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Colorado Department
of Public Health
and Environment

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Mr. William Rautzen
Office of Federal and State Materials and
Environmental Management Programs
Nuclear Regulatory Commission

Subject: Alternate Soils Standards Application for portions of the Uravan, Colorado Radioactive Materials License 660-02.

This letter is to clarify alternate soil standards for four discrete areas and expand on the justification for the alternate soils standards for the Uravan Site in Montrose County, Colorado (CO RML 660-02). This site is part of the UMTRA Title II program administered by the Colorado Department of Public Health and Environment (CDPHE). This site is also under a Consent Decree as part of the EPA's Superfund Program. The site was listed on the National Priorities List in 1980. CDPHE is the Lead Agency at this site per a Memorandum of Agreement signed with EPA Region VIII in 1986.

The site covers over 500 acres, most of which is in very steep, rugged terrain, the remainder of which is dominated by the San Miguel River Valley. Remedial activities have concluded and the final cap is in place; cleanup costs at this site exceeded \$120 million. Portions of the site will title to DOE for Legacy Management, other portions of the site (buffer areas) will be transferred to other Federal Agencies (e.g., BLM) or to a land trust for institutional management. A County Road bisects the site and is also one of the four areas requiring alternate standards. The license termination process is starting, with a Completion Review Report per SA-900 planned for late 2009. For brevity, maps, most of the data, risk assessments and cost estimates are found in the attached report rather than being reproduced in this letter.

Four discrete areas of the site (about 40 acres total) could not meet the 5/15 pCi/g ²²⁶Ra in soil above background standard, found in the *Colorado Rules and Regulations Pertaining to Radiation Control*, 6 CCR 1007-18, Appendix A, Criteria 6. The areas were remediated as best as practical. The specifics are described in the referenced report, and are summarized in the attachment to this letter.

Site-specific assessments show that while the concentration-based soil standard may be exceeded in discrete locations, the four areas do not pose a dose- or risk-based case for further action, and are protective of public health and the environment.

CDPHE has accepted the licensee's report and believes the areas were cleaned to a level that is ALARA, and are protective of public health. This is further demonstrated by meeting equivalent criteria for supplemental standards in UMTRA Subpart C, as well as contemporary dose limits for restricted release found in the License Termination Rule, which in Colorado are found at CCR 1007-04§61.3.

Three of the areas are in the footprint of the area to be transferred to the DOE Legacy Management, and the fourth area, a County Road, will also be under an institutional control with BLM, DOE and the County (final exact outer boundaries of the area to be transferred to DOE Legacy Management are still being negotiated between the County, BLM and DOE based on road access and uranium leases in the area).

While we recognize that alternate soil limits are rare in Title II, there is a provision for them in regulation. The introduction to Part 18 Appendix A (compatible with 10 CFR 40) allows for "alternates to the requirements with Commission approval." This is based on language found in Part 274.o of the Atomic Energy Act. There can be "...alternates to the requirements, including site-specific alternatives, if the Commission determines that such alternatives will achieve a level of stabilization and containment of the sites concerned, and a level of protection for public health, safety, and the environment from radiological and non-radiological hazards associated with such sites, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by the Administrator of the Environmental Protection Agency in accordance with section 275. Such alternative State requirements may take into account local or regional conditions, including geology, topography, hydrology and meteorology." There is no language to indicate that this is limited to liner and cap design (the vast majority of Appendix A addresses containment and stabilization of tailings piles and groundwater protection).

As such, we expect this issue to be brought in front of the Commissioners for their approval.

Uravan was a licensed and operating mill at the time of passage of UMTRA (November 1978) making it a Title II mill, yet some of the contamination is a result of practices going back to the early 1900s, including the four areas requiring alternate standards. NUREG-0706 made specific mention of this situation and called for active programs to address residual contamination during the operational phase. We believe the licensee made credible efforts to mitigate these areas and satisfies that guidance from NRC. As discussed below, most of the discussions of alternate soil concentration limits are found in the Final Environmental Impact Statements for 40 CFR 192 rather than in NRC guidance (e.g., NUREG-0706).

