectively, due to the complexities in designing and installing a multi-layered cap. Alternative 4A would be easier to implement than Alternaitve 4B as it involves a smaller multi-layer cap than Alternative 4B.

Excavation of the localized PCB-contaminated soil area is easily implemented under either PCB Soil Removal Option. Option 1 has some implementability problems due to the finite availability of incinerators that are licensed to handle PCB contaminated soil. This could potentially lead to delays in transporting the materials to be incinerated if a large volume of soils is removed.

G. Cost

The estimated present worth value of each alternative and option is as follows:

Groundwater and Soil Remediation Alternatives

Alternative 2	$ 1,729,400
Alternative 3A	$ 1,956,700
Alternative 3B	$ 1,872,800
Alternative 4A	$ 2,285,000
Alternative 4B	$ 2,997,000

Localized PCB Soil Removal Options

Option 1	$ 17,700
Option 2	$ 8,600

H. Agency Acceptance

U.S. EPA and IEPA agree on the preferred alternative. Both Agencies have been involved in the technical review of this state-lead fund financed HS/FS, and the development of the Proposed Plan and ROD.

I. Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the RS/FS and Proposed Plan, and U.S. EPA's and IEPA's responses to the comments received.

Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. For both of these elements, the factors considered in the evaluation are the elements of the alternative which are supported, the elements of the alternative which are not supported, and the elements of the alternative that have strong opposition.

8. State Acceptance

Washington State Department of Ecology (Ecology) has been closely involved with the development and review of the Remedial Investigation and Feasibility Study processes. Ecology commented on the RI/FS and worked with EPA on the proposed plan. The comments from the state were an important factor in EPA's decision to recommend an alternative that differed from the recommendation in the Feasibility Study. The state strongly favors pump and treatment of the contaminated groundwater plume as an interim measure until contamination coming from the landfill is reduced to acceptable levels. Although EPA has been working closely with Ecology to ensure that this ROD includes the state's comments, EPA, has not yet received the state's concurrence letter.

9. Community Acceptance

The results of the public comment period and the discussion during the RI/FS public meeting indicate that the residents who live near or have been affected by contamination from the Northside Landfill support the proposed plan with its interim pump and treatment system. The community desires a remedy which would begin treating the contamination as soon as possible. The City of Spokane (the PRP) recommended that pump and treat only be implemented if contaminant levels in the plume were not lowered by the other closure actions, specifically the cap. The community recognizes that none of the alternatives, except for the pump and treatment system, will be implementable until the landfill closes. The pump and treatment system provides a protection mechanism which is not contingent on landfill closure.

The differences between the city's and EPA's recommended remedial actions were highlighted in the proposed plan fact sheet and at the public meeting. The resident community supported the EPA interim pump and treatment system because it actually reduces the contamination in the aquifer, rather than relying solely on natural attenuation. It was estimated that it would take between five to ten years after the cap was in place before the natural attenuation process would be noticed in the aquifer. The pump and treat system can be implemented in about 2 years.

Closure of the landfill with a cap, periodic monitoring, and other state landfill closure actions were considered by all parties to be necessary parts of the remedial action. Individual concerns about cost and institutional controls (administrative requirements) were responded to in the attached Responsiveness Summary.

8. SELECTED REMEDY

This section of the ROD should identify the selected remedy and remediation goals , state the carcinogenic risk level to be attained and the rationale for it, and the specific points of compliance for each media addressed.

EXAMPLE: VOGEL PAINT AND WAX, IA

This example provides a good, detailed technical description of the selected remedy. The strong points are the inclusion of a figure that depicts the selected treatment process in general terms, and cost tables for both the source control and ground water components. One flaw in this discussion is that a specific vendor is named for the low temperature thermal treatment system that may be used. Vendors should never be named in a ROD. Also, although technical parameters are well established, remediation goals and points of compliance are not distinctly addressed. A summary of the important features of this ROD's contingency remedy and the criteria for its implementation are described in an appropriate level of detail.

EXAMPLE: MARATHON BATTERY, NY

This second example provides a good, succinct description of the selected remedy and explicitly addressed remediation goals and their basis. Points of compliance are, however, not outlined specifically.

2.8 Selected Remedy

The selected remedy is Alternative S-3 involving on-site bioremediation of soils coupled with Alternative GW-1 involving pumping and air stripping of groundwater.

The selected remedy will include the following ancillary activities:

- o Continued listing and restrictions associated with the State Abandoned or Uncontrolled Sites Registry until no further threat remains.
- o Continued floating hydrocarbon removal until no appreciable amounts can be recovered.
- o Removal of the uncontaminated cover soil and temporary storage of the material in a protected area.
- o Removal of solid waste material, other than contaminated soil (e.g., drums, paint cans, wooden pallets, paint solids, general trash), from the disposal trenches and temporary storage in a protected area.
- o Ultimate disposal of the solid waste material in a municipal landfill if the material is non-hazardous or can be made non-hazardous through decontamination. Ultimate disposal in a hazardous waste landfill or off-site incineration of this material may be warranted if the material is hazardous and cannot be made non-hazardous.
- o Removal of free solvent liquids from the excavation and temporary storage in tanks, and off-site recycling of the solvent, if possible, or off-site incineration.

- For "clean closure" soils must pass the EP Toxicity test for leachable metals (40 CFR 261.24), the TCLP test for leachable organics (40 CFR 268.41) and shall not contain more than 100 mg/kg of Total Organic Hydrocarbons prior to final placement.

- An air monitoring program approved by the DNR will be implemented during all site work.

- Dust control will be provided during excavation.

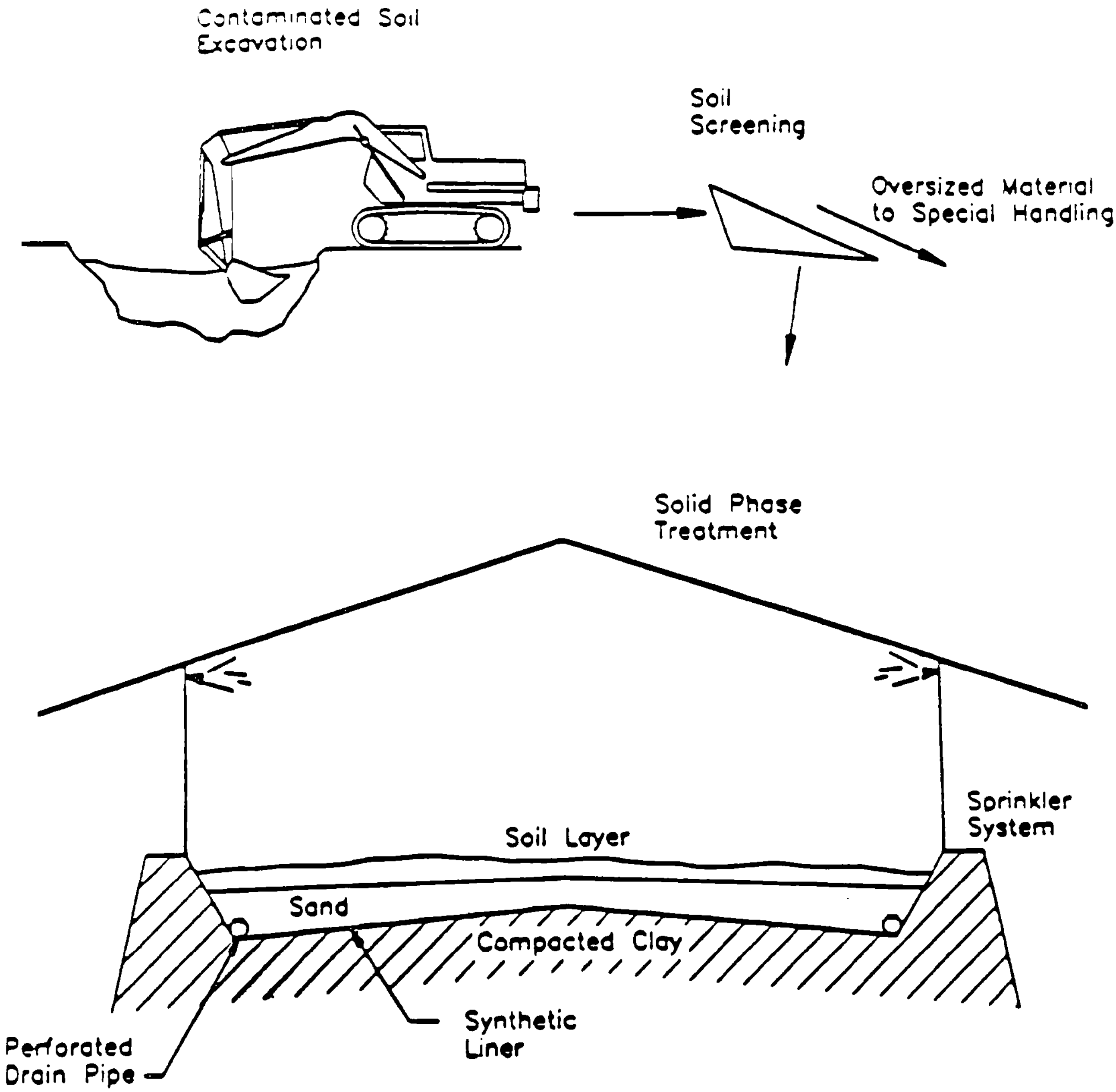
Bioremediation of soils will involve a fully contained surface impoundment system complying with minimum technology standards using conventional soil management practices (e.g., nutrient addition and soil aeration) to enhance microbial degradation and volatilization of organic contaminants. The system will be designed to contain and treat soil leachate and volatilized contaminants.

A system consists of a double lined treatment bed, a sand/gravel layer to serve as a leachate collection system with perforated drainage pipe and a sump, and groundwater monitoring. If volatile contaminants must be contained, the entire treatment bed will be covered by a modified plastic film greenhouse. An overhead spray irrigation system will be installed to control moisture and used as a means of distributing nutrients (see Figure 9).

The leachate will be recycled back to the treatment area via the spray irrigation system. Leachate in excess of acceptable limits will be treated on-site or collected for off-site treatment. Vapors will be treated (i.e. carbon adsorption) and released. The spent carbon would be regenerated if possible, or sent to an approved landfill facility. Approximately one-acre of land will be needed for treatment of 3000 cubic yards of soil.

High concentrations of heavy metals may prohibit use of this process. Additional soil sampling and testing and a treatability study are necessary prior to implementation. If small quantities of soils are identified as containing high levels of heavy metals which are incompatible with bioremediation, these soils will be isolated and treated on-site using a stabilization process (e.g. lime, Portland cement or bentonite). Treated soil will be redeposited in the excavation and covered with clean soil.

If high concentrations of heavy metals pose excessive restrictions on the use of bioremediation, thermal treatment of soils would be implemented in its place; in which case, ancillary activities would remain the same and the soil would then be treated using low temperature thermal treatment to drive off the volatile organic compounds. The organic compounds in the off-gas would be destroyed using an afterburner if ARARs for air emissions cannot be met. The mobile low temperature thermal treatment system developed by WESTON is designed to handle 15,000 lb/hr of contaminated soil based on



Source: Evoca Corp.
(revised)

SOLID PHASE BIODEGRADATION

FIGURE 9

20% soil moisture and 1% (10,000 ppm) VOCs. The system is comprised of three trailers that are a total of 120 feet long and 8 feet wide. The total height of the trailers, with the equipment assembled, is under 13.5 feet. As with bioremediation, thermal treatment will not remove metals and residual soil will be stabilized, if necessary, prior to redeposition.

Contaminated groundwater would be removed by pumping from one or more recovery wells. A pumping test will be conducted during the remedial design to determine aquifer characteristics. This information will be used to design the pumping system; i.e., number and location of wells, pumping rates, and gradient controls. The well (or wells) would be located and sized to draw water from the entire contaminant plume thereby preventing any off-site migration of groundwater contaminants. The pumped water would be treated by air stripping to remove greater than 95 percent of the volatile organic contaminants. Carbon adsorption would be used to remove contaminants in the air discharged from an air stripper, if necessary. Treated water from the air stripper would be discharged to the adjacent stream. Activated carbon used for air stripping off-gas and water polishing prior to discharge would be regenerated or disposed of in an approved landfill facility. Pumping and treatment will be continued until groundwater ARARs are met. A groundwater monitoring program, approved by the DNR, will be implemented and criteria for ceasing remedial action based on monitoring results will be developed.

Air modeling will be done to ensure that air emissions pose no acute or chronic health risks with risks from carcinogens less than 10^{-6} and 1/100 threshold limit value (TLV) for non-carcinogens. Air emissions will be evaluated during pilot studies and an air monitoring program acceptable to the DNR will be developed for normal operation.

Some changes may be made to the selected remedy as a result of the remedial design and construction processes.

Estimated costs for the selected remedy are shown in Tables 4 and 5.

TABLE 4

ESTIMATED COST OF SOIL REMEDIATION

Direct Cost Items		Basis	Cost*
1.	Removal of clean soil & staging	$4/cy x 9,000 cy	$ 36,000
2.	Excavation of solid waste, staging and disposal	$150/cy x 3,200 cy	480,000
3.	Free product removal, transportation and incineration	$0.50/gal x 5,000 gal	2,500
4.	Air monitoring		2,000
5.	Excavation & staging of contaminated soil	$5/cy x 3,000 cy	15,000
6.	Sampling & analysis of staged soil		20,000
7.	Land & site development		10,000
8.	Construction of staging areas & physical facilities for bioremediation		99,000
	(Thermal Treatment)		(40,000)
9.	Biological Treatment including leachate disposal)	$33/cy x 3,000 cy	100,000
	(Thermal Treatment)	($265/cy x 3,000 cy)	(795,000)
10.	On-site stabilization	$60/cy x 3,000 cy	180,000
11.	Backfill	$4.5/cy x 3,200 cy	14,400
12.	Clay Cap	$15/cy x 6,450 cy	96,750
13.	Revegetation	$1,250/ac x 2 ac	2,500
		TOTAL DIRECT	$1,058,150 ($1,694,150)

Indirect Cost Items

1.	Engineering, design and treatability study		$150,000(100,000)
2.	Contingency		$160,000(250,000)
		TOTAL INDIRECT	$310,000(350,000)
		TOTAL CAPITAL COST	$1,368,150(2,045,000)

O&M Cost Items $1,000/year for 30 years

TOTAL PRESENT WORTH COST $1,385,000(2,060,000)

Discount Rate = 5.00%

*NOTE: Cost for Thermal treatment same as bioremediation except as shown in parentheses.

TABLE 5
ESTIMATED COST OF GROUNDWATER REMEDIATION

Direct Cost Items		Cost
1.	Construction of recovery wells	$ 40,000
2.	Installation of pumps	10,000
3.	Construction of air stripper	110,000
4.	Activated carbon disposal (air treatment)	3,000
5.	Air monitoring	2,000
6.	Monitoring well installation	$ 20,000
	TOTAL DIRECT	$ 185,000

Indirect Cost Items		
1.	Engineering and Design (incl. treatability study)	$ 80,000
2.	Aquifer pump test	25,000
3.	Contingency	30,000
	TOTAL INDIRECT	$ 135,000
	TOTAL CAPITAL COST	$ 320,000

O&M Cost Items		
1.	Power, operation and maintenance	$50,000/year for 3 years
2.	Groundwater monitoring	$ 1,200/year for 3 years
3.	Lab analyses	$ 2,400/year for 3 years
	TOTAL PRESENT WORTH COST	$ 466,000
	Discount Rate =	5.00%

The combination of Alternative S-3 for soils and GW-1 for groundwater, would provide a substantial risk reduction through treatment of contaminated soils and removal and air stripping of contaminated groundwater. The selected remedy ranks high with respect to the nine evaluation criteria except for implementability of the soil remediation. If implementability of on-site bioremediation of soils proves impractical, then Alternative S-2 (on-site thermal treatment) will be utilized as the method for soils remediation. Alternatives S-2 and S-3 are similar with regard to the evaluation criteria except for costs and implementability.

Since no immediate risk has been identified, the risks (i.e., time and development costs) of attempting to implement Alternative S-3 are justified. If Alternative S-3 proves impractical, Alternative S-2 will provide a well-proven technology as a substitute.

THE SELECTED REMEDY

The results of the RI/FS have shown that elevated levels of cadmium above backround are present in Area III sediments.

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, both EPA and NYSDEC have selected Alternative EFC-3, dredging of the contaminated sediments from East Foundry Cove to a depth of one foot, chemical fixation and off-site disposal of those sediments, and restoration of the original contours, as necessary; Alternative WFC-1, continued monitoring, for West Foundry Cove; and Alternative CSP-3, sampling and analysis adjacent to and under Cold Spring pier with dredging of any contaminated sediments determined to be a threat to the environment, followed by chemical fixation, off-site disposal, and restoration of the original contours, as necessary.

The data compiled for East Foundry Cove indicate that over 95% of the cadmium contamination is located in the upper layer (1 foot) of the sediments. Due to the nature of the dredging process, dredging to a specific action level (e.g., 10, 100, or 250 mg/kg of cadmium) would be technically difficult, since these concentrations vary in the sediments by only a few inches of depth. Therefore, expectations are that by dredging the upper layer of contaminated sediments, 95% of the cadmium contamination will be removed. Following remediation, it is anticipated that cadmium concentrations would not exceed 10 mg/kg in most of the dredged areas.

A no-action alternative was chosen for West Foundry Cove. It was assumed that West Foundry Cove receives cadmium-contaminated sediments from East Foundry Cove and East Foundry Cove Marsh and the Cold Spring Pier Area. Once these sources are remediated, cadmium-free sediments would then be deposited in West Foundry Cove. Tidal action would cause the existing sediments to mix with the newly deposited sediments thereby causing the average cadmium concentration in the sediments to decrease gradually below its current average concentration of 43.9 mg/kg. A hydrologic analysis of Area III will be conducted in order to evaluate sediment transport routes.

Sediment samples at and beneath the Cold Spring pier will be collected, analyzed, and evaluated to ascertain whether this area is a source of cadmium contamination. If, based upon this analysis, these sediments are determined to be a source, these sediments will be dredged to a depth of one foot.

During the dredging operation, silt curtains will be utilized to contain resuspended sediments and minimize short-term environmental impacts.

The dredged sediments will be thickened on-site. The dredge water, resulting from the thickening process, will be clarified and tested to make sure that it meets EPA and New York State water quality standards before it is discharged into the Cove. The solids resulting from the clarification process will be added to the contaminated sediments awaiting fixation. Fixation of the thickened sediments will take place at an on-site facility. Bench scale tests were performed for the Area I ROD and indicate that fixation of the contaminated sediments is a viable remedy. Following treatment, the fixated material will be transported to an off-site sanitary landfill. For costing purposes, it was assumed that the more costly rail transport would be used to remove the fixated sediments from the site.

Following dredging, the dredged areas will be resampled to determine the levels of cadmium remaining in the sediment; this information will be used as a baseline study for the monitoring program. The dredged areas will be restored as necessary, pending the outcome of the previously stated studies to preserve the estuary structure and function and to provide an added level of protection to the environment. Monitoring will be conducted to assure the success of the restoration. The capital cost for the remedy in East Foundry Cove is $17,000,000. The operation and maintenance cost is estimated to be $19,770,160. The estimated capital cost for the remedy for the Pier Area is $8.5 million. The operation and maintenance cost is estimated to be $1.5 million.

The selected remedy for treating the contaminated sediments from Area I and Area II is chemical fixation. It was assumed that sediments from Area III could be treated at the facility constructed on-site for Areas I and II, and a savings in capital cost could be realized. This cost saving was not reflected in the cost estimates stated in the ROD.

REMEDIATION GOALS

The risk assessment has concluded that, with the cadmium contamination presently remaining in East Foundry Cove and the Pier Area, a threat to human health and the environment exists. Existing conditions at the site have been determined to pose a threat predominantly from ingestion of contaminated sediments by human and animal populations.

The purpose of this response action is to remove the contaminated sediments to levels consistent with state and Federal ARARs and to ensure protection of the environment from the continued exposure of contaminants from the sediments. Since no federal or state ARARs exist for sediments, the action level was determined through a site-specific risk analysis.

9. STATUTORY DETERMINATIONS

The remedy selected must satisfy the requirements of Section 121 of CERCLA to:

- protect human health and the environment
- comply with ARARs or justify a waiver
- be cost effective
- utilize permanent solutions and alternative technologies or resource recovery technologies to the maximum extent practical
- satisfy the preference for treatment as a principal element to justify not meeting the preference

Documentation of each finding is important but perhaps most crucial is the rationale for the selection decision (in terms of the nine criteria), which should be made under the Utilization of Permanent Solutions (to the maximum extent practicable) determination.

EXAMPLE: WAUSAU WATER SUPPLY, WI

Highlights worth noting in this example are that the discussion under Protection of Human Health and the Environment describes how the selected remedy addresses the specific risks identified in the baseline risk assessment. This discussion also explicitly states that the remedy will not pose any unacceptable short-term risks, cross-media impacts, or environmental risks. These items should be addressed in every ROD.

The rationale for ARARs determination are provided as necessary and the land disposal restrictions are discussed ,as they should be in every ROD, in order to document clearly whether or not they are ARAR. The discussion under Utilization of Permanent Solutions and Alternative Treatment Technologies to the maximum extent practicablel provides a logical rationale for the selection that highlights choices made on the basis of differences between the options related the the five balancing criteria.

EXAMPLE: SOLID STATE CIRCUITS, MO

The second example is well written overall and shares many of the same strengths as the previous example. In addition, the ARARs have been organized into chemical, action, and location-specific and pertinent "To Be Considered" is also included.

1. Protection of Human Health and the Environment

Based on the risk assessment developed for the site, long-term exposure to low levels of VOCs in drinking water, potential exposure through the use of private wells, and exposure to air emissions from existing VOC treatment systems are the identified risks associated with the site. Implementation of SVE systems at the source areas and treatment of off-gases, as called for under Alternative 5, provides protection to human health and the environment through volatilization of VOCs from contaminated soils, and expedited removal of contaminants from groundwater by increased pumpage of municipal wells.

Volatilization of VOC-contaminated soils will eliminate the source of continued loading of VOCs to the aquifer; thus reducing the time during which residents are exposed to trace levels of VOCs. Implementation of Alternative 5 will not pose any unacceptable short-term risks or cross-media impacts to the site, the workers, or the community. No environmental impacts have been identified for the site. This is largely due to the fact that impacts from the site have been to groundwater, and soils in industrial areas.

2. Attainment of Applicable or Relevant and Appropriate Requirements of Environmental Laws

Alternative 5 will be designed to meet all applicable or relevant and appropriate requirements (ARARs) of Federal and more stringent State environmental laws. Tables 7-11 list the ARARs that apply to each of the action alternatives and the following discussion provides the details of the ARARs that will be met by Alternative 5. The Land Ban requirements of RCRA do not apply to this remedial action.

a. Federal: Safe Drinking Water Act (SDWA) / State: Chapter NR 109 Wisconsin Administrative Code (WAC)

The SDWA and corresponding State standards specifies maximum contaminant levels (MCLs) for drinking water at public water supplies. Since TCE is regulated under the SDWA MCLs, requirements for achieving MCLs are relevant and appropriate for this remedial action. PCE is under consideration for a proposed MCL of 5 ug/l in the near future. Therefore, the likely proposed MCL for PCE is a TBC (to be considered) for this remedial action.

b. State: Chapter NR 140 WAC

Wisconsin groundwater protection Administrative Rule, Chapter NR 140 WAC, regulates public health groundwater quality standards for the State of Wisconsin. The enforceable groundwater quality standard for TCE is 1.8 ug/L. Groundwater quality standards as found in NR 140 WAC are ARARs for this remedial action.

c. Federal: Clean air act (CAA)

The CAA identifies and regulates the release of pollutants to air. Section 109 of the CAA identifies those pollutants for which Ambient Air Quality Standards (AAQS) have been established. Section 112 outlines criteria for pollutants for which there are no applicable AAQS. Emissions from existing and proposed treatment systems are not expected to exceed the AAQSs for any of the compounds present in groundwater.

d. State: Chapter NR 445 WAC

Wisconsin Chapter NR 445 establishes hourly or annual emission rate limits for specific contaminants. Emissions rates on the order of 1 lb/day for individual systems are estimated and would be expected to meet the limits.

3. Cost-effectiveness

Alternative 5 affords a high degree of effectiveness by providing protection from chronic low level exposure of TCE for production wells CW3 and CW6, providing protection from potential exposure to future private well users, and preventing further discharge of VOC emissions. Alternative 5 is the least costly alternative that is protective of human health and the environment. Therefore, Alternative 5 is considered to be the most cost-effective alternative that is protective.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

U.S. EPA and the State of Wisconsin believe the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final remedy at the Wausau site. Of the alternatives that are protective of human health and the environment and comply with ARARs, U.S. EPA and the State have determined that the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume achieved through treatment, short-term effectiveness, implementability, cost, also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Although all of the alternatives that are protective and comply with ARARs will achieve reduction of risks, there are significant differences in the time required to achieve this goal. Alternatives 2, 3, and 4 are groundwater remediation alternatives that do not address source areas. This results in contamination from source area soils loading to the aquifer for several additional years. In addition, none of these alternatives provide any reduction in time to remediate the deep TCE plumes originating from the former landfill source area. This also results in a significant time period to achieve reduction of risks. Alternative 5 requires the shortest time period for remediation of the site because it eliminates the continued loading of contaminants to the groundwater, and it provides for reduction in time to purge the deep TCE plumes by removing the source and increasing removal rates of contaminants at the Municipal supply wells.

The selection of a treatment technology for remediation of contaminated soils is consistent with the Superfund program policy that the highly toxic and mobile wastes are a priority for treatment and to ensure permanence and long-term effectiveness of the remedy. Under the selected remedy, treatment of groundwater will not provide a reduction of toxicity, mobility, or volume (TMV). However, it will reduce contaminant levels in groundwater and thus reduce the risks associated with ingestion of groundwater, which has been determined to be a greater risk than inhalation of air emissions. While other alternatives evaluated provided treatment to achieve TMV reductions in groundwater, these alternatives had other difficulties. Alternative 2 required almost twice as long to purge contaminants. Alternatives 3 and 4 propose a technology that has not been shown to work on contaminants present in groundwater at the site and thus would require extensive testing that would delay full scale operation of the system for an estimated two years. Based on these factors, it was determined that Alternative 5 would provide the shortest time period during which receptors would be exposed to contaminants in drinking water. In addition, based on air modeling, release of emissions from the municipal air strippers do not contribute a greater than 1×10^{-6} risk level to receptors.

Since treatment of groundwater will not achieve a reduction in toxicity, mobility or volume, the major trade-offs that provide the basis for this selection decision are long-term effectiveness, short-term effectiveness, implementability, and cost. The selected remedy can be implemented and completed more quickly with less difficulty and at less cost than groundwater treatment alternatives, thus reducing the exposure time for pathways of concern. Alternative 5 is therefore considered to be the most appropriate solution to contamination at the site because it provides the best trade-offs with respect to the nine criteria and represents the maximum extent to which permanent solutions and treatment are practicable.

5. <u>Preference for Treatment as a Principal Element</u>

By treating the VOC-contaminated soils using SVE with carbon absorption of off-gases with regeneration of the carbon, the selected remedy satisfies the statutory preference for remedies that employ treatment of the principal threat which permanently and significantly reduces toxicity, mobility, or volume of hazardous substances as a principal element. Treatment of groundwater to reduce toxicity, mobility, or volume would also seem to be desirable to satisfy the statutory preference. However, treatment of groundwater to permanently and significantly reduce toxicity, mobility, or volume of contaminants was not found to be practicable or cost-effective for remediation of the site.

SECTION 10.0 STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

The selected remedy protects human health and the environment through extraction and treatment of the VOC contaminated ground water. The contaminants will be permanently removed from the ground water by air stripping. The volatile dissolved gases will be transferred to the air stream for release to the atmosphere.

Extraction of the VOC contaminated ground water also will eliminate the threat of exposure to the most mobile contaminants from direct contact or from ingestion of contaminated ground water. The future carcinogenic risks associated with these exposure pathways are as high as 1.1×10^{-1}, or one person in ten, for TCE. By extracting the contaminated ground water and treating it by air stripping, the cancer risks will be reduced to about 1×10^{-6} and an Hazard Indices (HI) ratio of less than 1. A numerical computer model was utilized to predict the highest airborne concentrations emitted from the air strippers. The location with the highest concentrations was used to evaluate potential health risks. The highest cancer risk is 6.5 x 10-6 and the highest HI ratio is 0.3997. These levels are within the range of acceptable exposure levels of between 10^{-4} and 10^{-} and an HI ratio of less than 1 There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

10.0 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy of extraction, onsite physical/chemical treatment, and discharge of the treated effluent to the POTW will comply with all applicable or relevant and appropriate chemical, action, and location specific requirements (ARARs). The ARARs are presented below.

