STATE COMMENTS ON OFFPOST
OPERABLE UNIT ENDANGERMENT ASSESSMENT/FEASIBILITY
STUDY, REVISED DRAFT FINAL REPORT
DECEMBER 13, 1991

FEASIBILITY STUDY

GENERAL COMMENTS

1. Land Use

a. The preamble to the NCP specifically states that "[w]hen considering land use, the baseline risk assessment should consider both actual risks due to current conditions and potential risks assuming no remedial actions" (55 Fed. Reg. 8710). The preamble goes on to state that the assessment, in addition to considering residential, commercial/industrial, recreational, agricultural and ecological use of the land, will look

> at a future land use that is both reasonable, from land use development patterns, and may be associated with the highest (and most significant) risk, in order to be protective. These considerations will lead to the assumption of residential use as the future land use in many cases. Residential land use assumptions generally result in the most conservative exposure stimates.

(Id.; emphasis supplied.) This prescription has not been followed in this report. Instead, the Army's approach is to use subjective judgments regarding the likelihood of various development scenarios, and representations of co-defendant Shell to presuppose the cleanup standard required. The determination of acceptable risk by this approach is dependent on land use assumptions which ignore reasonable and plausible uses for the Offpost OU, such as unrestricted residential and agricultural scenarios. The failure to address certain land uses results in a corresponding failure to address associated pathways, durations and frequencies of exposure. The flawed Exposure Assessment results in high PRGs, which are then used to justify the selection of a no additional action alternative.

In its evaluation, the Army is basing its cleanup requirements in large part on present and forecasted land use. While this is consistent with the intention of CERCLA and the NCP, the Army's method of determining the present and future land use with

respect to the Shell parcel to presuppose its cleanup standard in this area is not. The Army cannot base its remedial selection analysis on land use assumptions derived from the intentions of one of the polluters. But for the acquisition of the property by Shell, the present land use in sections 13 and 14 would be rural residential. It defies common sense to allow a lead agency to select a preferred alternative based on the acquisition by a liable party of a contaminated area and its mere assurance to use the area in such a manner as to minimize potential exposures and thus limit cleanup. Taken to the extreme, any liable party could construct a fence and declare its intention never to use the land for any purpose. Such a practice defies the plain directive of Section 121(b) of CERCLA which requires that "[r]emedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants are to be preferred." (42 U.S.C. § 9621.) The Army's failure to select a remedy protective of rural residential exposures in zones 3 and 4 is therefore in clear violation of CERCLA and the NCP.

b. The Army's forecasted land use in zones 3 and 4 ignores the possible future acquisition by a private party of the property Shell now owns. There is no indication that institutional controls will be used or are even contemplated as part of the selected alternative for this property (indicated by the cross-hatched area on Figure 2.4.4.5-2 in Volume V "Property Purchased by Shell Oil Company Within the Offpost Operable Unit" and roughly consisting of the areas of the southwest corner of section 13 and the southeast corner of section 14). There is also no indication that the Army has given any consideration to the possibility that future land use will revert back to residential/agricultural use. In the absence of institutional controls which would preclude potential residents from living on these parcels and using the contaminated groundwater as a drinking supply or irrigation source, the preferred alternative is not protective of human health.

c. The use of institutional controls as a remediation measure, however could only be employed as a supplement, and not in lieu of, active response measures to ensure continued effectiveness of the response over time (55 Fed. Reg. 8706). The preamble to the NCP specifically states that institutional controls should not "substitute for active response measures as the sole remedy unless active response measures are not practicable as determined based on the balancing of the trade-offs of alternatives that is conducted during the selection of the remedies." Id. There has been no determination in this case that active response measures are not practical; therefore, reliance on institutional controls

would not be legal.

2. Point of Departure

The Army's selected preliminary remediation goals (PRGs) reflect an acceptable cancer risk exposure level for rural residential use at 1 X 10-4. For commercial/industrial use it has selected a risk level of 1 X 10-6.

The NCP specifically states that remediation goals

> shall establish acceptable exposure levels that are protective of human health and the environment and shall be developed by considering the following:
>
> ....
>
> (2) For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10-4 and 10-6 using information on the relationship between dose and response. The 10-6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure; ... (40 C.F.R. 300 430(e)(2)(i)(A)(2), 55 Fed. Reg. 8848; (emphasis added)).

Since soils ARARs were not identified by the Army, it should have developed alternatives to achieve a 10-6 goal for the soils medium.

Guidance for the use of a 10-6 point of departure can be found in the NCP preamble discussion:

> Where the aggregate risk of contaminants based on existing ARARs exceeds 10-4 or where remediation goals are not determined by ARARs, EPA uses 10-6 as a point of departure for establishing preliminary remediation goals. This means that a cumulative risk level of 10-6 is used as the

> starting point (or initial "protectiveness goal") for determining the most appropriate risk level that alternatives should be designed to attain. The use of 10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range ... [I]t is important to have an initial value to which adjustments can be made, particularly when the risk range covers two orders of magnitude .... EPA intends that there be a preference for setting remediation goals at the more protective end of the range, other things being equal. (55 Fed. Reg. 8718; (emphasis added)).

The Army has inappropriately relied on an ambiguous EPA guidance document for its selection of a 10-4 residential risk level rather than the current NCP and its preamble; this is not in accordance with the law.