One of the reasons EPA favored a concentration-based limit in 40 CFR 192 rather than a dose- or risk-based limit (e.g., 40 CFR 190) was "they have an inadequate relationship with some of the principal objectives of disposal, such a preventing misuse of the tailings and controlling radon emissions from tailings for long periods of time. Establishing an environmental dose rate limit (or Working-Level Limit) near a tailing pile gives no assurance of providing a long-lasting barrier controlling radon or of inhibiting the use of tailings. In addition, limits on dose imply a need to know the locations of

individuals for long periods of time into the future. Unless an exclusion area can be maintained indefinitely, conformance to a dose standard cannot be assured¹.”

Fortunately, an exclusion area can and will be maintained indefinitely on these four locations, so a dose-based limit is acceptable to the Department. It is interesting to note that the UMTRA soil standards are the only concentration-based radiation standards promulgated for soil. The Commission has adopted only dose-based standards for radioactivity in soil in the intervening years (i.e. LTR). Project-specific clean up values have been approved for numerous sites based on dose. The Commission’s justification for dose-based standards in the LTR should be applicable in these four cases since they will be under perpetual institutional control and are not being free released. By using site-specific scenarios and parameters in modeling the four areas that don’t meet the concentration based limit, we are able to show that they are in fact protective of public health since they meet today’s more stringent public dose limit. Additionally, since three of the four areas will be under perpetual care of the DOE, access will be restricted such that use of tailings are inhibited (i.e., controlled), and homes will not be built on these areas. Since the fourth area is a County Road, it will be under an institutional control between DOE, BLM and the County; homes will not be built on it either. The risk assessment performed for the County Road shows that future road workers are unlikely to meet a fraction of the public dose limit should they be exposed to tailings.

EPA also realized that the standards must be flexible. EPA states “However, the standards could be too strict in any specific application if the costs or undesirable side effects of the remedial actions were grossly disproportionate to the benefits for full compliance.²” EPA then lists the criteria that are found in Subpart C of 40 CFR 192, and used in the contractor’s report to support alternate standards.

Since Uravan is also a Superfund Site, it has a Consent Decree and a Remedial Action Plan that lists the supplemental standards at 40 CFR 192.21 as ARARs. This provides additional linkage and reason to cite the Subpart C supplemental standard criteria from Title I to these areas at this Title II facility.

It may be prudent to note here that the surface soil concentration-based limit for ²²⁶Ra in 40 CFR 192 published in 1983 was essentially based on back-calculating the amount of radium in soil that would result in 4 pCi/L (or 0.02 WL) radon in the lowest level of a single family residence (hence the adoption of averaging over 100 m²), along with indoor gamma exposure rate criteria. Clearly there were uncertainties in estimates and assumptions made to arrive at those criteria, and flexibility should be afforded for areas that don’t match those assumptions, yet are protective of public health and the environment.

At the time UMTRA regulations were promulgated, the public dose limits were 500 mrem/y, compared to 100 mrem/y today (and the newer source constraint of 25 mrem/y from any one licensee in Part 4.61.3 of the CO regulations). Since all four of these areas meets the more current dose based standard and source constraint of the public dose limit, we believe this provides additional assurance that the areas are candidates for alternate limits.

¹ Final Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing. EPA 520/1-83-008-1. September 1983. p 9-1.

² Final Environmental Impact Statement for Remedial Action for Inactive Uranium Processing Sites. EPA 520/4-82-013-1. October 1982. p-138.

Much of the work at Uravan was done prior to publication of MARSSIM. It had approved decommissioning plans in place prior to the adoption of the LTR, and so the data used in these reports are not in survey units, do not have derived DCGLs, etc. Rather, traditional survey protocols developed for Title I of UMTRA were used.

Safety prevented additional remediation along the cliff face that makes up the bulk of the “Hill-side Area” under consideration for alternate standards. Remediation was performed as much as possible and was terminated when safety to workers became too much of a risk, and costs to continue showed diminishing returns, along with concern that additional removal could cause mass wasting of the cliff face that would cause environmental harm to the riparian area and the San Miguel River. Two other areas, the old ponds area and A Plant area, were cleaned as much as possible prior to annual spring flooding that has since buried the areas under up to three feet of sediments (the San Miguel is a free flowing river and does not have any dams to control flow). This riparian area now hosts fauna and wildlife that would not be best served if remediation were to continue.