Action-specific ARARs:

- National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)
- State air quality De Minimis Emission Levels (10 CSR 6.060(7)(A));
- State water quality standards for aquatic life protection (10 CSR 20-7.031) incorporated into the NPDES permit for the POTW discharge to Dry Branch;
- National Pretreatment Standards, 40 CFR Part 403; and,
- Pretreatment standards of 200 ug/l and 200 gpm established by the City of Republic for the discharge of treated SSC effluent to the POTW.

Chemical-specific ARARs:

- Federal Maximum Contaminant Levels for inorganic and volatile organics in drinking water supplies (40 CFR Part 141);
- State Maximum Inorganic Chemical Contaminant Levels (10 CSR 60-4.030) for public water systems;
- State Maximum Volatile Organic Chemical Contaminant Levels for public water systems (10 CSR 60-4.100); and,
- State water quality standards for inorganic and volatile organics in ground water (10 CSR 20-7.031).

Location-specific ARARs:

- None

Other Criteria, Advisories or Guidance To Be Considered for This Remedial Action (TBCs):

- EPA and the State of Missouri have agreed to incorporate a local ordinance to prohibit construction of new water supply wells in or near the contaminant plumes until the remediation is complete. This will prevent direct contact and or ingestion of contaminated ground water.

10.3 Cost-Effectiveness

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $4,629,400. The selected remedy is the least costly of the Alternatives II, III and IV, which are equally protective of human health and the environment.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The State of Missouri and EPA have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the Solid State Circuits Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the State of Missouri and EPA have determined that this selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, also considering the statutory preference for treatment as a principal element and considering State and community input.

Alternative II reduces the toxicity, mobility, and volume of the contaminants in the ground water; complies with ARARs; provides short-term effectiveness; and protects human health and the environment equally as well a Alternatives III and IV. In terms of long-term effectiveness, Alternative II is more reliable backup to the stripper units and because it does not generate any residuals. Alternative II will be easier to implement technically because it requires less construction and administratively because it will require less coordination with relevant agencies. Finally, and importantly, Alternative II costs the least of the equally protective alternatives. The major tradeoffs that provide the basis for this selection decision are long-term effectiveness, implementability, and cost. The selected remedy is more reliable and can be implemented more quickly, with less difficulty and at less cost than the other treatment alternatives and is therefore determined to be the most appropriate solution for the contaminated ground waters at the SSC site.

The State of Missouri is in concurrence with the selected remedy. Although public comments were received concerning the capacity of the community's POTW, those comments are fully addressed in the Responsiveness Summary.

The Proposed Plan for the SSC site was released for public comment on August 14, 1989. The Proposed Plan identified Alternative II as the preferred alternative. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, was necessary.

10.5 Preference for Treatment as a Principal Element

By treating the VOC-contaminated ground waters in two existing onsite air strippers and discharging the treated effluent to the POTW for secondary treatment, the selected remedy addresses the principal threat of future direct contact/ingestion of contaminated ground waters posed by the site through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

10. RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary which serves two purposes. First, it provides lead agency decision makers with information about community preferences regarding both the remedial alternatives and general concerns about the site. Second, it demonstrates to members of the public how their comments were taken into account as an integral part of the decision making process.

EXAMPLE: CHEMICAL INSECTICIDE, NJ

The sample Responsiveness Summary is very thorough and easy to follow. It provides an overview of the activities required by Section 121 for public notification and comment and outlines the various sections of the remainder of the Summary. There is a brief history of the community relations activities for the community, and a summary of major questions and responses received during the comment period. The questions found here are excellent examples and typical of concerns often posed by the public. The responses are logical and informative. A citizens' petition and the specific response to it are also reproduced. For general information and a reference source the proposed plan, attendance sheets from the public meeting, list of information repositories and labs used (in response to a specific question) are attached as appendices.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

SEP 26 1989

See Address List

Re: Your August 28, 1989 Letter Concerning the Chemical Insecticide Corporation Site in Edison, New Jersey

Dear

Thank you for the August 28, 1989 letter which you and other concerned citizens wrote to express your questions and comments concerning the Environmental Protection Agency's Proposed Plan for an interim remedial action at the Chemical Insecticide Corporation Site. The concerns expressed in your letter have been reviewed by appropriate Environmental Protection Agency staff, by Ebasco Services personnel who worked on the Remedial Investigation and Feasibility Study for the site, and also by an Agency for Toxic Substances and Disease Registry representative assigned to the EPA Region II office. A response to the questions and comments expressed in your letter has been prepared, incorporating information obtained from the reviewers mentioned above. A copy of this response is enclosed and is being be sent to each of the signers of the August 28 letter. Copies of both the August 28 letter and EPA's response will also be placed in the information repositories for the Site.

EPA will keep you informed of our progress regarding the Chemical Insecticide Corporation Site, including the decision regarding the selection of an interim remedial action. I appreciate your interest and participation in the Superfund program.

Sincerely yours,

Jonathan Josephs

Jonathan Josephs
Chemical Engineer
New Jersey Compliance Branch
Emergency and Remedial Response Division

RESPONSIVENESS SUMMARY
CHEMICAL INSECTICIDE CORPORATION SITE
EDISON, NEW JERSEY

I. RESPONSIVENESS SUMMARY OVERVIEW

The U.S. Environmental Protection Agency (EPA) held a public comment period from August 3, 1989 through September 8, 1989 for interested parties to comment on the Focused Remedial Investigation/Feasibility Study (RI/FS) report for Surface Water Run-off Control and the Proposed Remedial Action Plan (PRAP) for the Chemical Insecticide Corporation (CIC) Site in Edison, New Jersey.

The PRAP, which has been provided as Appendix A of this document, provides a summary of the background information leading up to the public comment period. Specifically, the PRAP includes information pertaining to the history of the CIC Site, the scope of the proposed cleanup action and its role in the overall Site cleanup, the risks presented by the Site, the descriptions of the remedial alternatives evaluated by EPA, the identification of EPA's preferred alternative, the rationale for EPA's preferred alternative, and the community's role in the remedy selection process.

EPA held a public meeting at 7:00 p.m. on August 10, 1989 at the Edison Municipal Complex in Edison, New Jersey to outline the interim remedial alternatives described in the focused RI/FS and to present EPA's proposed remedial alternative for controlling the surface water run-off from the CIC Site.

The responsiveness summary, required by the Superfund Law, provides a summary of citizens' comments and concerns identified and received during the public comment period, and EPA's responses to those comments and concerns. All comments received by EPA during the public comment period will be considered in EPA's final decision for selecting the remedial alternative for addressing surface water run-off from the CIC Site.

This responsiveness summary is organized into sections and appendices as described below:

I. **RESPONSIVENESS SUMMARY OVERVIEW.** This section outlines the purposes of the Public Comment period and the Responsiveness Summary. It also references the appended background information leading up to the Public Comment period.

II. **BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS.** This section provides a brief history of community concerns and interests regarding the Chemical Insecticide Corporation Site.

III. **SUMMARY OF MAJOR QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES TO THESE COMMENTS.** This section summarizes the oral comments received by EPA at the August 10, 1989 public meeting, and provides EPA's responses to these comments.

IV. **WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES TO THESE COMMENTS.** This section contains the one letter received by EPA containing written comments, as well as EPA's written response to that letter.

Appendix A: The Proposed Remedial Action Plan (PRAP) which was distributed to the public during the public meeting on August 10, 1989.

Appendix B: Sign-in sheets from the Public Meeting held on August 10, 1989 in The Edison Municipal Complex, Edison, New Jersey.

Appendix C: Names, addresses and phone numbers of the information repositories designated for the CIC Site.

Appendix D: A list of the laboratories used to analyze samples from the CIC Site.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Township records show that community concern regarding the CIC Site, existed as early as 1966, when residents living near the Site complained of odors emanating from the CIC Site. The Edison Township Department of Health and Human Resources and the New Jersey Department of Health (NJDOH) continued to receive complaints from residents and business operators about odors and air pollution from 1966 through 1970.

Community interest increased in June 1983 when the New Jersey Department of Environmental Protection (NJDEP) and EPA began collecting soil samples for a State-wide dioxin-screening program. Residents were concerned about the potential for off-site migration of dioxin into surrounding residential areas. EPA held a public meeting on June 20, 1983 to address community concerns. Several hundred residents attended the meeting and extensive media coverage continued for weeks.

Residents, local officials and business owners were interviewed in 1987 during the development of the Community Relations Plan for the Site. Their concerns are summarized below:

- Residents would like to be better informed of all EPA activities at the CIC Site.
- Residents were concerned about the potential exposure to dioxin during EPA activities.
- Local officials and residents were concerned that local property values could be adversely affected by the EPA activities at the CIC Site.
- Residents and business owners were concerned regarding the extent and potential of contamination at the Site and of the surrounding business and residential properties.

As part of EPA's responsibility and commitment to the Superfund Program, the community has been kept informed of ongoing activities conducted at the CIC Site. EPA has established information repositories where relevant site documents may be reviewed. Documents stored at the repositories include:

- The focused RI/FS Report for surface run-off control.
- The Proposed Remedial Action Plan (PRAP).
- Fact sheets, summarizing the technical studies conducted at the Site.
- Public Meeting Transcript.

EPA's selection of a remedy to control surface water run-off at the Site will be presented in a document known as a Record of Decision (ROD). The ROD and the documents containing information that EPA used in making its decision (except for documents that are published and generally available) will also be placed in the information repositories, as will this responsiveness summary.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES TO THESE COMMENTS

Oral comments raised during the public comment period for the CIC Site interim remediation have been summarized below together with EPA's response to these comments.

COMMENT: One resident wanted to know why it was necessary to select an interim remediation alternative if a final remedy would be the most protective of human health and the environment.

RESPONSE: A final remedy which would, among other things, clean up the contaminated soil at the Site, cannot be selected at the present time. EPA has determined that treatability studies are needed to find the most effective technology or combination of technologies for treating the Site soils. The particular mixture of pollutants in the Site soils (arsenic and pesticides, in particular) is potentially difficult to treat. This is because the most proven technology for organic pesticides, thermal treatment (e.g. incineration), may not be effective in treating arsenic. In fact, the arsenic emissions from an incinerator treating Site soils might present an air pollution hazard, unless treatability studies can show that air pollution controls are capable of reducing arsenic emissions to safe levels. Therefore, EPA is currently planning to test thermal treatment and other technologies such as soil extraction and soil fixation on soil samples from the Site.

Depending on the final remedy eventually selected, it could take up to eight years to perform treatability studies, select the remedy, design the remedy and implement the remedy. Unless an interim remedy is implemented first, the surface water run-off from the Site would present continued risks until the remedy for Site soils has been implemented.

EPA believes that the surface water run-off problem should be addressed first, since EPA is now in a position to address the hazards presented by the surface water run-off from the Site. While the interim remedy is proceeding, EPA would not slacken its efforts to achieve a final remedy. Once the final remedy for site soil has been implemented, surface run-off from the Site would no longer be contaminated by contact with Site soils. Therefore, the surface water remedy is considered to be an interim measure which would no longer be needed once the Site soils have been cleaned up.

COMMENT: One resident asked what type of capping system would be used and how effective would it be.

RESPONSE: If an impermeable surficial capping system was implemented, it would probably consist of a multi-layer cap with a synthetic membrane or a sprayed-on lining, together with protective layers, such as textile fabrics. Standard landfill caps are intended to be effective for thirty years or more. However, the capping system recommended by EPA for the CIC Site would only be needed for the duration of the interim remedy (probably less than eight years). This capping system would have fewer layers than the standard landfill caps. Therefore, the capping system would allow easier access to collect any soil samples required for a treatability study, and would be easier to remove once the final remediation plan was implemented.

COMMENT: A resident inquired whether capping systems have been used on other sites and, if so, how effective they were.

RESPONSE: Surficial caps have been employed at a number of sites such as hazardous waste landfills and municipal landfills. This technology has proven quite effective over time periods similar to that contemplated for this interim action in preventing the migration of contamination in the past.

COMMENT: One resident noted that there would be a large quantity of run-off if a surficial cap were installed on CIC's six acre lot. The resident wanted to know what type of storage capacity EPA has planned to accommodate the large volume of accumulated run-off.

RESPONSE: A detention structure would be constructed in the northeast corner of the Site to regulate the flow of discharge so that the remedy would not cause any adverse flooding impact. As part of the remedial design for Alternative 2, a drainage analysis would be performed. The size of the detention structure and the details of any other measures needed to avoid flooding impact (e.g., improvements in area storm drains), would be based on that drainage analysis. The detention structure for Alternative 2 would not necessarily be designed to detain the precipitation from a once in twenty-five year storm event.

COMMENT: A resident asked if Alternative 2 was selected, when would EPA expect the surficial cap to be installed.

RESPONSE: Work could begin on capping the Site approximately six months following finalization of the ROD for this interim action. The remedial design would be performed during those six months.

EPA RESPONSE TO THE AUGUST 28, 1989 WRITTEN COMMENTS REGARDING THE CHEMICAL INSECTICIDE CORPORATION SITE IN EDISON, NEW JERSEY

The August 28, 1989 written comments regarding the Chemical Insecticide Corporation Site have been summarized below, together with and EPA's responses to these comments.

COMMENT: How much and what types of contaminants were on-site and have spread off-site?

RESPONSE: The types of contaminants linked to the Site were discussed at the August 10, 1989 public meeting and summaries of the analytical data were presented. Unfortunately, the slides that were projected were not very clear. The chief contaminants are arsenic, pesticides (DDT, lindane, chlordane, dieldrin, etc.), herbicides (e.g., 2,4,5-T, 2,4-D and dinoseb) and dioxin. Summaries of this data, which provide concentration values for the measured contaminants in the different media sampled, can be found in Exhibits 1-12 through 1-24 of the Focused RI/FS Report. The results for on-site and off-site samples have been summarized separately in these exhibits. The complete set of sampling data, together with maps showing the sampling locations, can be found in the two-volume document containing the "Remedial Investigation Field Data: Validated Laboratory Results" (Ebasco, July 1989). These documents are available in the information repositories for the Site. Because of the volume of this information, it is not practicable to present it here.

COMMENT: What effects did these contaminants have on the workers of the factory, the community and the surrounding land and animals?

RESPONSE: There is little information currently available to EPA indicating any effects of the contaminants on the CIC employees, the area residents and animals. In the 1960's several cattle were alleged to have died as a result of drinking arsenic contaminated water downstream of the factory. However, the levels of arsenic found at the downstream sampling locations during the Remedial Investigation are much less than those associated with such acute effects. In all likelihood, the arsenic concentrations were much higher during the period when the Chemical Insecticide Corporation was operating and the cattle deaths occurred.

As noted at the public meeting, sampling results from the Remedial Investigation and other studies indicates that contamination of the land around the CIC property by arsenic, pesticides and herbicides is chiefly limited to the easement area immediately east of the CIC property. In addition, soil concentrations of dioxin off of the CIC property have all been

11. LETTER FROM SUPPORT AGENCY

It is recommended that a letter stating the position of the support agency be attached as an appendix to the ROD to demonstrate their concurrence. State concurrence may also be demonstrated by the State Director's signature, however, that seems to be more rare than a copy of the State letter. If the State has withheld an opinion or given concurrence verbally, the ROD should state this in the Declaration and in the Summary of Comparative Analysis of Alternatives section of the Decision Summary.

EXAMPLE: MW MANUFACTURING, PA

A copy of two State letters are attached. These letters are brief and recount what documents were reviewed, the major components of the remedial action with which the State concurs, and lists any conditions to that concurrence such as continued consultation during RD/RA, reserving the right to take independent enforcement action and to be party to any negotiations with the PRPs.

EXAMPLE: WAUSAU WATER SUPPLY, WI

The second letter reviews costs and recognizes that the State may be required to contribute 10% of the cost of the remedy should the PRPs refuse or be unable to fund the action. It also outlines the role the State expects to play during the RD/RA.

PENNSYLVANIA DER

Deputy Secretary for
Environmental Protection

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

March 30, 1989

(717) 787-5028

Mr. Stephen R. Wassersug, Director
Hazardous Waste Management Division
EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
M. W. Manufacturing Superfund Site, Record of Decision (ROD)

Dear Mr. Wassersug:

The Record of Decision for the initial operable unit which addresses the main source of the contamination by remediation of the carbon waste pile at the M. W. Manufacturing site has been reviewed by the Department.

The major components of the selected source control remedy include:

* Excavation of approximately 875 cubic yards of contaminated waste and contaminated underlying soils and incineration in an off-site RCRA approved incinerator.

* Disposal of incinerator ash in a RCRA permitted hazardous waste landfill.

I hereby concur with the EPA's proposed remedy with the following conditions:

* The Department will be given the opportunity to concur with decisions related to the overall Remedial Investigation and Feasibility Study to identify the extent of, and future potential for, groundwater contamination and remaining sources of that contamination, and evaluate appropriate remedial alternatives to assure compliance with DER cleanup ARARs and design specific ARARs.

* EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.

* The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state law.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

Thank you for the opportunity to concur with this EPA Record of Decision. If you have questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Mark M. McClellan
Deputy Secretary
Environmental Protection

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES
Carroll D. Besadny, Secretary
Box 7921
Madison, Wisconsin 53707
TELEFAX NO. 608-267-3579
TDD NO. 608-267-6897

September 28, 1989

IN REPLY REFER TO: 4440

Mr. Valdus Adamkus, Regional Administrator
U.S. Environmental Protection Agency, Region V
230 South Dearborn Street
Chicago, IL 60604

SUBJECT: Selected Superfund Remedy
Wausau Groundwater Contamination Site
Wausau, Wisconsin

Dear Mr. Adamkus:

Your staff has requested this letter to document our position on the final remedy for the Wausau Groundwater Contamination Site. The proposed final remedy, identified as Alternative No. 5, is discussed fully in the Record of Decision and includes:

- Installation of Soil Vapor Extraction (SVE) systems to remove volatile organic compounds (VOCs) in soils at each of the three identified source areas
- Treatment of off-gases from the SVE operation using vapor phase carbon units which will be regenerated at a off-site RCRA-approved facility; and
- Groundwater remediation utilizing specified pumpage rates of the municipal supply wells in order to expedite removal of the groundwater contaminant plumes affecting these wells.

The costs of the selected remedy are estimated to be

- Capital costs - $252,000
- Operation costs - $222,000

An eighteen month operating period was assumed and the costs were not discounted.

Based upon our review of the public comment Feasibility Study received on August 14, 1989, and the draft Record of Decision received on September 8, 1989, our agency concurs with the selection of this remedy.

We understand that your staff and contractors, or the potentially responsible parties will develop the major design elements of the soil vapor extraction systems, the off-gas treatment system and the groundwater remediation system in close consultation with my staff during the predesign and design phases of the project. We also understand that if the potentially responsible parties do not agree to fund the remedy, the State of Wisconsin will contribute 10% of the remedial action costs. In addition to cost sharing on the remedy we acknowledge our responsibility for operation and maintenance of this system once the remedy is constructed.

As always, thank you for your support and cooperation in addressing the contamination problem at this site. If you have any questions regarding this matter, please contact Mr. Paul Didier, Director of the Bureau of Solid & Hazardous Waste Management at (608) 266-1327.

Sincerely,

C. D. Besadny

C. D. Besadny
Secretary

CDB:SB:sb33
d:\8910\sw9wsclt.sxb

cc: Lyman Wible - AD/5
Paul Didier - SW/3
Mark Giesfeldt - SW/3
Gary Kulibert - NCD
Rene Sanford - FN/1
Norm Niedergang - EPA Region V
Margaret Guerriero - EPA Region V

Compendium Of Examples from FY'89 Records of Decision

1. Declaration
2. Site Description, Site History, Community Relations
3. Scope and Role of Operable Unit
4. Summary of Site Characteristics
5. Summary of Site Risks
6. Description of Alternatives
7. Comparative Analysis
8. Selected Remedy
9. Statutory Determinations
10. Responsiveness Summary
11. State Letter of Concurrence

Office of Emergency and Remedial Response
Office of Waste Programs Enforcement

May 1990

INTRODUCTION

Sections 113 and 121 of CERCLA require that the Agency issue a final remedial action plan, known as the Record of Decision (ROD). It may include the basis and purpose for the selected remedy and certain public notification and involvement activities which must occur to provide opportunity for the public discussion of the information.

The ROD documents the remedial action plan for a site or operable unit. It is prepared by the lead agency in consultation with the support agency(ies). It has three purposes:

- legally certifies that the remedy selection process was carried out in accordance with the requirements of CERCLA and, to the extent practicable, the NCP
- outlines the engineering components and remediation goals of the selected remedy
- provides the public with a consolidated source of information about the site , the cleanup alternatives considered and the rationale for the one selected.

The ROD has three major components: the Declaration, the Decision Summary and the Responsiveness Summary. Good examples of each section will be presented in this portion of the handbook. They can serve as illustrative models for remedial Project Managers responsible for preparing RODs in FY90.

The primary criteria used to compile these examples were:

1) Whether the sections followed the format and contained the appropriate contents suggested by the "Guidance in Preparing Superfund Decision Documents (ROD Guidance)" OSWER Directive 9355.0.

2) Whether the sections were clearly written and effectively presented.

3) Whether the sections appropriately reflect current Superfund program policy.

This compendium of examples reflects the fact that there is often more than one way to present similar information, and the level of detail may appropriately vary from ROD to ROD. However, some approaches are more effective than others and contain essential information which should always be included in the ROD.

There were many good examples available for some sections of the ROD which necessitated selecting a subset that would most effectively convey key concepts. For other sections of the ROD, ideal examples were not available. It is important to read the comments that introduce each set of examples to understand what each example is intended to demonstrate.

1. DECLARATION

The Declaration is a formal statement signed by the Regional Administrator that identifies the selected remedy and indicates that the selection was carried out in accordance with the statutory and regulatory requirements of the Superfund program.

EXAMPLE: CROSS BROTHERS PAIL, IL

This sample Declaration follows the guidance exactly by using the standard language for each section. Under the statement of Basis and Purpose, the Declaration includes the appropriate references to CERCLA as amended by SARA, and the NCP which is to be met "to the extent practicable".

Also, the administrative record is referenced as the basis of the decision but the index is not attached. (It is no longer a requirement for the administrative record index to be attached to the ROD.)

The Assessment of the Site section contains the necessary standard language reflecting that the site may pose an endangerment. This standard language is important to include because it provides the necessary basis for Section 106 enforcement actions. Some RODs used alternative language which may or may not accomplish the same legal purpose. Other RODs did not contain this section at all.

The selected remedy is effectively presented in a bullet fashion, explaining all major treatment and containment components as well as institutional controls.

The Statutory Determination section contains the appropriate language that indicates that the remedy will satisfy the statutory preference for treatment of a principal treatment and that the five year review will be conducted because material will remain on site above the health-based levels.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Cross Brothers Pail Recycling
Pembroke Township, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Cross Brothers Pail Recycling site developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the administrative record for the Cross Brothers Pail Recycling site.

The United States Environmental Protection Agency and the State of Illinois agree on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF REMEDY

This final remedy addresses remediation of groundwater and soil contamination by eliminating or reducing the risks posed by the site, through treatment and engineering and institutional controls.

The major components of the selected remedy include:

- Re-sampling of the localized PCB soil area to identify the existence of a PCB source.
- If identified, remove the localized PCB-contaminated soil area and incinerate the soils at a TSCA approved incinerator.
- Install and maintain a groundwater collection system capable of capturing the groundwater contaminant plume.

- Install and maintain an on-site groundwater treatment facility to remove contaminants from the collected groundwater.
- Install and maintain a soil flushing system for the 3.5 acres of contaminated soil within the disposal area.
- Install and maintain a 6 inch vegetative cover over that portion of the disposal area not subject to the soil flushing operation.
- Monitor the groundwater collection/treatment system and the groundwater contaminant plume during groundwater remediation activities.
- Install and maintain a 6 inch vegetative cover over the 3.5 acre area subject to soil flushing upon terminating the soil flushing operation.
- Install and maintain a fence around the site during remedial activities.
- Initiate a deed notification identifying U.S. EPA and IEPA concerns regarding the conductance of intrusive activities at the site.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. As this remedy will initially result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

for Frank M. Covington — 9/28/89

Valdas V. Adamkus
Regional Administrator
U.S. EPA - Region V

Date

2. SITE DESCRIPTION, SITE HISTORY AND SUMMARY OF ENFORCEMENT AND COMMUNITY RELATIONS

These sections of the ROD provide essential background information on the site so the physical, enforcement and public participation context of the site can be properly understood.

EXAMPLE: PREFERRED PLATING, NY

The sample illustrates how the necessary information can be provided clearly and succinctly.

In the Site Location and Description sections note the reference to the fact that no endangered species or critical habitats have been identified and the proximity of wetlands to the site. These items should be included in all RODs to reflect that appropriate assessments have been made.

The Site History and Enforcement Activities section effectively summarizes the activities that caused the problem, the site investigations conducted to date, and pertinent enforcement information.

The Community Relations Activities section provides a brief overview of key public participation activities undertaken to fulfill the requirements of CERCLA Section 113 and 117.

SITE LOCATION AND DESCRIPTION

The Preferred Plating Corporation Site (the "Site") is located at 32 Allen Boulevard in Farmingdale, Town of Babylon, Suffolk County, New York. This 0.5-acre Site is situated in a light industrial area approximately 1 mile west of the Nassau-Suffolk County border. Route 110 passes just west of the Site (see Figure 1).

The land to the east and west of the Site is occupied by commercial or light industrial properties. Immediately north of the Site is a large wooded area followed by various industrial facilities further north of that. To the south are a residential community and a U.S. Army facility.

The 1980 census records a population of greater than 10,000 within a 3 mile radius of the Site. The population density in the area is estimated to be 3,000 to 6,000 persons per square mile. All homes and businesses, in the area surrounding the Site, are supplied by two public water companies. Ground water is the source of water supplies for the entire population of both Nassau and Suffolk Counties. All public water supply wells in the Site area draw water from the deeper aquifer, the Magothy Aquifer. The nearest public water supply well fields are located approximately 1 mile east and 1 mile south of the Site.

The nearest body of surface water is an unnamed intermittent tributary of Massapequa Creek which is approximately 6000 feet west of the Site. There is no designated New York State Significant Habitat, agricultural land, nor historic or landmark site directly or potentially affected. There are no endangered species or critical habitats within close proximity of the Site. The Site is located more than 2 miles from a 5-acre coastal wetland and more than 1 mile from a 5-acre fresh-water wetland.

The Site is situated in the south-central glacial outwash plain of Long Island, which constitutes the Upper Glacial Aquifer, estimated to be 90 feet in thickness under the Site. The naturally occurring surface soil is a sandy loam which promotes rapid infiltration to the ground water. On the Site proper and throughout much of the region, soils have been classified as urban. This is primarily due to the development and pavement which promote greater run-off of precipitation. The Upper Glacial Aquifer overlies the Magothy Aquifer and the two may act as distinct aquifers, or as one, depending upon the degree of hydraulic connection between the two. In the Site area, it is believed that the two are not hydraulically connected.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Preferred Plating Corporation (PPC) conducted operations beginning in September 1951 through June 1976. The primary activities at the Site were to chemically treat metal parts to increase their corrosion resistance and provide a cohesive base for painting. The plating processes included degreasing, cleaning, and surface finishing of the metal parts. These processes involved the use of various chemicals which resulted in the generation, storage, and disposal of hazardous waste. Untreated waste water was discharged to four concrete leaching pits directly behind the original building.

Ground water contaminated with heavy metals was detected in the Site area by the Suffolk County Department of Health Services (SCDHS) as early as June 1953. SCDHS indicated that the leaching pits on the Site were severely cracked and leaking. Samples taken from the pits showed the major contaminants to be heavy metals. From 1953 to 1976, SCDHS instituted numerous legal actions against PPC in an effort to stop illegal dumping of wastes and to install or upgrade the on-site treatment facility. PPC prepared an engineering report in May 1974 in order to apply for a State Pollutant Discharge Elimination System (SPDES) permit which was issued in June 1975. PPC chemically treated the waste water in the pits and, allegedly, then had the treated waste water removed. Whether the treated ground water was ever removed has not been confirmed by EPA. The facility was never in full compliance with the terms and conditions outlined in the permit.

In 1976, PPC declared bankruptcy. Since then, several firms have occupied the Site, none conducting similar operations to PPC. In 1982, the original building was extended by 200 feet, thereby burying the concrete leaching pits. Nearly the entire Site is covered either by the one existing building or paved driveways and parking areas.

In September 1984, Woodward-Clyde Consultants, Inc. performed a Phase I-Preliminary Investigation of the Preferred Plating Site for NYSDEC for the purpose of computing a Hazard Ranking System (HRS) score needed to evaluate whether to place the Site on the National Priorities List (NPL). In the Phase I report, an HRS score of 33.76 was documented, thereby enabling the Site to be included on the NPL. On October 15, 1984, (49 FR 1984), the Site was proposed for the NPL and was added with a ranking of 500 on June 10, 1986, (51 FR 21054).

