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United States Government

Department of Energy

memorandum

Albuquerque Field Office

DATE: SEP 14 1993

REPLY TO ATTN OF: ERPO:KB:assump.mem

SUBJECT: Final Technical Assumptions for Environmental Restoration at the New Mexico National Laboratories

TO: T. J. Taylor, Environmental Restoration Program Manager, ES&H, LAAO
J. E. Gould, Environmental Scientist, ESH&CB, KAO

Attached is the final version of the technical assumptions underlying the approach to environmental restoration at the New Mexico National Laboratories. These assumptions are the result of the Technical Assumptions Task Force, composed of participants from DOE, U. S. Environmental Protection Agency, New Mexico Environment Department, and the National Laboratories. This version reflects the changes discussed at the final meeting to the Technical Assumptions Task Force on September 1, 1993.

These assumptions will be in the next submittal of the Los Alamos National Laboratory Installation Work Plan and the Sandia National Laboratories/New Mexico Program Implementation Plan. If there are any further comments or concerns regarding these assumptions, they can be discussed during the review of those documents.

If you have any questions, please call Kelly Bitner at FTS (505) 845-4606.

Kelly Bitner for

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Attachment

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TECHNICAL ASSUMPTIONS FOR DATA COLLECTION

AND EVALUATION

The Environmental Restoration Program

at the

Los Alamos and Sandia National Laboratories

INTRODUCTION

The technical approach for data collection and evaluation at the Los Alamos National Laboratory (LANL) and Sandia National Laboratory (SNL/NM) within the Environmental Restoration (ER) Program depends on a number statistical and risk assessment assumptions. Such assumptions are required throughout the environmental remediation planning process. One of the ER Program's primary roles is to design and conduct data collection activities that will be sufficient to determine whether to propose sites for corrective action. LANL and SNL/NM recognize that the regulators have final decision authority and will base their decisions on data generated by the laboratories. Therefore, LANL, SNL/NM and their regulators need to reach agreement on assumptions upon which the technical approaches are based, to ensure data generated will be sufficient to support the required decisions. With this agreement in place, LANL and SNL/ NM can proceed more efficiently in planning site activities.