The alternate standards will still be protective even if the institutional controls fail in the distant future. The dose-based criteria show that even if the Legacy Management Program goes away, the cleanups have been ALARA and are protective. This is based on two limited assumptions – the cliff face will not be developed for residential construction, and the San Miguel River will not be relocated. Both of these assumptions are realistic. There has been much discussion and lessons learned in the literature about reliance on institutional controls out into the future.

The following guidelines were applied to the four areas to ensure they are candidates for alternate standards:

1. Does the alternate standard achieve a level of stabilization and containment?
2. Does the alternate standard achieve a level of protection for public health, safety, and the environment from hazards that are equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by EPA (supplemental standards)?
3. Does the alternate standard take into account local or regional conditions, including geology, topography, hydrology and meteorology.
4. Does the alternate standard prevent misuse of the tailings?
5. Does the alternate standard control radon emissions from tailings for long periods of time?
6. Does the alternate standard area fall within an exclusion area can be maintained indefinitely?

Additionally, the UMTRA Part C Supplemental Standards criteria were evaluated for relevance, they are:

1. Public health or safety would be unavoidably endangered by otherwise required remedial actions.

2. Remedial actions would cause significant environmental damage, in comparison to the environmental and health benefits that would result from satisfying the standard.
3. The costs of land cleanup would be unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.
4. The remedial action costs for building s are clearly unreasonably high relative to the benefits.
5. Radionuclides other than those upon which the standards are based cause significant hazards.
6. There are no known remedial actions available.

The evaluations for each area are provided in the attachment to this letter in addition to the analysis provided in the contractor's report.

Therefore, since all four areas have been cleaned ALARA, are under permanent institutional control, meet stringent dose-based free-release standards (while not being free released) as well as EPA risk-based criteria, and DOE Supplemental Standards, present safety or environmental challenges should additional cleanup be attempted with little corresponding reduction in dose, the Division believes the four areas are candidates for alternative limits.

The four areas shall remain under institutional control and conform to the alternate standard of CCR1007-04§61.3 for restricted release.

Based on the Division's review of the record, we have approved the alternate standards for the four areas, and believe sufficient justification exists for NRC to concur with the Division.

If you have any additional questions, please contact myself at (303) 692-3423 or at steve.tarlton@state.co.us or Phil Egidi at (970) 248-7162 or phil.egidi@state.co.us.

Sincerely,



Stephen F. Tarlton, Acting Manager
Radiation Program
Hazardous Materials and Waste Management Division

SFT:pve

Attachment: As stated

Attachment 1.

Analysis of alternate standards for four areas at the UMETCO Uravan Title II UMTRA Site.

Mill Hillside Area.

The area consists of steep/near vertical slopes that are the result of down cutting of the San Miguel River. The area is about twenty two acres in size and extends from the mesa rim to the valley floor with an elevation change of approximately 500 feet.

The hillside was first used in the early 1900s for mining access and ore transport on a road cut that has been removed. In the mid-1930s, U.S. Vanadium constructed a vanadium plant on the hillside. In the 1940s, the vanadium plant was expanded several times to include uranium extraction. New process works were constructed in the 1950s in both the river valley (A-Plant) and Club Mesa (B-Plant) areas. After WWII, the original vanadium plant was shut down. Those mill structures were demolished and the foundations left in place.

Concrete foundations and contaminated soils were removed from the Mill Hillside in 1999, 2001, and 2002. A total of approximately 46,000 cubic yards of contaminated materials were removed from the Mill Hillside. The cost of excavation and disposal exceeded \$1,800,000 including recontouring and rock armoring. Approximately 27,600 cubic yards of contaminated materials may remain in these cliff areas. Further excavation of contaminated soils from the steep slopes of the Mill Hillside poses an unacceptable risk to workers and threatens to de-stabilize the naturally stable slope. Additional excavation would require the use of heavy equipment in some areas, hand excavation in others, as well as scaling crews (hanging on ropes off the cliff face) and vacuum trucks to access the materials. Some materials would have to be carried by hand to a location where they can be placed into containers. These remedial actions would be extremely hazardous, entail great risk to workers, and result in destabilization of the existing slope. The use of heavy equipment to excavate these areas might in itself further destabilize the slope. In addition, de-stabilized slopes could be subject to mass wasting or rapid erosion and cause degradation of the water quality in the San Miguel River.