At EPA's direction, a remedial investigation (RI) was initiated in 1987. The RI consisted of a field sampling and analysis program followed by validation and evaluation of the data collected. The field work was initiated in June 1988 and completed in February 1989. The work was conducted by EPA's REM III contractor, Ebasco Services, Inc. The soil sampling program involved the determination of lateral and vertical extents of contamination by obtaining samples from six on-site monitoring wells, two off-site monitoring well locations, six surface soil locations, and seven angle borings which extended underneath the on-site building overlying the former leaching pits. The groundwater sampling program involved the installation of nine on-site and two off-site monitoring wells. In addition, two storm water run-off samples and two sediment samples were collected from on-site storm sewers.

The potentially responsible parties (PRP's) were notified in writing on February 12, 1988 via a special notice letter and given the opportunity to conduct the RI/FS under EPA supervision. However, none elected to undertake these activities.

In July 1989, Ebasco's remedial investigation (RI) and feasibility study (FS) reports were released to the public along with the Proposed Remedial Action Plan (PRAP) developed by EPA. A 28-day public comment period was provided, ending on August 18, 1989.

COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the Preferred Plating Site was finalized in March 1988. This document lists contacts and interested parties throughout government and the local community. It also establishes communication pathways to ensure timely dissemination of pertinent information. Subsequently, a fact sheet outlining the RI sampling program was distributed in June 1988. The RI/FS and the Proposed Plan were released to the public in July 1989. All of these documents were made available in both the administrative record and two information repositories maintained at the Babylon Town Hall and the West Babylon Library. A public comment period was held from July 19, 1989 to August 18, 1989. In addition, a public meeting was held on August 3, 1989 to present the results of the RI/FS and the preferred alternative as presented in the Proposed Plan for the Site. All comments which were received by EPA prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary which is attached, as Appendix V, to this Record of Decision.

3. SCOPE AND ROLE OF OPERABLE UNIT

This section should describe the role of the remedial action within the overall site cleanup strategy and summarize the scope of the problems to be addressed b y the remedial action selected. It should identify whether the action will address s any of the principal threats posed by the site.

EXAMPLE: CHEMICAL INSECTICIDE, NJ

This sample thoroughly describes past response actions, how they provided protection and the remaining threat and pathways. It also explains how this interim action ROD will provide additional controls, why EPA chose to address the site in operable units, and describes the principal threat addressed. (this provides the basis for the statutory determination made later in the ROD as to whether the remedy satisfies the preference for treatment of a principal threat.) Future response actions are briefly described as to their scope, the media they will address, and how they will mesh with this ROD. It also characterizes when a final remedy may be expected.

EXAMPLE: WAUSAU WATER SUPPLY, WI

This example illustrates how this section might work for a final action ROD and also does a good job of explaining how the principal threats are being addressed.

The CIC site, as characterized by the RI field investigations, is extremely complex, due to the number and variety of contaminants present, the concentrations of contaminants documented, and the physical and geological characteristics of the site. The specific combination of chemical contaminants at the CIC site (herbicides, pesticides and metals) will require performance of treatability tests prior to identification of alternatives to remedy the entire site. Preparation of an FS report which addresses all aspects of the CIC site requires performance of the proposed treatability tests and assessment of the results. Such treatability tests are in the planning stage.

EPA has already taken two limited response actions related to the surface water run-off problem at the site. The first action in February of 1988 was to install a fence to prevent access to the contaminated liquids and sediments in the drainage ditch east of the CIC property. The second action in March of 1989 was to clean up the overflow from the drainage ditch to the Metroplex parking lot and to improve the ditch to reduce the likelihood of future overflows. The surface water run-off during this overflow incident had a yellow color that is characteristic of standing water at the southern end of the CIC property. This yellow color is attributed to dinoseb, an herbicide which has been found in samples of standing water from the southern end of the site and in water samples from the drainage ditch and parking lot during the overflow incident. Dinoseb is known to produce a yellow color when dissolved in water.

These limited response actions have only partially addressed the surface water run-off problem in that the surface water run-off would continue to migrate to downstream waterways (i.e. the unnamed tributary, Mill Brook and the Raritan River), with potential for harm to the environment and for human exposure.

In this ROD, EPA is selecting an interim remedial action to control contaminated surface water run-off from the CIC site until the time that the FS addressing all aspects of the CIC site is finalized and the resulting ROD is implemented. This action will be the first operable unit (i.e., the first cleanup phase) of the remediation of the entire site. EPA has elected to address the surface water run-off problem as the first operable unit because of the threat posed by the surface water run-off (see Section 2, above) and because sufficient information is available to select an appropriate remedy for this problem. This action will focus on one of the principal threats presented by the site, that of the contaminated surface water run-off.

One or more future RODs will address the remaining problems presented by the site, including the contamination of soil and groundwater. It should be noted that once the contaminated soil at the site has been effectively remediated, the surface water run-off from the site would no longer become contaminated by contact with the soil. As a result, the remedy selected in this ROD would no longer be needed after the contaminated soil is cleaned up. Therefore, the remedy selected in this ROD is considered to be an interim remedy which can be discontinued once a remedy for the soil contamination has been implemented. EPA expects to be in a position to select a remedy for the soil contamination after treatability studies for the contaminated soils are conducted and after the results of the studies have been analyzed and incorporated in a FS.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The scope of this response action is to address the remaining concerns (principal threats) at the site. As discussed, a previous operable unit action at the site addresses the contaminant plume originating from the former landfill/Marathon Electric source area which affects CW6.

During development of the final FS, it was determined that the deep plume which originates from the former City landfill area and migrates under the River to CW3 would best be addressed by purging groundwater at the same location as the interim remedy extraction system. Therefore, it was determined that an increase in the minimum pumping rates called for in the extraction system

and modifications to the monitoring plan would provide the most effective remediation for this contaminant plume. It was also assumed that the City would continue to use CW3 as a supply well and thus continue to remove contaminants from the most eastern portion of the plume.

The selected alternative for the final phase of the Wausau project, in conjunction with the operable unit, will address all concerns at the site. Remaining concerns include three source areas and the shallow east side groundwater contaminant plume originating from the Wausau Chemical source area. The identified source areas include; former City landfill/Marathon Electric property, Wausau Chemical property, and Wausau Energy property.

The final remedy for the site is intended to address the entire site with regards to the principal threats to human health and the environment posed by the site as indicated in the risk assessment for the site. The findings of the risk assessment are included in the RI Report and are summarized in a later section of this document.

4. SUMMARY OF SITE CHARACTERISTICS

This section should highlight all known or suspected sources of contamination, affected media and the characteristics of the contamination such as the mobility, toxicity, the volumes and concentrations, and location at the site. Also, it should identify potential routes of migration and potentially exposed populations.

EXAMPLE: BYRON BARREL AND DRUM, NY

The first example demonstrates how site characteristics can be summarized in a narrative format. Although this summary does not explicitly delineate material comprising principal versus low-level threats, it does a good job of identifying the location of different contaminants and their associated concentrations and volumes. This helps establish a clear basis for the types of remedial alternatives developed.

EXAMPLE: NORTHWEST TRANSFORMERS, WA

The second example provides a good model for explaining the characteristics of PCBs, the primary contaminant at this site, and the potential migration pathways.

EXAMPLE: WAUSAU WATER SUPPLY, WI

The third example illustrates how a table can provide an efficient vehicle for conveying great amounts of information. This particular table includes contaminated media, contaminants found, concentrations (high, low, geometric mean), and the number of samples.

The first example states the concentrations, volumes, depths of contaminants in each media, potential migration pathways, and some characteristics of the contaminants. The contaminants of concern and sampling locations are also laid out well in two tables.

This section should also clearly state the characteristics (whether they are toxic, mobile, carcinogens, etc.), potential populations affected, and exposure pathways. Not all the RODs included had volumes, pathways, and areas affected.

SUMMARY OF SITE CHARACTERISTICS

Approximately 200 55-gallon steel barrels that were filled with hazardous waste were abandoned at the Byron Barrel and Drum site from 1978 to 1980, when the site was used as a salvage yard for heavy construction equipment. Leakage and spillage from these drums appears to have been the primary source of contamination of the site. The drums and their contents were removed from the site by EPA in 1984. In addition, approximately 40 cubic yards of visibly-contaminated surface soil and debris were removed from the site during the same period.

Analyses of soil, groundwater, sediment, and surface water from the site and adjacent areas indicate that the environmental contamination at the Byron Barrel and Drum site consists primarily of subsurface soil and groundwater contamination. Based on the absence of substantial soil contamination, it appears that the EPA removal action was effective in reducing contaminant releases. Chlorinated aliphatic hydrocarbons such as 1,1,1-trichloroethane, 1,1-dichloroethane, trichloroethene, and 1,1-dichloroethene are the primary contaminants. Various monocyclic aromatics such as toluene and xylenes were also detected, although groundwater contamination with these substances is minimal when compared to the contamination with chlorinated species.

SURFACE SOIL

A total of 25 surface soil samples were collected during the field investigation at the locations shown in Figure 3. The locations were selected based on the results of the soil-gas investigation and historical information. Of the 25 samples, 21 were collected on-site, and 4 were collected off-site to provide background information. Surface soil samples were collected to provide the necessary data to assess the risks posed by dermal contact, as well as to provide information on potential contamination migration via surface-water erosion of soil.

Surface soils at the Byron Barrel and Drum site contain only low levels of volatile organics (less than 50 parts per billion (ppb)), phthalate esters (less than 600 ppb), polynuclear aromatic hydrocarbons (less than 300 ppb), and benzoic acid (less than 500 ppb). By contrast, much higher concentrations of various pesticides, such as 4,4'-DDT, 4,4'-DDE, endrin, and dieldrin, were encountered. The highest concentrations of the pesticides were detected in surface soil samples which were collected from the adjacent farmland. On-site samples containing pesticides were obtained in proximity to the agricultural land and are believed to be present as a result of atmospheric transport of pesticides during their application to crops. Figure 3 summarizes the volatile organics detected in surface soil samples.

Although chromium and lead were detected in site surface soils above background, contamination with these substances is not pronounced. Figure 4 presents the analytical results for surface soil samples containing chromium and lead above background levels. As is evident from the Figure 4, chromium and lead contamination is greatest in Source Area 3.

Based on the results of a surface soil sampling program in Source Area 3, it is estimated that there are 1,100 cubic yards of contaminated soil in this area.

SUBSURFACE SOIL

As shown in Figure 5, test pits and trenches were dug at 46 locations, from which a total of 130 subsurface samples were collected for analysis. No drums were detected in any of these test pits.

As shown in Figure 6, volatile organics were detected in subsurface soil samples at concentrations ranging from 5 ppb to 2,669 ppb. The most pronounced contaminants based on the mobile laboratory results are toluene, 1,1,1-trichloroethane, and trichloroethane. Concentrations of these ranged as high as 865 ppb, 551 ppb, and 2,669 ppb, respectively.

Twenty subsurface soil samples were also obtained. As can be seen by the analytical results summarized in Table 1, volatile organics are the primary contaminants detected, and toluene and trichloroethene were detected at relatively high concentrations (2,700 ppb and 2,800 ppb, respectively). In addition, several other volatile organics, notably xylenes and tetrachloroethene (PCE), were detected at high concentrations. Xylene concentrations ranged as high as 1,700 ppb, while PCE concentrations ranged as high as 4,400 ppb. All of these samples were collected from the southwestern portion of Source Area 1. In addition, phthalate esters were detected in several samples at concentrations ranging as high as 2,000 ppb (di-n-butylphthalate). Arochlor 1254 was detected in one test pit sample at a depth of 4 feet. PCBs were detected in drum samples collected by the NYSDEC prior to the removal action. The detection of PCB Arochlor 1254 at a concentration of 690 milligrams per kilogram (mg/kg) indicates that some release of PCBs occurred at the site. However, only one sample from Source Area 1 contained a PCB compound, and the available data indicate that PCB contamination is not extensive. PCBs were not identified in any of the other matrices sampled at the site (i.e., surface soil, sediment, groundwater, or surface water).

Based upon the sampling results in Source Area 1, it is estimated that there are 1,100 cubic yards of contaminated soil in this area.

The analytical results for subsurface soil samples obtained in Source Area 2 are depicted in Figure 7. Subsurface soil samples contained several chlorinated aliphatic hydrocarbons, including 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, 1,1-dichloroethene, and methylene chloride. TCA concentrations ranged as high as 410 ppb in these samples.

Based on the results of the subsurface soil sampling and analysis program in Source Area 2, it is estimated that approximately 3,000 cubic yards of contaminated unsaturated zone soil exists in this area.

Figure 8 depicts detections of chromium and lead above background soil concentrations. From this figure, it is apparent that subsurface contamination with these contaminants is not extensive in any of the source areas.

GROUNDWATER

The primary contaminant transport mechanism at the Byron Barrel and Drum site is associated with groundwater advection of dissolved contaminants. Two contaminant plumes originating in the vicinity of Source Areas 1 and 2 were noted to be migrating in the downgradient direction to the northwest. No evidence of contaminant migration toward residential wells to the southwest was observed during the RI. Based on the analytical results for monitoring well samples, it is apparent that these contaminant plumes are confined to the immediate proximity of the source areas. It is estimated that the contaminant plumes have migrated no further than 400 and 300 feet from the Source Areas 1 and 2, respectively. This phenomenon is a manifestation of the shallow hydraulic gradient and the relatively recent time frame of disposal activities (as late as 1982).

Four distinct rounds of groundwater sampling were conducted at the Byron Barrel and Drum site. The first two rounds were conducted during the course of the monitoring well installation program. The second complete sampling round included analysis for volatile organics. The analytical results for groundwater sampling rounds 3 and 4 are summarized in Tables 2 and 3, respectively.

As shown in Tables 2 and 3, a number of volatile organic chemicals were detected in site groundwater samples during the third and fourth sampling rounds. Volatile organics detected frequently and/or at high concentrations include 1,1,1-trichloroethane, 1,1-dichloroethane, tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,2-dichloroethene. Concentrations of these compounds ranged as high as 4,400 ppb, 290 ppb, 82 ppb, 3,300 ppb, 41 ppb, and 110 ppb, respectively. Of these compounds, all but 1,2-dichloroethene are considered major site contaminants. Only one sample was found to contain 1,2-dichloroethene at a concentration above 1 ppb, which is the sample mentioned above. Methylene chloride was detected in one of three samples at a concentration of 2.8 ppb.

Figures 9 and 10 summarize the results for the predominant site groundwater contaminants for the third and fourth sampling rounds, respectively.

In addition to the organic contaminants detected in site groundwater samples, a number of inorganic constituents were detected above background levels. Table 4 provides a summary of the inorganic sample results for the upgradient monitoring well (MW-4A) versus the site monitoring well samples. Chemicals detected at concentrations significantly above background include aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc. It should be noted that groundwater samples were not filtered prior to acidification. Hence, these results are indicative of total inorganics in the water samples, including those present in suspended solids. The average concentrations presented in Table 4 indicate that there is little difference between the overall site concentrations and background levels. With the exception of sodium, mercury, and zinc, the average background concentrations exceed the site average values. Figure 11 displays the results for chromium and lead detected above background (upgradient) levels. Based on these results, it appears that lead contamination exists in all source areas.

The analytical results for groundwater samples collected during the supplemental activities are summarized in Figure 12. Groundwater contamination consists of chlorinated aliphatics and ketones. Organic contamination with 1,1,1-trichloroethane and MEK is most pronounced. Concentrations of TCA ranged as high as 2,500 ppb while concentrations of MEK ranged as high as 3,000 ppb.

The estimated extent of the contaminant plumes originating from Source Areas 1 and 2 is depicted in Figure 13. There is not a contaminant plume originating from Source Area 3.

SURFACE WATER AND SEDIMENT

Surface water and sediment samples obtained from a drainage ditch adjacent to the site property contained relatively low levels of organic chemicals. There is no evidence of any downstream impact on Oak Orchard Creek, the primary receiving surface water body. Several sediment samples from another drainage ditch that runs east to west, just north of the site, contained relatively high levels of toluene, acetone, and MEK. However, based upon surface drainage patterns and the absence of potential discharge of contaminated groundwater to this drainage channel, it is not believed that this contamination is site related.

V. Site Characteristics

Contaminant Characteristics

The contaminant of concern at the NWT site is PCB, primarily Arochlor 1260. It is unlikely that free-flowing PCB-bearing fluids (i.e., transformer dielectrics) are still present at the site. PCB is readily adsorbed onto soil particles and does not easily leach from soil. Adsorption of PCB by soil is related to the organic content of a particular soil type, and PCB recovered from soil is found to concentrate in the organic fraction of the soil media. The low water solubility and low volatility of PCB also suggest that it is partitioned most heavily into the organic fraction of soil. The rate of PCB movement in saturated soil has been found to be between one-tenth and one-hundredth the rate of groundwater movement.

Affected Matrices Characteristics

For site management, stabilization, and cleanup purposes, the NWT site can be divided into specific affected matrices.

The following discussion summarizes the characteristics and volumes of each matrix that are relevant to the identification, screening, and selection of remedial technologies and strategies.

S-11

The contaminant of concern in the soil is PCB. The tri-tetrachlorobenzenes were not included in analyses because these more volatile compounds were not expected to be persistent in surface soils, especially considering the length of time between the EPA IRM and the RI sampling effort. The distribution of PCB contamination in the surface soil is shown in Figure 2 (p.7). PCB contamination has been shown to exist at levels exceeding the April 1985 IRM cleanup level of 10 ppm (mg/kg) in two areas. 1) the area south of the barn and 2) the former seepage pit area (Figure 2). PCB concentrations between 1 and 10 ppm (mg/kg) exist in surface soil throughout the site.

During the July 1987 RI, shallow subsurface samples were taken from 2.5 and 5.0 feet below ground surface at selected locations. The principal contaminant of concern in these samples was PCB. The tri-tetrachlorobenzenes were not detected in the samples. Results indicated that PCB contamination generally decreased with depth and that the PCB levels were at or below 1 ppm (mg/kg) below the depth of five feet. The PCB analytical data show concentrations at or above 10 ppm (mg/kg) in the area just south of the barn. Analytical data indicate that below 2.5 feet some PCB concentrations are between 1 ppm (mg/kg) and 5 ppm (mg/kg). PCB concentrations in the subsurface soil in the seepage/septic tank area range between 1 to 10 ppm (mg/kg) at a depth of 19 feet.

The volumes of soil within the ranges of PCB contamination reported in the FS are shown in Table 1.

The surface area of the site is approximately 70,000 square feet (7,778 square yards) or approximately 1.6 acres.

Groundwater

There are two current primary PCB sources relative to groundwater contamination beneath the NWT site and vicinity. First, historical dumping of potentially high but undocumented concentrations of PCB in the seepage pit may have resulted in significant PCB migration into groundwater in the past. This high level contamination could act as a future source of groundwater contamination by PCB. The current low level PCB soil contamination can be considered a second source. The soil PCB contamination could act as a constant low level source of groundwater contamination until the site is remediated.

Based on the results of this RI and previous investigations, PCB contamination in groundwater has not been adequately characterized to assess the lifetime incremental cancer risk through ingestion of contaminated water, nor have the groundwater flow patterns been fully determined.

On-Site Structure (Barn)

During the IRM, a significant amount of washing, rinsing, and sandblasting of the surface of wooden structural members inside the barn was conducted, however, there is uncertainty as to the effectiveness of the decontamination of the deeper wood matrix of the barn. Core samples of the wood must be analyzed for PCB before all remediation alternatives, including the no action alternative, can be evaluated for the barn.

TABLE 1 NORTHWEST TRANSFORMER: ESTIMATED VOLUMES ASSOCIATED WITH SURFACE SOIL CLEANUP LEVELS

RESIDUAL PCB CONCENTRATION (PPM)	EXCAVATION DEPTH IN 10 PPM AREA (ft.)(1)(2)	VOLUME OF SOIL FROM 10 PPM AREA (cu.yd.)(1)	VOLUME OF SOIL FROM AREA BETWEEN 10 AND 1 PPM (cu.yd.)(1)	TOTAL VOLUME OF SOIL (cu.yd.)
40	0.0	0	0	0
32	0.5	313	0	313
24	1.0	625	0	625
16	1.5	938	0	938
10	1.9	1,172	0	1,172
8	2.0	1,250	171	1,421
5	2.2	1,367	468	1,836
1	2.5	1,563	964	2,526

(1) See Figure 2 for isoconcentration contours.
(2) Assume that concentration decreases from surface (avg = 40 ppm) to 2.5 ft. depth (1 ppm) in a linear manner.

Migration Pathways

The transport of the chlorinated contaminants in the environment is controlled by their physical properties. Three potential pathways of migration exist. groundwater, air, and surface water.

The potential for airborne migration of PCB from the site is minimal. The contaminants, especially the more chlorinated isomers, are not highly volatile. Also, the high equilibrium binding constant for PCB in soil indicates that contaminants bind tightly to the soils. Heavy vegetation on the site virtually eliminates any migration of contaminants on particulates generated from wind erosion. If surface vegetation is removed, the resulting wind dispersion of existing contaminated surface soils is not expected to result in off-site PCB contamination greater than one mg/kg based on results of background soils and on-site surface soils obtained in July 1987.

Likewise, the potential for transport of PCB from the site via surface water is minimal. Due to the very high permeability of the soils at the site and relatively flat topography, surface water runoff from the site is minimal.

It is for these reasons that the major potential pathway of contaminant migration identified for this site is the regional groundwater system. PCB is readily absorbed from water by solid particles and only slowly leaches from soils. PCB has poor mobility through saturated soil. Downward movement of contaminants would be effected very slowly by water infiltration from precipitation coupled with sorption/desorption mechanisms based on contaminant solubility. Rapid downward movement and horizontal migration would only be suspected if large quantities of oil-soluble solvents were allowed to percolate through the soil.

The highest potential for the downward migration appears to be in the seepage pit area, where the excavated and caved area tends to funnel precipitation. Review of previous investigations indicates that unknown amounts of liquids were disposed of in this area of the site by dumping into the seepage pit. The construction of this pit was such that liquids would seep out to the surrounding formations. Sources of the liquids are not known but are suspected to include some portions of the liquids generated on site. Unless large quantities of solvents were dumped into the excavated area, migration of PCB would not be expected to be significant.

WAUSAU WATER SUPPLY, WI

		Chemical Concentration			Number Locations Sampled for Analysis	
Medium	Chemical	Minimum	Maximum	Geometric Mean	Total	Positive Detection
	Metal/CN	ug/L	ug/L	ug/L	3	
	Iron	957	5300	2110		[illegible]
	Manganese	1610	2920	2110		[illegible]
SURFACE SOILS	Volatile	ug/kg	ug/kg	ug/kg	8	
	Methylene chloride	64	190	110		[illegible]
	1,1,1-Trichloroethane	--	3	--		[illegible]
	Tetrachloroethene	--	3	--		[illegible]
	Xylenes (total)	--	4	--		[illegible]
	Semivolatile	ug/kg	ug/kg	ug/kg	8	
	Phenol	89	93	90		[illegible]
	4-Methylphenol	--	200	--		[illegible]
	Benzoic acid	--	160	--		[illegible]
	Naphthalene	37	720	192		[illegible]
	2-Methylnaphthalene	32	770	264		[illegible]
	Acenaphthylene	2	110	22		[illegible]
	Acenaphthene	51	69	59		[illegible]
	Dibenzofuran	38	180	82		[illegible]
	Fluorene	100	120	109		[illegible]
	Phenanthrene	200	2500	651		[illegible]
	Anthracene	32	480	155		[illegible]
	Flouranthene	200	6600	1300		[illegible]
	Pyrene	150	2900	910		[illegible]
	Butylbenzylphthalate	59	390	150		[illegible]
	Benzo(a)anthracene	110	2400	749		[illegible]
	Bis(2-ethylhexyl)phthalate	150	1600	489		[illegible]
	Chrysene	390	3200	861		[illegible]
	Di-n-octylphthalate	--	380	--		[illegible]
	Benzo(b)fluoranthene	250	5400	1380		[illegible]
	Benzo(k)fluoranthene	--	1600	--		[illegible]
	Benzo(a)pyrene	100	2700	604		[illegible]
	Indeno(1,2,3-cd)pyrene	210	1200	614		[illegible]
	Dibenz(a,h)anthracene	--	390	--		[illegible]
	Benzo(g,h,i)perylene	230	1400	655		[illegible]
	Pesticide/PCB					
	Not Analyzed					
	Metal/CN					
	Not Analyzed					
SURFACE WATER						
Bos Creek	Volatile	ug/L	ug/L	ug/L	12	
	1,2 Dichloroethene (total)	1	1	1		[illegible]
	Trichloroethene	1	110	41		[illegible]
	Tetrachloroethene	1	3	2		[illegible]
	Semivolatile					
	Not analyzed					
	Pesticide/PCB					
	Not Analyzed					
	Metal/CN					
	Not Analyzed					

Table 2
(Continued)

Medium	Chemical	Chemical Concentration Minimum	Chemical Concentration Maximum	Chemical Concentration Geometric Mean	Number [illegible] Sampled for Analysis Total	Number [illegible] Sampled for Analysis Positive Detection
	Benzo(b)fluoranthene	110	680	220		[illegible]
	Benzo(k)fluoranthene	100	760	210		[illegible]
	Benzo(a)pyrene	120	750	250		[illegible]
	Indeno(1,2,3-cd)pyrene	130	680	220		[illegible]
	Dibenz(a,h)anthracene	--	74	--		[illegible]
	Benzo(g,h,i)perylene	130	800	270		[illegible]
	Pesticide/PCB					
	Not Analyzed					
	Metal/CN	mg/kg	mg/kg	mg/kg	15	
	Copper	--	107	--		[illegible]
LANDFILL REFUSE	Volatile	ug/kg	ug/kg	ug/kg	15	
	Methylene chloride	9	1900	70		[illegible]
	Acetone	71	160	100		[illegible]
	1,2-Dichloroethene (total)	21	220	67		[illegible]
	Trichloroethene	36	160000	680		[illegible]
	Toluene	3	750	60		[illegible]
	Ethyl benzene	2	4	3		[illegible]
	Xylenes (total)	4	24	13		[illegible]
	Semivolatile	ug/kg	ug/kg	ug/kg	15	
	Phenol	--	2200			[illegible]
	2-Chlorophenol	--	2200	--		[illegible]
	1,2-Dichlorobenzene	--	210	--		[illegible]
	2-Methylphenol	--	75	--		[illegible]
	4-Methylphenol	--	830	--		[illegible]
	Isophorone	--	130	--		[illegible]
	1,2,4-Trichlorobenzene	--	1200	--		[illegible]
	Naphthalene	49	1300	150		[illegible]
	4-Chloro-3-methylphenol	--	2300	--		[illegible]
	2-Methylnaphthalene	65	890	150		[illegible]
	2-Chloronaphthalene	--	170	--		[illegible]
	Acenaphthylene	--	130	--		[illegible]
	Acenaphthene	45	730	180		[illegible]
	Dibenzofuran	19	330	63		[illegible]
	Fluorene	82	500	186		[illegible]
	Pentachlorophenol.	820	32000	2900		[illegible]
	Phenanthrene	170	15000	1100		[illegible]
	Anthracene	19	2200	250		[illegible]
	Fluoranthene	60	45000	1600		[illegible]
	Pyrene	63	49000	1700		[illegible]
	Butylbenzylphthalate	130	2300	500		[illegible]
	Benzo(a)anthracene	420	24000	1400		[illegible]
	Bis(2-ethylhexyl)phthalate	110	54000	860		[illegible]
	Chrysene	54	25000	970		[illegible]
	Benzo(b)fluoranthene	410	25000	1700		[illegible]
	Benzo(k)fluoranthene	430	25000	1400		[illegible]
	Benzo(a)pyrene	480	25000	1200		[illegible]
	Indeno(1,2,3-cd)pyrene	640	31000	940		[illegible]
	Dibenz(a,h)anthracene	280	1200	490		[illegible]
	Benzo(g,h,i)perylene	560	14000	1600		[illegible]
	Pesticide/PCB	ug/kg	ug/kg	ug/kg	6	
	Arochlor 1260	850	2300	1400		[illegible]

5. SUMMARY OF SITE RISKS

The baseline risk assessment should be summarized in this section. It should include both human health risks and environmental risks. This provides the rationale for the lead agency's either undertaking a response action or taking no action

EXAMPLE: NORTHSIDE LANDFILL, WA

The example of the human health Site Risk section includes well defined sections which discuss contaminants of concern; exposure assessment including exposure points and calculation of dose; toxicity assessment with separate discussions of carcinogenic and noncarcinogenic criteria; characterization of carcinogenic and noncarcinogenic risks; uncertainties and conclusions. The narrative is supported by several tables on exposures, doses and cancer risk, and hazard index. The introduction to each section states the parameters to be discussed such as population at risk, and exposures. Terms such as Reference Dose, Chronic Daily Intake, No Observed Adverse Effect Levels, and classes of carcinogens are defined. The basic methodology used to arrive at the basic calculations are briefly explained. There is a great deal of information provided but it is presented logically, systematically, and is fairly readable. The result is a basic understanding of the actual and potential exposures, populations, pathways and risk.