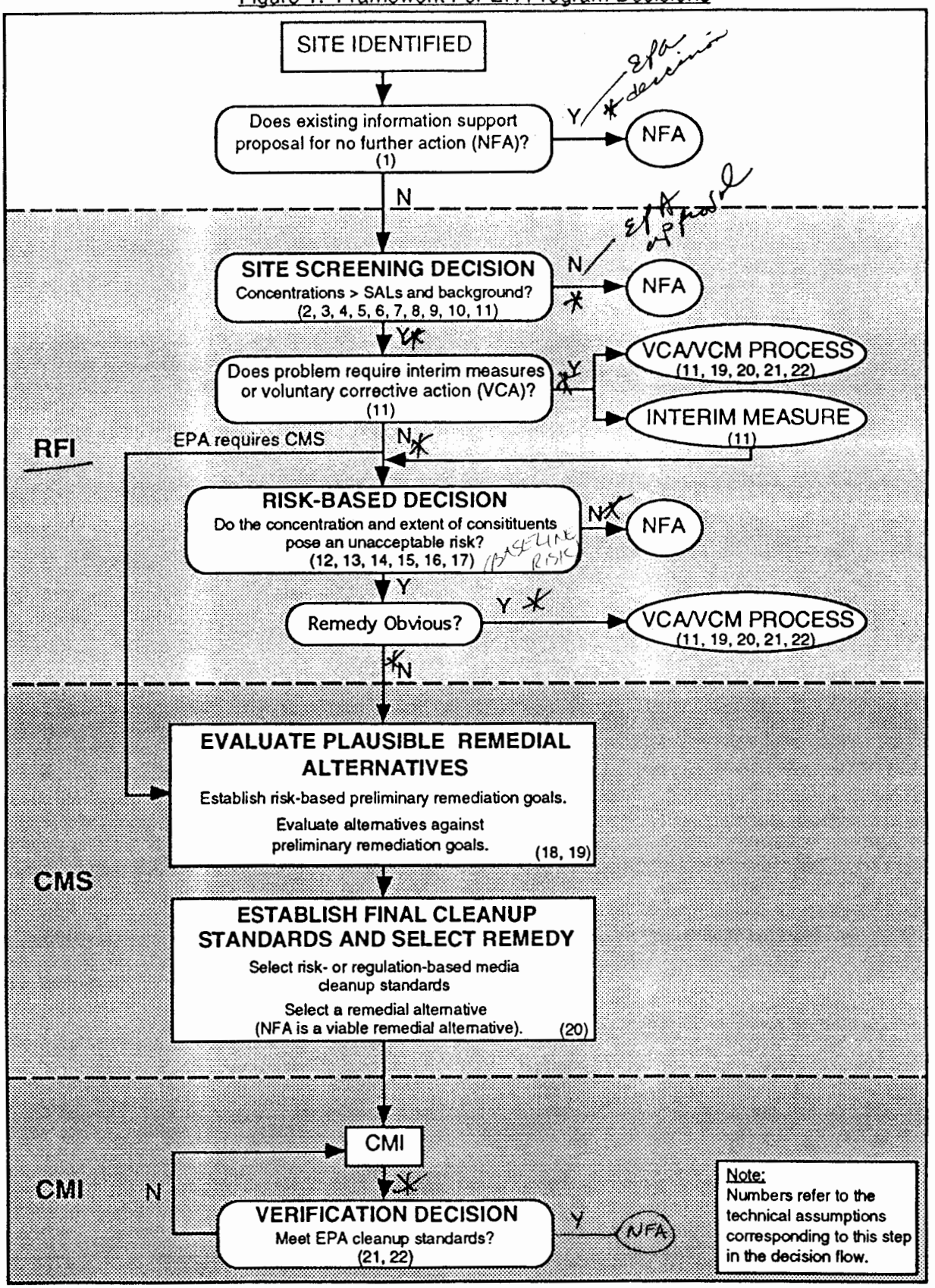
regulatory

The development of agreed-upon technical assumptions and definitions of terms is necessary to make RCRA and CERCLA guidance fully operational in planning and implementing ER work. The technical assumptions described herein are intended to supplement and be consistent with those regulations.

The proposed technical assumptions are derived in the context of the decision flow illustrated in Figure 1. "Framework for ER Program Decisions". The overall technical approach used by the LANL and SNL/NM ER programs is a modified DOE streamlined approach incorporating DQOs and risk assessment. Both the technical approach and decision logic are tied to EPA regulations and guidance. In the screening assessment phase, archival information is reviewed and when necessary site sampling plans are designed to screen out sites with negligible contamination and to identify sites that present a potentially significant health risk to workers or the public. At Los Alamos, a separate phase of sampling to collect data in support of screening decisions is anticipated at many sites, while SNL/NM screening will be incorporated as one step in a multi-stepped RFI sampling plan. At both Labs, sites failing the screening assessment criteria may undergo additional sampling to provide data sufficient to support a site-specific [redacted] If the site poses an unacceptable risk to human health or the environment, remedial alternatives will be evaluated and cleanup standards will be selected. Assuming the cleanup standards are exceeded, alternative corrective measures will be evaluated and a remedial alternative selected and designed before the cleanup is implemented. Finally, a determination of whether the remediated site meets the established cleanup standards will be necessary in order to complete the process.

? what are decision points

Figure 1. Framework For ER Program Decisions



ASSUMPTIONS FOR DATA COLLECTION AND EVALUATION FOR ER PROGRAM

SITE SCREENING DECISION ASSUMPTIONS

1. Sites with sufficient archival data/information to document that one or more of the criteria listed below (or additional criteria that may be added in revisions of the IWP/PIP) are met will be proposed for no further action (NFA) under the HSWA permit without additional RFI field work.