The hillside has been extensively surveyed for gamma radiation and 31 confirmatory soil samples were collected. Gamma measurements at one meter above the ground surface give a mean exposure rate of 45 $\mu\text{R/hr}$ or 0.4 $\mu\text{Sv/hr}$ with a maximum of 202 $\mu\text{R/hr}$ (2.02 $\mu\text{Sv/hr}$) for a single 10 by 10 meter grid on the Mill Hillside. Numerous outcrops of natural uranium (exhibited by the multiple uranium mines) are in the area, and contribute to the gamma exposure flux.

Results from soils analysis showed that the average Ra-226 value is 17.1 pCi/g (0.63 kBq/kg), for the surface (0-15 cm) samples and 10.5 pCi/g (0.39 kBq/kg) for the sub-surface (15-30 cm) samples. Average Thorium-230 (Th-230) concentration is 22.6 pCi/g (0.84 kBq/kg) for the surface samples and 12.7 pCi/g (0.47 kBq/kg) for the sub-surface samples. The average Uranium 238 concentration is 20 pCi/g (0.74 kBq/kg).

Probabilistic and deterministic risk assessments were performed for this area. A recreational scenario was chosen as most likely since this is a cliff face in a remote canyon. The scenario also requires that the individual be willing to trespass into the area despite warning signs and potential legal consequences. As such, there will be relatively few persons who might trespass on to the Mill Hillside area for recreational purposes.

Use of the site for eight hours, ten times per year, yields a calculated annual dose to the hunter-hiker of 0.3 mrem or 3.0 μ Sv excluding the ingestion of meat. The estimated annual dose for the hunter-hiker including the ingestion of meat was calculated to be 4.6 mrem (0.046 mSv).

Table 1. Hillside Area

Criteria	Result (Yes, Somewhat, No)	Comment
Does the alternate standard achieve a level of stabilization and containment?	Somewhat	Remediated ALARA, tailings still available for surface transport
Does the alternate standard achieve a level of protection for public health, safety, and the environment from hazards that are equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by EPA (supplemental standards)?	Yes	Meets NRC LTR as well as EPA risk levels. Dose estimates are about 3 mrem/y above background for the hiker/camper.
Does the alternate standard take into account local or regional conditions, including geology, topography, hydrology and meteorology.	Yes	Remote cliff face, not accessible by humans, will remain under DOE control.
Does the alternate standard prevent misuse of the tailings?	Yes	Limited access, DOE control, tailings not easily accessible
Does the alternate standard control radon emissions from tailings for long periods of time?	No	No control of radon from residual radioactive material
Does the alternate standard area fall within an exclusion area can be maintained indefinitely?	Yes	Will be in DOE Legacy Management footprint.
Public health or safety would be unavoidably endangered by otherwise required remedial actions.	Yes	Clear and present danger to workers on the cliff face
Remedial actions would cause significant environmental damage, in comparison to the environmental and health benefits that would result from satisfying the standard.	Yes	Possible mass wasting of the cliff could impact riparian areas and water quality in San Miguel River

Criteria	Result (Yes, Somewhat, No)	Comment
The costs of land cleanup would be unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.	Yes	Additional costs estimated at > \$6 million for potential reduction in dose of ~ 3 mrem/y.
The remedial action costs for buildings are clearly unreasonably high relative to the benefits.	NA	No buildings involved.
Radionuclides other than those upon which the standards are based cause significant hazards.	No	Th-230 levels comparable to Ra-226 in this area.
There are no known remedial actions available.	Somewhat	Technologies are available, but pose unacceptable risk to workers and the environment.

Conclusion: The Millside Area shall be subject to the following alternate standard:

CCR 1007-04§61.3 for restricted release (< 25 mrem/y above background to the reasonably maximally exposed individual). The site shall remain under institutional control and not be developed for human habitation.

2. A-Plant North

The A-Plant North area encompasses about 2 acres located on the northwestern part of the A-Plant area adjacent to the San Miguel River. The area includes riparian habitat in the flood plain of the San Miguel River. The area was a part of the A-Plant mill that produced uranium and vanadium (the B-Plant was on top of the mesa), and also includes the former Joe Junior radium mill.