EXAMPLE: FAA TECHNICAL CENTER, NJ

The summary of Site Risk section in this ROD provides good tables that concisely present appropriate risk information. Table 1 highlights contaminants of concern, maximum and average concentrations and their frequency of detection in the environmental media. Table 2 provides a good summary of the toxicity information for these contaminants. The exposure assumptions are reported in an easy-to-read manner in Table 3. Tables 4 and 5 should be abbreviated to report only those chemicals with risks that are above or near the 10^{-6} level or with hazard indices near or above one. We also recommend that the noncarcinogenic chemicals of concern not be included on the table of carcinogenic risks.

EXAMPLE: MARATHON BATTERY, NY

The summary of Site Risks should discuss environmental risks, summarizing the affects of contaminants on critical habitats and any endangered species.

This ROD also provides a discussion of bioassays conducted to determine concentrations of contaminants which may affect aquatic organisms. It describes sampling, levels of contaminants which would be protective of the environment, other factors which will impact achievement of those levels. The State believes that there may be an adverse ecological impact. Endangered species are identified and a conclusion drawn about potential impact of the contamination on that species.

SUMMARY OF SITE RISKS

Persons who may use contaminated groundwater from the area of the Northside Landfill as their only source of water were identified as the population at risk of adverse health effects. The primary routes of exposure to contaminants in groundwater are ingestion, inhalation of volatile constituents, and dermal absorption. Tetrachloroethylene, (PERC), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) detected in groundwater from offsite wells are the contaminants of concern. The maximum cancer risk from exposure to groundwater from the most contaminated private well is one in ten thousand (1×10^{-4}). Non-carcinogenic health effects are not expected from exposure to PERC and TCA at the present detected level of contamination in onsite and offsite wells.

Identification of Contaminants of Concern

The Remedial Investigation/Feasibility Study (RI/FS) identified groundwater as the exposure medium of greatest concern. Exposure via other media including soil and surface water was not considered to be significant. Thus, groundwater is the only exposure medium considered here.

The RI/FS identified PERC, TCE, and TCA as the contaminants of concern. These were the only organic compounds regularly detected in the offsite wells. Groundwater monitoring data from Appendix D of the Supplemental RI Addendum were used to calculate exposure point concentrations for the exposure scenarios described below.

Three hypothetical exposure scenarios were evaluated: (1) average exposure due to use of an offsite well, (2) exposure due to use of one of the most contaminated offsite wells, and (3) exposure due to use of one of the most contaminated onsite wells. The exposure point concentrations used to calculate risk estimates are described in the following paragraphs and are also listed in Tables 2-4.

For average exposure due to use of an offsite well, it was assumed that persons would be exposed to groundwater contaminants at a level equal to the mean of all the observations over time for all of the offsite wells. For PERC, TCE, and TCA, these concentrations are 3, 1, and 1 ug/l, respectively.

For exposure due to use of the one of the most contaminated offsite wells, the Pellow and Volkman Wells were identified as the two most contaminated wells: Two concentration levels of contaminants were considered at each of these wells: the average concentration at the wells and the highest concentration observed at the wells. At the Pellow Well, the average concentrations of PERC, TCE, and TCA are 28, 5, and 4 ug/l, respectively. The highest concentrations of PERC, TCE, and TCA observed at this well are 38, 8, and 10 ug/l, respectively. At the Volkman Well, the average concentrations of TCE and TCA are 1 and 7, respectively. The highest concentrations of TCE and TCA observed at this well are 7 and 15 ug/l, respectively. PERC was not detected in this well and therefore 0.5 ug/l (half the detection limit) was used as the average and maximum value.

In order to evaluate exposure due to use of one of the most contaminated onsite wells, the same approach was used as for offsite wells. The most volume of contaminated groundwater is estimated to be 13.3 million gallons.

SUMMARY OF SITE RISKS

A baseline risk assessment was conducted for Area D and is presented in a document entitled, Baseline Risk Assessment, Site D Jet Fuel Farm (TRC, June 1989). The risk assessment consisted of hazard identification, a dose-response evaluation, exposure assessment and risk characterization.

Selection of Contaminants of Concern

The hazard identification involved the selection of contaminants of concern (COCs), detected contaminants which have inherent toxic/carcinogenic effects that are likely to pose the greatest concern with respect to the protection of public health and the environment. Selected contaminants of concern at Area D included:

Volatile Organic Contaminants

* Benzene
* Toluene
* Ethylbenzene
* Xylene

Base/Neutral and Acid Extractable Compounds

* Naphthalene
* Phenol
* 2-Chlorophenol

Metals

* Chromium
* Nickel
* Lead

The media in which these contaminants were detected and associated concentrations are summarized in Table 1.

Dose-Response Evaluation

The dose-response evaluation presented available human health and environmental criteria for the contaminants of concern, and related the chemical exposure (dose) to expected adverse health effects (response). Included in this assessment are the pertinent standards, criteria, advisories and guidelines developed for the protection of human health and the environment. An explanation of how these values were derived and how they should be applied is presented below.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg/day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects of humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

The Office of Research and Development (ORD) has developed Health Effects Assessments (HEAs) for 58 hazardous substances. The intent of these assessments is to suggest an acceptable exposure level whenever sufficient data are available. These values reflect the relative degree of hazard associated with exposure to the chemical addressed.

When possible, two categories of maximum dose tolerated (MDT) have been estimated for systemic toxicants. The first, the "Acceptable Intake Subchronic" (AIS), is an estimate of an exposure level that would not be expected to cause adverse effects under subchronic exposure. Limited information is available on subhcronic exposure because efforts have been directed primarily to lifetime exposures. Subchronic human data are rarely available. Reported exposures are usually from chronic, occupational exposure situations, or from reports of acute accidental exposure. If data are available to estimate a chronic exposure, the subchronic exposure is also based on this data, with an uncertainty factor applied.

The "Acceptable Intake Chronic" (AIC) is similar to the concept of the Reference Dose (RfD) previously discussed. It is an estimate of an exposure level which would not be expected to cause adverse effects when exposure occurs for a significant portion of the life-span. As with the RfD, the AIC does not reflect the carcinogenic properties of the contaminant since it is assumed, correctly or incorrectly, that there is no acceptable intake level for carcinogens. The AIC is also considered to be route specific, thus it estimates the acceptable exposure for a given route with the implicit assumption that exposure via other routes is insignificant.

AIC and AIS values are generally derived from animal studies to which uncertainty factors have been applied. AIC and AIS values are expressed both in terms of human intake (mg/kg/day) and ambient concentration (e.g., mg/1 for drinking water).

Dose-response parameters used in the assessment of noncarcinogenic and carcinogenic risks at Area D are presented in Table 2.

Exposure Assessment

The exposure assessment identified potential pathways and routes for contaminants of concern to reach the receptors and the estimated contaminant concentration at the points of exposure. Contaminant release mechanisms from environmental media, based on relevant hydrologic and hydrogeologic information (fate and transport, and other pertinent site-specific information, such as local land and water use or demographic information), were also presented. At Area D, the current receptor population was identified as basically limited to government employees due to the size and security of the FAA facility. In addition, only a small percent of the Government employees (<2%) who work at the Technical Center are authorized access to the Fuel Farm. Potential exposure pathways evaluated include the ingestion of groundwater, ingestion of or direct contact with surface soils, and ingestion of or direct contact with subsurface soils. Inhalation of airborne contaminants or fugitive dust was not identified as a significant exposure pathway. For each potentially significant exposure pathway, exposure assumptions were made for realistic worst-case and most probable exposure scenarios.

Assumptions used to characterize exposure point concentrations were all based on a 70-kg adult. Specific assumptions for each exposure pathway and scenario are summarized in Table 3.

Risk Characterization

The risk characterization quantifies present and/or potential future threats to human health that result from exposure to the contaminants of concern at Area D. The site-specific risk values are estimated by incorporating information from the hazard identification, dose-response evaluation, and exposure assessment.

When sufficient data are available, a quantitative evaluation is made of either the incremental risk to the individual, resulting from exposure to a carcinogen or, for noncarcinogens, a numerical index or ratio of the exposure dose level to an acceptable dose level is calculated.

Risks which were assessed in the Area D feasibility study include noncarcinogenic and carcinogenic risks resulting from exposure to individual COCs.

For noncarcinogenic compounds, various regulatory agencies have developed standards, guidelines and criteria which provide "acceptable" contaminant levels considered to protect human populations from the possible adverse effects resulting from chemical exposures. A ratio of the estimated body dose level to the RfD or AIC/AIS provides a numerical index to show the transition between acceptable and unacceptable exposure. This ratio is referred to as the chronic hazard index. For noncarcinogenic risks, the term "significant" is used when the chronic hazard index is greater than one. When Federal standards do not exist, a comparison was made to the most applicable criteria or guideline.

Calculated body dose levels, as described previously, were compared to the body dose level associated with the most applicable standard or guideline. The estimated chronic body dose level in ug/kg/day is estimated using the exposure assessment assumptions and actual site data as summarized in Table 3. The body dose level is then compared to the AIC to determine if chronic exposure to the contaminated soil presents a risk. Because certain standards are derived for protection against acute (e.g., 1-day HA), subchronic (e.g., AIS), and chronic (e.g., AIC) exposures, body dose levels for noncarcinogens are developed for both acute and chronic exposures and the associated risks assessed.

For carcinogens or suspected carcinogens, a quantitative risk assessment involves calculating risk levels considered to represent the probability or range of probabilities of developing additional incidences of cancer under the prescribed exposure conditions. Carcinogenic risk estimates, expressed as additional incidences of cancer, are determined by multiplying the carcinogenic potency factor, as described earlier, by the projected exposure dose level. It is the carcinogenic potency factor, expressed in $(mg/kg/day)^{-1}$, which converts the estimated exposure dose level, expressed in (mg/kg/day), to incremental risk. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6} or 1E-6). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. To put the calculated risk estimates into perspective, they should be evaluated against a baseline risk level. Risk levels of 10^{-4} to 10^{-7} can be used to determine the "environmental significance" of the risk incurred and are used as a target range for remedial purposes (U.S. EPA, 1986). Using this range as a baseline, a risk level greater than 10^{-4} is considered to present a "significant" risk with regard to human health in an environmental context, and levels less than 10^{-7} are considered "insignificant". A risk level between 10^{-4} and 10^{-7} is classified as "potentially significant". The use of the terms "significant", "potentially significant", and "insignificant" are not meant to imply acceptability; however, they help to put numerical risk estimates developed in risk assessment into perspective.

The noncarcinogenic risk characterization for Area D concluded that under realistic worst-case and most probable exposure scenarios the acute and chronic noncarcinogenic risks associated with future exposures (ingestion or dermal contact) to surface and subsurface soils appear to be "insignificant". Likewise, acute or chronic ingestion of contaminated groundwater under realistic worst-case and most probable exposure scenarios does not appear to result in "significant" noncarcinogenic risk. A summary of noncarcinogenic chronic hazard indices is presented in Table 4.

The carcinogenic risk characterization concluded that the carcinogenic risks associated with future incidental ingestion of surface or subsurface soils under realistic worst-case and most probable exposure scenarios are considered "insignificant". Direct dermal contact with surface or subsurface soils under future realistic worst-case and most probable exposure scenarics also appears to be "insignificant". Future scenarios which evaluate the carcinogenic hazard associated with groundwater ingestion predict the carcinogenic risk to be "significant" (i.e., exceeds the EPA target range of 10^{-4} to 10^{-7}) for the realistic worst-case and "potentially significant" for the most probable exposure scenarios. A summary of carcinogenic risks at Area D is presented in Table 5.

Environmental risks associated with the presence of contamination at Area D are expected to be minimal. Based on the investigation results, surficial contamination is limited to the presence of petroleum hydrocarbons in relatively small areas of jet fuel spills. The majority of the threats posed by Area D are associated with the presence of the floating hydrocarbon plume and subsurface soil contamination. Therefore, risks to flora and fauna at the surface are limited.

Regardless of the type of risk estimate developed, it should be emphasized that all estimates of risk are based upon numerous assumptions and uncertainties. In addition to limitations associated with site-specific chemical data, other assumptions and uncertainties that affect the accuracy of the site-specific risk characterizations result from the extrapolation of potential adverse human health effects from animal studies, the extrapolation of effects observed at high dose to lose dose effects, the modeling of dose response effects, and route-to-route extrapolation.

The use of acceptable levels (established standards, criteria and guidelines) and unit cancer risk values which are derived from animal studies introduces uncertainty into the risk estimates. In addition, the exposure coefficients used in estimating body dose levels are often surrounded by uncertainties. As such, these estimates should not stand alone from the various assumptions and uncertainties upon which they are based. In developing numerical indices of risk, an attempt is made to evaluate the effect of the assumptions and limitations on the numerical estimates. When the assumptions and uncertainties outweigh the meaningfulness of a risk assessment, a qualitative assessment of the risk is performed.

The uncertainty factors which are incorporated into the risk estimates are believed to be conservative. As such, when they are considered collectively, exposure, and subsequently risk, may be overestimated.

In conclusion, based on the results of the risk assessment, actual or threatened releases of hazardous substances from Area D, if not addressed by implementing the response action selected in this ROD, may present an endangerment to public health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

Eight remedial alternatives were developed for analysis in the Area D FS. Each of these alternatives is described in detail below. Because a number of the alternatives involve common remedial elements, these are described separately, where applicable, and then are referenced in the individual alternative descriptions.

TABLE 1

CONTAMINANTS OF CONCERN - AREA D

	MONITORING WELLS			SURFACE SOIL	EPA Carcinogenic Classification
	Concentration		Detected Frequency	Concentration Detected	
	Maximum	Average			
VOLATILE ORGANICS (ppb)					
Benzene	4,000	390.18	5/17	160	A[1]
Toluene	3,100	325.41	4/17	150	--
Ethylbenzene	530	67.53	6/17	160	D[2]
Xylene (total)	4,700	404.00	5/17	560	D[2]
SEMI-VOLATILE (BNAs) (ppb)					
Naphthalene	1,000	79.82	6/17		--
Phenol	303	33.79	9/16	600	--
2-Chlorophenol				570	--
INORGANICS (ppb)					
Chromium, Total	192[3]	29.73	8/17	7,700	D[2]
Nickel, Total	344[3]	36.51	6/17		D[2]
Lead, Total	68[3]	12.94	9/17	4,000	B2[1]

(1) EPA Carcinogen Classification: A = Known Human Carcinogen
B2 = Probable Human Carcinogen (based on animal studies - Inadequate evidence in humans)
D = Not Classified

Reference-Memorandum from S. Lee (Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)

(2) Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December 1988).

(3) Inorganic concentrations are based on the analysis of unfiltered ground water samples.

TABLE 2 DOSE-RESPONSE PARAMETERS USED IN THE ASSESSMENT OF NONCARCINOGENIC AND CARCINOGENIC RISK - AREA D

Contaminant of Concern	(1) AIS (mg/kg/day)	(2) AIC (mg/kg/day)	(3) RfD (mg/kg/day)	(4) Health Advisories (ppb) 1-Day (Adult)	Long-Term (Adult)	(5) Carcinogenic Potency Factor -1 (mg/kg/day)
Benzene	--	--	--	200	--	2.90E-02
Ethylbenzene	9.70E-01	1.00E-01	1.00E-01	30000	3000	--
Toluene	4.30E-01	3.00E-01	3.00E-01	20000	10000	--
Xylene	4.00E+00	2.00E+00	2.00E+00	40000	10000	--
Naphthalene	4.10E-01	4.10E-01	4.00E-01	--	--	--
Phenol	4.00E-02	4.00E-02	6.00E-01	--	--	--
2-Chlorophenol	5.70E-03	5.70E-03	5.00E-03 (6)	--	--	--
Chromium	2.50E-02	5.00E-03	5.00E-03 (6)	1000	800	--
Nickel	1.40E-02	1.00E-02	2.00E-02	1000	600	--
Lead	--	1.40E-03	1.40E-03 (7)	--	--	--

(1) Subchronic Acceptable Intake - Memorandum from S Lee (EPA, Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)

(2) Chronic Acceptable Intake - Memorandum from S Lee (EPA, Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)
Source RfD for lead

(3) Reference Doses (RfDs) of Oral Exposure- EPA Office of Research and Development, Health Effects Assessment Summary Tables, First Quarter FY89, January 1989

(4) Health Advisories - Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December, 1988)

(5) Carcinogenic Potency Factor (Oral) - EPA Office of Research and Development, Health Effects Assessment Summary Tables, First Quarter FY89, January 1989

(6) Reference Dose (RfD) of Oral Exposure - Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December, 1988)

(7) Reference Dose (RfD) - Superfund Public Health Evaluation Manual, October, 1986
EPA is currently reviewing lead as a carcinogen and may calculate a cancer potency factor (CPF) in the future. The RfD value listed in this table has been revoked. Since a CPF does not exist at present, the old RfD is being retained so that the noncarcinogenic potential of lead can be evaluated.

TABLE 2

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM AVERAGE EXPOSURE DUE TO USE OF AN OFFSITE WELL

	Oral	Inhalation	Dermal
TCE			
Concentration (ug/l)	1	1	1
Risk	3×10^{-7}	3×10^{-7}	1×10^{-9}
PERC			
Concentration (ug/l)	3	3	3
Risk	4×10^{-6}	4×10^{-6}	2×10^{-8}
Total Excess Risk	1×10^{-5}	(Sum of risks due to three exposure routes and both chemicals)	

TABLE 3

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM
EXPOSURE DUE TO USE OF THE MOST CONTAMINATED OFFSITE WELLS

Pellow Well	Average Case			Upper-bound Case		
	oral	inhalation	dermal	oral	inhalation	dermal
TCE						
Concentration (ug/l)	5	5	5	8	8	8
Risk	2×10^{-6}	2×10^{-6}	1×10^{-5}	3×10^{-6}	5×10^{-6}	1×10^{-8}
PERC						
Concentration (ug/l)	28	28	28	38	38	38
Risk	4×10^{-5}	4×10^{-5}	2×10^{-7}	6×10^{-5}	1×10^{-4}	2×10^{-7}
Total Excess Risk	8×10^{-5}	(Sum of risks due to three routes and both chemicals)		2×10^{-4}	(Sum of risks due to three routes and both chemicals)	

Volkman Well	Average Case			Upper-bound Case		
	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
TCE						
Concentration (ug/l)	1	1	1	7	7	7
Risk	3×10^{-7}	3×10^{-7}	1×10^{-9}	2×10^{-6}	4×10^{-6}	8×10^{-9}
PERC						
Concentration (ug/l)	.5	.5	.5	.5	.5	.5
Risk	7×10^{-7}	7×10^{-7}	3×10^{-9}	7×10^{-7}	1×10^{-6}	3×10^{-9}
Total Excess Risk	2×10^{-6}	(Sum of risks due to three routes and both chemicals)		1×10^{-5}	(Sum of risks due to three routes and both chemicals)	

TABLE 4

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM
EXPOSURE DUE TO USE OF THE MOST CONTAMINATED ONSITE WELLS

<u>Well MW-M</u>		<u>Average Case</u>			<u>Upper-bound Case</u>	
	<u>oral</u>	<u>inhalation</u>	<u>dermal</u>	<u>oral</u>	<u>inhalation</u>	<u>dermal</u>
TCE						
Concentration (ug/l)	13	13	13	22	22	22
Risk	4×10^{-6}	4×10^{-6}	2×10^{-8}	7×10^{-6}	1×10^{-5}	3×10^{-8}
PERC						
Concentration (ug/l)	14*	14	14	26	26	26
Risk	2×10^{-5}	2×10^{-5}	8×10^{-8}	4×10^{-5}	8×10^{-5}	1×10^{-7}
Total Excess Risk	5×10^{-5}	(Sum of risks due to three routes and both chemicals)		1×10^{-4}	(Sum of risks due to three routes and both chemicals)	

<u>Well MW-I</u>		<u>Average Case</u>			<u>Upper-bound Case</u>	
	<u>Oral</u>	<u>Inhalation</u>	<u>Dermal</u>	<u>Oral</u>	<u>Inhalation</u>	<u>Dermal</u>
TCE						
Concentration (ug/l)	4	4	4	4	4	4
Risk	1×10^{-6}	1×10^{-6}	5×10^{-9}	1×10^{-6}	3×10^{-6}	5×10^{-9}
PERC						
Concentration (ug/l)	33	33	33	33	33	33
Risk	5×10^{-5}	5×10^{-5}	2×10^{-7}	5×10^{-5}	1×10^{-4}	2×10^{-7}
Total Excess Risk	1×10^{-4}	(Sum of risks due to three routes and both chemicals)		1×10^{-4}	(Sum of risks due to three routes and both chemicals)	

contaminated onsite wells were identified as monitoring wells MW-M and MW-T. At the MW-M well, the average concentrations of PERC, TCE, and TCA are 14, [illegible] and 5 ug/l, respectively. The highest concentrations of PERC, TCE, and TCA observed at this well are 26, 22, and 15 ug/l, respectively. MW-T well was sampled only once in June 1988. The concentrations of PERC, TCE, and TCA detected in this well are 33, 4, and 18 ug/l, respectively.

Four other organic compounds--chloroform, 1,2-transdichloroetnylene, 1,1-dichloroethane, and vinyl chloride--were detected on a few occasions in less than 30% of the offsite wells. Vinyl chloride, for example, was analyzed on only one occasion and was detected only in the Pellow, MW-M, and MW-T Wells at 1 ug/l. Chloroform was sampled for regularly in each well, but was detected in only 3 wells, on one occasion in each well (maximum concentration = 6 ug/l detected in the Costello Well, October 1987). These chemicals were therefore not evaluated in the risk assessment, because they were detected so infrequently and at very low concentrations relative to their toxicity (often near the detection limit of 1 ug/l). However, because of the weight of evidence and cancer potency of vinyl chloride and chloroform, the maximum likely additional cancer risks due to exposure to these chemicals are discussed in the uncertainty section.

Iron was the only inorganic compound detected in offsite wells that exceeded drinking water standards. The ambient water quality criterion for iron (0.3 mg/l) is based on taste, odor, and staining properties. This compound was not considered a contaminant of concern because there are no known health effects from ingestion of iron at the concentrations measured.

Exposure Assessment

The population at greatest risk of adverse health effects are those people who potentially use the groundwater in the area of the Northside Landfill as their only source of drinking water. The primary routes of exposure to contaminants in groundwater are ingestion, inhalation of volatile constituents, and dermal absorption.

A. Exposure Point Concentrations

As mentioned above, groundwater monitoring data from Appendix D of the Supplemental RI Addendum were used to derive exposure point concentrations. Appendix D contains organic chemical concentration data for samples taken during the period of September 1983 through June 1988 for onsite and offsite wells. Most wells were sampled periodically during this period and so a time series of data is available for these wells. Some wells were sampled only once or very infrequently during this period.

A great number of analytical results are reported as below a detection limit of 1 microgram per liter or as below an unspecified detection limit. When calculating exposure point concentrations for PERC, TCE and TCA, these "non-detectable" results were treated in the following manner. If a result was reported as less than 1 microgram per liter, then it was assumed that the concentration equals one-half of the detection limit, i.e., 0.5 ug/l. If a result was reported as less than an unspecified detection limit, it was assumed that the detection limit is 1 microgram per liter, and that the concentration equals 0.5 ug/l.

1) Average Exposure Due to Use of Offsite Wells

In this scenario, it was assumed that persons would be exposed to groundwater contaminants at a level equal to the arithmetic mean of all the observations (N = 523) averaged over time for all of the offsite wells (total = 61). For PERC, TCE, and TCA, these concentrations are 3, 1, and 1 ug/l, respectively.

2) Exposure Due to Use of the Most Contaminated Offsite Well(s)

For this scenario, for each of the three chemicals of concern, the offsite well which showed the highest average concentration was identified. The average concentration at a well is defined as the arithmetic mean of the time series of concentration data.

For PERC, the Pellow Well showed the highest average concentration (28 ug/l based on 24 observations). The average concentration of PERC at all other offsite wells is less than 9 ug/l.

For TCE as well, the Pellow Well showed the highest average concentration (5 ug/l based on 24 observations). The average concentration of TCE at all other offsite wells is less than 2 ug/l.

For TCA, the Volkman Well showed the highest average concentration (7 ug/l based on 31 observations). The average concentration of TCA at the Pellow and Shaw Wells was 4 ug/l. At all other offsite wells, the average concentration of TCA is less than 2 ug/l.

The Pellow and Volkman Wells were therefore identified as the most contaminated wells. Risks associated with the exposure to groundwater contaminants from the both these wells are evaluated assuming two levels of exposure. The first level is the average concentration at the wells. These concentrations are given in the paragraphs above.

The second level considered is the highest concentration observed at the wells. At the Pellow Well, the highest observed concentrations of PERC, TCE, and TCA are 38, 8, and 10 ug/l, respectively. At the Volkman Well, the highest observed concentrations of TCE and TCA are 7 and 15 ug/l, respectively. PERC was assumed to be at a concentration of 0.5 ug/l, as it was not detected in this well.

3) Exposure Due to Use of the Most Contaminated Onsite Wells

For this scenario, for each of the three chemicals of concern, the onsite well which showed the highest average concentration was identified. The average concentration at a well is defined as the arithmetic mean of the time series of concentration data.

For PERC, the MW-T Well showed the highest average concentration (33 ug/l based on 1 observation in June 1988).

For TCE, the MW-M Well showed the highest average concentration (13 ug/l based on 16 observations).

For TCA, the MW-T Well showed the highest average concentration (18 ug/l based on one observation in June 1988).

The MW-M and MW-T wells were therefore identified as the most contaminated wells. Risks associated with the exposure to groundwater contaminants from both these wells are evaluated assuming two levels of exposure. The first level is the average concentration at the wells. These concentrations are given in the paragraphs above.

The second level considered is the highest concentration observed at the wells. At the MW-M Well, the highest observed concentrations of PERC, TCE, and TCA are 26, 22, and 15 ug/l, respectively. At the MW-T Well, the only observed concentrations of PERC, TCE, and TCA are 33, 4, and 18 ug/l, respectively.

B. Calculation of Dose

For each chemical of concern, an average daily dose was calculated for two routes of exposure, ingestion and dermal contact. A dose from inhalation of volatile organic compounds, such as the chemicals of concern, was not calculated directly, as the various models for estimating risks from inhalation exposure have not been critically reviewed by the EPA, Region 10. Therefore, in this risk assessment it was assumed that the inhalation risks are equal to (average case) or two times (upper-bound case) the risks from ingestion of 2 liters of water per day, according to current EPA, Region 10 guidelines (USEPA, 1989a).

The average daily dose (mg/kg/day) via ingestion was calculated as follows:

dose = concentration of contaminant (mg/l) x intake rate (l/day) / 70 kg body weight

For all exposure scenarios, a person was assumed to ingest 2 liters of contaminated water every day for a lifetime. Absorption was assumed to be 100% for all chemicals.

The average daily dose from dermal absorption of contaminants while bathing was calculated as follows:

dose = C x CF x Kp x SA x EF / 70 kg body weight

where,

C = concentration of contaminant (mg/l)
CF = conversion factor (10^{-3} l/cm^3)
Kp = dermal permeability constant (cm/hr)
SA = body surface area contacted (cm^2)
EF = frequency (hr/day)

For all the volatile contaminants, a dermal permeability constant of 8.4 x 10^{-4} cm/hr was used in the above equation (USEPA, 1989c). The body surface area exposed to water while bathing was assumed to be 18,000 cm^2 for the average adult (USEPA, 1989b). For each exposure scenario, a person was assumed to bathe for a duration and frequency equivalent to one-half hour every day for a lifetime.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic and non-carcinogenic effects due to exposure to site chemicals are considered separately. Criteria for evaluating the potential of site chemicals to cause these two types of adverse effects are described below.

A. Criteria for Non-Carcinogenic Effects

The acceptable daily intake for chronic exposure (ADI) is an estimate of the highest human intake of a chemical, expressed as mg/kg/day, that does not cause adverse effects when exposure is long-term (lifetime). ADI values are based on animal or human toxicity studies from which a no-observed-adverse-effect level (NOAEL) is experimentally determined. The NOAEL is the highest dose at which there was no statistically or biologically significant adverse effect observed. The ADI is derived by dividing the NOAEL from the selected study by an uncertainty factor. The uncertainty factor consists of multiples of 10 to account for specific areas of uncertainty in the available data. For example a total uncertainty factor of 1,000 may be used to account for: use of a subchronic (short-term) study (10), for extrapolation from animals to humans (10), and for protection of sensitive human populations (10).