   - The site was listed by mistake, e.g., SWMU does not exist.
   - No release or potential for release was associated with the site. → Does this mean release to the site or release from the site?
   - Existing information is adequate to demonstrate that the level and extent of any release associated with the site presents no significant health or safety risks and no other significant problems, e.g., ~~the design or operating~~ characteristics of the facility effectively prevented any release, or historical records clearly show that the site did not release any hazardous wastes. defined?
   - The site is regulated or closed under a different authority. ? If not subject to RCRA why considered in first place

2. Historical process knowledge will be used to focus the analyses of samples to those that are plausible at a site, rather than performing a full-scan on all samples.

   - Where historical process information implies that certain contaminants (e.g., high explosives, Pu) were never handled at a site, analyses for these constituents need not be performed. ?

3. Sampling plans for site screening decisions will incorporate directed sampling based on professional judgment and/or field survey results when this approach is expected to increase the probability of detecting contaminants relative to purely random sampling approaches.

4. Non site specific screening action levels (SALs) will be ~~used to identify contaminants of concern for surface exposure and determine the need for further study.~~ set an criteria for comparing screening sample analytical results to for determining the need for further study.

5. For most applications, risk-related SALs computed following the method proposed in Subpart S for "action levels" will be appropriate for the site screening decision.

   - Subpart S provides conservative default values for certain parameters required in the calculation of action levels: body weight of receptor, intake of contaminated medium, and also, for carcinogens, duration of exposure and target risk level (10^{-6} or 10^{-5} depending on carcinogenic class). These defaults will be accepted for the purpose of SAL calculations only.
   - SALs for deep subsurface contamination may be calculated using preliminary, conservative models for transport to groundwater. Such exceptions will be negotiated on a case-by-case basis.

   Steve? Is this OK

   What about for multiple contaminants?

6. For most radioactive constituents, SALs will be based on dose rather than carcinogenic risk.

   - SALs for radionuclides will be calculated using RESRAD.

   Does this imply that RCRA constituents are assumed to be present or absent based on rad?

which radionuclides will you consider to be included or excluded from the dose limits and included in the toxic category on heavy metals?

— Subpart S default values will be used in RESRAD for body weight, intake rate, exposure duration, etc.

— Dose will be summed over multiple pathways, e.g., the inhalation and produce consumption pathways are considered as well as direct soil ingestion.

— Environmental parameters required by RESRAD will be set conservatively but appropriately for the facility (Los Alamos or Sandia). These parameters include the mass loading factor and other soil horizon characteristics for estimating dose from inhalation, and root uptake for the produce consumption pathway.

- The target dose level used for these calculations will be 10 mrem/yr, based on the following considerations:

  — 10 mrem/yr is a fraction of the DOE dose limit (100 mrem/yr) for an individual from a facility (DOE 1990, ICRP 1991, NCRP 1988).

  — 10 mrem/yr is a fraction of the terrestrial component of background radiation at both Los Alamos and Sandia.

  — The dose limit applies to multiple exposure routes, not just ingestion.

7. In general, the maximum observed concentration, rather than averages of several observations, will be compared with SALs in order to identify contaminants of concern.

   - In some cases (with prior approval from EPA), observations made on composite samples, or averages of closely related samples such as field duplicates, may be compared with SALs to identify contaminants of concern.

I assume this applies to both RAI & RCRA contaminants

8. SAL comparisons will be based on measured concentrations, unadjusted for natural or anthropogenic (e.g., atmospheric fallout) background.

   - For some contaminants, SALs or other trigger levels are below background levels, and for these background comparisons will also be necessary.

     — Background comparisons will be performed using a number of statistical tests to compare concentrations measured at a site with background distributions.

     — Constituents whose concentrations are statistically indistinguishable from background will not be identified as contaminants of concern, even if these concentrations exceed the risk-related SALs.

9. Where multiple contaminants are observed further evaluation will be necessary and contaminants of concern may be identified even where SALs are not exceeded.

10. Whenever possible, analytical methods will be selected to ensure that screening action level concentrations ~~can be detected~~. comparison to

    - SW 846 methods (when available) will be used unless another method is justified.

    - If field analytical techniques will not be sufficient to detect constituents at SAL concentrations, EPA approved fixed analytical laboratory methods will be used.

what about using lowest EQL because of multiple cont. & cumulative risk.