Ground Water

3. No Action Alternative

One of the minimum requirements in the EA/FS remedy selection process is the evaluation of a "no-action" alternative. The Army has incorrectly interpreted this to mean that a worst case scenario must be developed in such a manner that when compared to an alternative which provides for the maintenance of status quo remedial measures, the status quo will appear to be more favorable and thus selected as the preferred alternative. The Army's "no-action" alternative described is not a no-action alternative. It provides for the discontinuation of current onpost remediation measures (the North and Northwest Boundary Containment systems) and Offpost interim response action IRA-A. This is an action in and of itself and allows the Army to select a no-action alternative for the entire Offpost OU without designating it as such.

"No action," as defined by NEPA and incorporated by reference in CERCLA, means maintenance of the status quo. 40 C.F.R. § 300.430(e)(3)(i)(6) states that among the alternatives the lead agency must develop is "[t]he no-action alternative, which may be no further action if some removal or remedial action has already occurred at the site." (Emphasis supplied.) This alternative is not, as the Army would suggest, a shutdown of pre-existing remedial measures. The Council on Environmental Quality (CEQ) has provided specific guidance as to the interpretation of "no

action." In discussing Section 1502.14(d) of NEPA (which requires the inclusion of a no-action alternative in an EA/EIS analysis) the CEQ specifically addressed the situation where on-going remediation programs initiated under existing legislation and regulations will continue, even as new alternatives are developed:

> In these cases, "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. 46 Fed. Reg. 18026, 27.

Where, as here, the Army in its FS selection has constructed an alternative based on no management at all of existing remediation measures and in turn evaluates this alternative as its "no action" alternative in the final remediation selection, it has engaged in a useless exercise in direct contravention of the law. Such an alternative selection is patently unreasonable and should be eliminated from the FS alternative selection process altogether.

4. Groundwater

a. The timeframe for achieving ARARs must be included as a consideration in the development of groundwater PRGs for the Offpost FS (Section 2.4). For example, in the case of the selected remedy for the northern paleochannel, a groundwater-intercept system will be placed directly adjacent to and on the upgradient side of the O'Brian Canal to prevent further migration of contaminants into the canal. Under "natural" gradient conditions, groundwater will flow from the NBCS to the intercept wells, and the aquifer in-between will eventually flush itself to achieve ARARs. The numerical model used to evaluate this scenario (Appendix E, N-4) predicts a timeframe of 15 to 30 years. However, it is mentioned throughout the report that the model cannot accurately predict contaminant distributions; and, without specifically stating so, the numerical model is not able to accurately predict timeframes for achieving ARARs. Furthermore, its degree of uncertainty has not been quantified. The actual timeframe in which this remedy will achieve ARARs is unknown but could range from tens of years to over 100 years.

Because the PRGs do not specifically include a time element, there is little incentive to select the remedy most

capable of achieving ARARs in the shortest period of time. A more aggressive remedial alternative should be developed and selected.

b. An inappropriate value was used as a retardation factor for dieldrin in the groundwater model. The Army opted to use a calculated value which does not reflect the sum of information available. The calculated values for dieldrin are suspect, as discussed in comments regarding the groundwater model.

A study conducted at Shell Oil Company's Westhollow Research Center by Deeley et al. indicates that retardation factors for dieldrin in RMA Onpost alluvium samples from the water table aquifer, as determined in laboratory absorption tests, are larger than those calculated by the Army. Additionally, another study on remediation of aquifer material at the RMA conducted by Shell indicates that the retardation factor of dieldrin as determined by desorption tests is larger than those determined by adsorption tests. This indicates that any retardation factor determined by adsorption will not accurately predict the remediation time required for removal of dieldrin from the aquifer.

Another source of information on dieldrin retardation is the boundary systems. Because downgradient analytical data and records of operation for the boundary systems are available to the Army, estimates of dieldrin retardation could be made using this information. These estimates would be based on desorption of dieldrin.

A realistic estimate of the retardation factor is essential to the transport modeling process. To select an alternative for the North and the Northwest plume groups, the Army must be able to determine how long each alternative will require for remediation. In this way, the selection of an alternative could be based on its ability to remediate the Offpost OU groundwater within a reasonable timeframe.

c. The Offpost FS has been completed without the benefit of any treatability studies. CERCLA, the NCP, and FS guidance suggest the use of treatability studies where literature or other information is inadequate to evaluate the potential of a process option or technology. The State, in a letter to Mr. Blose dated 10/10/91, requested a treatability study to determine the Kd for dieldrin in the Offpost water table aquifer. This request has been ignored

by the Army. The information which would be obtained from this study would be very useful in estimating the effectiveness of and ultimately selecting the best groundwater remedial alternative. The State again urges the Army to undertake such a study to support selection of its groundwater remedy.

d. A State standard of 6 ppb for chloroform in groundwater is being exceeded in the NWBCS treatment plant effluent. In the detailed analysis of alternatives for the Northwest plume group, the Army has used 13.8 ppb as the chloroform concentration in the effluent. This is the average NWBCS effluent concentration from 1986 to 1990. The NWBCS treatment system must be upgraded to include treatment of chloroform to the State standard of 6 ppb. This standard must also be considered for all future expansions including IRA A and any additional remedial systems identified in the Decision Document.

