

Colorado Department of Health

Review and Comment

Remedy Report - Operable Unit 3, SWMU 199
Final Draft, October, 1990

=====

General Comments

1) It is stated many times within this document that existing data within IHSS 199 is not sufficient to perform a quantitative health risk assessment. However, there is no data presented to support this claim. Where are the holes in the data? Why was this data insufficiency not known when the IAG was being negotiated? If it had been known, these documents could have been given a different scope or cancelled altogether. The Division is concerned that, in this form, this document, including only a qualitative health risk assessment (along with the Historical Information and Preliminary Health Risk Assessment for OU 3), does not fulfill the IAG requirements. It is therefore requested that, at a minimum, a summary of the available data be presented and a tabulation of risks associated with various plutonium soil concentrations and exposures pathways be included in the document (this could be similar in form to the data presented in 10 CFR 20, Table II) (as per the EPA/DOE/EG&G meeting of 1/10 91, this could be satisfied by the 1 pCu/gm, 10 pCu/gm, and 100 pCu/gm risk evaluation). As the EPA has already indicated, DOE must begin quantifying the risks associated with plutonium inhalation and ingestion so that future remediation decisions, operations decisions, and public health decisions can be guided by these risk assessments.

2) From the description of these documents in the IAG, the following items must be addressed:

- 1) Assessment of public health risk before remediation
- 2) Assessment of public health risk during remediation
- 3) Assessment of public health risk after remediation
- 4) Effectiveness of remedy
- 5) Assessment of public health risk with "no action"
- 6) Exposure risk during remediation
- 7) Exposure risk after remediation

However, only items 4, 5 and 7 are were found in the text. Even if only a qualitative discussion can be done, all of these items must

be covered at some point in the document.

3) Many of the following comments ask for data and/or maps of data that either should have been included in this document or summarized in appendices. The title of this document is "Remedy Report," not "Remedy Overview," and it should completely explain what has been done so that any reader can follow both the actions taken and the underlying reasons for the actions taken at this portion of IHSS 199. (As per the meeting of 1/10/91, the Division understands that a series of appendices will be added that contain the past data.)

4) With the exception of sections 4.2 and 4.6, no distinction is made between soluble and insoluble plutonium. Was the soil sampling data that dictated which portions of IHSS 199 were remediated of sufficient quality to distinguish between the types of plutonium? Since the text states that the ARAR values for each of these plutonium types is different, will future sampling and remediation address both types? If so, both types need to be dealt with as separate entities within the scope of this document.

"Soluble" and "insoluble" are relative terms. All plutonium compounds are insoluble by certain definitions; only the relative degree of insolubility is different. In addition, the Division is concerned that the designation for Class Y and W plutonium is being used incorrectly in the text of this document. All references reviewed by the division do not refer to these classes as relating to solubility, but to biological elimination rates. This is a related, but not identical, use of the class distinction. Because of this, the discussion of the biological half-lives relating to solubility needs additional clarification. Different biological half-lives and residence times within the body will give rise to different risks. Hence, the risk assessment must take that into consideration.

5) The Colorado Department of Health, through the Rocky Flats Program Unit, is managing a toxicological review and dose reconstruction for the off-site areas around the Rocky Flats Plant. This study is part of the Agreement in Principle and is funded by DOE. Most of the work is being done by Chem-Risk, Inc., a contractor to CDH. For preparation of the final version of this document, please incorporate that study to the greatest extent possible. While still in it's infancy, this dose reconstruction will play a large part in the formulation of a health risk assessment, and cross-reference to that report within this document is a must.

6) In many places within this document, it is stated that plutonium is the only contaminant of concern. That is not the case. Just because plutonium is the only contaminant sampled and tested for in the past does not mean it is alone. Please make this clear in all portions of the document.

7) There is a general tone in this document that casts the Colorado Department of Health in a bad light. Our historical data for air, water, and soils is presented as worthless because it will not pass today's QA/QC standards. Our plutonium in-soil standard is given no respect, let alone being incorrectly referenced. Please make an effort to be objective and consistent in referring to the regulatory agencies in the future.