- If the detection limit of the fixed analytical laboratory method is above the SAL, the detection limit may be used as the trigger level to identify a contaminant of concern.

11. When contaminants of concern are identified, this indicates only that a problem may exist.

    - SALs will not be used as target risk levels or cleanup standards unless supported by site specific risk calculations as outlined below.

    - Further action may take several forms, to be determined on a case-by-case basis.

      — Immediate corrective action. If conditions pose an obvious threat to human health and the environment, EPA may require an interim measure, and/or DOE may elect to carry out a voluntary corrective action (VCA).

      — Baseline risk assessment. If one or a few measurements at a site are found to be above SALs and background, baseline risk assessment may be used to determine if corrective action is required. Additional data may be required for baseline risk assessment.

    - Where no contaminants of concern have been identified, the site will be proposed for NFA.

RISK BASED DECISION ASSUMPTIONS

12. Further decisions about a site (i.e., beyond identification of COCs and interim measures) will take into account the risks to human health and the environment posed by contamination at the site.

    - Risk-based decisions are not based on comparison of individual observations to a SAL, both because the exposure assumptions underlying the SAL calculation are not site specific, and also because risk depends on the extent of contamination as well as the level.

13. Estimation of risks to human health and the environment will be based on reasonable and site-specific exposure assumptions. In particular, site specific ~~land use~~ assumptions will be used.

    - Land use is assumed to be residential until Stakeholder input is incorporated into exposure assumptions.

    - Risks associated with the use of alluvial aquifers and surface waters will be considered.

14. Land use assumptions for SNL/NM are under development. For Los Alamos, the following assumptions may be proposed to Stakeholders.

    - Land use assumptions are dependent on whether a site is located within, or outside, the LANL boundaries.

      Current land use assumptions:

      — The most prevalent current land use for sites within DOE boundaries is commercial/industrial use. These exposure scenarios describe potential exposure to Laboratory employees and other site workers. Site-specific

information will be used to determine long-term worker and construction worker exposure scenarios.

How is access controlled?

— Current land use of PRSs located in undeveloped DOE-controlled areas is limited to occasional recreational use by Laboratory employees, the public, and trespassers. The youth recreational user is the receptor assumed to access canyon side and bottom areas.

— Current land use assumptions for sites located outside DOE boundaries is classified as commercial/industrial, recreational, and residential.

- Future land use assumptions:

  — Land within DOE-controlled areas may be under the long-term management of DOE. Future land uses considered may be either Commercial/Industrial, as part of Continued Laboratory Operations, or Recreational. (Each of these proposed land use scenarios includes several exposure scenarios, of which one or more will be evaluated for each site.)

  — Future land use assumptions for sites located outside DOE boundaries is assumed to be residential, with potential recreational use dependent on the access to steep canyon areas

15. Potential to impact groundwater will be evaluated at those sites where the potential for transport to groundwater exists, as determined on a case-by-case basis.

16. Baseline risk assessment may provide a basis for NFA at sites where contaminants of concern have been identified.

    - Superfund's Risk Assessment Guidance documents (RAGs) will provide the basic guidance for performing baseline risk assessments.

    - If the total non-radiological carcinogenic risk posed by a PRS is within the 10^{-4} to 10^{-6} risk range (or lower), and the non-carcinogenic risk threshold has not been exceeded, the site may be proposed by DOE for NFA.

    - If the expected dose to an individual from the site is expected to be less than 25 mrem/yr, DOE may propose NFA (25 mrem/yr is the DOE dose limit to an individual from a single site.)

17. Exposure estimates will be based on the distribution of contamination throughout areas/volumes of contaminated media and over time periods that are consistent with land use assumptions.

    - Current EPA guidance suggests using the 95% upper confidence level (UCL) for the mean concentration within such areas/volumes as an estimate of the reasonable maximum exposure associated with that area/volume.

      — Alternative statistics, if proposed, will provide estimates of reasonable maximum exposure.

    - These areas/volumes will be established through the DQO process with Stakeholder involvement.