The State standard for chloroform is also not being considered in the groundwater modeling described in Section 5 of this document. The Army has compared maximum concentration with time to evaluate groundwater model results for different alternatives. For alternatives considered for the Northwest Plume group, model results show maximum chloroform concentration dropping to only about 13 ppb.

Additionally, for the Northern Plume group model, the Army has assumed that the concentrations of COCs in the effluent of all treatment systems is equal to the average measured effluent concentrations from the NWBCS. Since chloroform is not present in the NBCS influent or effluent, the Army has modeled the IRA A treatment system effluent at one-half of its CRL. However, since chloroform has been detected in the Northern Plume group at concentrations up to 200 ppb, and the treatment system is not designed to remove chloroform; therefore, this is an incorrect assumption which has made model results for the Northern Plume group useless. The model must be rerun after removing the assumption discussed above. In addition, the extraction and treatment system for the Northern Plume must be designed to capture all groundwater exceeding 6 ppb and treat the influent to levels below that ARAR.

e. The preferred alternative selected for the Northern Plume Group ignores the current and forecasted residential land use in an area that will contain untreated, contaminated groundwater in excess of MCLs, and is therefore not

protective of human health and the environment. The preferred alternative for the North Plume Group (N-4, IRA A) consists of a system designed to intercept and treat groundwater just before it intersects the O'Brian Canal. Apparently, since there is no axial remediation measure contemplated, the Army is implicitly relying on natural attenuation as a treatment method for the area between the intercept system and the North Boundary Containment System (NBCS).

A significant portion of this area, approximately 75% of section 13, is currently zoned for residential/agricultural use (Adams County "A3" irrigated farming) and, according to the Army's forecasted land use map, is forecasted for residential use. (See Figures 2.4.4.5-3 "Offpost Operable Unit Current Land Use Map, 1991"; 2.4.4.5-1 "Offpost Operable Unit Future Land Use.") "EPA's policy is to attain ARARs ... so as to ensure protection at all points of potential exposure." 53 Fed. Reg. 51440. This policy is explicitly adopted in the preamble to the NCP. 55 Fed. Reg. 8753. Since contamination exceeding health-based levels will remain untreated in this area, this alternative is not protective of human health and is therefore not in accordance with CERCLA.

This alternative is also not in accordance with the NCP. The preamble to the NCP discusses at length the groundwater policy for determining the appropriate remediation for contaminated groundwater at CERCLA sites. The preference is for "rapid restoration when practicable, of Class I ground waters and contaminated ground waters that are currently, or likely in the near term to be, the source of a drinking water supply." (55 Fed. Reg. 8732; emphasis supplied.) This policy generally reflects the CERCLA intent to decide the level and timing of remediation that is most appropriate for contaminated groundwater. Where, as here, the groundwater is both a current and future source of drirking water "the most rapid remediation will be employed." Id. at 8733.

The preamble also discusses when natural attenuation is to be the preferred alternative. The NCP recommends natural attenuation "only when active restoration is not practicable, cost-effective or warranted because of site-specific conditions." Id. at 8734. This means that unless natural attenuation can achieve remediation of the groundwater in a timeframe comparable to that which could be achieved through active restoration, active restoration is the pre-

ferred alternative.

The Army's reliance on a transverse extraction system near the leading edge of the groundwater contamination plume exceeding ARARs also violates EPA's point of compliance policy which is found at 55 Fed. Reg. 8753 and states " ... that remediation levels should be attained throughout the contaminated plume, or at and beyond the edge of the waste management area, when the waste is left in place."

The State has previously directed the Army's attention to this matter. Please review the letter from J. Edson to the Army and C. Mears, dated March 12, 1991, Comment number 4; and State Comments Regarding Results of Pilot-Scale Hydraulic and Treatment Testing North of the RMA Interim Response Action A Draft Final Report, June 1990, General Comment 6(e). The FS must be revised to evaluate the construction of additional extraction wells along the axis of the northern plume.

5. Cost Analysis

The Army has inappropriately used cost considerations to eliminate remedial alternatives in the final selection process. In the FS the Army relies on time estimates which are based on modeling that contains the caveat "due to the approximate nature of the models and the considerable uncertainty ... none of the modeling results should be construed as accurate predictions of the future ... rather [they] should be viewed as tools for assessing the relative merits of remedial actions." (See Vol. I, p. ES-12 and Vol. VI, p. VI-5-6, 1st paragraph.)

Alternative N-5, which would improve on the Interim Response Action for the Northern Plume and shorten the estimated timeframe for remediation, is eliminated due to the higher short-term capital cost that would be incurred. This is despite the fact that the total overall costs (present value adjusted) are nearly identical (the lower level estimate is actually lower for the eliminated alternative).

Alternative NW-5 (which would provide substantial improvements to the existing Northwest Boundary Containment System) is eliminated based on the conclusion that the increase in cost is too disproportional to the estimated timeframe of remediation (3-8 years), which is essentially the same for the two alternatives.

The Army cannot use their time estimates both ways. They cannot conclude that on the one hand, time estimates are so uncertain

that decisions will be based solely on short-term cost estimates, then rely on those same time estimates to claim that additional costs are disproportionate to the benefit received.