Specific Comments

Executive Summary: IHSS 199 is incorrectly defined in the text as "approximately 350 acres of land which were the subject of a 1975 lawsuit . . ." IHSS 199 is defined in the IAG as "contamination of the ground surface" and is not limited to those areas subject to the lawsuit.

Executive Summary, page ES-2: Even though the 903 pad has been covered and has been removed as a source for contamination, it is not accurate to say or imply that there is now no source for contamination within IHSS 199. New contamination to IHSS 199 can result from any new abnormal emissions from the plant as well as from the already contaminated area stretching from the old 903 pad and lip area eastward to Indiana Street.

Executive Summary, page ES-2: Plutonium may not be the only contaminant of concern in IHSS 199. The Division is not aware of any analysis for Americium or other non-radiological hazardous contaminants for this IHSS. Before a statement to this effect can be made, please validate it with supporting studies.

Executive Summary, page ES-3: Please clarify the statement "appears to be very low." This is a relative statement so a comparison to some other standard is necessary. The standard used in the lawsuit was the State In-Soil Standard.

Section 1.0, Introduction: The CDH Plutonium In-Soil Standard is a STANDARD, not a guideline. It is a codified regulation and has requirements if the value is exceeded. The standard should be referenced accordingly.

Section 1.0, Introduction: In the third paragraph, reference is made to IHSS 198 and that it does not require any action. Please give a description of IHSS 198 and explain why no action is necessary. This IHSS was deleted from the IAG and does not need to be addressed at all.

Section 1.2, Regulatory Background: The first paragraph of this section needs additional clarification. Moving the off-site areas up to OU 3 from OU 10 reflects the change in priority that, to a large degree, was mandated by public comment to the draft IAG.

Section 1.2, Regulatory Background: There is, at present, no EPA screening level, contrary to the text in the third paragraph of this section (please see EPA's recent document on transuranic guidance). Again, the CDH standard is not a special construction guideline. It is a standard which provides requirements during construction. There is a difference. The standard is referenced in the Court Order.

Section 1.2, Regulatory Background: At the conclusion of this section, at least two maps need to be added. The first should be similar to Figure 2-1, but include adjacent land ownership, zoning, and both future and present land-use plans as well as the tracts and portions thereof which are being remedied. These items all play a part in the formulation of the risk associated with the "no action" alternative and it would be helpful to have them on a map. The second map should cover a larger area and should indicate plutonium concentrations in the soil wherever (and whenever) it has been measured. This map should be contoured to show the extent of the known plutonium soil contamination plume, particularly the areas that exceed the CDH guideline of 2 dpm/gm or 0.9 pCu/gm (a map similar to the one requested can be found in the document under the Krey and Hardy, 1970 reference in the bibliography in Section 6.0). It is unlikely that the lands covered by the lawsuit will be the only portions of IHSS 199 to be remedied for soil contamination within OU 3. This "Remedy Report" on the efficacy of this particular remedy will help guide the choice of future restoration techniques and it would be helpful to know the extent and location of the problem areas.

Section 2.0: At several places within section 2.0, the fact that a large amount of cobbles have been brought to the surface by tilling is mentioned. The text states that in some areas, as much as 90% of the land surface is covered by these cobbles. While this may be an interesting physical characteristic of the land surface, it is unclear how or if this fact affected past remedy efforts and if it will change future remedy implementation. It is also unclear if the adjacent wheat fields have a similar problem. If they do have this problem, how has dust mitigation been addressed. If they do not have this problem, how did they avoid it? Also, the percentage of cobble sized constituents at the surface is hard to imagine given the 0-15% rock fragment volume described for each soil type given in section 2.1.2.1. Please add text to clear up these questions and apparent contradictions.

Section 2.1: The text states that public access to IHSS 199 is restricted. Please define "restricted" and address all portions of IHSS 199.