When the EPA completes verification of the chronic toxicity of a specific chemical, it establishes a "reference dose" or RfD. If the RfD for a chemical has been established, then the RfD is used as the ADI for evaluating long-term non-carcinogenic risks at the site.

The dose calculated from the exposure assessment is compared to the RfD to determine whether adverse effects might occur. If predicted exposure concentrations are below the level of the RfD, no adverse health effects are expected according to current EPA guidelines.

The oral RfDs for PERC and TCA are 0.01 and 0.09 mg/kg/day, respectively, each calculated with an uncertainty factor of 1,000 (USEPA, 1988). The RfD for PERC is based on observations of liver toxicity in mice, including increased liver weight/body weight ratios, changes in liver enzyme levels, and necrosis (death of liver tissue). Increases in liver and kidney weight/body weight ratios have been observed in rats, also. The RfD for TCA is based on fatty changes in the liver and increased liver weights in guinea pigs exposed via inhalation. Non-carcinogenic health effects of TCE are similar to those of PERC and TCA; however, an oral RfD for TCE is not currently available and therefore not evaluated here.

RfDs for dermal absorption have not yet been determined by the EPA. However, for volatile organic compounds, such as the chemicals of concern at the Northside Landfill, current EPA policy is to use the oral RfD in calculating the hazard index for dermal exposure. The hazard index is the ratio between route-specific calculated dose and the RfD. Ratios exceeding unity (one) indicate doses that exceed the acceptable levels; ratios less than one are not expected to cause adverse health effects. One of the assumptions in using an oral RfD is that 100% of the chemical was absorbed via the route investigated in the study that was used to derive the oral RfD. This is a reasonable assumption for a dermal RfD for the chemicals of concern at this site.

As noted previously, risks from inhalation exposure were not calculated directly, but assumed to be equal to (average case) or two times (upper-bound case) the risks from ingestion of 2 liters of water per day, according to EPA guidelines (USEPA, 1989a).

B Criteria for Carcinogenic Effects

The EPA uses a weight-of-evidence system to convey how likely a chemical is to be a human carcinogen, based on epidemiological studies, animal studies, and other supportive data. The classification system of the EPA for characterization of the overall weight of evidence for carcinogenicity includes: Group A- Human Carcinogen; Group B- Probable Human Carcinogen; Group C- Possible Human Carcinogen; Group D- Not Classifiable as to Human Carcinogenicity; and Group E- Evidence of Non-Carcinogenicity for Humans. Group B is subdivided into two groups: Group B1- limited human evidence for carcinogenicity; and Group B2- sufficient data in animals, but inadequate or no evidence in humans.

TCA is currently in Group D, not classifiable as to human carcinogenicity, and therefore was not evaluated for carcinogenic risks. PERC and TCE are currently classified as probable human carcinogens by the EPA, Group B2. However, the status of these compounds and their respective cancer potency factors is now under review.

For PERC, the review concerns whether this chemical is most appropriately classified in Group B2 or C. Evidence of liver tumors (in both sexes of mice by two routes of administration), leukemia in rats, and renal carcinomas in male rats, along with supportive metabolic considerations, provide a basis for classifying PERC in Group B2. However, mutagenicity data have in general been negative or inconclusive. Furthermore, the relevance of mouse liver tumors to human cancer risk is still in question. PERC would therefore be classified as Group C, possible human carcinogen, if one accepts the weighting of the animal evidence to be limited.

For chemicals with carcinogenic effects, EPA calculates the cancer risk associated with a given dose by multiplying the dose from a given route of exposure by a cancer potency factor or potency slope. The EPA derives potency factors from the upper 95% confidence limit of the slope of the extrapolated dose-response curve, which shows the relationship between a given dose and the associated tumor incidence. As a result, the predicted cancer risk is an upper-bound estimate of the potential risk associated with exposure.

The present oral cancer potency factors for PERC and TCE are 5.1×10^{-2} and 1.1×10^{-2}, respectively (USEPA, 1988). There are no cancer potency factors for dermal absorption. However, for volatile organic compounds, such as the chemicals of concern, current EPA policy is to use the oral potency slope in calculating cancer risk from dermal exposure.

Risk Characterization

A. Carcinogenic Risks

Estimates of carcinogenic risks for the three exposure scenarios considered are presented in Tables 2, 3, and 4. These risks are the estimated lifetime incremental upper-bound risks of developing cancer as a result of being exposed to PERC and TCE under the assumed conditions. The risks associated with exposure to each chemical via oral, inhalation, and dermal exposures routes are given. Also, total excess risk values are shown for each scenario. Total excess risk values are calculated by adding the risks due to exposure to both chemicals by all three exposure routes.

Table 2 shows the estimated cancer risks based on an average exposure to PERC and TCE due to use of an offsite well. The total excess risk is 9 x 10^{-6} for this scenario. This number represents an increased risk of contracting cancer of nine chances in one million for a person exposed for 70 years.

Estimated cancer risks based on exposure to PERC and TCE due to use of the most contaminated offsite wells (the Pellow and Volkman Wells) is shown in Table 3. For each of these wells, exposure to the average and maximum concentrations of each chemical observed at the well was considered (average and upper-bound cases, respectively). For the Pellow Well, total excess risks are estimated to be 8 x 10^{-5} and 2 x 10^{-4} assuming exposure to average and maximum concentrations, respectively. For the Volkman Well, total excess risks are estimated to be 2 x 10^{-6} and 9 x 10^{-6} assuming exposure to average and maximum concentrations, respectively.

Table 4 shows the estimated cancer risks based on exposure to PERC and TCE due to use of the most contaminated onsite wells (the MW-M and MW-T Wells). For Well MW-M, the same two levels of exposure were considered as for the offsite wells. Total excess risks are estimated to be 5 x 10^{-5} and 1 x 10^{-4} assuming exposure to average and maximum concentrations, respectively. For the MW-T Well, the total excess risk is 1 x 10^{-4} for both the average and upper-bound exposure calculations, based on the single available observation.

B. Non-Carcinogenic Risks

Non-carcinogenic risks are presented as a hazard index which is the ratio between the route-specific calculated dose and the RfD. Ratios exceeding unity (one) indicate doses that exceed the acceptable level; ratios less than one are not expected to cause adverse health effects.

Based on the highest observed concentrations of PERC and TCA, the Pellow and MW-T Wells were the offsite and onsite wells, respectively, found to pose the greatest risk of non-carcinogenic effects. The estimated doses of each chemical, based on the maximum observed concentration, and the corresponding hazard index are presented below for the Pellow and MW-T Wells.

Pellow Well	PERC (mg/kg/day)	TCA (mg/kg/day)
Oral Dose	1.1 x 10^{-3}	2.9 x 10^{-4}
Inhalation Dose	2.2 x 10^{-3}	5.7 x 10^{-4}
Dermal Dose	4.1 x 10^{-6}	1.1 x 10^{-6}
Total Dose (A)	3.3 x 10^{-3}	8.6 x 10^{-4}
RfD (B)	1.0 x 10^{-2}	9.0 x 10^{-2}
Hazard Index (A/B)	0.30	0.01

MW-T Well	PERC (mg/kg/day)	TCA (mg/kg/day)
Oral Dose	9.4×10^{-4}	5.1×10^{-4}
Inhalation Dose	1.9×10^{-3}	1.0×10^{-3}
Dermal Dose	3.6×10^{-6}	1.9×10^{-6}
Total Dose (A)	2.8×10^{-3}	1.5×10^{-3}
RfD (B)	1.0×10^{-2}	9.0×10^{-2}
Hazard Index (A/B)	0.30	0.02

The hazard indices for both chemicals may be totaled as PERC and TCA have similar toxic endpoints. The total hazard indices for the Pellow and MW-T Well are 0.34 and 0.30, respectively. As these hazard indices are below unity, non-carcinogenic health effects are not expected from exposure to PERC and TCA in these two wells. The risk from exposure to PERC and TCA in other wells would be less, as the Pellow and MW-T Wells have the highest concentrations of these contaminants. Thus no non-carcinogenic effects are expected due to exposure to these chemicals in any well.

C. Uncertainty

The accuracy of the risk characterization depends in large part on the quality and representativeness of the available sampling, exposure, and toxicological data.

One major area of uncertainty that may have underestimated health risks is that cancer risks from exposure to chloroform and vinyl chloride were not evaluated in this study. These chemicals were detected very infrequently and the RI/FS determined there was insufficient data to evaluate them. However, vinyl chloride is classified as a human carcinogen, Group A, and chloroform is classified in Group B2, probable human carcinogen. Because of their inherent toxicity, likely maximum additional increases in cancer risk from exposure to vinyl chloride and chloroform were therefore calculated. Using the highest single concentration detected for vinyl chloride (1 ug/l) and an oral cancer potency slope of 2.3 (USEPA, 1989d), the upper-bound estimate of additional cancer risk is 2×10^{-4}. For chloroform, the upper-bound estimate of additional cancer risk is 3×10^{-6}, based on the highest observed concentration (6 ug/l) and an oral cancer potency slope of 0.0061 (USEPA, 1988). Because these chemicals are degradation products of the other chlorinated organics, vinyl chloride and chloroform levels could rise and pose risks greater than the above estimates.

D. Conclusions

In conclusion, the total incremental increase in cancer risk for the average exposure scenario is 9×10^{-6}. For exposure to one of the offsite wells with the highest average concentration of carcinogens, cancer risks range from 2×10^{-6} to 1×10^{-4}. Estimated cancer risks from exposure to groundwater from the most contaminated onsite wells range from 5×10^{-5} to 1×10^{-4}. These scenarios are based on the assumption that the population at risk is using groundwater near the Northside Landfill as the only source of drinking water over an entire lifetime (70 years). Non-carcinogenic health effects are not expected from exposure to PERC and TCA at the present level of contamination in onsite and offsite wells.

ENVIRONMENTAL RISKS

Sediment bioassays were conducted on four freshwater estuarine species (Ceriodaphnia dubia, Selanastrum capricornutum, Crangog sp and Pimephales promales) to determine the concentrations of cadmium, nickel, and cobalt in sediment which adversely affect aquatic organisms. Thirteen sediment samples were collected from Foundry Cove and the Pier Area and one from Wappingers Falls (reference location) and used in the bioassay tests. Samples were recovered from the top 6 inches of sediment. Based on the results of these tests, it was concluded that a level between 10 and 255 mg/kg of cadmium in the sediment would protect the environment.

Research performed for EPA (JRB, 1984) established sediment criteria for cadmium based upon limiting concentrations in water to levels below EPA Ambient Water Quality Criteria. Preliminary results have shown that sediment cadmium toxicity decreases with increasing organic content. Therefore, for a total organic carbon (TOC) concentration of 5%, the chronic sediment cadmium criterion was found to be 38.5 mg/kg, and at a TOC of 10%, the chronic level was found to be 77 mg/kg. Ebasco's field results showing an average TOC value of 9.4% for this area would imply that a cadmium concentration somewhere in the range of 73 mg/kg would be required to prevent chronic exposure. The proportion of cadmium found in the sediment to that in aqueous solution in the marsh, however, will depend not only on TOC, but on other site-specific factors, including water chemistry, pH, oxidation/reduction potential, and temperature. Therefore, the model for partitioning based upon simplifying assumptions will only approximate site-specific cadmium criteria (ERT, 1986). NYSDEC feels that even at 10 mg/kg of cadmium in sediments there may be adverse ecological impacts.

The shortnosed sturgeon (Acipenser brevirostrum), an endangered species since 1967, occurs in the Hudson River from Troy to Piermont, a range of 125 miles which includes the site. Because it is a bottom feeder, and benthic organisms accumulate cadmium, exposure to site contamination is possible. However, since critical life stages (e.g., juveniles and larvae) and over-wintering individuals do not congregate in the Foundry Cove area, it is expected that the site contamination may not have a significant effect on these fish.

6. DESCRIPTION OF ALTERNATIVES

The objective of this section is to provide an understanding of the remedial alternatives developed for the site and their specific components. Each alternative should be described to provide a clear understanding of how all of the wastes (including any residuals) will be addressed through treatment, containment, and/or institutional controls.

An excellent description of alternatives includes discussion of chemical-, action- and location-specific ARARs, why they are ARARs, assumptions, limitations and uncertainties, risk reduction, volumes, and the degree of hazard of waste left on site or disposed off site. Capitol, O&M, and present worth costs should be provided as well as implementation requirements and time frames.

EXAMPLE: BYRON BARREL AND DRUM, NY

This example contains a helpful introductory section that provides an overview of the number of alternatives presented and the respective problems they are intended to address. Although brief, the descriptions provide essential information to convey how all of the waste is being addressed through treatment, containment, or institutional controls. In addition, each description addressed volumes of material, implementation requirements and time frames, monitoring, and the need for a five year review, as well as present worth costs. Additional information that would be useful to include are capitol and O&M costs, a bit more detail on the major ARARs each alternative will trigger (particularly the land ban), and the ground water classification and area of attainment for the ground water alternatives.

EXAMPLE: NORTHSIDE LANDFILL, WA

Example two is included because it provides a good summary of other major ARARs associated with each alternative. The ROD also describes the objectives of the alternative well, although the discussion of advantages and disadvantages is unnecessary in this section. It would be better placed in the Comparative Analysis section. Costs, volumes, and other information is missing, although the ROD did address implementation time frames and the need for treatability studies in a table that was not included.

United States Environmental Protection Agency
DRAFT
Office of Solid Waste and Emergency Response
Superfund Publication. 9335.3-02FS-3
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EPA

Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs

Office of Emergency and Remedial Response
Hazardous Site Control Division
Quick Reference Fact Sheet

This guide provides Remedial Project Managers (RPMs) with a quick reference to the essential components of Records of Decision (RODs) prepared to document the following three special types of remedial action decisions: (1) no action; (2) interim actions; and (3) contingency remedies. The first type of special ROD, the **no action ROD**, documents that no response action is necessary to ensure adequate protection of human health and the environment or is not possible either technologically or under CERCLA authority. The second type of special ROD, the **interim action ROD**, documents that the response action selected will be of limited scope and will be followed by a later, final response action for that operable unit. For interim action RODs, the documentation provided should be tailored to the limited scope and purpose of the interim action (as opposed to a limited final action, where the ROD may be streamlined within the standard ROD format). Finally, the **contingency remedy ROD** provides a fall-back remedy in the event that the primary, selected remedy does not achieve its expected performance. In preparing all three types of special RODs, RPMs should modify, as outlined in this guide, the format of the standard ROD for final response actions (see **Highlight 1**). **Sections that have been crossed out should not appear in a special ROD. Sections that appear in bold should be supplemented according to the directions provided in this fact sheet.** Finally, sections of the standard ROD that are not modified in the outlines below should be included in the special ROD at the same level of detail as if they were standard ROD discussions. More detail on preparing the three types of special RODs is provided in Chapter 9 of the Interim Final Guidance on Preparing Superfund Decision Documents (the "ROD Guidance")(December 1989, EPA/624/1-87/001).

I. DOCUMENTING NO ACTION DECISIONS

EPA may determine that no action is warranted for a site or operable unit within a site under the following three general sets of circumstances:

- When the site or operable unit poses no current or potential threat to human health or the environment (i.e., the site or operable unit is already in a protective state);
- When the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, does not provide the authority to take remedial action; or
- When no effective action can be taken, given currently available technology and the site or contaminant characteristics.

Highlight 2 provides specific examples of potential sites requiring no action decisions for each of the reasons cited above. The remainder of this section presents an outline of the ROD format to use in each of these situations.

Highlight 1
OUTLINE FOR THE STANDARD ROD

1. Declaration

- Site Name and Location
- Statement of Basis and Purpose
- Assessment of the Site
- Description of the Selected Remedy
- Statutory Determinations
- Signature and Support Agency Acceptance of the Remedy

2. Decision Summary

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Highlights of Community Participation
- Scope and Role of Operable Unit
- Site Characteristics
- Summary of Site Risks
- Description of Alternatives
- Summary of Comparative Analysis of Alternatives
- Selected Remedy
- Statutory Determinations
- Documentation of Significant Differences

3. Responsiveness Summary

- Community Preferences
- Integration of Comments

Highlight 2
POTENTIAL SITES REQUIRING NO ACTION DECISIONS

- Where a previous removal action mitigated the threat;
- Where a natural environmental process, such as the attenuation of a ground-water contaminant plume, eliminated the threat;
- Where the baseline risk assessment concluded that the conditions posed no threat;
- Where a remedy includes no treatment, engineering, or institutional controls; and
- Where a release involved only petroleum wastes, making the contaminants exempt from remedial action under CERCLA section 101.

NO ACTION SITUATION #1: ACTION NOT NECESSARY FOR PROTECTION

1. Declaration

- Site Name and Location
- Statement of Basis and Purpose
- ~~Assessment of the Site~~
- **Description of the Selected Remedy: The lead agency should state that it has selected no action as the remedy for the site or operable unit, although it may authorize monitoring to verify that no unacceptable exposures to risks posed by conditions at the site occur in the future.**
- ~~Statutory Determinations~~
- **Declaration Statement: None of the Section 121 statutory determinations are necessary in this section. Instead, the lead agency should state briefly that no remedial action is necessary to ensure protection of human health and the environment. This section should also note whether five-year review is required. (A five-year review is necessary under a no action ROD when previous removal or remedial actions at the site resulted in the implementation of engineering controls to prevent unacceptable exposures and when these controls will remain in place over the long term.)**
- Signature and Support Agency Acceptance of the Remedy

2. Decision Summary

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Highlights of Community Participation
- Scope and Role of Operable Unit or Response Action
- Site Characteristics
- **Summary of Site Risks: The information in this section provides the primary basis for the no action decision. The discussion should support the determination that no remedial action is necessary to ensure protection of human health and the environment. The lead agency should explain how the baseline risk assessment conducted during the remedial investigation (RI) indicates that unacceptable exposures will not occur. Any engineering controls implemented as part of previous actions that contribute to protection of human health and the environment should be discussed.**
- ~~Description of Alternatives~~
- ~~Summary of Comparative Analysis of Alternatives~~
- ~~Selected Remedy~~
- ~~Statutory Determinations~~
- **Description of the No Action Alternative: The lead agency should identify the no action alternative in this section of the ROD. If alternatives were developed in the feasibility study (FS), the lead agency should reference the RI/FS Report.**
- Explanation of Significant Changes

3. Responsiveness Summary.

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NO ACTION SITUATION #2: NO CERCLA AUTHORITY TO TAKE ACTION

1. Declaration

- Site Name and Location
- Statement of Basis and Purpose
- ~~Assessment of the Site~~
- **Description of the Selected Remedy: The lead agency should state that it has selected no action as the remedy for the site or operable unit, although it may authorize monitoring to verify that no unacceptable exposures to risks posed by conditions at the site occur in the future.**
- ~~Statutory Determinations~~
- **Declaration Statement: No Section 121 statutory determinations are necessary in this section. This section should explain that EPA does not have authority under CERCLA Section 104 to address the site or operable unit. The statement that the no action decision does not constitute a finding by EPA that adequate protection has been achieved at the site. Rather, the statement should identify the statutory or regulatory authority that does have, or potentially could have, jurisdiction over the problem. If the problem has been referred to other authorities, this should be explained.**
- Signature and Support Agency Acceptance of the Remedy

2. Decision Summary

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Highlights of Community Participation
- Scope and Role of Operable Unit or Response Action
- Site Characteristics
- Summary of Site Risks
- ~~Description of Alternatives~~
- ~~Summary of Comparative Analysis of Alternatives~~
- ~~Selected Remedy~~
- **Statutory Authority Finding: The concluding statement of the absence of CERCLA authority to address the problem should be the same as in the Declaration.**
- Explanation of Significant Changes

3. Responsiveness Summary.

NO ACTION SITUATION #3: NO EFFECTIVE ACTION POSSIBLE

1. Declaration

- Site Name and Location
- Statement of Basis and Purpose
- ~~Assessment of the Site~~
- **Description of the Selected Remedy: The lead agency should state that is has selected no action as the remedy for the site or operable unit, although it may authorize monitoring to verify that no unacceptable exposures to risks posed by conditions at the site occur in the future.**
- ~~Statutory Determinations~~
- **Declaration Statement: This Declaration should state that it has been determined that no effective remedial action is possible at the site. The Declaration should also explain that the no action decision does not constitute a finding that the remedy ensures adequate protection of human health and the environment. A statement that a five-year review will be conducted should be included.**
- Signature and Support Agency Acceptance of the Remedy

2. Decision Summary

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Highlights of Community Participation
- Scope and Role of Operable Unit or Response Action
- Site Characteristics

DRAFT

- Summary of Site Risks
- ~~Description of Alternatives~~
- ~~Summary of Comparative Analysis of Alternatives~~
- ~~Selected Remedy~~
- ~~Statutory Determinations~~
- **Summary of Basis for No Action Decision: The rationale for the no action decision should be provided. The remedial alternatives that were considered, and the impact associated with them or their feasibility, should be summarized in this discussion. A detailed comparative analysis using the nine evaluation criteria need not be included. A statement should also be included to the effect that this no action decision does not constitute a finding that adequate protection of human health and the environment has been achieved at the site.**
- Explanation of Significant Changes

3. Responsiveness Summary

II. DOCUMENTING INTERIM ACTION DECISIONS

During scoping, or at other points in the RI/FS, the lead agency may determine that an interim action should be taken either to respond to an immediate site threat or to take advantage quickly of an opportunity to reduce risk at a site. Interim actions are limited in scope and are followed by other operable units that complete the steps to provide definitive protection of human health and the environment for the long term. **Highlight 3** provides specific examples of types of interim action decisions.

Highlight 3
EXAMPLES OF INTERIM ACTION DECISIONS

- Constructing a fence to restrict access to the site;
- Pumping a ground-water aquifer to restrict migration of a contaminant plume;
- Providing an alternative source of drinking water; and
- Constructing a temporary cap.

Interim actions should not be confused with final actions that are limited in scope. A limited final action is the last action to be taken at or on a limited portion of the site to ensure that protection of human health and the environment has been achieved. The ROD used for these actions should be a streamlined version of the standard ROD format shown in **Highlight 1**. An interim action is an action that must be followed by a subsequent action (and ROD) to achieve definite protection of human health and the environment at a portion of a site. In an Interim Action ROD, an outline of which follows this discussion, the "Summary of Site Risks" discussion may be very brief, providing information to support the need to take action but usually not specifying final acceptable exposure levels for the site. The findings of the baseline risk assessment should be included in the decision documents for future, final operable units. The number of alternatives considered for interim actions should generally be limited to three or fewer, and the nine-criteria evaluation should be limited to addressing factors pertinent to the scope and purpose of the interim action.

INTERIM ACTION ROD FORMAT

1. Declaration

- Site Name and Location
- Statement of Basis and Purpose
- Assessment of the Site
- Description of Selected Remedy
- **Statutory Determinations: The declaration statement should read as follows:**

  This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements directly associated with this action, and is cost-effective. This action utilizes permanent solutions and alternative treatment (or resource recovery) technologies, to the maximum extent practicable, given the limited scope of the action. Because this action does not constitute the final remedy for the [site/operable unit], the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element [will not be satisfied by this interim action (or) will be addressed by the *final response action]. Subsequent actions are planned to address fully the principal threats posed by the conditions at this [site/operable unit].*

- Signature and Support Agency Acceptance of the Remedy

2. Decision Summary

- Site Name, Location, and Description

- Site History and Enforcement Activities

- Highlights of Community Participation

- **Scope and Role of Operable Unit: This section provides the rationale for taking the limited action. To the extent that information is available, the section should detail how the response action fits into the overall site strategy. This section should state that the interim action will be consistent with any planned future actions, to the extent possible.**

- **Site Characteristics: This section should focus on the description of those site characteristics to be addressed by the interim remedy.**

- **Summary of Site Risks: This section should focus on risks addressed by the interim action and should provide the rationale for the limited action. This could be supported by facts that indicate that action is necessary to stabilize the site, prevent further degradation, or achieve significant risk reduction quickly. Qualitative risk information may be presented if quantitative risk information is not yet available, which will often be the case.**

- **Description of Alternatives: This section should describe only the limited alternatives that were considered for the interim action. Applicable or relevant and appropriate requirements (ARARs) associated with the limited action should be incorporated into the description of alternatives.**

- **Summary of Comparative Analysis of Alternatives: The comparative analysis should be presented in light of the limited scope of the action. Criteria not relevant to the evaluation of interim actions need not be addressed in detail. Rather, their irrelevance to the decision should be noted briefly.**

- Selected Remedy

- **Statutory Determinations: The interim action should protect human health and the environment from the exposure pathway or threat it is addressing, any releases generated, or the waste material that is managed. The ARARs discussion should focus only on those ARARs specific to the interim action -- those related to any final disposition of waste, off-site treatment or disposal, or released caused during implementation. An interim remedy waiver may be necessary in some situations. However, if an interim waiver is needed, the final remedy must comply with this requirement. The discussion under "utilization of permanent solutions and treatment to the maximum extent practicable" should indicate that the selected remedy represents the best balance of tradeoffs among alternatives with respect to pertinent criteria, given the limited scope of the action. The discussion under the preference for treatment section should note that the preference will be addressed in the final decision document for the site or operable unit.**

- Explanation of Significant Changes

3. Responsiveness Summary.

III. DOCUMENTING CONTINGENCY REMEDIES

In some limited cases, the lead agency may determine that to ensure implementation of the most appropriate remedy, a ROD will be prepared with a selected remedy that is accompanied by a contingency remedy. The contingency remedy may be appropriate to use in the following cases: (1) when an innovative treatment technology appears to be the most appropriate remedy for the site, although further testing is needed during remedial design to verify its potential effectiveness; and (2) when two different technologies appear to offer comparable performance on the basis of the five primary balancing criteria, and neither one offers the better balance of tradeoffs. **Highlight 4** provides specific examples of contingency remedies, which typically involve treatment categories, rather than specific technology process options.

In general, the lead agency identifies a preferred alternative in the Proposed Plan and selects a single remedy in the ROD. When selecting a treatment technology to address the source of contamination, this typically involves selection of a **treatment class or family**, (i.e.,thermal destruction), rather than a specific technology process option (i.e., rotary kiln). Selection of a treatment class affords the lead agency flexibility during the remedy

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> **Highlight 4**
> **CIRCUMSTANCES WHERE CONTINGENCY REMEDIES MAY BE APPROPRIATE**
>
> - An innovative treatment technology may appear to be the most appropriate remedy for a site or operable unit during the RI/FS, but more testing is needed during remedial design to verify the technology's expected performance potential. If there are uncertainties about an innovative treatment technology, then the lead agency, in consultation with the support agency, may elect to include a proven technology as a contingency remedy in the ROD.
>
> - Where two different technologies under consideration appear to offer comparable performance on the basis of the five primary balancing criteria, such that both could be argued to provide the "best balance of tradeoffs." Under such circumstances, the ROD may identify one as the selected remedy and the other as a contingency remedy and specify the criteria whereby the contingency remedy would be implemented.

remedy design to procure the most cost-effective process through competitive bidding. There are limited situations, however, where additional flexibility may be required to implement the most appropriate treatment remedy for a site. In such situations, the lead agency may determine a ROD with a selected remedy and a contingency remedy is appropriate.

CONTINGENCY REMEDY ROD FORMAT

1. <u>Declaration</u>

- Site Name and Location
- Statement of Basis and Purpose
- Assessment of the Site
- **Description of the Selected Remedy: Both the selected remedy and the contingency remedies should be described in bullet form.**
- **Statutory Determinations: The Declaration should be modified to indicate that both the selected remedy and the contingency remedy will meet the statutory findings.**
- Signature and Support Agency Acceptance of the Remedy

2. <u>Decision Summary</u>

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Highlights of Community Participation
- Scope and Role of Operable Unit or Response Action
- Site Characteristics
- Summary of Site Risks
- **Description of Alternatives: This section should identify any uncertainties about the use of the technologies being considered, and the extent additional testing is needed. The selected remedy and the contingency remedy must be fully described.**
- **Summary of Comparative Analysis: The selected remedy and any contingency alternative should be evaluated <u>fully</u> against the nine criteria. The uncertainties should be noted, as well as performance expectations. In the discussion of community (and support agency) acceptance of an innovative technology, the support of the interested parties should be discussed in light of the CERCLA provisions in Section 121(b)(2). Where alternatives are chosen because they are comparable, the analysis should provide support for the finding.**
- **Selected Remedy: The selected and contingency remedy should be identified. If an innovative technology is identified as the preferred alternative, this section should describe what will happen if further testing determines that the preferred alternative is not effective or implementable. If comparable alternatives are selected, each should be described in detail.**
- **Statutory Determinations: The statutory determination discussion should show that both remedies fulfill CERCLA Section 121 requirements.**
- Explanation of Significant Changes

3. <u>Responsiveness Summary</u>.