In discussing the role of cost-effectiveness in the selection process, the preamble to the NCP states that "cost is considered in making two statutory determinations required for selected remedies: that the remedy is cost-effective (i.e. the remedy provides effectiveness proportional to its cost) and that it utilizes permanent solutions and treatment to the maximum extent practicable." (55 Fed. Reg. 8726.) Further, overall effectiveness, as used in a cost-effectiveness determination is

> a composite of long-term effectiveness and permanence; reduction in toxicity, mobility or volume of the hazardous substances through treatment; and short-term effectiveness. The relationship between overall effectiveness and cost is examined across all the alternatives to identify which options afford effectiveness proportional to their cost. (55 Fed. Reg. 8728.)

Without reasonable time estimates, the Army cannot evaluate the short or long-term effectiveness of its selected alternative. By ignoring the overall effectiveness of the alternatives and instead using time estimates which, by its own admission can only be used in a relative manner, the Army has impermissibly selected a remedy based on cost while ignoring other important selection criteria mandated by § 300.430(f) of the NCP. The resulting preferred alternative is thus not selected in accordance with the law.

6. No Migration Off of RMA in Excess of PRGs

Repeatedly over the past several years the State has expressed its view that any offpost selected remedy must include upgrades of the onpost boundary systems to meet cleanup requirements of CERCLA and the NCP. At the special RMA committee meeting held September 2, 1991, the Army agreed that it would not wait until finalization of the Onpost ROD to construct necessary improvements to the treatment systems. The Offpost FS, however, does not reflect this agreement; nor does it state how or when the boundary systems will be upgraded to reliably meet PRGs. Please modify the document to include a discussion of this important issue.

The same concern exists regarding the Army's reliance on modifi-

cations of the sanitary sewer system to address current contamination in First Creek. Again, the State requests that any planned response action intended to address offpost contamination be fully explained and committed to in the offpost remedy selection documents.

7. Surface Water

The FS for the surface water medium was not completed. The Army's justification for its no action alternative contains two assumptions. The first assumption is that PRGs for surface water will be met at the boundary of RMA. The second assumption is that remediation of the Offpost groundwater will effectively remediate the surface water in First Creek because the contamination present in First Creek in the Offpost is due to discharge of contaminated groundwater into First Creek. The validity of these two assumptions have not been adequately proven by the Army. Yet an alternative has been selected without evaluating potential remedies in accordance with criteria set forth in CERCLA and the NCP. The FS document must be revised to evaluate remediation of Offpost surface water.

SPECIFIC COMMENTS

1. Page V-2-3, last paragraph. The relationship between the First Creek surface water organic contamination and groundwater contamination has been discussed, but not proven. Without specific evidence proving the link between First Creek and the groundwater, surface water contamination must be evaluated in the FS. This statement is one of many throughout the text referring to this linkage.

2. Page V-2-4, first paragraph, fourth and fifth sentence. The Army should explain the transport mechanism mentioned here or reference where the transport mechanism is discussed in the Remedial Investigation. Results from the State's Arapahoe Well Sampling Program indicate that Arapahoe Fm contamination is more pervasive than believed by the Army. The Arapahoe Fm must, therefore, be considered in the FS.

3. Page V-2-5, First Sentence of the Third Paragraph. This sentence states that First Creek is "primarily a gaining stream as it passes through the Offpost OU." The Army goes on to document this by listing many supporting RMA documents. However, on page VII-E-23 in Appendix E of this document, it is stated that:

it is not clear on the basis of previous

> studies whether this reach of First Creek [referring to First Creek in the Offpost operable unit] loses water to the UAFS or gains in flow from groundwater discharge during a typical year. Estimates of average stream losses for this reach of First Creek range from 0.43 cfs (HLA and Ebasco, 1990) to 0.15 cfs (Carr, 1987).

The inconsistency between these two statements indicates extreme uncertainty in the understanding of the hydrologic interconnection between First Creek and the groundwater. Without persuasive documentation that groundwater discharges to First Creek surface water, remediation must be evaluated in the FS.

4. Page V-2-5, Last Sentence on the Page. In this sentence the Army discusses a "potential source of arsenic in First Creek surface water." All sources of arsenic must be addressed by the Army in the FS.

5. Page V-2-6, Fourth Sentence of the Last Paragraph. This sentence indicates that contaminant concentrations in the sediment were statistically compared with background concentrations. The methodology, data and results of this comparison must be referenced or provided.

6. Page V-2-13, Third Sentence of Section 2.4. In this sentence the Army has listed sources of PRGs which include Certified Reporting Limit (CRLs). Under the NCP, a CRL is not an allowable PRG if an MCL exists for the contaminant in question. The State, in its comments on the Draft Final Workplan, Offpost Operable Unit Remedial Investigation dated January 26, 1990, alerted the Army to the fact that its CRLs exceed health-based limits and need to be lowered. We have received no evidence that attempts to lower CRLs have been made.

7. Page V-2-13, Third Sentence of Section 2.4. This list also includes the use of background concentrations as PRGs. For consideration as PRGs, background concentrations must be calculated and statistically evaluated as suggested in EPA guidance. The text must include the qualifying criteria for background concentrations of COCs. The text should also include methodology, data, and explanation of results such that all results can be reproduced from the included data.

8. Page V-2-14, Last Paragraph. The Army has stated that additional OCP data for soils has been evaluated and zone 4 has been redefined as a result. The criteria used to delineate these

zones and how the new data changed the zoning should be explained in the document.