Section 2.1.1: The text states that one of the significant findings from past investigations is that the only compounds in IHSS 199 with soil concentrations above background are plutonium and americium. The Division is unaware that any previous studies

tested for other contaminants and could, therefore, remove them from a list of contaminants of concern. Please clarify this item and reference these studies.

Section 2.1.1: The information and data that is referred to in this section needs to be more adequately addressed and synthesized so that a better picture of existing contamination is generated. The reports cited neither constitute a definitive conceptual framework for the characterization of contaminants nor do they provide the strategies to be used to restore areas and control release of contaminants.

Section 2.1.1: The second bullet makes no reference to the fires at RFP that caused the release of significant amounts of radioactivity into the atmosphere. How much plutonium was released during these episodes and was it enough to impact the soil quality in SWMU 199?

Section 2.1.1: The Krey and Hardy reference used in the second bullet of this section used the old plant boundary when making an estimate of off-site contamination. The values from this report need to be adjusted for the current boundaries of the plant.

Section 2.1.1: Within the third bullet of this section, the text says that, in 1970, the soils "around" RFP contained 99% of the total ecosystem plutonium inventory. Please clarify "around." The addition of the map mentioned above would help address this problem.

Section 2.1.1: The fourth bullet states that the dominant pathway for plutonium contamination was the resuspension of dust from grass blades. This needs more explanation. How did the plutonium dust get on the grass in the first place? In this context, what is meant by "pathway"?

Common sense would argue that if the text is correct in stating that the dominant method of plutonium entrainment in the air is resuspension of dust from grass blades, then air concentrations of plutonium laden dust should have increased with an increase in vegetative cover. This is obviously not correct. Resuspension resulted from barren ground exposed to high winds. The barren ground was the result of vehicle traffic and construction. Until the 903 pad area was covered, the lip area removed and revegetated, and the buffer zone purchased and overgrazing of that area ceased, resuspension continued. In addition, vertical downward migration of the plutonium is a major reason for reduced air concentrations of contaminated dust.

Section 2.1.2.2: The last sentence in the first paragraph of this section says that Walnut Creek traverses the southern end of IHSS 199. This is incorrect and should read Woman Creek.

Section 2.1.2.3: Reference is made in the last paragraph of this section to wells that were used for lithologic and ground water analysis. Please locate these wells on one of the maps included in the document.

Section 2.1.2.3: Because the existence of the Eggleston Fault is being questioned by the EG&G group doing the site-wide geologic characterization, reference to it in this document may be premature.

Section 2.1.2.4: Please clarify "rainfall" versus total precipitation for this area. What percentage of yearly precipitation falls as snowfall?

Section 2.2.1: The gravel pit referred to in this section does not appear on the map where it should according to the text. Which is correct?

Section 2.2.2: The State of Colorado was also a defendant in the lawsuit referenced in this section. Had the plaintiffs prevailed, the State would have been deemed to have not properly protected the public with the plutonium in-soil standard. If the plaintiffs had prevailed, the State would have been seen as over-reactive in adopting the in-soil standard.

Section 2.2.2: In the second paragraph of this section, studies commissioned by the various parties to the litigation are referenced. Where is this data? Where were the sample locations? Please provide maps showing this information.

Section 2.2.2: The text states that one of the conditions of the remediation was preparation of an annual report on remediation progress. Where are these reports and are they too voluminous for inclusion in the document?

Section 2.2.2: In 1985, according to the text, more soil sampling was done. Where is the data?

Section 2.2.3.1: The text implies that the SCS recommended that the land be left undisturbed because they (the SCS) had concerns regarding radiation risk. That is not true. The SCS had concerns about soil stabilization, only.

Section 2.2.3.1: If possible, it would be appropriate to add within this section, or as an appendix, the approved Jefferson County Open Space lands remediation plan which contained more specifics than are addressed in the text and was based on input from the SCS, RFP, EPA, CDH, and Jeffco personnel.