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
Directive: 9355.0-27FS
April 1990

EPA

A Guide to Selecting Superfund Remedial Actions

Office of Emergency and Remedial Response
Hazardous Site Control Division OS-220
Quick Reference Fact Sheet

INTRODUCTION

The Superfund program's remedy selection process is the decision-making bridge between the analysis of remedial alternatives for cleaning up a site conducted in a remedial investigation/feasibility study (RI/FS) and the explanation of the selected remedy that is documented in a Record of Decision (ROD). This fact sheet describes statutory requirements for CERCLA remedies and the process EPA has established in the 1990 revised National Contingency Plan (55 FR 8666 (3/8/90)) or meeting these requirements. This process is a general framework for reaching a judgment as to the most appropriate method of achieving protection of human health and the environment at a particular site. This framework can be streamlined as appropriate to the site.

STATUTORY REQUIREMENTS

Section 121 of CERCLA mandates that the remedial action must:

1. Protect human health and the environment;
2. Comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified;
3. Be cost-effective;
4. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable;
5. Satisfy the preference for treatment as a principal element, or provide an explanation in the ROD why the preference was not met.

EPA has established a national goal and expectations reflecting these requirements in the 1990 NCP (Sec. 300.430(a)(1)(i) and (iii). The NCP also defines nine criteria that are to be used to compare remedial alternatives, to establish the basis for the selection decision, and to

EXHIBIT 1: PROGRAM EXPECTATIONS

Protection of human health and the environment can be achieved through a variety of methods: treatment to destroy or reduce the inherent hazards posed by hazardous substances, engineering controls (such as containment), and institutional controls to prevent exposure to hazardous substances. The NCP sets out the types of remedies that are expected to result from the remedy selection process (Sec. 300.430(a)(1)(iii)).

➢ *Treat principal threats, wherever practicable.* Principal threats for which treatment is most likely to be appropriate are characterized as:

- Areas contaminated with high concentrations of toxic compounds;
- Liquids and other highly mobile materials;
- Contaminated media (e.g., contaminated ground water, sediment, soil) that pose significant risk of exposure; or
- Media containing contaminants several orders of magnitude above health-based levels.

➢ *Appropriate remedies often will combine treatment and containment.* For a specific site, treatment of the principal threat(s) may be combined with containment of treatment residuals and low-level contaminated material.

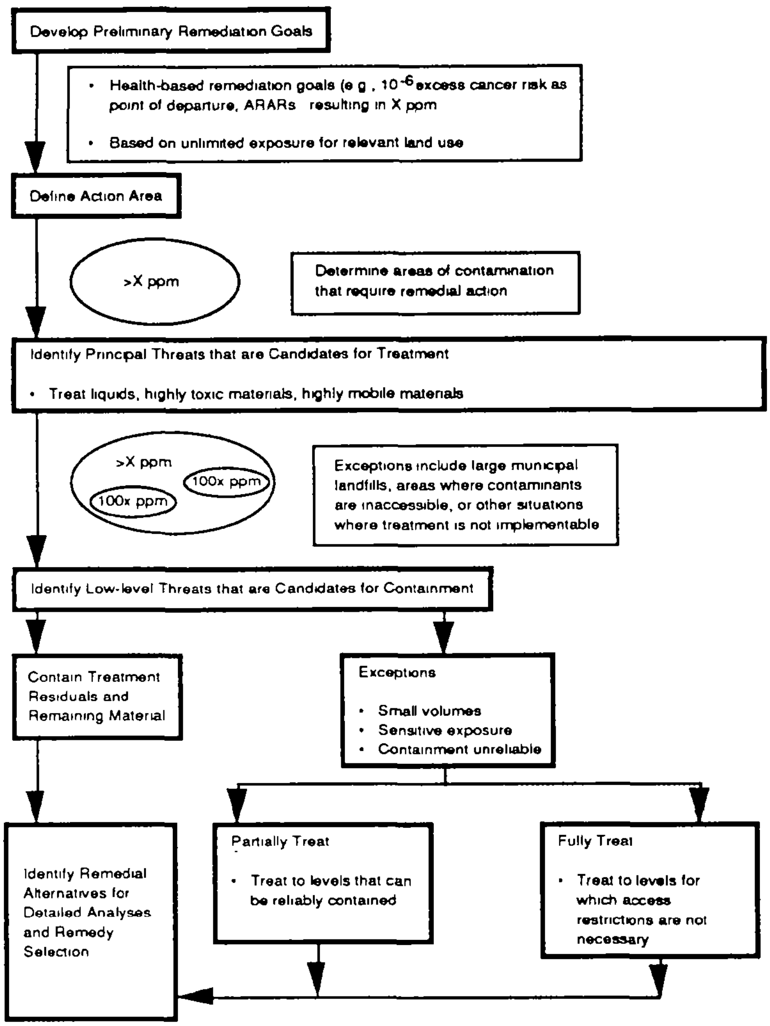
➢ *Containment will be considered for wastes that pose a relatively low long-term threat or where treatment is impracticable.* These include wastes that are near health-based levels, are substantially immobile, or otherwise can be reliably contained over long periods of time; wastes that are technically difficult to treat or for which treatment is infeasible or unavailable; situations where treatment-based remedies would result in greater overall risk to the human health or the environment during implementation due to potential explosiveness, volatilization, or other materials handling problems; or sites that are extraordinarily large where the scope of the problem may make treatment of all wastes impracticable, such as municipal landfills or mining sites.

➢ *Institutional controls are most useful as a supplement to engineering controls for short- and long-term management.* Institutional controls (e.g. deed restrictions, prohibitions of well construction) are important in controlling exposures during remedial action implementation and as a supplement to long-term engineering controls. Institutional controls alone should not substitute for more active measures (treatment or containment) unless such active measures are found to be impracticable.

➢ *Innovative technologies should be considered if they offer the potential for comparable or superior treatment performance, fewer / lesser adverse impacts, or lower costs for similar levels of performance than demonstrated technologies.*

➢ *Ground waters will be returned to their beneficial uses within reasonable periods of time wherever practicable.*

Exhibit 2
Key Steps in the Development of Remedial Alternatives



demonstrate that statutory requirements have been satisfied (Sec. 300.430(f)(1)). Each of these aspects of EPA's remedy selection approach are described below.

GOAL AND EXPECTATIONS OF THE REMEDY SELECTION PROCESS

The national goal of the remedy selection process is "to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste" (NCP Sec. 300.430(a)(1)(i)).

While protection of human health and the environment can be achieved through a variety of methods, this goal reflects CERCLA's emphasis on achieving protection through the aggressive, but realistic use of treatment. The 1990 NCP presents EPA's expectations regarding circumstances under which treatment, as well as engineering and institutional controls, are most likely to be appropriate (Sec. 300.430(a)(1)(iii), see Exhibit 1). These expectations are intended primarily to assist in focusing the development of alternatives in the FS (see The Feasibility Study: Development and Screening of Alternatives, OSWER Directive 9355.3-01FS). These expectations do not substitute for site-specific balancing of the nine criteria to determine the maximum extent to which treatment can be practicably used in a cost-effective manner for a operable unit.

Exhibit 2 illustrates the alternatives development process, as shaped by the expectations. The process begins with the identification of preliminary remediation goals, which provide initial estimates of the contaminant concentrations/risk levels of concern. Based on ARARs, readily available toxicity information, and current and future land use, preliminary remediation goals are initial health-based levels and are used to define site areas that may require remedial action (i.e., action areas). Areas onsite with contaminant concentrations several orders of magnitude (e.g., 2) above these preliminary remediation goals are candidate areas for treatment. Areas onsite with contaminant concentrations within several orders of magnitude of these preliminary remediation goal levels are candidate areas for containment. The remediation goals, action areas, and target treatment/containment areas are refined throughout the RI/FS process as additional information becomes available. The final determination of remediation goals, action areas, and the appropriate degree of treatment and containment are made as part of the remedy selection.

THE REMEDY SELECTION PROCESS

Overview

The remedy selection process begins with the identification of a preferred alternative from among those evaluated in detail in the FS by the lead agency, in consultation with the support agency. The preferred alternative is presented to the public in a Proposed Plan that is

EXHIBIT 3: NINE EVALUATION CRITERIA

EPA has developed nine criteria to be used to evaluate remedial alternatives to ensure all important considerations are factored into remedy selection decisions. These criteria are derived from the statutory requirements of Section 121, particularly the long-term effectiveness and related considerations specified in Section 121(b)(1), as well as other additional technical and policy considerations that have proven to be important for selecting among remedial alternatives.

Threshold Criteria

The two most important criteria are statutory requirements that must be satisfied by any alternative in order for it to be eligible for selection.

1. *Overall protection of human health and the environment* addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (assuming a reasonable maximum exposure) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with applicable or relevant and appropriate requirements* (ARARs) addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental laws or whether a waiver can be justified.

Primary Balancing Criteria

Five primary balancing criteria are used to identify major trade-offs between remedial alternatives. These trade-offs are ultimately balanced to identify the preferred alternative and to select the final remedy.

1. *Long-term effectiveness and permanence* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

2. *Reduction of toxicity, mobility, or volume through treatment* is the anticipated performance of the treatment technologies a remedy may employ.

3. *Short-term effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

4. *Implementability* is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

5. *Cost* includes estimated capital and operation and maintenance costs, and net present worth costs.

Modifying Criteria

These criteria may not be considered fully until after the formal public comment period on the Proposed Plan and RI/FS report is complete, although EPA works with the State and community throughout the project.

1. *State acceptance* addresses the support agency's comments. Where the State or other Federal agency is the lead agency, EPA's acceptance of the selected remedy should be addressed under this criterion. State views on compliance with State ARARs are especially important.

2. *Community acceptance* refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS report.

The 1990 NCP at 55 FR 8719-23 describes how the detailed analysis of alternatives is to be performed using these criteria. The detailed analysis is the information base upon which the remedy selection decision is made. Chapter 7 of the "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (October 1988) provides further detail on the process.

issued for comment along with the RI/FS. Upon receipt of public comments on the Proposed Plan, the lead agency consults with the support agency to determine if the preferred alternative remains the most appropriate remedial action for the site or operable unit. The final remedy is selected and documented in a Record of Decision.

Considering the Nine Criteria

The identification of a preferred alternative and final selection of a remedy is derived from consideration of nine evaluation criteria in three major steps, as described in the 1990 NCP (Sec. 300.430(f)(1)(ii)(E)). The nine criteria are presented in Exhibit 3. The steps in which the criteria are considered are depicted in Exhibit 4 and discussed below.

Threshold Criteria

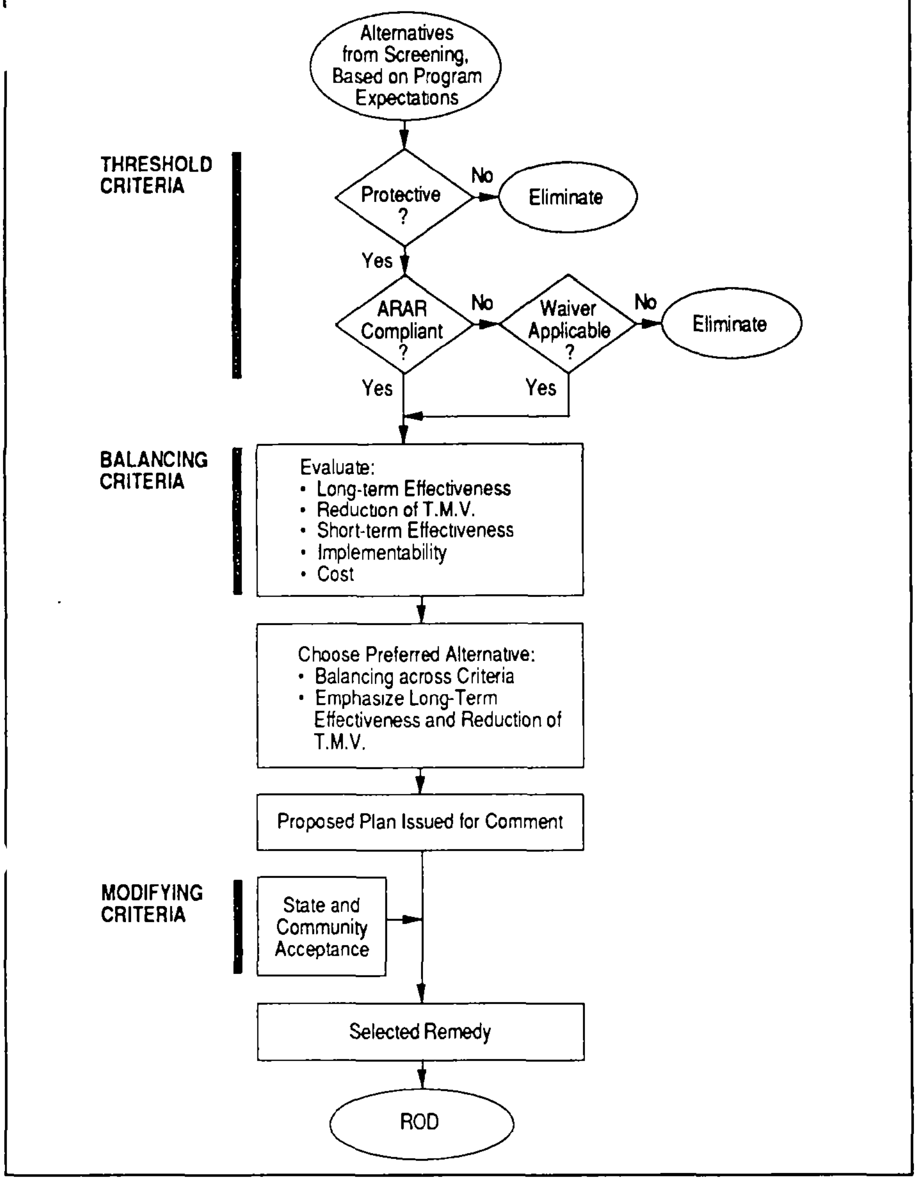
The first step of remedy selection is to identify those alternatives that satisfy the threshold criteria. Only those alternatives that provide adequate protection of human health and the environment and comply with ARARs (or justify a waiver) are eligible for selection. Alternatives that do not satisfy the threshold criteria should not be evaluated further.

Primary Balancing Criteria

The second step involves the balancing of tradeoffs among protective and ARAR-compliant alternatives with respect to the five primary balancing criteria (and modifying criteria, if known). In this step, alternatives are compared with each other based on their long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, implementability, short-term effectiveness, and cost. The sequence in which the criteria are generally considered, and pertinent considerations related to each, are noted below.

1. Long-term effectiveness and permanence is a major theme of CERCLA Section 121, and, therefore, is one of the two most important criteria used during remedy selection to determine the maximum extent to which permanence and treatment are practicable. This factor will often be decisive where alternatives vary significantly in the types of residuals that will remain onsite and/or their respective long-term management controls.

Exhibit 4



2. Reduction in the toxicity, mobility, or volume of contaminants achieved through the application of treatment technologies is the other criterion that will be emphasized during remedy selection in determining the maximum extent to which permanent solutions and treatment are practicable. Remedies that use treatment to address materials comprising the principal threats posed by a site are preferred over those that do not. Treatment as part of CERCLA remedies should generally achieve reductions of 90 to 99 percent in the concentrations or mobility of individual contaminants of concern. There will, however, be situations where reductions outside the 90 to 99 percent range will be appropriate to achieve site-specific remediation goals.

3. The short-term effectiveness of an alternative includes consideration of the time required for each alternative to achieve protection, as well as adverse short-term impacts that may be posed by their implementation. Many potential adverse impacts can be avoided by incorporating mitigative steps into the alternative. Poor short-term effectiveness can weigh significantly against an option and can, in fact, result in an alternative being rejected as unprotective if adverse impacts cannot be adequately mitigated.

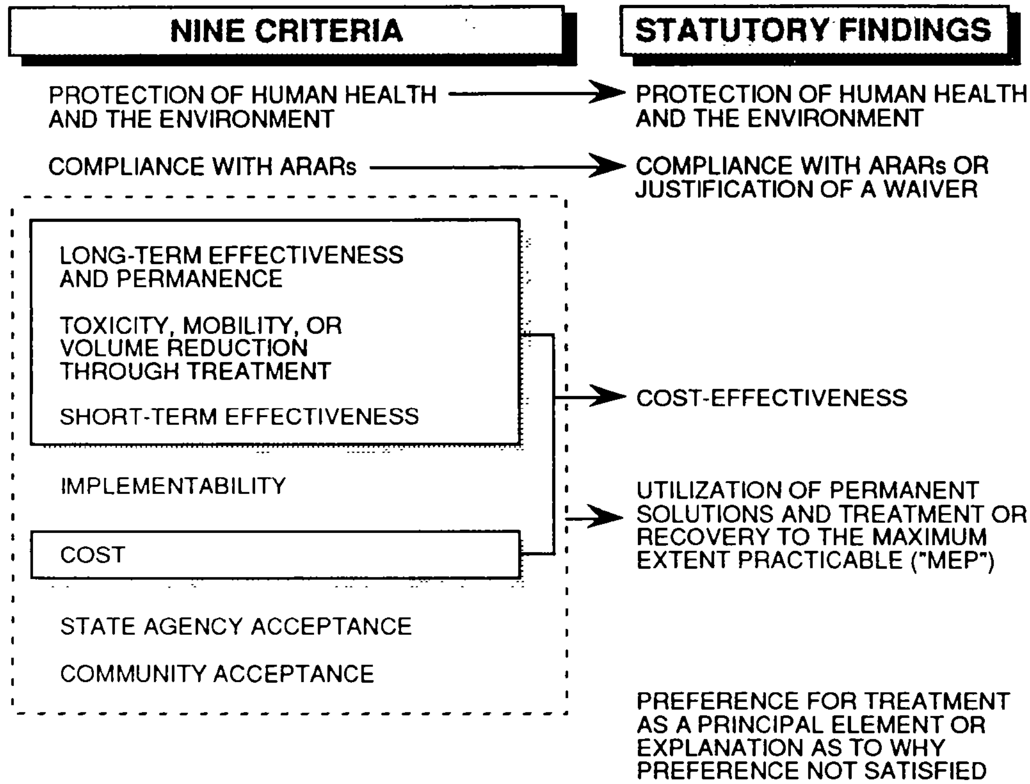
4. Implementability is particularly important for evaluating remedies at sites with highly heterogeneous wastes or media that make the performance of certain technologies highly uncertain. Implementability is also significant when evaluating technologies that are less proven and remedies that are dependent on a limited supply of facilities (e.g., TSCA - permitted land disposal facility), equipment (e..g., in-situ vitrification units), or experts.

5. Cost may play a significant role in selecting between options that appear comparable with respect to the other criteria, particularly long-term effectiveness and permanence, or when choosing among treatment options that provide similar performance. Cost generally will not be used to determine whether or not principal threats will be treated, except under special circumstances that make treatment impracticable (see expectations). Cost can never be used to pick a remedy that is not protective.

Modifying Criteria

If known at the completion of the RI/FS, state (support agency) and community acceptance of the alternatives should be considered with the results of the balancing criteria evaluation to identify the preferred alternative. After the public comment period, state and community acceptance are again considered, along with any new information, and may prompt modification of the preferred alternative.

Exhibit 5
Relationship of the Nine Criteria to the Statutory Findings



Identification of a Preferred Alternative

Once the relative performance of the protective and ARAR-compliant alternatives under each criterion has been established, preliminary determinations of which options are cost-effective and which alternatives utilize permanent solutions and treatment technologies to the maximum extent practicable are made to identify the preferred alternative. Exhibit 5 illustrates the relationship between the nine criteria and the statutory requirements for remedy selection.

Cost-effectiveness is determined by comparing the costs of all alternatives being considered with their overall effectiveness to determine whether the costs are proportional to the effectiveness achieved. Overall effectiveness for the purpose of this determination includes long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness. More than one alternative can be cost-effective.

The determination of which cost-effective alternative utilizes permanent solutions and treatment to the maximum extent practicable is a risk management judgment made by the decisionmaker who balances the tradeoffs among the alternatives with respect to the balancing criteria (and modifying criteria to the extent they are known). As a general rule, those criteria that distinguish the alternatives the most will be the most decisive factors in the balancing. See Exhibit 6 for a summary of criteria likely to be important in certain site situations. The alternative determined to provide the best balance of trade-offs, as considered in light of the statutory mandates and preferences, as well as the NCP goal and expectations, is identified as the preferred alternative and presented to the public for comment in a Proposed Plan.

Final Selection of Remedy

Upon receipt of public comments, the preferred alternative is reevaluated in light of any new information that has become available, including State and community acceptance, if previously unknown. This new information should be considered to determine whether an option other than the preferred alternative better fulfills the statutory requirements. The decisionmaker's final judgment is documented in a Record of Decision.

Exhibit 6

EXAMPLES OF PROMINENT CRITERIA AND EXPECTATIONS FOR SELECTED SITE SITUATIONS

SITUATION	PROMINENT CRITERIA	EXPECTED RESULT OF REMEDY SELECTION*
Small area of high levels of toxic contaminants (e.g., lagoon, hot spots)	Long-term effectiveness, Reduction of toxicity, mobility, or volume through treatment	Treatment is preferred when highly toxic material is a principal threat at a site
Highly mobile contaminants (e.g., liquids, volatiles, metals)	Long-term effectiveness, Reduction of mobility through treatment	Treatment is preferred when highly mobile material is a principal threat at a site
Very large volume of material contaminated marginally above health-based levels (e.g., mine tailings one order of magnitude above health-based levels in soil)	Implementability, Cost	Containment may afford high level of long-term effectiveness; treatment may be difficult to implement because of insufficient treatment capacity for large volume of material, and cost of treatment may be prohibitive due to large scope of site
Complex mixture of heterogeneous waste without discrete hot spots (e.g., heterogeneous municipal landfill waste)	Implementability, Short-term effectiveness, Cost	Treatment of heterogeneous waste often difficult or infeasible, reducing implementability; containment avoids short-term impacts and uncertainties associated with excavation; cost of treatment may be prohibitive
Soils contaminated with high concentrations of VOCs	Long-term effectiveness, Short-term effectiveness	In-situ treatment may be preferred over excavation because of negative short-term impacts and high cost of excavation
Contaminated ground water	Long-term effectiveness, Short-term effectiveness	Ground waters should be returned to beneficial use as soon as is practicable

* These are only examples and have been highly simplified for illustration purposes. They are not intended to prescribe certain remedies for certain situations.

NOTICE: The policies set out in this memorandum are intended solely for the guidance of Government personnel They are not intended, nor can they be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this memorandum, or to act at variance with the guidance, based on an analysis of specific site circumstances Remedy selection decisions are made and justified on a case-specific basis. The Agency also reserves the right to change this guidance at any time without public notice.

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CHECKLIST FOR RECORDS OF DECISIONS

I. The Declaration

o Site Name and Location

____ Does the ROD contain the name of the site as it appears on the National Priorities List (NPL)?

____ Does the ROD contain the name of the town or county and the State in which the site is located?

o Statement of Basis and Purpose

____ Does the ROD contain the following standard language?

"This decision document presents the selected remedial action for the (site name), in (location), which was chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site."

____ "The State/Commonwealth of _____ concurs with the selected remedy."

o Assessment of the Site

____ Does the ROD contain the following standard language?

"Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment."

o Description of the Selected Remedy

____ Does the ROD include a description of the role of this operable unit within the overall site strategy?

____ Does the description indicate whether the operable unit addresses the principal threats posed by the conditions at the site?

____ Does the ROD include a description of the major components of the selected remedy in bullet fashion?

o **Statutory Determinations**

____ If the selected remedy satisfies the statutory preference for treatment as a principal element (by addressing the principal threats at the site with treatment), does it contain the following standard language?

"The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action [or "a waiver can be justified for whatever Federal and State applicable or relevant and appropriate requirement that will not be met"], and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element."

____ If the remedy does not satisfy the preference for treatment as a principal element, does it contain the following standard language?

(Repeat standard psrt) "However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment that as a principal element."

____ If hazardous substances will remain on-site above health-based levels, does the ROD contain the following standard language?

"Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment."

____ If hazardous substances will not remain on-site above health-based levels, does the ROD contain the following standard language?

"Because this remedy will not result in hazardous substances on-site above health-based levels, the five-year review will not apply to this action."

II. The Decision Summary

o **Site Name, Location, and Description**

____ Does the ROD include a description of the site in terms of the following factors?

- ___ name, location, and address of the site;
- ___ area and topography of the site (especially if the site is located within a floodplain or wetlands);
- ___ adjacent land uses;
- ___ natural resource uses;
- ___ general surface-water and ground-water resources;
- ___ location of and distance to nearby populations; and
- ___ surface and subsurface features (e.g., number and volume of tanks, lagoons, drums, or other structures).

____ Does the ROD include maps, a site plan, or other graphic descriptions?

o **Site History and Enforcement Activities**

____ Does the ROD include a history of the site activities that led to current problems?

____ Does the ROD include a history of Federal and State site investigations, removal actions, and remedial actions conducted under the CERCLA or other statutory authorities?

____ Does the ROD include a history of CERCLA enforcement activities at the site, including:

- ___ the results of searches for PRPs?
- ___ whether special notices have been issued?

o **Highlights of Community Participation**

____ Does the ROD summarize how the public participation requirements of CERCLA sections 113(k)(2)(B)(i-v) and 117 were met in the remedy selection process?

o **Scope and Role of Operable Unit [(or Response Action)] Within Site Strategy**

____ Does the ROD include a description of the role of this remedial action within the overall site clean-up strategy?

____ Does the ROD summarize the scope of the problems addressed by the remedial action selected?

____ Does the ROD describe whether or not the action will address any of the principal threats posed by conditions at the site?

o **Summary of Site Characteristics**

____ Does the ROD indicate all known or suspected sources of contamination at the site?

____ Does the ROD include a description of the following information related to the contamination and affected media?

- ___ types and characteristics (e.g., toxicity, mobility, carcinogenicity) of contaminants?
- ___ volume of contaminated material?
- ___ concentrations of contaminants?

____ Does the ROD include a description of the location of contamination and known or potential routes of migration, including the following factors?

- ___ population and environmental areas that could be affected, if exposed?
- ___ lateral and vertical extent of contamination?
- ___ potential surface and subsurface pathways of migration?

____ Does the ROD include maps, charts, tables, or other graphic descriptions of contaminants and affected media?

o **Summary of Site Risks**

____ Does the ROD summarize the results of the baseline risk assessment conducted for the site?

____ Does the ROD include a description of the following factors related to human health risks?

- ___ concentrations of the contaminants chemicals) of concern in each medium of exposure?
- ___ results of the exposure assessment?
- ___ results of the toxicity assessment of contaminants of concern?
- ___ results of the risk characterization for each population by each pathway and the total risk for the site?
- ___ potential or actual carcinogenic risks
- ___ non carcinogenic risks
- ___ explanation of key risks times

____ Does the ROD include, where appropriate, a description of the following factors related to environmental risks?

- ___ effects of the contamination on critical habitats?
- ___ effects of the contamination on any endangered species?

o Description of Alternatives

____ Does the ROD include a description of the treatment components of each remedial alternative, including the following?

- ___ treatment technologies that will be used?
- ___ type and volume of waste to be treated?
- ___ process sizing?
- ___ primary treatment levels (e.g., best demonstrated available technology [BDAT], percentage or order of magnitude of concentration reductions expected?

____ Does the ROD include a description of the containment or storage components of each remedial alternative, including the following:

- ___ type of storage (e.g., landfill, tank, surface impoundment)?
- ___ type of closure that will be implemented (e.g., RCRA Subtitle C clean closure, landfill closure, Subtitle D solid waste closure)?
- ___ type and quantity of waste to be stored?
- ___ quantity of untreated waste and treatment residuals to be disposed of off-site or managed on-site in a containment system (e.g., cap, minimum-technology unit) and the degree of hazard remaining in such waste)?

____ Does the ROD include a description of the ground-water components of each remedial alternative (if appropriate), including the following?

- ___ ground-water classification (e.g., Class I, II, or III)?
- ___ remediation goals (e.g., maximum contaminant levels [MCLs] to be achieved)?
- ___ estimated restoration timeframe?
- ___ area of attainment?

____ Does the ROD include a description of the general components of each remedial alternative, including the following?

- ___ quantities of contaminated media addressed (and physical location at the site)?
- ___ expected risk reduction to be achieved?
- ___ whether treatability testing has been or will be conducted?
- ___ implementation requirements
- ___ use of institutional controls?
- ___ residual levels (e.g., delisting, BDAT)?
- ___ implementation requirements?
- ___ whether treatability testing has been or will be conducted?
- ___ estimated implementation timeframe?
- ___ estimated capital, operation and maintenance (O&M), and present-worth costs?
- ___ assumptions and uncertainties?