9. Page V-2-19, Last Two Paragraphs. In these two paragraphs the Army states that the Health-Based Criteria (HBC) developed in the EA were multiplied by three before they were used in the FS. This factor is inappropriate. Literature references or EPA guidance supporting past usage of this factoring are requested. If this documentation is not provided, the State requests the multiplier be removed. See HHEA General Comment 2.

10. Page V-2-20, Second Paragraph. According to Army representations made at the June 10, 1991 EA subcommittee meeting, background concentrations were only to be used for identification of COCs. The Army's "background concentrations" cannot be adopted as PRGs.

11. Page V-2-22, Last Paragraph. In this paragraph the Army describes how background concentrations were determined. The Army must also include information used in the determination of these background concentrations, including arithmetic means, standard deviations, as well as all raw data used in the calculations. A reference to where this information is contained will be adequate. The State must be able to reproduce these numbers using the appropriate statistical tests.

12. Page V-2-23, Second Paragraph. In this paragraph the Army has stated that the PRGs for the rural residential scenario for soil contamination reflects a 10-4 risk for carcinogens. These PRGs must be changed to be protective at a 10-6 risk level as required by the NCP. See FS General Comment 2.

13. Page V-2-23, Second Paragraph. It is stated by the Army that a commercial/industrial land use scenario was used for zones 3 and 4. The present land use for these zones, as indicated by present zoning, is agricultural. The rural/residential land use scenario therefore must be used for zones 3 and 4. Intentions or desires of responsible parties cannot be relied upon in establishing reasonable potential uses as required by the NCP.

14. Page V-2-23 (and referenced Volume I, p. I-8): The need for remedial action in Offpost OU Zones 3 and 4 are evaluated in the FS solely on the basis of a future hypothetical land use scenario (i.e., commercial/industrial) with no regard to current zoning status. While EPA guidance (i.e., RAGS pp. 6-7) indicates that information sources such as city and county master plans (e.g., the Denver Airport Environs Plan, Adams County, 1990) are useful sources of information from which to evaluate future

potential land use, EPA guidance also states clearly that such information "... should not be interpreted as proving proof that a certain land use will or will not occur" (RAGS pp. 6-7). Given that fact that Offpost OU Zones 3 and 4 are currently zoned as agricultural, and the fact that future changes in the current zoning status of these areas are not guaranteed, the FS must evaluate remedial action needs in accordance with current zoning within zones 3 and 4.

15. Page V-2-26, Second Paragraph of Section 2.5.2. The first sentence of this paragraph is incorrect. Data obtained from Figure 6.1 of the Offpost RI addendum indicate that there is one detection of dieldrin exceeding the PRG in zone 1, and several widespread detections in 11 out of 24 samples in zones 3 and 4. See Attachment 1 attached. This statement must be deleted and the FS revised to address this contaminated medium.

16. Page V-2-26, Second Paragraph of Section 2.5.2. The Army indicates a comparison of soils PRGs to concentrations of COCs in the soils medium was made. This comparison must be fully documented. Any data analysis, such as concentration contouring, which was used must be included and explained.

17. Page V-2-27, Fourth Paragraph. The Army has stated that PRGs for surface water in First Creek will be met at the RMA boundary. This is an undocumented assumption. The RMA database indicates that First Creek surface water samples taken at sample location SW 24-001 at Sewage Treatment Plant (STP) outfall, contained numerous exceedences of the dieldrin surface water PRG. Furthermore, Figure 2.5.3-1 indicates that the dieldrin and arsenic PRGs are currently exceeded at the northern boundary. In addition, on page 4-2 of the Final Water Remedial Investigation report, Volume III, dated June 1989, the Army states:

> Surface water quality analytical results frequently display a high degree of variability as a result of changing surface water conditions. For example, within the RMA boundaries, First Creek exhibits chemical concentrations that are substantially higher during storm flows.
>
> Sampling of First Creek has not been sufficiently frequent to accurately characterize contaminations that may be leaving the Arsenal. The Offpost ROD must not rely on unproven assumptions. If the protectiveness of the offpost selected alternative

depends upon remedial actions being taken onpost, those actions must be addressed in the Offpost Record of Decision (ROD).

18. Page V-2-48, Third Paragraph. In this paragraph the Army explains the elimination of resin adsorption from groundwater treatment process options. Its major premise is the "limited demonstration in treatment of hazardous waste sites." This is a specific example of where a treatability study should have been performed.

19. Table 2.4.3.3.1. A column should be included in this table showing residual risk for each COC after treatment to the PRG listed. This column should then be summed to yield the residual risk after remediation of the Offpost groundwater to PRGs. Total risk (including exposure to other contaminated media) must not exceed 10-6 or a Hazard Index (HI) of 1.

20. Table 2.4.4.5-1. In the first column of this table, according to footnote a, the Army has used a 10-4 risk for carcinogens for the rural/residential land-use scenario. These values must be changed to reflect a risk level of 10-6 as required by the NCP. See F.S. General Comment 2. Also, please compare the Endrin RME listed in the first column of this table with the value listed on the first column of Table 2.4.4.5-1. This is an inconsistency because this value was not adjusted for risk level as were the others.

21. Table 2.4.4.5-1. In the second column of this table, the Commercial/Industrial and Recreational land use scenario RME values for DDT/DDE and dieldrin in the soils medium have been incorrectly listed. The correct values, obtained from the Army's procedure, are listed on Table 2.4.4-1. The values for the risk level given in the footnote should be 2400 ug/kg for DDT/DDE and 46 ug/kg for dieldrin. The values must be corrected on the table.