Section 2.2.3.2: The document entitled "Remedial Action Program on Jefferson County Open Space Lands in Section 7, T2S, R69W, South of Great Western Reservoir" (EAC-420-87-1) that was prepared for

Rockwell International by C. T. Illsley and submitted on January 15, 1987 was given to the Division for review along with this remedy report. It contains a map showing the layout of the strips of land that were tilled. This map or a similar one should be included in this document. It visually explains a complicated situation that prose has a hard time clarifying. In the same document is a map showing the locations and plutonium concentrations of certain soil samples. Maps similar to this should be included for all of the different generations of soil sampling data for this site.

Section 2.2.3.2: When the Jeffco land was subdivided in to strips, it is unclear from the text how the subdividing and resultant tilling were done. From the map in the document referenced above, it appears that the strips that were tilled only cover half of the acreage. Was the remaining land between the strips ever sampled and was it ever tilled? If not, the text needs to make clear the fact that the remedy is only half completed after successful revegetation occurs.

Section 2.2.3.2: The portions of pages 17 and 18 that explain the history of the remedy are good but could be augmented by a table (similar to Table 2.1 in the Historical Information Summary document for OU 3) that summarizes the dates, the action taken, and the portion of IHSS 199 affected. This would make this portion of the text easier to follow.

Section 2.2.3.2: The third paragraph mentions that, after tilling, the soil plutonium concentrations were below 0.9 pCu/gm. What were the actual levels achieved? This can be addressed again in the fifth paragraph of this section.

Section 2.2.3.2: In the third paragraph of this section, the text mentions sorghum as a cover crop that did not perform to the extent anticipated. When was this sorghum planted? Was it a part of the wild grass seeding or did it precede the wild grasses?

Section 2.2.3.2: There are six specific actions listed in the text that were proposed to be completed in 1990. Were they, in fact, completed and if so, what was the result.

Section 2.2.3.2: Since irrigation will probably be necessary to successfully establish good ground cover on the remedied acreage, where will the responsibility rest to monitor the soil and bring in irrigation if necessary?

Irrigation could have already helped failed revegetation efforts of the last several years. Why has it not already been used?

Section 2.2.3.2: On-site sources for the irrigation water needed in OU 3 are unacceptable particularly when plenty of off-site water sources are available. Pond C-2 is presently a IHSS that is being

evaluated under the RFI/RI process for OU 5 (Woman Creek). Water from pond C-2 is currently diverted to the "B" series ponds where it is added to the water that goes through the NPDES treatment facility. At that point, this water is released from plant site but is still diverted around Great Western Reservoir. Use of this water for irrigation off-site would be very difficult to explain to the public and may have undesirable liabilities in the future. While the Division recognizes that plant water is not being used when it leaves plant site and irrigation may seem a good use for some of this water, until these on-site water sources are completely characterized and understood, their use as irrigation on off-site locales should not be considered.

Section 2.2.3.2: Though not required as a part of this document, some discussion on the future plans for the remedied acreage would be helpful.

Section 3.0: This section is actually a "primer" or introduction for a workplan to develop a conceptual model. The lack of data (no site-specific water or solids balances, particle size distributions, analytical data on loads and concentrations, important forms or species of contaminants, aquatic communities surveys, toxicological and bio-uptake data, etc.) would not support the use of this section or conclusions drawn from it. Any model(s) will require not only an initial characterization of the site, but also follow-up activities to confirm initial and changing conditions.

Section 3.1: Are the soils and soil properties still the same after the deep tilling that was conducted in the remedy?

Section 3.1: Based on the morphology of the surrounding areas, recent water erosion and desiccation do not appear to be a big problem on undisturbed soil surfaces. If revegetation is successful, will erosion by surface run-off remain a large contributor to plutonium migration?

Section 3.1: The second paragraph of this section references particular values for data collected in 1977 and 1985. This data needs to be presented in it's entirety in this document along with maps presenting it visually.