      — In general, the areas/volumes will be consistent with the proposed exposure scenario. That is, the smallest area or volume to which a

receptor would be exposed over the entire exposure period determined by that scenario will be used.

- Default exposure areas/volumes and exposure frequencies/duration's for Los Alamos exposure scenarios are proposed in Table 1.

REMEDY SELECTION AND IMPLEMENTATION ASSUMPTIONS

18. Site specific land use assumptions and exposure scenarios will be considered as above in establishing preliminary remediation goals and media clean up standards, and also in risk assessments to estimate the reduction of risk realized by a potential corrective action.

19. Target risk and dose levels will be set following EPA and DOE guidance.

    - Following EPA guidance, preliminary remediation goals and media clean up standards for non radioactive carcinogens will be derived using EPA's target incremental risk range of 10^{-4} to 10^{-6}. A target hazard index value of 1 will be used for non-carcinogens.

    - The DOE dose limit of 25 mrem/yr for a single site will be used to calculate preliminary remediation goals for radionuclides using RESRAD methodolgy or other appropriate methods.

20. Remedy selection will be made by EPA, and media clean up standards will be established, after the results of the CMS have been considered.

    - ALARA considerations will enter into the determination of media clean up standards for radionuclides.

    - Remedy selection will take into consideration the potential impacts on the health and safety of workers and the public that will be associated with increased exposure during implementation of the remedy.

    - The Laboratory may elect to perform a VCA/VCM if the choice of a remedy is obvious (see Figure 2).

      — In this case, DOE approval to pursue the VCA/VCM will be sought, a VCA/VCM report will be developed which will include proposed risk-based clean up levels, the design of the VCA and an evaluation of the proposed remedy against clean up levels and any relevant HSWA permit criteria.

      — If a VCA/VCM is taken, DOE approval will be obtained, and all Stakeholders will be informed and input obtained whenever possible.

      — For Los Alamos, permit modification or temporary authorization will be sought under conditions specified in Subpart S, Section 264.500, e.g., if a new on-site disposal area or incinerator is required.

      — For Sandia, permit modification or temporary authorization will be sought as specified in the SNL/NM HSWA permit.

21. The attainment of cleanup standards will be judged based on achievement of the required risk levels or promulgated standards judged to be relevant to the site by EPA.

- Verification sampling may be designed to estimate average residual concentrations in appropriate risk-based areas/volumes of contaminated media.

- For migration studies, further action may be triggered by finding concentrations exceeding background levels or method detection limits, since this may be an indication that migration has occurred.

22. If media clean up standards are unattainable using the selected remedy, an alternative remedy (e.g.,. conditional) will be negotiated.

REFERENCES

1) U.S. Department of Energy (DOE) 1990, Radiation Protection of the Public and the Environment, DOE Order 5400.5 (Change 1), Washington DC. (DOE 1990, 0080)

2) International Commission on Radiological Protection (ICRP), 1991, The 1990 Recommendations of the International Commission on Radiological Protection. ICRP Report No. 60, Pergamon Press, Oxford, UK.

3) National Council on Radiation Protection (NCRP), 1988, Measurement of Radon and Radon Daughters in Air, NCRP Report No. 97, Bethesda MD., Nov. 15.