22. Table 2.4.6.2-1. This table should include a column with ecological criteria for sediments.

23. Table 2.4.6.3-1. This table should include a column with ecological criteria.

24. Table 2.7.1-1. The process option, Alternative Water Supplies, should include additional explanation. Does the Army mean alternative drinking water supplies, or alternative supplies for all domestic water use? This explanation can be included in the comment section.

25. Figure 2.4.1-1. What does the dashed line between Zones 1a and 1c represent? Please include a complete explanation.

26. Figure 2.4.1-1. Why don't the contaminant distribution zones encompass the entire Offpost OU? What is being done to evaluate areas outside the contaminant distribution zones? Please include a complete evaluation of risks associated with receptors in those areas, as well as an evaluation of remedial alternatives.

27. Figure 2.4.4.5-2. The outlines of the contaminant distribution zones and the outline of the Offpost OU should be added to this figure.

28. Figure 2.4.4.5-3. This figure should show the zoning for the entire Offpost OU. Outlines of all the contaminant distribution zones should be added to this figure.

29. Page VI-3-3, Second Paragraph. The Army states that remediation of groundwater will attain PRGs for First Creek. However, First Creek is contaminated with OCPs in exceedence of PRGs as it enters the Offpost OU. Figure 2.5.3-1 shows apparent exceedences of the dieldrin and arsenic surface water PRGs at the northern RMA boundary. Additionally, the RMA database indicates exceedences of the dieldrin surface water PRG at sample location SW 24-001, which is in First Creek just upgradient of the northern boundary of the RMA. The Army must therefore explain how it will ensure PRGs will be met at the northern RMA boundary.

30. Page VI-3-4, Third Paragraph. The seventh sentence of this paragraph should be removed. This sentence implies that a plume must be of minimum areal extent before it can be evaluated. This sentence should be replaced with the sentence: "The data obtained for the RI was adequate to provide interpretations of plumes for only six of the fifteen carcinogenic COCs present in the Offpost OU."

31. Page VI-3-5, Last Paragraph. This paragraph states that the No Action Alternative was modeled to include operation of the NBCS and NWBCS. According to Table 3.5.1.7-1 and Table 3.5.2.5-1, no action alternatives N-1 and NW-1 do not include operation of the two boundary systems. The text must be changed to be consistent.

32. Page VI-3-6, Second Paragraph. In the statement of groundwater modeling purpose number 3, which reads "Evaluating the effectiveness of proposed systems to ensure a range of groundwater alternatives varying in the degree of treatment employed and

the timeframe required for remediation," the Army has utilized the model for purposes beyond those discussed in Offpost FS meetings with the parties. In those meetings, it was stated that the model would only be used for comparing alternatives. More importantly, the model as currently constructed cannot accurately predict the effectiveness of these alternatives. This purpose, therefore, should be removed from the text, and all references in the document to projected timeframes should be removed.

33. Page VI-3-10, Second Paragraph. This paragraph states that the evaluation of groundwater alternatives "assumes the boundary response action would comply with Offpost OU PRGs at the RMA boundary." Because the boundary systems are not part of the Offpost OU, the alternatives which rely on this assumption must include a proposed plan for ensuring this compliance. It is our understanding, based on the special RMA Committee Meeting held September 2, 1991, that any improvements to the boundary system will be conducted in accordance with the Offpost ROD or in an IRA prior to issuance of the Offpost ROD.

34. Page VI-3-15, Second Sentence of the Last Paragraph. This sentence states that "[F]irst Creek surface water COC concentrations would be reduced as groundwater COC concentrations are reduced." This is an undocumented assumption. The statement should be adequately documented/proven, or it should be removed. See General Comment 10.

35. Page VI-5-5, Third Paragraph. This paragraph discusses groundwater model results. The Army states "[t]ransport simulation results were compared on the basis of maximum concentration versus time plots." This is only one of many ways to compare results of a groundwater contaminant transport model. Comparison of model results should include comparing contaminant removal rates as well as predicted plume configurations. These additional comparisons should be included in Appendix E.

36. Page VI-5-28, First Paragraph Under Section 5.4.5.4.3. In the last sentence of this paragraph, forty months is given as the total implementation period for Alternative No. N-5; this is incorrect. This period was determined by adding 12 months to the implementation period of Alternative No. N-4, which is 20 months. The sum of these periods is 32 months, not 40 months. The text must be corrected.

37. Page VI-5-35, Second Paragraph. In the last two sentences of this paragraph, the Army describes the groundwater monitoring component of Alternative No. N-4. The groundwater monitoring component is also included in Alternative No. N-5, although it is

not discussed. The text should be changed to reflect this.

38. Page VI-6-1, last paragraph, second sentence.

> The detailed analysis of alternatives showed that for overall protectiveness, compliance with ARARs, effectiveness, and reduction of toxicity, mobility and volume, Alternative No. N-4 is ... equally effective as Alternative No. N 5.

This statement is incorrect. In Section 5.5, Alternative No. N-5 was superior to Alternative N-4 in overall protectiveness and compliance with ARARs, and the alternatives were equal in effectiveness and reduction of toxicity, mobility and volume. The statement quoted above must be changed to indicate that Alternative No. N-5 is superior to Alternative No. N-4.