Once again, the Division is not aware that the referenced report from Rockwell (Rockwell, 1985a) includes any analysis for contaminants other than radioactive isotopes.

Section 3.2: Resuspension factors are given in the text for each of the governmental sections of land involved in the remedy. Please give some background on these figures and show how these figures were calculated.

These resuspension factors are for quiescent vegetated lands. CDH

determined similar values in the 1970's. CDH also found that vehicular disturbance would change the values to 1E-8/m. EPA used this value in their draft transuranic guidance. EPA recommended that the state use 1E-7/m for the plutonium in-soil standard risk assessment (CDH, 1976).

Section 3.2: The Division believes that the Allard et al, 1983 reference cited in this section is too generic for routine application to the RFP environs. Location-specific values would remove any questions on applicability. Information from the USGS (Cleveland) provides a very different view and was, apparently, not considered.

Section 3.2: The text indicates that the percentage of respirable plutonium particles with diameters less than 10 micrometers is 20 to 40%. Why is this true? If one 10um particle is respirable, are not all 10um particles respirable?

Section 3.4: The figures given in this section for erosion by surface water make it imperative to rapidly revegetate. Referring back to the figures given in section 2.1.2.1, there is no difference between the estimated soil loss due to water and wind erosion versus water erosion alone. How does this fact impact the risk analysis in terms of the primary pathways? What plans are being made to make revegetation more rapid and successful? Also, how do the figures presented here relate to the comment above that undisturbed soils seem to be very stable based on the morphology of the plant and surrounding areas?

Section 4.0: Historic dosimetric models for RFPu (see FEIS 1980) use Am-241 at 20% of the Pu-239+240 radiometric concentrations. The soil contamination will be there 80 years post any separation, so the maximum transient equilibrium value must be used.

Section 4.0: The last sentence of the introductory portion of this section (immediately before section 4.1) needs to be re-worded and/or clarified.

Section 4.2: The text needs to elaborate on the Memorandum of Understanding and Mutual Cooperation Agreement. How does this agreement relate to this document? What was the purpose of the Agreement?

Section 4.2: In this section, there is a sentence referencing airborne levels of plutonium to 0.02 pCu/m³ (0.0074 Bq/m³). There appears to be a word missing or some sort of error in the text because the sentence is incomplete as written.

Section 4.2: Does the air monitoring data referred to in this section include data that was collected during any phase of remediation, particularly tilling operations?

During the bar-screening portion of remediation, a week-long ambient air concentration close to the activity showed ~ 0.02 pCu/m³; a value not quite so insignificant as the text implies. However, the average values would still be low, but the text should be changed to clarify this fact.

Section 4.2: Is this section intended to state RFP's proposed ARAR's for IHSS 199? If so, is the Division correct in reading that the proposals are 0.9 pCu/gm (2 dpm/gm) for soil, 0.02 pCu/m³ (0.0074 Bq/m³) for air, and 0.05 pCu/l (0.002 Bq/l) for surface water? What is the source of the proposed ARAR of 0.04 pCu/m³ for Class Y (insoluble) plutonium? Is this value being proposed as a separate ARAR for insoluble plutonium?

Section 4.2: Do the ARAR's mentioned in this section have any human and/or public health basis? If so, what is the basis?

Section 4.2: Why are ARAR's even addressed in this document? It seems that a more appropriate document for the discussion of ARAR's is the RFI/RI Workplan.

Section 4.5.2.1: In the middle paragraph on page 35, there is a sentence which refers to a study done by Langer, 1986, concerning impactor samples. This reference, as it presently appears in the text, needs clarification. What is being said here and what does it mean?

Section 4.5.2.1: While there may be three categories in which soil particles can be dislodged from the ground surface, there are more than three specific release mechanisms. Please clarify the text on this item.

Section 4.5.2.1: Releases from the 903 pad and lip areas were still significant later than the early 1970's. Please see the CDH monitoring data from the RFP south-east perimeter road.