____ Does the ROD include a description of the major applicable or relevant and appropriate requirements (ARARs) and other standards "to be considered" (TBCs) being met/utilized for the specific components of the waste management process of each remedial alternative, including the following?

- ___ how the specific components of each will or will not comply with the major ARARs?
- ___ why the standard is applicable or relevant and appropriate for each alternative?
- ___ whether RCRA Land Disposal Restrictions are ARARs?

o **Summary of Comparative Analysis of Alternatives**

____ Does the ROD highlight the key differences among the alternatives in relation to the nine criteria?

___ <u>Overall protection of human health and the environment</u>: addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls;

___ <u>Compliance with ARARs</u>: addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies use of a waiver.

___ <u>Long-term effectiveness and permanence</u>: addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met;

___ Reduction of toxicity, mobility, or volume through treatment: addresses the anticipated performance of the treatment technologies the remedy may employ;

___ Short-term effectiveness: addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period (i.e., until clean-up goals are achieved);

___ Implementability: addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option; and

___ Cost: addresses the estimated capital and O&M costs, as well as a present-worth.

___ State/support agency acceptance: addresses the support agency's comments and concerns. (Where the State or Federal agency is the lead agency for the ROD, EPA's acceptance of the selected remedy should be addressed under this criterion);

___ Community acceptance: addresses the public's comments on and concerns about the Proposed Plan and RI/FS report. (The specific responses to public comments should be addressed in the Responsiveness Summary section of the ROD).

o **The Selected Remedy**

____ Does the ROD identify the selected remedy

____ Does the ROD identify remediation goals for the selected remedy?

____ Does the ROD describe the carcinogenic risk level that the selected remedy will attain and the rationale for selecting that level?

____ Does the ROD identify the specific points of compliance, as appropriate, for the media addressed by the selected remedy (e.g., "MCLs will be met at the edge of the waste-management area")?

o **Statutory Determinations**

____ Does the ROD document how the selected remedy satisfies the requirement of CERCLA section 121 to protect human health and the environment, as follows?

___ A description of how the selected remedy will eliminate, reduce, or control risks posed through each pathway to each population through treatment, engineering controls, or institutional controls, to ensure adequate protection of human health and the environment (including that the site risk will be reduced to within the 10^{-4} to 10^{-6} risk range for carcinogens, and that the Hazard Indices for non-carcinogens will be less than one?

___ An indication that no unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy?

____ Does the ROD document how the selected remedy satisfies the requirement of CERCLA section 121 to comply with ARARs, as follows?

___ A statement of whether the selected remedy will comply with ARARs. When appropriate, the ROD should state that a waiver that is being invoked and justify the waiver. The ARARs should be organized as chemical-specific, location-specific, and action-specific?

___ A list and description of the Federal and State ARARs that the selected remedy will attain, distinguishing applicable from relevant and appropriate requirements, as necessary?

___ A listing and the rationale for using any TBCs?

____ Does the ROD describe how the selected remedy provides overall effectiveness proportionate to its costs, such that it represents a reasonable value for the money to be spent (i.e., is cost-effective).

____ Does the ROD document how the selected remedy satisfies the requirement of CERCLA section 121 to utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, as follows?

___ A description of the rationale for the remedy selection, including a statement that the remedy selected provides the best balance of tradeoffs among the alternatives with respect to the evaluation criteria, especially the five balancing criteria?

___ A discussion of those criteria that were most critical in the selection decision (i.e., those criteria that distinguish the alternatives most)?

___ Emphasis on the tradeoffs among the alternatives with respect to the five balancing criteria?

___ A description of the role of the State and community acceptance considerations (i.e., modifying criteria)in the decision-making process?

___ A general statement that the selected remedy meets the statutory requirement to utilize permanent solutions and treatment technologies to the maximum extent practicable?

____ Does the ROD document how the selected remedy satisfies the preference of CERCLA section 121 for treatment as a principal element, as follows?

___ If the remedy uses treatment to address the principal threat(s) posed by conditions at the site, a description of how the preference for treatment is satisfied; or

___ If treatment is not used to address the principal threats, an explanation of why the preference is not satisfied. This explanation will refer back to the explanation under the "maximum extent practicable" finding of why treatment of the principal threats was found to be either impracticable or not within the limited scope of the response action.

o **Documentation of Significant Changes**

____ Does the ROD identify the preferred alternative originally presented in the Proposed Plan?

____ Does the ROD describe any significant changes and explain the reasons for them, as required by CERCLA section 117(b)?

III. <u>The Responsiveness Summary</u>

____ Does the ROD contain information about (1) community preferences regarding the remedial alternatives; and (2) general public concerns about the site?

____ Does the ROD contain the comments of the public, including PRPs, on key Agency documents related to the site cleanup, as well as the Agency response to those comments?

DRAFT

CHECKLIST FOR PROPOSED PLANS

I. INTRODUCTION

____ Does the introduction state the site name and location, identify the lead and support agencies, and state that the Proposed Plan:
- ___fulfills requirements of CERCLA section 117(a)?
- ___describes remedial alternatives analyzed?
- ___identifies preferred alternative and explains rationale for preference?
- ___highlights key information in the RI/FS and administrative record?
- ___solicits community involvement in the selection of remedy?
- ___invites public comment on all alternatives?

II. SITE BACKGROUND

____ Does the Proposed Plan provide a brief description of the site, including:
- ___history of site activities leading to current problems?
- ___site area or media to be addressed by the selected remedy?

III. SCOPE/ROLE OF OPERABLE UNIT OR RESPONSE ACTION

____ Are the principal threats posed by conditions at the site identified?

____ Is the scope of the problems addressed by the preferred alternative and its role within the overall site clean-up strategy discussed?

IV. SUMMARY OF SITE RISKS

____ Is a brief overview of results of the baseline risk assessment presented?

____ Are current risks compared against remediation goals?

____ Are environmental risks addressed?

V. SUMMARY OF ALTERNATIVES

____ Is each alternative adequately described by highlighting the following:
___treatment/engineering components and quantities of waste related to each component
___institutional controls
___implementation time/requirements
___estimated construction and O&M costs (including present worth)
___major ARARs

VI. EVALUATION OF ALTERNATIVES & THE PREFERRED ALTERNATIVE

____ Is the preferred alternative identified and is it emphasized that selection of this alternative is preliminary and could change as a result of public comments or new information?

____ Are the nine criteria used to evaluate alternatives described?

____ Is the expected performance of the preferred alternative (in terms of the nine criteria) discussed, explaining how the preferred alternative compares to the other alternatives?

____ Does discussion present the lead agency's preliminary determination that the preferred alternative provides the best balance of tradeoffs with respect to the nine criteria, and that it is anticipated to meet the following statutory requirements:
___protect human health and the environment
___comply with ARARs (or justify a waiver)
___be cost-effective
___utilize permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable
___satisfy the statutory preference for treatment as a principal element, or justify not meeting the preference

VII. COMMUNITY PARTICIPATION

____ Does the plan provide information that helps public understand how they can be involved, including:
___notice of the dates of the public comment period
___date, time, and location of public meeting(s) planned
___names, numbers, and addresses of lead and support agency contacts to whom comments should be sent
___whether a special notice has been issued to PRPs
___location of the administrative record and other information repositories

RECORD OF DECISION (ROD) GUIDANCE FOR SELECTING AND DOCUMENTING GROUND WATER EXTRACTION REMEDIES

Office of Emergency and Remedial Response
Directive No. 9355.4-03

October 1989

OVERVIEW OF GROUND WATER EVALUATION

A. Study Findings

B. Study Recommendations

C. Recommended Language for Ground Water Records of Decision (RODs)

A. STUDY FINDINGS

1. Extraction systems are generally effective in containing contaminant plumes

2. Extraction systems can achieve significant mass removal of contaminants

3. Concentrations of contaminants generally decrease significantly after extraction is initiated, but tend to level off after a period of time. This leveling off usually occurs at concentrations above the cleanup goals or concentrations expected at that point in time

4. Data collection was insufficient to fully assess contaminant movement and system response to pumping

STUDY FINDINGS
(continued)

Factors which limit the effectiveness of extraction systems include:

1. Hydrogeological factors, such as subsurface heterogeneities
2. Contaminant-related factors, such as soil sorption/desorption processes, presence of non-aqueous phase liquids (NAPLs)
3. Continued leaching from source areas, such as contaminated soils
4. System design parameters, such as pumping rate, placement of wells and well screens

B. STUDY RECOMMENDATIONS

1. Initiate early response measures to contain the ground water plume and prevent further migration of contaminants. This can be achieved through:

   a. Early Action Record of Decision; or

   b. Interim Action Record of Decision

STUDY RECOMMENDATIONS
(continued)

2. Indicate the degree of uncertainty associated with the selected remedy

   Provide enough flexibility in the remedy to allow modifications to the system in response to new information obtained during its operation

   a. Final Action Record of Decision (low uncertainty)

   b. Contingency Record of Decision (moderate to high uncertainty) and Explanation of Significant Difference

      i Change in Selected Remedy
      ii. Change in Remedial Goals (ARARs waiver)

   c. Interim Record of Decision (high uncertainty)

      i. Phased system design
      ii. Review remedy and goals at specified intervals

STUDY RECOMMENDATIONS (continued)

3. Collect data that will allow evaluation of contaminant behavior, and assessment of extraction effectiveness, such as information on:

   a. Detailed vertical variations in stratigraphy

   b. Contaminant-soil interactions (sorption/desorption) in the unsaturated and saturated zones

C. RECOMMENDED LANGUAGE FOR GROUND WATER RODS

- Study findings indicate that it is often difficult to predict the ultimate concentrations to which contaminants in ground water may be reduced until an extraction system has been operating for some period of time

- RODs should indicate the amount of uncertainty believed to be associated with achieving health-based remediation goals in ground water at a particular site

RECOMMENDED LANGUAGE FOR GROUND WATER RODS (continued)

- Final Action RODs
- Contingency measures and goals
- Interim Action RODs
- Early Action RODs

FINAL ACTION RODS (low uncertainty)

- A final remedy may be specified in the ROD if there is little uncertainty that the remedy will be able to achieve health-based levels of contaminants throughout the area of attainment

- The "Selected Remedy" section for a Final Action ROD should include language that:

  1. Recognizes the potential technical impracticability of the selected extraction and treatment system; and

  2. Describes recommended modifications to that system which may improve its performance, such as:

     i. discontinuing operation in certain areas
     ii. alternating pumping
     iii. pulse-pumping

CONTINGENCY MEASURES AND GOALS
(high to moderate uncertainty)

- Information may emerge from the operation of the extraction system that strongly suggests that it is technically impracticable to achieve health-based levels throughout the area of attainment

- If this is considered likely, the ROD should provide for contingency measures, which may involve changing both the remedy and the remedial goals

CONTINGENCY MEASURES AND GOALS
(high to moderate uncertainty)
(continued)

- The "Selected Remedy" section of a Contingency ROD should include language that:

  1. Recognizes the <u>potential</u> technical impracticability of the selected extraction and treatment system; and

  2. Describes recommended modifications to that system which may improve its performance if the selected remedy cannot meet remedial goals

  3. Describes the criteria for implementing contingency measures

     a. hydrogeological or contaminant-specific data that call into question the ability of the primary remedy to achieve health-based goals

     b. an observed "leveling-off" of contaminant concentrations before health-based goals have been reached

CONTINGENCY MEASURES AND GOALS (high to moderate uncertainty) (continued)

4. Describes the actual contingency measures which will modify the existing system if portions of the aquifer cannot be restored to its beneficial use after a reasonable period of time

   a. institutional controls to restrict access to contaminated ground water

   b. an ARARs waiver for those portions of the aquifer that remain contaminated

   c. low-level pumping to restrict plume migration

- Any contingency remedy or measures discussed in the "Selected Remedy" section of the ROD must be accompanied by supporting language in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections

INTERIM ACTION ROD (high uncertainty)

- An Interim Action ROD should be specified when there is substantial uncertainty regarding the ability of a remedy to restore contaminant concentrations in ground water to health-based levels

- The purpose of the remedy is to restrict plume migration and initiate ground water restoration

- An Interim Remedy is not a final action for the ground water

INTERIM ACTION ROD (high uncertainty) (continued)

- An Interim Action ROD should include language that:

  1. Recognizes the potential technical impracticability of the selected extraction and treatment system
  2. States the interim goals of the remedy
  3. Specifies the period of time before system performance is reviewed and a Final Action ROD is prepared

EARLY ACTION ROD
(Subset of Interim Action ROD)

- At some point during the project scoping or RI/FS, it may be determined that an operable unit should be implemented immediately to prevent further migration of a contaminant plume. An Interim Action ROD should be prepared specifically to implement early containment measures, and should include language that:

1. Describes the limited goals (i.e., containment) of the action
2. Describes the anticipated time period covered by the action
3. States that MCLs/MCLGs are not ARARs for this action

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C 20460

OCT 18 1989 Directive No. 9355.4-03

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Considerations in Ground Water Remediation at Superfund Sites

FROM: Jonathan Z. Cannon
Acting Assistant Administrator

TO: Waste Management Division Directors
Regions I, IV, V, VI, VII, VIII
Emergency and Remedial Response Division Director
Region II
Hazardous Waste Management Division Directors
Region III, IX
Hazardous Waste Division Director
Region X

Purpose

The purpose of this memorandum is to transmit our findings from a recently completed study of several sites where ground water extraction is being conducted to contain or reduce levels of contaminants in the ground water. In addition, this memorandum presents several recommendations for modifying the Superfund approach to ground water remediation.

Background

The most common method for restoring contaminated ground water is extraction and treatment of contaminated ground water. Recent research has suggested that in many cases, it may be more difficult than is often estimated to achieve cleanup concentration goals in ground water. In response to these findings, the Office of Emergency and Remedial Response (OERR) initiated a project to assess the effectiveness of ground water extraction systems in achieving specified goals. Nineteen case studies were developed from among Superfund and State-lead sites, RCRA and Federal facilities. These sites were selected primarily on the basis that the ground water extraction systems had been operating for a period of time sufficiently long to allow for an evaluation of the system.

Objective

The objective of this memorandum is to describe the findings of this study and to recommend the consideration of certain factors and approaches in developing and implementing ground water response actions at Superfund sites.

Findings of Study

Several trends were identified from the case studies:

- The extraction systems are generally effective in containing contaminant plumes, thus preventing further migration of contaminants.
- Significant mass removal of contaminants (up to 130,000 pounds over three years) is being achieved.
- Concentrations of contaminants have generally decreased significantly after initiation of extraction but have tended to level off after a period of time. At the sites examined, this leveling off usually began to occur at concentrations above the cleanup goal concentrations expected to have been attained at that particular point in time.
- Data collection was usually not sufficient to fully assess contaminant movement and system response to extraction.

Several factors appear to be limiting the effectiveness of the extraction systems examined, including:

- Hydrogeological factors, such as the heterogeneity of the subsurface, the presence of low permeability layers, and the presence of fractures;
- Contaminant-related factors, such as sorption to the soil, and presence of non-aqueous phase liquids (dissolution from a separate non-aqueous phase or partitioning of contaminants from the residual non-aqueous phase);
- Continued leaching from source areas;
- System design parameters, such as pumping rate, screened interval, and location of extraction wells.

The report summarizing the study and findings, entitled Evaluation of Ground Water Extraction Remedies is attached. Additional copies of the report are available through the Public Information Center ((202) 382-2080) or the Center for

Environmental Research Information (FTS 684-7391 or (513) 569-7391).

Recommendations

The findings of the study substantiate previous research and confirm that ground water remediation is a very new, complex field. Based on this study, I am recommending consideration of certain factors and approaches in developing and implementing ground water response actions. The major recommendation is to orient our thinking so that we initiate early action on a small scale, while gathering more detailed data prior to committing to full-scale restoration. These recommendations are consistent with the Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites and do not alter Superfund's primary goal of returning ground water to its beneficial uses in a time frame that is reasonable given the particular site circumstances. The recommendations do, however, encourage the collection of data to allow for the design of an efficient cleanup approach that more accurately estimates the time frames required for remediation and the practicability of achieving cleanup goals.

While standard procedures for the more refined data collection techniques suggested below are being developed, it will be beneficial at most sites to implement the ground water remedy in stages. This might consist of operating an extraction system on a small scale that can be supplemented incrementally as information on aquifer response is obtained.

These recommendations are described further below. The attached flow chart illustrates how the recommendations fit into the Superfund ground water response process.

Recommendation 1: Initiate Response Action Early.

The bias for action should be considered early in the site management process. Response measures may be implemented to prevent further migration of contaminants if they will prevent the situation from getting worse, initiate risk reduction, and/or the operation of such a system would provide information useful to the design of the final remedy. Because the data needed to design a ground water containment system are often more limited than that needed to implement full remediation, it will in a number of cases be possible and valuable to prevent the contaminant plume from spreading while the investigation to select the remediation system progresses. The determination of whether to implement a containment system should be based on existing information, data defining the approximate plume boundaries, hydrologic data, contaminants present, and approximate concentrations, and best professional judgment. Examples of situations where this type of action will probably be warranted include sites where ground water plumes are migrating rapidly (e.g., highly permeable aquifers, mobile contaminants, potential migration thorough fractures) and sites near drinking water wells that are potentially affected by the plume.

A Record of Decision (ROD) for an interim remedy may be prepared with a limited evaluation of alternatives that compares the advantages of taking an early action to the possible ramifications of waiting until the investigation has been completed. The evaluation of this action should be included as part of the scoping phase for the site and if determined to be appropriate, implemented while the overall RI/FS is underway. The RI/FS for the final action at the site should continue and incorporate information gained from this early action. If a containment action is implemented, the ground water flow should be monitored frequently, immediately before, during, and immediately after initiation of the action to obtain information on system response.

It is also advisable to implement ground water remediation systems in a staged process at sites where data collected during the remedial investigation did not clearly define the parameters necessary to optimize system design. This might consist of installing an extraction system in a highly contaminated area and observing the response of the aquifer and contaminant plume during implementation of the remedy. Based on the data gathered during this initial operation, the system could be modified and expanded as part of the remedial action phase to address the entire plume in the most efficient manner.

Recommendation 2: Provide Flexibility in the Selected Remedy to Modify the System Based on Information Gained During Its Operation.

In many cases it may not be possible to determine the ultimate concentration reductions achievable in the ground water until the ground water extraction system has been implemented and monitored for some period of time. Records of Decision should indicate the uncertainty associated with achieving cleanup goals in the ground water.

In general, RODs should indicate that the goal of the action is to return the ground water to its beneficial uses; i.e., health-based levels should be achieved for ground water that is potentially drinkable. In some cases, the uncertainty in the ability of the remedy to achieve this goal will be low enough that the final remedy can be specified without a contingency. However, in many cases, it may not be practicable to attain that goal, and thus it may be appropriate to provide in the ROD for a contingent remedy, or for the possibility that this may only be an interim ROD. Specifically, the ROD should discuss the possibility that information gained during the implementation of the remedy may reveal that it is technically impracticable to achieve health-based concentrations throughout the area of attainment, and that another remedy or a contingent remedy may be needed.

Where sufficient information is available to specify an alternative or contingent remedy at the time of remedy selection, the ROD should discuss the contingency in equal detail to the primary remedial option, and should provide substantive criteria by which the Agency will decide whether or not to implement the contingency. See Interim Final Guidance on Preparing Superfund Decision Documents, OSWER Directive 9355.3-02 (May 1989), at page 9-17.[1] The ROD may also discuss the possibility that an ARARs waiver will be invoked when MCLs or other Federal or State standards cannot practicably be attained in the ground water; a written waiver finding should be issued at the time the contingency is invoked, or in limited circumstances, in the ROD itself.[2]

The public should be informed of the decision to invoke the contingency (and, perhaps, the waiver) through issuance of an Explanation of Significant Differences (ESD) which involves a public notice. A formal public comment period is not required when a decision is made to invoke a contingency specified in the ROD; however, the Region may decide to hold additional public comment periods pursuant to NCP section 300.825(b) (proposed) (Dec. 21, 1988, 53FR at 51516). In any event, the public may submit comments after ROD signature on any significant new information which "substantially support[s] the need to significantly alter the response action" NCP Section 300.825(c) (proposed).

There may also be situations where the Region finds that it is impracticable to achieve the levels set out in the ROD, but no contingency had been previously specified in the ROD. In such cases, a ROD amendment would be necessary to document fundamental changes that are made in the remedy based on the information gained during implementation; an ESD would be necessary to

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[1] For instance, the ROD may provide that a contingent remedy will be implemented if there is a levelling-off of contaminant concentrations despite continued ground water extraction over a stated period of time.

[2] It may be possible to invoke a waiver at the time of ROD signature (a "contingent waiver") where, for example, the ROD is detailed and establishes an objective level or situation at which the waiver would be triggered. However, the use of contingent waivers should only be considered on a case-by-case basis after discussion with OERR\OWPE.

document significant but non-fundamental changes in the remedy based on the additional information.

For sites where there is substantial uncertainty regarding the ability of the remedy to return the ground water to its beneficial uses (e.g., dense non-aqueous phase liquids in fractured bedrock) it is appropriate to indicate that the initial action is interim with an ultimate remedy to be determined at some specified future date. The action should be designed to achieve the basic goal and carefully monitored over time to determine the feasibility of achieving this goal. In many of these cases, this can only be determined after several years of operation. The five year review may be the most appropriate time to make this evaluation. When sufficient data have been collected to specify the ultimate goal achievable at the site (e.g., first or second five year review), a final ROD for ground water would be prepared specifying the ultimate goal, including anticipated time frame, of the remedial action.

Although overall system parameters must be specified in the ROD, it is usually appropriate to design and implement the ground water response action as a phased process. An iterative process of system operation, evaluation, and modification during the construction phase can result in the optimum system design. Extraction wells might be installed incrementally and observed for one to three months to determine their effectiveness. This will help to identify appropriate locations for additional wells and can assure proper sizing of the treatment systems as the range of contaminant concentrations in extracted ground water is confirmed.

If it is determined that some portion of the ground water within the area of attainment cannot be returned to its beneficial uses, an evaluation of an alternate goal for the ground water should be made. Experience to date on this phase of ground water remediation is extremely limited and more definitive guidance on when to terminate ground water extraction will be provided later. When the point at which contaminant concentrations in ground water level off, however, this should be viewed as a signal that some re-evaluation of the remedy is warranted. In many cases, operation of the extraction system on an intermittent basis will provide the most efficient mass removal. This allows contaminants to desorb from the soil in the saturated zone before ground water is extracted providing for maximum removal of contaminant mass per volume of ground water removed.

Ground water monitoring should continue for two to three years after active remediation measures have been completed to ensure that contaminant levels do not recover. For cases where contaminants remain above health-based levels, reviews to ensure that protection is being maintained at the site will take place at least every five years.

Recommendation 3: Collect Data to Better Assess Contaminant Movement and Likely Response of Ground Water to Extraction.

In addition to the traditional plume characterization data normally collected, the following data is of particular importance to the design and evaluation of ground water remedies and should be considered in scoping ground water RI/FSs. Assessments of contaminant movement and extraction effectiveness can be greatly enhanced by collecting more detailed information on vertical variations in stratigraphy and correlating this to contaminant concentrations in the soil during the remedial investigation. More frequent coring during construction of monitoring wells and the use of field techniques to assess relative contaminant concentrations in the cores are methods that may be used to gain this information. More detailed analysis of contaminant sorption to soil in the saturated zone can also provide the basis for estimating the time frame for reducing contaminant concentrations to established levels and identifying the presence of non-aqueous phase liquids. Cores taken from depths where relatively high concentrations of contaminants were identified might be analyzed to assess contaminant partitioning between the solid and aqueous phases. This might involve measuring the organic carbon content and/or the concentration of the contaminants themselves.

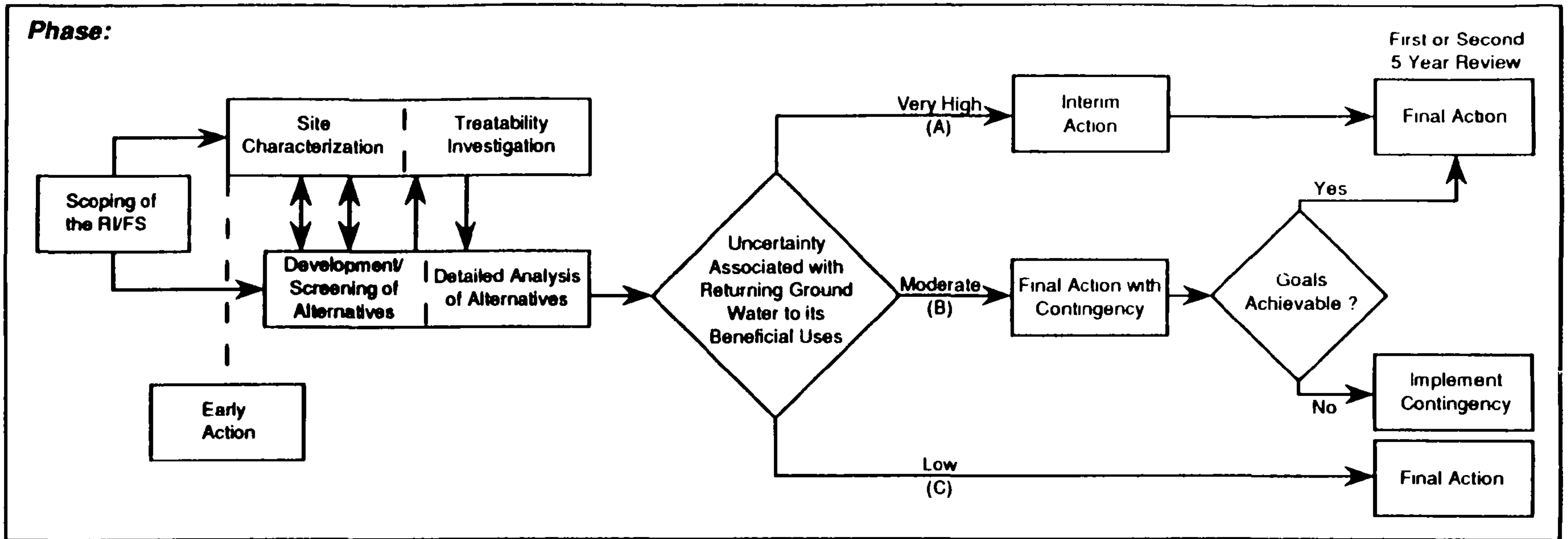
The long-term goal is to collect this information during the RI so that more definitive decisions can be made at the ROD stage. Standardized sampling and analytical methods to support these analyses are currently being evaluated.

For further information, please consult the appropriate Regional Ground Water Forum member, Jennifer Haley at FTS 475-6705 or Caroline Roe at FTS 475-9754 in OERR's Hazardous Site Control Division, or Dick Scalf at the Robert S. Kerr Environmental Research Laboratory (FTS 743-2308)

Attachment: Flow Chart
Summary Report

cc: Superfund Branch Chiefs, Regions I - X
Superfund Section Chiefs, Regions I - X wo/summary report

GROUND WATER REMEDIATION PROCESS



Actions:

- Identify data collection needs
- Identify possible containment action

- Install gradient control wells in phased process
- Monitor aquifer response

- Design and implement ground water extraction system in <u>phased process</u>
- Monitor aquifer response

- Evaluate data from system operation
- Determine practicable goals
- Identify any areas where long-term institutional controls will be necessary

Administrative Considerations:

ROD (Early Action)

A). ROD (Interim Remedy)
B). ROD (Contingency)
C). ROD (Final)

A). ROD (Final)
B). ESD or ROD amendment

Enforcement Considerations:

Negotiate RI/FS Scope:
- Data collection
- Early action

Negotiate Consent Decree

A). Negotiate Consent Decree
B) Possible stipulation or amendment to Consent Decree

10/02/89

CLARIFYING THE ROLE OF BASELINE RISK ASSESSMENT IN REMEDY SELECTION

OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

May 1990

IDENTIFYING RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

- Where the baseline risk assessment of the current and future land use indicates that a cumulative risk from a site exceeds the 10^{-4} lifetime excess cancer risk level or the hazard index exceeds one, a site poses an unacceptable risk to human health.

- Sites with risks between 10^{-4} and 10^{-6} also may be determined to pose an unacceptable risk, depending on site-specific conditions.

IDENTIFYING RISKS TO HUMAN HEALTH AND THE ENVIRONMENT (continued)

- Interim action RODs do not require completion of a quantitative baseline risk assessment. A qualitative description of risk should be included in the ROD for interim actions.

- If the baseline risk assessment indicates that a site presents no risk, then no remedial action is required and ARARs are not triggered. If Section 104 criteria are not met, 121 and ARARs are not triggered.

- Baseline risk assessment is used to demonstrate endangerment under Section 106.