39. Page VI-6-1, third paragraph, fifth sentence to the end of the paragraph. There is no basis presented to support the statement: "Given the uncertainty, a 20-year timeframe for remediation is essentially the same as a 30-year time for remediation." In Appendix E, the times frames are described as a basis for relative comparisons. Therefore, a 20-year cleanup is 33 percent faster than a 30-year cleanup. If the actual cleanup time is 60 or 90 years, a 33 percent reduction is significant. Regardless of all the uncertainties inherent in any numerical model, simple logic supports the notion that the remedy (N-5) which includes more intercept wells and recharge trenches than the less aggressive remedy (N-4) will have a higher rate of mass-removal and flushing of contaminants. Therefore, the State does not agree that N-4 is equivalent to N-5. Given that the estimated costs for N-4 and N-5 are equivalent, the more aggressive remedy should be chosen.

40. Page VI-6-2, First Complete Sentence In the last half of this sentence, the Army states "the larger capital outlay required for Alternative No. N-5 relative to Alternative No. N-4 is not warranted because of the questionable reduction in the time for remediation." There is no basis for this statement; it must therefore be removed. Furthermore, the NCP does not recognize the avoidance of initial capital outlay as a legitimate selection criterion. The elimination of N-5 on this basis is not acceptable.

41. Page VI-6-2, Second Complete Sentence This sentence should be changed to indicate performance monitoring is part of both Alternative Nos. N-5 and N-4.

42. Page VI-6-2, Third Complete Sentence The detailed analysis of alternatives indicates Alternative No. N-5 is the superior alternative, and should be selected. This sentence should be changed to reflect this.

APPENDIX E -- Groundwater Model

43. A table of contents for Appendix E would be very helpful to the reader.

44. The selection of the preferred site-wide alternative for groundwater cleanup is based on the use of a numerical flow and transport model. The model was used to simulate each remedial alternative considered and to evaluate its effectiveness. However, the transport model was not calibrated because of the complexity of the flow system and the uncertainty of the magnitude and sources of contaminants to the Offpost system. Therefore, the transport model is not able to predict with any certainty contaminant-plume movement in response to applied remedies, nor the timeframe for each remedy to achieve the PRGs. Moreover, no sensitivity analyses were performed to quantify the uncertainties regarding the model's ability to predict remedial effectiveness.

45. A sensitivity analysis is needed of the model's uncertainty in predicting the effectiveness of remedial alternatives with respect to predicted timeframes for meeting preliminary remedial goals (PRGs) over the full areal extent of the present-day plumes. As presently written, Appendix E provides no basis for any quantitative claims of uncertainty.

46. An important step in selecting a remedy is to evaluate the volumetric rate of contaminant-mass removed versus the volumetric rate of water pumped from the aquifer over the lifetime of the remedy. This is a part of the groundwater monitoring program which will evaluate the effectiveness of the enacted remedy with an eye to potential necessary improvements (Page VI-6-8, Section 6.2.2.3). Results of the model are not presented in such a format with respect to the full extent of the plume and therefore raise doubts over whether the best remedies were considered. For example, no remedies are presented which address the present-day high concentration areas of DIMP (vol. VII, Figure E12) nor dieldrin (vol. VII, Figure E16) along the north pathway of the north model.

47. The results of the modeling study as presented are not sufficient to support any choice of a remedial alternative. The

effect of each remedial alternative on contaminant concentrations is only presented temporarily at one point and not spatially over the entire plume. This does not allow for an independent review of whether the maximum-volumetric-rate of extraction of the contaminant mass was achieved or even considered. Moreover, by not presenting the results of each remedial alternative spatially, it is not clear whether or when the PRGs would be met over the entire extent of the plume.

48. The fact that the retardation factor is considerably higher than laboratory values from Onpost soil samples indicates a significant gap in the input data. This discrepancy is not properly explained and could mean that cleanup projections for some of the model scenarios are too optimistic. See General Comment 4.b.

49. The upper weathered zone of the Denver formation, which is part of the unconfined flow system and a source of contaminants to the Offpost groundwater plumes, is not considered in the model. Therefore, the effectiveness of any remedial alternative must be considered too optimistic.

50. The interaction of the upper sand units within the confined portion of the Denver Formation and the unconfined-flow system has not been adequately characterized and may also be a continuing source of contaminants to the unconfined-flow system Offpost. Therefore, the Denver Formation must be evaluated.

51. Page VII-E-1, third paragraph, last sentence. "Thus, a primary objective of the modeling effort was to produce transport model results in a form that adequately portrayed estimated cleanup times." This contradicts the first sentence in the first full paragraph on page VII-E-8:

> Because of uncertainty and nonuniqueness issues, and the fact that the models discussed herein are intended only to be approximate indicators of remedial scheme effectiveness, model results should not be construed as accurate predictions of contaminant transport.

Please modify or delete this objective.

52. Page VII-E-2, second paragraph, third indented item, first sentence. Please clarify the phrase "...where the Denver Formation exceeds water-table elevation...."