Section 4.5.2.2: Ingestion by children is a significant pathway that needs to be considered, especially since large portions of IHSS 199 may one day be open space with unrestricted use.

Section 4.5.3: This section, as well as figure 4-1, is incomplete and will be challenged. The descriptors on Figure 4-1 and on page 39 have no basis stated and the factors used are not identified.

Section 4.5.3.1: The Division suggests that the recent HP Journal article on worldwide plutonium resuspension be consulted to place the document's values in perspective.

Section 4.5.3.1: There was considerable QA/QC done on the soil sampling referenced in the text. However, the text is correct in stating that the what was done then does not meet today's criteria for QA/QC. It was good work then, just as work done today is good.

the CDH standard would be helpful.

Section 5.0: Please expand the discussion of monitoring presented in the fourth bullet of this section. Where are the monitoring stations? What does the data show? Can the data be presented here?

Section 5.0: Can the statement made in the fifth bullet of this section be substantiated? If so, where is the data? Does this statement include measurements made before, during, and after remediation? If it is true, why is it true? Were dust mitigation techniques successfully implemented or was the amount of dust released so small as to have no ill health effects?

Section 5.0: This section should contain a plan on how the needed data on the meteorology, biology, and air will be collected. It should also identify the interpretive techniques and protocols that will be used on the data to yield the needed results. While the conclusions presented in the Executive Summary may become factually supported in the future, environmental conditions and ecologically significant pathways have not been thoroughly surveyed and reported to date. No data has been presented in this report that, at present, would allow full confirmation or elimination of the various pathways and their relative importance. Section 5.0 is also the logical place for a discussion on the overall effectiveness of the remedy and whether or not it is a suitable remedy to be used on other areas affected by similar plutonium contamination in the soils.

The future, however, will probably judge today's efforts as inadequate just as we judge yesterday's.

Section 4.5.3.1: The text is pre-judging the air pathway as being the most significant without referencing soil ingestion. This assumption may prove correct but is premature for this document.

Section 4.5.3.6: Since the Jeffco Open Space land is for recreational use, the use of recreational vehicles should be considered in an evaluation of potential dust re-entrainment.

Section 4.6.2: The EPA lists an F1 factor (GI absorption) of 1E-3, 1E-4, and 1E-5. For plutonium ingested from atmospheric discharges, EPA uses 1E-4 (EPA NESHAPS 1989). For ingestion of plutonium from a water source, EPA and DOE use 1E-3. Without specific documentation as to the form of the material in the specific circumstance, the most conservative value must be used (1E-3).

Section 4.6.3: Bio-uptake from dermal contact and GI absorption is plausible. It may be small but it is plausible.

Section 4.7: This section has no value in its present form. The narrative descriptors are unsupported with documented values and the qualifications for the selection of the EPA dose/risk factors are not provided. The EPA soil and water ingestion factors are not provided and neither are the EPA inhalation class assumptions stated.

Section 4.7.3: This section indirectly states that the "negligible" risks associated with soil and water ingestion are 8.4×10^{-8} and 1.6×10^{-6} respectively. However, according to ICRP guidelines, a dose of 100 mrem/yr (the allowable dose for the general public) carries an approximate risk of 5×10^{-5} . This risk is only 30 times greater than that listed for water ingestion and makes the risk from water ingestion more than "negligible".

Section 4.7.3: A statement is made in the text which says that "it has been shown that the air pathway from IHSS 199 produces a negligible risk to the public." Where is this shown? Has it been quantified? If it has not been quantified, who's definition of "negligible" is being used?

Section 4.8: As with section 4.7, there are no criteria presented for the narrative descriptors.

Section 5.0: Earlier discussion of the remedied lands states that all tilled soil now has a plutonium concentration below the CDH standard of 0.9 pCu/gm. Yet, in the first bullet of this section, the text states that "a few land sections do exceed this limit by a factor of 2-4." Please clarify this apparent contradiction. Once again, a map showing where these areas are that still exceed