Figure 2. VCA /VCM Process Flow

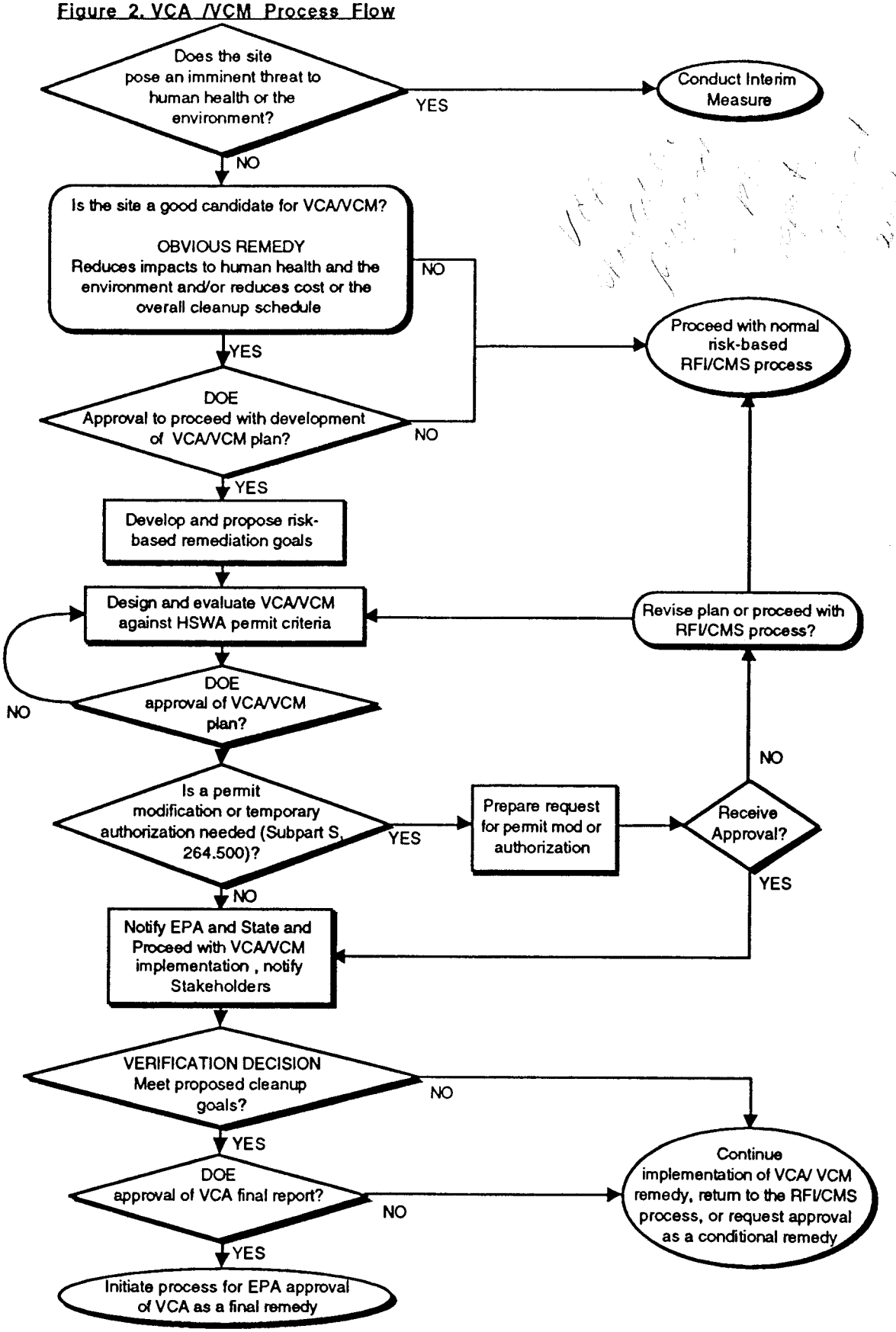


Table 1
Risk Assessment for Los Alamos National Laboratory
Suggested Values for Scenario Parameters