A-Plant mill decommissioning, begun in June 1994, required the demolition, removal and disposal of 91 mill buildings and assorted mill processing equipment. Approximately 23,500 cubic yards of building debris were sized and placed in Tailings Pile 2. Between March 1995 and June 1999, approximately 480,000 cubic yards of contaminated soils were removed from the A-Plant area and placed in Tailings Pile 2. Almost the entire mill area was stripped to bedrock and reclaimed using uncontaminated soil. Total cost for the 1995 - 1999 reclamation of the A-Plant area exceeded \$7,250,000. In 2006, remediation in the northern part of the A-Plant area was undertaken to remove additional contaminated soils in areas identified by post remediation surveys. This activity removed an additional 43,000 cubic yards of contaminated soils.

Approximately 10,000 cubic yards of elevated soils remain within a riparian area in the flood plain of the San Miguel River. Excavation of contaminated soils would necessitate the removal of all riparian vegetation from the banks and in the flood plain of the San Miguel River and would cause excessive harm to the environmentally sensitive wetland area. The area is within the annual flood plain of the San Miguel River and within the DOE's long-term surveillance area. No habitable structures can or will be constructed in the alternative standards area within the flood plain of the San Miguel River.

Gamma exposure measurements collected in the riparian area at one meter above the ground surface average 21.47 $\mu\text{R/hr}$ (0.2 $\mu\text{Sv/h}$) with a maximum of 45.1 $\mu\text{R/hr}$ (0.45 $\mu\text{Sv/h}$) for a single 10 by 10 meter grid. Seven confirmation soil samples were collected in the A-Plant North area for laboratory analysis. The average Ra-226 value was 2.54 pCi/g (0.09 kBq/kg) for the surface samples and 2.88 pCi/g (0.11 kBq/kg) for the sub-surface samples. Average Thorium-230 concentrations were 5.36 pCi/g (0.20 kBq/kg) for the surface samples and 5.27 pCi/g (0.20 kBq/kg) for the sub-surface samples. The A-Plant North area does not contribute any significant contaminants to the San Miguel River and there are no impacts to the river system from residual materials in the area.

The most likely exposed person is a hunter, hiker or fisherman who ignores signs and fences. Since this area is under perpetual DOE control, the person would be trespassing onto the property. The risk assessment conducted for County Road Y-11 is applicable here also since the conditions are the same. The risk assessment shows that the maximum exposure would be to a fisherman (1.28 mrem per year) who fishes along the river bank and that the estimated collective annual dose to members of the public would be 0.11 person-rem (0.001 person-sievert), whose level of exposure is well below 25 mrem per year (and EPA's risk limit) acceptable public dose even if that person were to visit the site several times a year.

Table 2. A-Plant North Area

Criteria	Result (Yes, Somewhat, No)	Comment
Does the alternate standard achieve a level of stabilization and containment?	Yes	Soils are stabilized by vegetation and subject to additional sedimentation by

Criteria	Result (Yes, Somewhat, No)	Comment
		future flooding.
Does the alternate standard achieve a level of protection for public health, safety, and the environment from hazards that are equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by EPA (supplemental standards)?	Yes	Meets all alternate criteria for CDPHE and EPA.
Does the alternate standard take into account local or regional conditions, including geology, topography, hydrology and meteorology.	Yes	Sensitive wetlands/riparian area in a remote location.
Does the alternate standard prevent misuse of the tailings?	Yes	Tailings are in exclusion area under DOE Legacy Management control.
Does the alternate standard control radon emissions from tailings for long periods of time?	Yes	Sediments will likely build up over the tailings, no structures to be built on or in the area.
Does the alternate standard area fall within an exclusion area can be maintained indefinitely?	Yes	DOE Legacy Management
Public health or safety would be unavoidably endangered by otherwise required remedial actions.	No	Environmental concerns in this instance.
Remedial actions would cause significant environmental damage, in comparison to the environmental and health benefits that would result from satisfying the standard.	Yes	No meaningful reduction in dose or dose rate, yet would require complete destruction of riparian/wetlands vegetation.
The costs of land cleanup would be unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a	Somewhat	Would require heavy engineering (e.g., coffer dams) to divert river flows.