53. Page VII-E-3, SCOPE AND APPROACH, first paragraph, third

sentence. "Nonetheless, the resulting models are sufficiently detailed that simulated flow and chemical transport phenomena agree with historical and current hydrologic data and observed contaminant distributions." There is little basis for this statement because the transport model was not calibrated. Without a presentation of the model's ability to reproduce the historical development of the contaminant plumes, it is difficult to have confidence in the model's ability to predict contaminant migration as a result of each remedial alternative and the timeframes given for each remedy to achieve PRGs. This point is conceded several times throughout the document.

54. Page VII-E-3, SCOPE AND APPROACH, first paragraph, fourth sentence. This sentence also contradicts the sentence referenced above in Specific Comment 53. The main point made throughout Appendix E is that the model is not able to accurately predict contaminant distributions which result from each remedial alternative. What is not stated but is equally true is that the model is not able to accurately predict the timeframes required to reach the PRGs for each remedy.

55. Page VII-E-7, second full paragraph and pages VII-E-26 through VII-E-28, Retardation Factors. The retardation factors used for the modeling are based on historical plume movement and are at least a factor of 3 lower than the lowest laboratory values determined by Shell for onpost soil samples (Deeley and Wester, 1990). As mentioned on page E-26, the historical plume movement is apparently faster than predicted using the lab determined retardation factors. However, in many instances this fast plume movement is caused by large inhomogeneities which are neglected in the aquifer characterization. Such heterogeneities may not have any impact on the water levels, which are the main model calibration target, but significantly impact transport. For example, flow can be channelized in several high hydraulic conductivity streaks which may represent only a small fraction of the aquifer volume, but which may conduct a large fraction of the groundwater flux. To correct a model for this effect, the large-scale effective porosity should be reduced from the 30 percent used. The models reviewed could have an effective porosity as low as 10 percent which would allow the retardation factor to be a factor of 3 higher to obtain the same historical plume movement. This higher retardation factor would then be in agreement with the lab-derived retardation values. The higher retardation factor, however, would cause cleanup to take a much longer time which, in turn, would suggest that a more aggressive remedy is needed than the one chosen.

56. Page VII-E-8, first full paragraph. The uncertainty of the

modeled results needs to be quantified through a thorough sensitivity analysis which addresses the range of simulated results as a function of a reasonable range for the flow and transport model's input parameters. The sensitivity analysis should be performed for at least one of the contaminants simulated. Such an analysis is especially important given that the transport model was not calibrated.

57. Page VII-E-10, second paragraph. The weathered upper part of the Denver formation is part of the unconfined aquifer flow system (UAFS), but is neglected in the model. Contaminants have been detected in this zone (e.g. in wells 23053 and 23106; see "State's Report on DIMP Contamination in the Alluvial Aquifer and Denver Formation at the North Boundary" dated October 16, 1991). The fact that minimal data are available does not justify the omission of this zone; some hypothetical scenarios for contamination of the upper weathered part of the Denver below the existing plumes in the alluvium should be considered.

58. Page VII-E-10, last paragraph. Please present a figure which summarizes the boundary conditions applied to the flow model.

59. Page VII-E-13, last paragraph. The rate and location of the municipal supply well, close to the NW-model's western lateral boundary, should be given to support the judgment that the impact of this well is insignificant. An analysis should be presented which supports this assertion.

60. Page VII-E-16, first partial and full paragraphs. The upstream boundary of each model is a prescribed groundwater and contaminant flux representing the effluent of the NBCS and the NWBCS. This assumption implies that the conclusions regarding cleanup are only valid if these boundary systems are maintained perpetually and that the effluent concentrations are always equal to or below the current design specifications. Moreover, other sources of contaminants to the offpost alluvial-flow system, such as the weathered portion at the top of the Denver Formation, are not considered in the model. Both of these assumptions are problematic and unacceptable, as discussed elsewhere in these comments.

61. Page VII-E-29, first paragraph. Please present a figure which shows the calibrated zonation of hydraulic conductivity for the flow model.

62. Page VII-E-30. Because the transport model was not calibrated, little confidence can be placed on the model's ability to

predict the groundwater system's response to the simulated remedies. This places increased importance on the need for a sensitivity analysis which attempts to quantify the model's range of uncertainty with respect to predicted timeframes for achieving PRGs.

63. Page VII-E-31, third paragraph, and Figures E13, E15, E17 through E26, and E29 through E31. Remedial alternatives were evaluated using graphs of maximum contaminant concentration versus time. This procedure may be misleading in evaluating the differences between remedial scenarios. For example, because of groundwater stagnation, the maximum concentration within a plume can be very persistent at one location, given different remedial scenarios. The actual extent of the plume and the total mass removed, however, may vary considerably among the different scenarios evaluated and among each contaminant considered. The exposure risk during the cleanup is not solely related to the maximum concentration, but is related also to the extent of the area over which the concentrations exceed PRGs. Therefore, for all relevant scenarios, model results should be presented of the mass removed, the total mass remaining in the plume, and the spatial extent of the plume (all versus time).

64. Figures E4 through E7. Well locations used to develop these contour maps should be posted on the figures to show the control points.

65. Figures E12 and E14. These figures strongly suggest that the DIMP and chloroform contaminant plumes extend beneath the shaded areas indicating unsaturated alluvium, to the unconfined portions of the Denver Formation. Please clarify.

66. Figure E16 and E27. The State standard for dieldrin is .002 ug/l. This figure should be modified to show the extent of the plume to that level, and the PRG for dieldrin should be modified accordingly.