Parameter	Unit	Long-Term Worker[a]	Construction Worker[b]	Youth Recreational User[c]	Resident[d]	Future Camper[e]
General Exposure Parameters						
Total Exposure Time (ET)	h/d	8	8	2	20	24
Exposure Time Outdoors (ET_o)	h/d	0-8	8	2	2	24
Exposure Frequency (EF)	d/yr	250	90	170	350	28
Exposure Duration[f] (ED)	yr	25	1	9	30	20
Area of Exposure Unit[g] (A_{EU})	m^2	500	Area of Contamination	2000	500	2000
Body weight[h] (BW)	kg	70	70	50	70 Adult 15 Child	70 Adult 15 Child
Indoor Shielding Factor for External Gamma (SF)	%	70	NA[i]	NA	70	NA
Pathway-Specific Exposure Parameters						
Inhalation Pathway						
Inhalation Rate[j] (IR_a)	m^3/h	0.83 Indoors 1.7 Outdoors	1.7	3.2	0.83 Indoors 1.7 Outdoors	1.3
Particulate Concentration in air[k] (PC)	mg/m^3	0.09	15	PRS-specific	0.09	0.09
Amount of outdoor dust present indoors[l]	%	40	NA	NA	40	NA
Ingestion Pathways						
Soil Ingestion Rate[m] (IR_s)	mg/d	50 or 100	480	100	100-Adult 200-Child	100 Adult 200 Child
Groundwater ingestion rate[n] (IR_{gw})	L/d	NA	NA	NA	2	2
Surface water ingestion rate[n] (IR_{sw})	L/d	NA	NA	0.05	0.05	0.05
Exposure Frequency for surface water ingestion[o] (EF_{sw})	d/yr	NA	NA	40	40	28
Produce or berry ingestion rate[p] (IR_p)	g/d	NA	NA	NA	340	140
Fraction ingested produce grown on contaminated area[p] (F_{HG})	%	NA	NA	NA	30	100
Soil Dermal Contact Pathway						
Exposure Frequency - soil dermal contact[q] (EF_d)	events/yr	NA	90	170	170	28
Skin Surface Area Available for Soil Contact[r] (SA_s)	cm^2/event	NA	3200 (arms & hands)	5000	5000	5000
Soil-to-Skin Adherence Factor[r] (ADF)	mg/cm^2	NA	1	1	1	1
Groundwater Dermal Contact Pathway						
Dermal Contact Exposure Time for Groundwater (ET_{gw})	hr/event	NA	NA	NA	0.25	NA
Skin Surface Area Available for Groundwater Contact[r] (SA_{gw})	cm^2/event	NA	NA	NA	20000	NA
Surface Water Dermal Contact Pathway						
Dermal Contact Exposure Time for Surface Water (ET_{sw})	hr/event	NA	NA	1	1	1
Exposure Frequency for Surface Water Dermal Contact[o] (EF_{sw})	d/yr	NA	NA	40	40	28
Skin Surface Area Available for Surface Water Contact[r] (SA_{sw})	cm^2/event	NA	NA	5000	5000	5000

Table 1 Risk Assessment for Los Alamos National Laboratory
Values Assumed for Scenario Parameters (Cont.)

a Current and future long-term workers; usually will assume 4 hrs working outdoors per day (represents reasonable maximum exposure). Primarily for mesa top areas, but may be used for canyon bottoms as appropriate.

b Construction worker; for evaluation of exposure to areas of surface and subsurface contamination as appropriate. Evaluation limited to contaminants in soils at depths of 12 ft or less.

c Youth recreational user of canyon sides and bottoms. Receptor is a youth age 10 to 18 using canyon sides and bottoms for hiking or biking. This is the only land use scenario applicable for areas of contamination on canyon sides. Although unlikely as a current use scenario because of institutional controls on Laboratory property, it is possible that limited trespassing occurs.

d Current or future resident is a resident of extra-Laboratory areas (may include some canyon bottom areas in the future). This scenario does not apply to Laboratory property, for which future land use will be controlled by DOE.

e Future camper on Laboratory mesa top or canyon bottom areas assuming the site is released for recreational use (e.g., released to National Park Service or Bandelier National Monument).

f Exposure duration for occupational and residential scenarios (i.e., 25 and 30 years) recommended by the EPA (1991). For youth recreational user, 9 years is the age-range duration and is also the median time at one residence (EPA 1989b). Construction worker exposure duration is chosen based on assumption that projects will be of limited scope. Future recreational users assumed to use site as long-term vacation area.

g Area of residential exposure unit based on EPA guidance (EPA 1989b). Other areas based on assumptions on likely scenario-specific activity patterns.

h Body weights: 70 kg for adult scenarios (EPA 1991); 50 kg for youth scenarios (12 to <15 years old (EPA 1989a); and 15 kg for child 1-6 years old (EPA 1991).

i Not applicable.

j Inhalation Rates: standard default value of 0.83 m^3/hr used for indoor residential and indoor long-term worker exposures (EPA1991). Inhalation rates accounting for resting, light, moderate, and heavy activity (EPA 1989a) calculated for other scenarios as follows:

Long-term or Construction Worker, Resident - Outdoor inhalation rate of 1.7 m^3/hr equal to 0.5 exposure time at light activity + 0.5 exposure time at moderate activity, adult male inhalation rate.