Criteria	Result (Yes, Somewhat, No)	Comment
clear present or future hazard.		
The remedial action costs for buildings are clearly unreasonably high relative to the benefits.	NA	No buildings involved.
Radionuclides other than those upon which the standards are based cause significant hazards.	No	Thorium in relative equilibrium with radium.
There are no known remedial actions available.	No	Remediation could be pursued, but not worth the environmental insult and cost.

Conclusion: The A-Plant North Area shall be subject to the following alternate standard: CCR 1007-04§61.3 for restricted release (< 25 mrem/y above background to the reasonably maximally exposed individual). The site shall remain under institutional control and not be developed for human habitation.

3. River Ponds Areas

The River Ponds were constructed of mill tailings along the main channel of the San Miguel River. There were seven ponds, two on the northeast bank of the river and five on the southwest bank. These ponds were directly north of the A-Plant area and were used in the uranium and vanadium recovery operations including the former Joe Junior radium mill. The area commonly floods during spring runoff and contains diverse wildlife habitat.

During the mid-1990s, excavation was conducted during winter low-flows in the river and extended into natural soils beneath the tailings material. Excavation ceased when river water flooded the excavation areas. Approximately 332,500 cubic yards of material were excavated from the River Ponds area. Riprap dikes or groins two to three feet high were constructed across the excavated areas to the limits of the river channel. These groins protected the area against future erosion and promoted alluviation in the former River Ponds area. Total cost for reclamation of the River Ponds area exceeded \$4,000,000.

Gamma exposure rates from 20 to 60 $\mu\text{R/hr}$ indicated local hot spots in the cleanup area prior to final excavation and river alluviation. Final verification surveys were not possible because the excavation was flooded before a survey could be conducted. Areas of residual contamination were subsequently covered by 2 to 3 feet of recent alluvial sediment and stabilized by riparian vegetation.

During the seasonal low-water period of the San Miguel River in 2007 (~ 15 years post remediation), a random walking survey was conducted in the north and south river ponds areas. This survey measured gamma ray exposure rates at an elevation of one meter above the ground surface and Ra-226 equivalent concentrations at 1 foot above ground surface. The exposures ranged from 13.7 to 17.9 $\mu\text{R/hr}$ (0.137 to 0.179 $\mu\text{Sv/h}$) in the North Pond area and between 14.4 and 17.2 $\mu\text{R/hr}$ (0.144 and 0.172 $\mu\text{Sv/h}$) in the South Pond area. Ra-226 equivalent concentrations (i.e., calculated based on exposure rate) ranged from 2.4 to 5.8 pCi/g (0.089 to 0.21 kBq/kg) in the North Pond area and between 3.8 and 6.9 pCi/g (0.15 and 0.26 kBq/kg) in the South Pond area. The results of the survey show that there are no sources of significant radiation at the surface in the reclaimed pond areas and that exposure rates and Ra-226 concentrations are within background ranges.

Monitoring of water in the San Miguel River has been conducted quarterly since 1987 at stations above and below the River Ponds. Monitoring results indicate that the River Ponds area does not contribute any significant contaminants to the San Miguel River and that there are no impacts from residual materials from the area. Because current exposure rates are within background ranges there is no incremental health risk to the general public or future site workers from residual radiological materials within the River Ponds area.

The most likely exposed person is a hunter, hiker or fisherman who ignores signs and fences. Since this area is under perpetual DOE control, the person would be trespassing onto the property. The risk assessment conducted for County Road Y-11 is applicable here also since the conditions are the same. The risk assessment shows that the maximum exposure would be to a fisherman (1.28 mrem per year) who fishes along the river bank and that the estimated collective annual dose to members of the public would be 0.11 person-rem (0.001 person-sievert), whose level of exposure is well below 25 mrem per year (and EPA's risk limit) acceptable public dose even if that person were to visit the site several times a year.