CONSISTENT RISK ASSESSMENT METHODOLOGY

- Risk assessment should address all chemicals likely to be associated with significant risk, which are identified as chemicals of concern.

- Standardized exposure assumptions [found in Risk Assessment Guidance(RAGS): Human Health Exposure Manual (HHEM) and others, as developed] should be used wherever possible. Use of different assumptions should be justified.

- Institutional controls (e.g., fences) should not be considered in the baseline assessment.

DEVELOPMENT OF ALTERNATIVES

- Baseline risk assessment helps identify areas of the site requiring remedial action and principal threats that are candidates for treatment.

DOCUMENTATION IN THE ROD

- All RODs (except no-action RODs) should include in the ROD "Declaration" and "Summary Risks" section of the ROD "Decision Summary" standard language indicating that the site may present an imminent and substantial endangerment.

- "Summary of Site Risks" section should include a discussion of current and future risk.

- ROD should include how remedial alternatives will reduce risks and the level of residual risk remaining at the site after remediation, if quantifiable.

EXHIBIT 6-11

RESIDENTIAL EXPOSURE: INGESTION OF CHEMICALS IN DRINKING WATER [a]
(AND BEVERAGES MADE USING DRINKING WATER)

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$

Where:

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CW: Site-specific measured or modeled value

IR: 2 liters/day (adult, 90th percentile; EPA 1989d)
1.4 liters/day (adult, average; EPA 1989d)
Age-specific values (EPA 1989d)

EF: Pathway-specific value (for residents, usually daily — 365 days/year)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.*

EXHIBIT 6-12

RESIDENTIAL EXPOSURE: INGESTION OF CHEMICALS IN SURFACE WATER WHILE SWIMMING[a]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CW \times CR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CW = Chemical Concentration in Water (mg/liter)
CR = Contact Rate (liters/hour)
ET = Exposure Time (hours/event)
EF = Exposure Frequency (events/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CW: Site-specific measured or modeled value

CR: 50 ml/hour (EPA 1989d)

ET: Pathway-specific value

EF: Pathway-specific value (should consider local climatic conditions [e. g., number of days above a given temperature] and age of potentially exposed population)
7 days/year (national average for swimming; USDOI in EPA 1988b, EPA 1989d)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequer and duration variables.*

EXHIBIT 6-13

RESIDENTIAL EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN WATER[a]

Equation:

$$\text{Absorbed Dose (mg/kg-day)} = \frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Where:

CW = Chemical Concentration in Water (mg/liter)
SA = Skin Surface Area Available for Contact (cm^2)
PC = Chemical-specific Dermal Permeability Constant (cm/hr)
ET = Exposure Time (hours/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
CF = Volumetric Conversion Factor for Water (1 liter/1000 cm^3)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)

Variable Values:

CW: Site-specific measured or modeled value

SA:

50th Percentile Total Body Surface Area (m^2) (EPA 1989d, 1985a)

AGE (YRS)	MALE	FEMALE
3 < 6	0.728	0.711
6 < 9	0.931	0.919
9 < 12	1.16	1.16
12 < 15	1.49	1.48
15 < 18	1.75	1.60
Adult	1.94	1.69

50th Percentile Body Part-specific Surface Areas for Males (m^2) (EPA 1989d, 1985a)

AGE (YRS)	ARMS	HANDS	LEGS
3 < 4	0.096	0.040	0.18
6 < 7	0.11	0.041	0.24
9 < 10	0.13	0.057	0.31
Adult	0.23	0.082	0.55

[a] *See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables. Use 50th percentile values for SA; see text for rationale.*

(continued)

EXHIBIT 6-13 (continued)

RESIDENTIAL EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN WATER[a]

NOTE: Values for children were calculated using age-specific body surface areas and the average percentage of total body surface area represented by particular body parts in children, presented in EPA 1985a. Values for adults presented in EPA 1989d or calculated from information presented in EPA 1985a. Information on surface area of other body parts (e.g., head, feet) and for female children and adults also is presented in EPA 1985a, 1989d. Differences in body part surface areas between sexes is negligible.

PC: Consult open literature for values [Note that use of PC values results in an estimate of absorbed dose.]

ET: Pathway-specific value (consider local activity patterns if information is available)
2.6 hrs/day (national average for swimming; USDOI in EPA 1988b, EPA 1989d)

EF: Pathway-specific value (should consider local climatic conditions [e. g., number of days above a given temperature] and age of potentially exposed population)
7 days/year (national average for swimming; USDOI in EPA 1988b, EPA 1989d)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

CF: 1 liter/1000 cm^3

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.

EXHIBIT 6-14

RESIDENTIAL EXPOSURE: INGESTION OF CHEMICALS IN SOIL[a]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where:

CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
CF = Conversion Factor (10^{-6} kg/mg)
FI = Fraction Ingested from Contaminated Source (unitless)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CS: Site-specific measured value

IR: 200 mg/day (children, 1 through 6 years old; EPA 1989g)
100 mg/day (age groups greater than 6 years old; EPA 1989g)

NOTE: IR values are default values and could change based on site-specific or other information. Research is currently ongoing to better define ingestion rates. IR values do not apply to individuals with abnormally high soil ingestion rates (i.e., pica).

CF: 10^{-6} kg/mg

FI: Pathway-specific value (should consider contaminant location and population activity patterns)

EF: 365 days/year

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
16 kg (children 1 through 6 years old, 50th percentile; EPA 1985a)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.2 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration variables.*

EXHIBIT 6-15

RESIDENTIAL EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SOIL[a]

Equation:

$$\text{Absorbed Dose (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

CS = Chemical Concentration in Soil (mg/kg)
CF = Conversion Factor (10^{-6} kg/mg)
SA = Skin Surface Area Available for Contact (cm^2/event)
AF = Soil to Skin Adherence Factor (mg/cm^2)
ABS = Absorption Factor (unitless)
EF = Exposure Frequency (events/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CS: Based on site-specific measured value

CF: 10^{-6} kg/mg

SA:

50th Percentile Total Body Surface Area (m^2) (EPA 1989d, 1985a)

AGE (YRS)	MALE	FEMALE
3 < 6	0.728	0.711
6 < 9	0.931	0.919
9 < 12	1.16	1.16
12 < 15	1.49	1.48
15 < 18	1.75	1.60
Adult	1.94	1.69

50th Percentile Body Part-specific Surface Areas for Males (m^2) (EPA 1989d, 1985a)

AGE (YRS)	ARMS	HANDS	LEGS
3 < 4	0.096	0.040	0.18
6 < 7	0.11	0.041	0.24
9 < 10	0.13	0.057	0.31
Adult	0.23	0.082	0.55

NOTE: Values for children were calculated using age-specific body surface areas and the average percentage of total body surface area represented by particular body parts in children, presented in EPA 1985a. Values for adults presented in EPA 1989d or calculated from information presented in EPA 1985a.

[a] *See Section 6.4.1 and 6.6.2 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency variab' Use 50th percentile values for SA; see text for rationale.*

(continued)

EXHIBIT 6-15 (continued)

RESIDENTIAL EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SOIL[a]

NOTE (continued): Information on surface area of other body parts (e.g., head, feet) and for female children and adults also is presented in EPA 1985a, 1989d. Differences in body part surface areas between sexes is negligible.

AF: 1.45 mg/cm^2 — commercial potting soil (for hands; EPA 1989d, EPA 1988b)
2.77 mg/cm^2 — kaolin clay (for hands; EPA 1989d, EPA 1988b)

ABS: Chemical-specific value (this value accounts for desorption of chemical from the soil matrix and absorption of chemical across the skin; generally, information to support a determination of ABS is limited — see text)

EF: Pathway-specific value (should consider local weather conditions [e.g.,number of rain, snow and frost-free days] and age of potentially exposed population)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] See Section 6.4.1 and 6.6.2 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.

EXHIBIT 6-16

RESIDENTIAL EXPOSURE: INHALATION OF AIRBORNE (VAPOR PHASE) CHEMICALS[a b]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CA = Contaminant Concentration in Air (mg/m^3)
IR = Inhalation Rate (m^3/hour)
ET = Exposure Time (hours/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CA: Site-specific measured or modeled value

IR: 30 m^3/day (adult, suggested upper bound value; EPA 1989d)
20 m^3/day (adult, average; EPA 1989d)
Hourly rates (EPA 1989d)
Age-specific values (EPA 1985a)
Age, sex, and activity based values (EPA 1985a)
0.6 m^3/hr — showering (all age groups; EPA 1989d)

ET: Pathway-specific values (dependent on duration of exposure-related activities)
12 minutes — showering (90th percentile; EPA 1989d)
7 minutes — showering (50th percentile; EPA 1989d)

EF: Pathway-specific value (dependent on frequency of showering or other exposure-related activities)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.3 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration variables.*

[b] *The equation and variable values for vapor phase exposure can be used with modification to calculate particulate exposure. See text.*

EXHIBIT 6-17

RESIDENTIAL EXPOSURE: FOOD PATHWAY -- INGESTION OF CONTAMINATED FISH AND SHELLFISH[a]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CF \times IR \times FI \times EF \times ED}{BW \times AT}$$

Where:

CF = Contaminant Concentration in Fish (mg/kg)
IR = Ingestion Rate (kg/meal)
FI = Fraction Ingested from Contaminated Source (unitless)
EF = Exposure Frequency (meals/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CF: Site-specific measured or modeled value

IR: 0.284 kg/meal (95th percentile for fin fish; Pao *et al.* 1982)
0.113 kg/meal (50th percentile for fin fish; Pao *et al.* 1982)

132 g/day (95th percentile daily intakes averaged over three days for consumers of fin fish; Pao *et al.* 1982)
38 g/day (50th percentile daily intake, averaged over three days for consumers of fin fish; Pao *et al.* 1982)
6.5 g/day (daily intake averaged over a year; EPA 1989d. NOTE: Daily intake values should be used in conjunction with an exposure frequency of 365 days/year.)
Specific values for age, sex, race, region and fish species are available (EPA 1989d, 1989h)

FI: Pathway-specific value (should consider local usage patterns)

EF: Pathway-specific value (should consider local population patterns if information is available)
48 days/year (average per capita for fish and shellfish; EPA Tolerance Assessment System in EPA 1989h)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for intake rate and exposure frequency and duration variables.*

EXHIBIT 6-18

RESIDENTIAL EXPOSURE: FOOD PATHWAY -- INGESTION OF CONTAMINATED FRUITS AND VEGETABLES[a]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CF \times IR \times FI \times EF \times ED}{BW \times AT}$$

Where:

CF = Contaminant Concentration in Food (mg/kg)
IR = Ingestion Rate (kg/meal)
FI = Fraction Ingested from Contaminated Source (unitless)
EF = Exposure Frequency (meals/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CF: Site-specific measured value or modeled value based on soil concentration and plant:soil accumulation factor or deposition factors

IR: Specific values for a wide variety of fruits and vegetables are available (Pao *et al.* 1982)

FI: Pathway-specific value (should consider location and size of contaminated area relative to that of residential areas, as well as anticipated usage patterns)

EF: Pathway-specific value (should consider anticipated usage patterns)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration variables.*

EXHIBIT 6-19

RESIDENTIAL EXPOSURE: FOOD PATHWAY -- INGESTION OF CONTAMINATED MEAT, EGGS, AND DAIRY PRODUCTS[a]

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CF \times IR \times FI \times EF \times ED}{BW \times AT}$$

Where:

CF = Contaminant Concentration in Food (mg/kg)
IR = Ingestion Rate (kg/meal)
FI = Fraction Ingested from Contaminated Source (unitless)
EF = Exposure Frequency (meals/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CF: Site-specific measured or modeled value. Based on soil concentrations, plant (feed) accumulation factors, and feed-to-meat or feed-to-dairy product transfer coefficients

IR: 0.28 kg/meal — beef (95th percentile; Pao *et al.* 1982)
0.112 kg/meal — beef (50th percentile; Pao *et al.* 1982)
Specific values for other meats are available (Pao *et al.* 1982)

0.150 kg/meal — eggs (95th percentile; Pao *et al.* 1982)
0.064 kg/meal — eggs (50th percentile; Pao *et al.* 1982)

Specific values for milk, cheese and other dairy products are available (Pao *et al.* 1982)

FI: Pathway-specific value (should consider location and size of contaminated area relative to that of residential areas, as well as anticipated usage patterns)

EF: Pathway-specific value (should consider anticipated usage patterns)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

[a] *See Section 6.4.1 and 6.6.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration.*

4

BRIEFING ON LDRs FOR ROD FORUM

OVERVIEW OF SUPERFUND APPROACH FOR COMPLYING WITH RCRA LAND DISPOSAL RESTRICTIONS

	ON-SITE		OFF-SITE
	Applicable	**Relevant and Appropriate**	**Applicable**
Industrial Process Waste	Meet BDAT <u>or</u> - Obtain Treatability Variance - Delist waste - Obtain No-Migration Petition	Meet BDAT <u>or</u> - Obtain Treatability Variance - Delist waste - Obtain No-Migration Petition	Meet BDAT <u>or</u> - Obtain Treatability Variance - Delist waste - Obtain No-Migration Petition <u>and</u> Comply with administrative requirements - notification - certification
Soil and Debris (Make case-by-case determination for sludges)	Obtain Treatability Variance	Treat consistent with NCP expectations - 90-99 percent reduction in concentration or mobility of waste	Obtain Treatability Variance <u>and</u> comply with administrative requirements - notification - certification

- Major factors in evaluating compliance are:
  - -- Type of waste (industrial process vs. soil and debris)
  - -- Does action occur on- or off-site
  - -- Whether LDRs are applicable or relevant and appropriate
- Presumption is to comply with the LDRs for soil and debris through a Treatability Variance

ARAR DETERMINATION

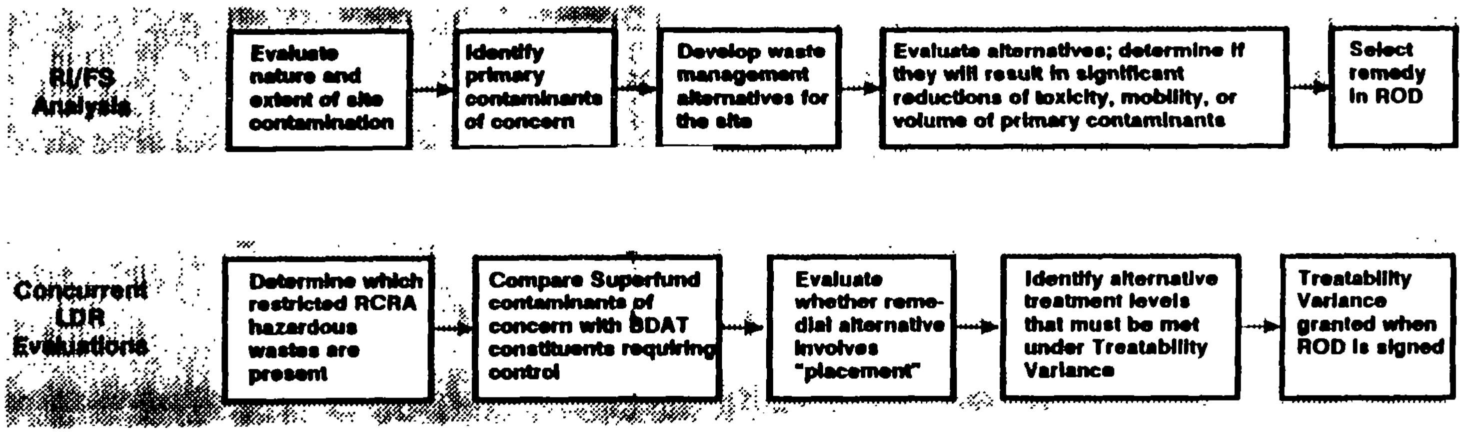
APPLICABLE (Superfund LDR Guide #5)

- PLACEMENT
- RCRA WASTE
- RESTRICTED AT TIME OF PLACEMENT

RELEVANT AND APPROPRIATE (Superfund LDR Guide #7)

- CERCLA OBJECTIVES vs. LDR OBJECTIVES
- SIMILARITY OF WASTE
    - CONSTITUENTS
    - MATRIX
- MEDIUM OF OCCURRENCE

LDRs IN THE RI/FS PROCESS



INFORMATION TO BE INCLUDED IN AN RI/FS TO DOCUMENT THE INTENT TO COMPLY WITH THE LDRs THROUGH A TREATABILITY VARIANCE FOR ON-SITE AND OFF-SITE CERCLA RESPONSE ACTIONS INVOLVING THE PLACEMENT OF SOIL AND DEBRIS CONTAMINATED WITH RESTRICTED RCRA WASTES

ON-SITE

- Description of the soil or debris waste and the source of the contamination;
- Description of the Proposed Action (e.g., "excavation, treatment, and off-site disposal");
- Intent to comply with the LDRs through a Treatability Variance;
- For each alternative using a Treatability Variance to comply, the specific treatment level range to be achieved.

OFF-SITE

For off-site Treatability Variances, the information above should be extracted from the RI/FS report and combined with the following information in a separate document:*

- Petitioner's name and address and identification of an authorized contact person (if different);
- Statement of petitioner's interest in obtaining a Treatability Variance; and

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* This document may be prepared after the ROD is signed (and Treatability Variance granted) but will need to be compiled prior to the first shipment of wastes (or treatment residuals) to the receiving treatment or disposal facility.

SAMPLE LANGUAGE FOR A RECORD OF DECISION

DESCRIPTION OF ALTERNATIVES SECTION:

This alternative will comply with the LDRs through a Treatability Variance for the contaminated soil and debris. The treatment level range established through a Treatability Variance that [Enter technology] will attain for each constituent as determined by the indicated analyses are: [Example shown below]

Barium	**0.1 - 40 ppm (TCLP)**
Mercury	**0.0002 - 0.008 ppm (TCLP)**
Vanadium	**0.2 - 22 ppm (TCLP)**
TCE	**95-99.9% reduction (TWA)**
Cresols	**90-99.9% reduction (TWA)**

- Treatability Variance is effective when ROD is signed by Regional Administrator.
- In the Comparative Analysis section, indicate which alternatives will comply with the LDRs through a Treatability Variance.
- In circumstances where the need for a Treatability Variance is discovered after ROD is signed (e.g., because site was found to contain RCRA wastes), will need an ESD or ROD amendment.

WASTES REGULATED UNDER 3RD THIRDS

- CHARACTERISTIC WASTES
- MULTI-SOURCE LEACHATE
- LAB PACKS
- MIXED RADIOACTIVE WASTE

- Characteristic wastes
  - EPA set concentration-based treatment standards for most characteristics
  - LDR treatment standard level established at level that defines waste as hazardous
  - Some characteristic standards set as a method of treatment
  - Establishing new subcategories for certain wastes

- Multi-source leachate
  - F039 waste code, with treatment standards for 200 constituents in wastewaters and nonwastewaters

- Lab packs
  - Segregate lab packs with special LDR treatment standards set for organometallics and certain organics
  - Lab packs with mixtures of wastes must meet standards for each waste in lab pack

- Mixed radioactive waste
  - Treatment standards for three categories of characteristic mixed wastes
  - National capacity extension for all First, Second, and Third Third mixed wastes
  - Storage of these wastes allowed (does not violate storage prohibition)

SUBCATEGORIES FOR CHARACTERISTIC WASTES

The following are RCRA characteristic wastes for which EPA established more than the two standard treatability groups (i.e., wastewaters and nonwastewaters):

- D001 Ignitables
  - Ignitable liquids
    - -- organic liquids
    - -- aqueous liquids
    - -- wastewaters
  - Ignitable reactives
  - Oxidizers
  - Ignitable compressed gases

- D002 Corrosives
  - Acids
  - Alkalines
  - Other corrosives

- D003 Reactives
  - Reactive cyanides
  - Explosives
  - Water reactives
  - Reactive sulfides
  - Other reactives

- D006 Cadmium
  - Wastewaters
  - Nonwastewaters
  - Cadmium Batteries

- D007 Chromium
  - Wastewaters
  - Nonwastewaters
  - Chromium Bricks
  - Chromium Batteries

- D008 Lead
  - Wastewaters
  - Nonwastewaters
  - Lead-Acid Batteries

Note: Those characteristic wastes not included were divided only into wastewater and nonwastewater forms.

COMPLIANCE DATES

- **EFFECTIVE DATE DELAY**
- **NATIONAL CAPACITY EXTENSIONS**

- Effective date delay
  - -- Third Third rule goes into effect August 8, 1990 for all wastes.
  - -- National capacity variances, however, were not granted a delay. They will extend from May 8, 1990 until May 8, 1992.
- National capacity extensions
  - -- Granted for several surface-disposed wastes, as well as soil and debris for which LDR treatment standards were based on combustion, vitrification, wet-air oxidation, mercury retorting, and chromium reduction.

SURFACE-DISPOSED WASTES RECEIVING NATIONAL CAPACITY VARIANCES IN THE THIRD THIRD RULE

Technology	Waste Code[a]
Vitrification	D004 K031 K084 K101 K102 P010 P011 P012 P036 P038 U136
Chromium Recovery	D007[b]
Combustion of Sludge/Solids	F039[c]
Mercury Retorting	D009 K106 P065 P092 U151
Secondary Smelting	D008[d]
Thermal Recovery	P015 P073 P087
Combustion, vitrification, wet-air oxidation, mercury retorting, and chromium reduction	Soil and Debris

[a] Variances are granted only to the nonwastewater forms.
[b] D007 refractory bricks.
[c] Multi-source leachate.
[d] D008 lead-acid batteries.

THIRD THIRDS/CALIFORNIA LIST OVERLAP

- MORE SPECIFIC STANDARDS APPLY
- CERTAIN CIRCUMSTANCES - CA-LIST RESTRICTIONS STILL APPLY

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- More specific standards apply
  - -- California list wastes are defined as RCRA wastes that also meet other conditions (e.g., contain HOCs greater than 1,000 ppm)
  - -- All RCRA wastes are now restricted; therefore, in most cases, California list wastes standards will not apply because the RCRA standards are more specific

- Certain circumstances - California list restrictions apply when:
  - -- Liquid hazardous wastes contain over 50 ppm PCBs, where the PCBs are not regulated by the treatment standard;
  - -- HOC-containing wastes are identified as hazardous by a characteristic property that does not involve HOCs, such as an ignitable waste that also contains greater than 1,000 ppm HOCs;
  - -- Liquid hazardous wastes contain a total concentration of more than 134 mg/l of nickel and/or 130 mg/l of thallium (because these two constituents are not regulated under the characteristic of toxicity);
  - -- Wastes granted a 2-year national capacity variance are also Calif. list wastes, until the treatment standards become effective.

DILUTION

- **AFFIRMED DILUTION PERMISSIBLE IF:**
  - -- **LEGITIMATE TYPE OF TREATMENT**
  - -- **OCCURS DURING ONE OF SPECIFIED CIRCUMSTANCES**

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- Remove the characteristic property from all D001 through D017 <u>wastewaters</u> when managed on-site; and
- Remove the characteristic property from non-toxic D001, D002, D003 <u>nonwastewaters</u>, except when the following toxic nonwastewaters are in the following subcategories: high TOC ignitable nonwastewaters (D001), reactive cyanide wastes (D003), and reactive sulfide wastes (D003).

CONSTITUENTS AND REGULATORY LEVELS ESTABLISHED UNDER THE TOXICITY CHARACTERISTIC RULE

Old EP Toxicity Characteristics (also regulated under TC)

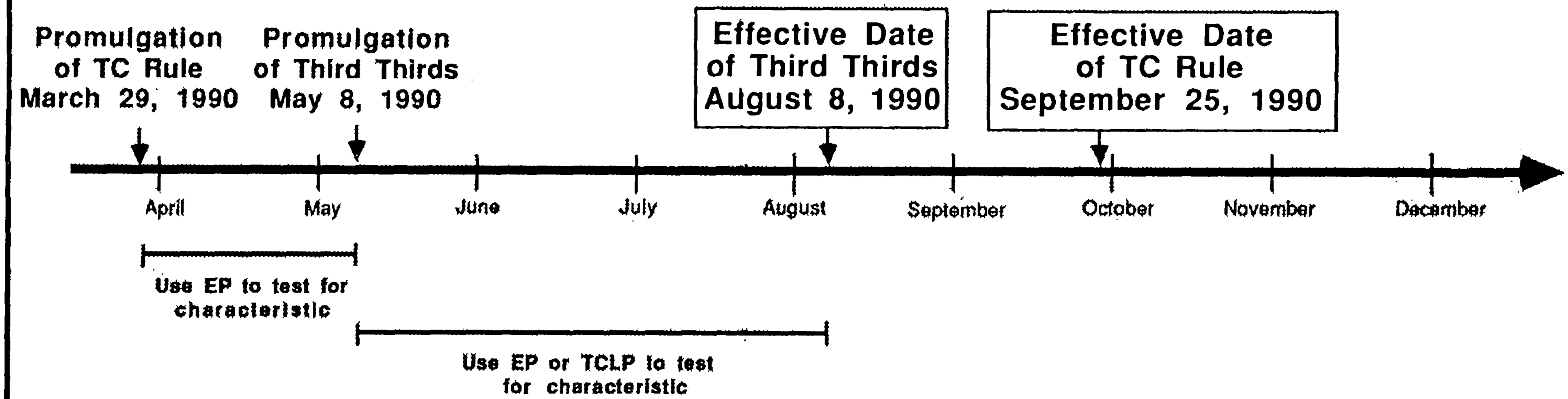
Waste Code	Regulated Constituent	Reg. Level (mg/l)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
D012	Endrin	0.0
D013	Lindane	0.4
D014	Methoxyclor	10.0
D015	Toxaphene	0.5
D016	2,4-D	10.0
D017	2,4,5-TP (silvex)	1.0

New TC Constituents

Waste Code	Regulated Constituent	Reg. Level (mg/l)
D018	Benzene	0.5
D019	Carbon Tetrachloride	0.5
D020	Chlordane	0.0
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D023	o-Cresol	200.0*
D024	m-Cresol	200.0*
D025	p-Cresol	200.0*
D026	1,4-Dichlorobenzene	7.5
D027	1,2-Dichloroethane	0.5
D028	1,1-Dichloroethylene	0.7
D029	2,4-Dinitrotoluene	0.1
D030	Heptachlor	0.0
D031	Hexachlorobenzene	0.1
D032	Hexachloro-1,3-butadiene	0.5
D033	Hexachloroethane	3.0
D034	Methyl ethyl ketone	200.0
D035	Nitrobenzene	2.0
D036	Pentachlorophenol	100.0
D037	Pyridine	5.0
D038	Tetrachloroethylene	0.7
D039	Trichloroethylene	0.5
D040	2,3,5-Trichlorophenol	400.0
D041	2,4,6-Trichlorophenol	2.0
D042	Vinyl chloride	0.2

* If o-, m-, and p-Cresol cannot be differentiated, total cresol concentration of 200.0 mg/l is used as a regulatory level.

CHARACTERIZATION & LDR COMPLIANCE OF RCRA CHARACTERISTIC WASTE: EP vs. TCLP



Before September 25, 1990, wastes that were not characteristic hazardous wastes using the EP, but that do exhibit the hazardous characteristic of toxicity using the TCLP are considered to be "newly identified wastes." These wastes are not prohibited, therefore, under the LDRs until EP sets LDR treatment standards (i.e., within six months) even if these constituents are currently contained on the list of constituents regulated under the EP. For example, if mercury is not EP toxic prior to September 25, but does exhibit the TC after this date, the waste would not be subject to the LDRs; it would be considered a newly identified waste The waste would have to be managed, however, as a hazardous waste in accordance with Subtitle C requirements

Use EP or TCLP to test for characteristic; Use TCLP to test for compliance with LDR treatment standards (EP or TCLP for arsenic and lead)

Use TCLP to test for characteristic; Use TCLP to test for compliance with LDR treatment standards (EP or TCLP for arsenic and lead)

IMPLEMENTATION RECOMMENDATIONS FOR ALTERNATIVES INVOLVING PLACEMENT/DISPOSAL

- AS OF MARCH 29, 1990, THE TCLP SHOULD BE USED TO DETERMINE WHETHER A WASTE IS HAZARDOUS IN CHARACTERISTIC

- IF RI/FS COMPLETED, PLAN TO PERFORM TCLP ANALYSIS DURING RD/RA

- INCLUDE COMPLIANCE LANGUAGE IN ROD <u>OR</u> ACTUAL MANAGEMENT CONTINGENCIES IF THEY CAN BE ANTICIPATED

- IF TCLP IS RUN AND POSITIVE RESULTS OBTAINED AFTER ROD IS SIGNED, ASSESS NEED FOR REMEDY MODIFICATIONS AND ISSUANCE OF ESD OR ROD AMENDMENT

- <u>ROD COMPLIANCE LANGUAGE</u>

  "Should waste or waste residuals be found to be TC characteristic, they will be managed in accordance with specified RCRA requirements."