Youth Recreational User - inhalation rate of 3.2 m^3/hr equal to entire exposure time at moderate activity, inhalation rate for 10 year olds.

Future Camper - inhalation rate of 1.3 m^3/hr equal to 8 hr/d resting, 12 hr/d light activity, 2 hr/d moderate activity and 2 hr/d heavy activity, adult male inhalation rate.

Definitions: resting-reading, sleeping, watching television; light activity-domestic work, personal care, conducting minor indoor repairs & home improvements; moderate activity-heavy indoor cleanup, major indoor repairs, climbing stairs; heavy activity-vigorous physical exercise, climbing stairs carrying a load (EPA 1989a).

k Reference for 0.09 mg/m^3 particulate concentration in air is from LANL 1989. Value of 15 mg/m^3 considered maximum for construction worker scenarios (U.S. Department of Labor 1991).

l Based on value given in Alzona et al., 1979. Only applies for inhalation pathways, and soil ingestion pathway where entire exposure occurs indoors.

m Standard default soil ingestion rates recommended by EPA (1991). For the resident and future camper scenarios, the soil ingestion pathway assumes an ingestion rate of 200 mg/d and body weight of 15 kg for 6 years exposure as a child, and an ingestion rate of 100 mg/d and body weight of 70 kg for 24 years and 14 years, respectively, for exposure as an adult. Long-term worker rates of 50 or 100 mg/d are rates recommended for commercial/industrial scenarios by EPA (1991). Rate of 480 mg/d for the future construction worker based on EPA guidance (1991), to account for substantial soil contact and potential ingestion of inhaled material that is not retained in the lungs.

n For groundwater, standard default water ingestion rate recommended in EPA 1991. For surface water ingestion, 0.05 L/day based on EPA recommended ingestion level of 50 ml/hr for the 1 hr exposure time (EPA 1989b).

o Exposure frequency for surface water ingestion and dermal exposure equal to total exposure frequency (28 d/yr) for the future camper; equal to 40 d/yr for the youth recreational user and future residents (based on best professional judgement of likely wading frequency.

p Produce ingestion rate and fraction produce grown on or collected from the contaminated area - 340 g/day, 30% for residential scenario includes ingestion of vegetables and fruits; 140 g/day, 100% for future recreational user for fruits only (EPA 1991).

q Number of soil dermal contact events equal to exposure frequency, except for residential scenario. For residents, it is assumed that dermal contact occurs seasonally (e.g., during gardening), about 5 days/wk for 8 months/yrs.

r Skin surface area available for contact and soil-to-skin adherence factor assumptions as recommended in EPA 1992.

Table 1 Risk Assessment for Los Alamos National Laboratory
Values Assumed for Scenario Parameters (Cont.)

REFERENCES

Alzona et al.1979. Indoor-Outdoor Relationships for Airborne Particulate Matter of Outdoor Origin, Atmospheric Environment, 13:55-60.

EPA 1989a. Exposure Factors Handbook, EPA/600/8-89/043, Office of Health and Environmental Assessment, Washington, D.C., July 1989.

EPA 1989b. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A, Interim Final), EPA/540/1-89/001, prepared by Office of Emergency and Remedial Response, Washington, D.C., December 1989.

EPA 1991. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors," Interim Final, OSWER Directive 9285.6-03, Office of Emergency and Remedial Response, Washington, D.C., March 25, 1991.

EPA 1992. Dermal Exposure Assessment: Principles and Applications (Interim Report), EPA/600/8-91/011B, Office of Research and Development, Washington, D.C., January 1992.

LANL 1989. Environmental Surveillance at Los Alamos During 1989. Los Alamos National Laboratory Report # LA-12000-ENV, Los Alamos, New Mexico.

U.S. Department of Labor 1991. Air Contaminants, (29 CFR 1910.1000), Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C.

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