Addition remedial actions would include the stripping the area of all riparian vegetation and excavating and stockpiling approximately 2 to 3 feet of clean alluvial sediments. Excavation of contaminated soils would necessitate the removal of all riparian vegetation from the banks of the San Miguel River. Destruction of the wetlands would directly cause excessive environmental harm. A cutoff wall or withdrawal wells would need to be installed so that the entire area could be dewatered and the presence of residual contaminants confirmed and then removed. Excavation and disposal of an estimated 48,400 cubic yards of contaminated materials could then be conducted. All activities would require the construction on run-on and run-off control features as well as the building of a decontamination facility for equipment decontamination. Disposal would have to be off-site since the final cap is in place on all cells at this site. Proximity of the remedial activities to the San Miguel River would make this a difficult and costly exercise. The existing surface treatment, including mantling, groins and re-vegetation would have to be reestablished after any additional remediation.

Table 3. River Ponds Area

Criteria	Result (Yes, Somewhat, No)	Comment
Does the alternate standard achieve a level of stabilization and containment?	Yes	Materials are under 2- 3 feet of sediment.
Does the alternate standard achieve a level of protection for public health, safety, and the environment from hazards that are equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by EPA (supplemental standards)?	Yes	Gamma exposure rates are background. Radon not measured, however the cover sediments are often saturated and 2 – 3 feet thick.
Does the alternate standard take into account local or regional conditions, including geology, topography, hydrology and meteorology.	Yes	Riparian area of San Miguel River.
Does the alternate standard prevent misuse of the tailings?	Yes	Tailings are in-accessible under 2 – 3 feet of sediments
Does the alternate standard control radon emissions from tailings for long periods of time?	Yes	Additional sediments will continue to build up and shield radon.
Does the alternate standard area fall within an exclusion area can be maintained indefinitely?	Yes	DOE Legacy Management Area.

Criteria	Result (Yes, Somewhat, No)	Comment
Public health or safety would be unavoidably endangered by otherwise required remedial actions.	No	Environmental harm.
Remedial actions would cause significant environmental damage, in comparison to the environmental and health benefits that would result from satisfying the standard.	Yes	All wetlands/riparian vegetation in the area would be destroyed, sediment load in river could increase as a result of stirring things up.
The costs of land cleanup would be unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.	Yes	No reduction in dose even if buried sediments are remediated.
The remedial action costs for buildings are clearly unreasonably high relative to the benefits.	NA	No buildings now or in the future.
Radionuclides other than those upon which the standards are based cause significant hazards.	No	Thorium in relative agreement with radium.
There are no known remedial actions available.	No	There are remedial actions that could be undertaken, they would however not be environmentally or economically feasible and would not result in reduction of dose.

Conclusion: The River Ponds Area shall be subject to the following alternate standard:
CCR 1007-04§61.3 for restricted release (< 25 mrem/y above background to the reasonably maximally exposed individual). The site shall remain under institutional control and not be developed for human habitation.

4. County Road Y-11.

The County Road Y- 11 alternative standards area consists of a 5,800-foot section of road between the County Road Y-11 Bridge and the Old Iron Bridge. The area is on the southwest side of the San Miguel River, paralleling the Club Ranch Ponds area. The road is located partially within the DOE Legacy management footprint. County Road Y- 11 is composed of natural earthen materials that were used in construction of the road, including NORM in the form of overburden and waste rock; some tailings were also used in the right of way for the road. The roadway is relatively flat and follows the gentle down gradient direction of the San Miguel River. Contaminated materials were located in the borrow ditches for the road as well as under the road surface.

Removal activities were initiated in 1998 as a part of the cleanup of the Town Dump area and additional contaminated soils were excavated in 2006 (the additional removal is accounted for in the Alternate Soil Standards Report). A total of approximately 8,200 cubic yards of contaminated materials were removed from the roadway and transported to a disposal cell on Club Mesa. These previous remedial activities have been conducted to assure that routine maintenance along the roadway can be conducted without creating worker exposures. The County prefers the alternate standard be applied rather than expend funds for a limited reduction in dose.

Contaminated soils may exist at depth ($> 3'$) beneath the roadway. Exposure readings along the roadway after reclamation activities were complete are within background ranges and pose no additional or incremental risk to human health for people traveling on the road.

Gamma exposure measurements at one meter above the ground surface range from 13.9 to 36.8 $\mu\text{R/hr}$ (0.139 to 0.369 $\mu\text{Sv/h}$) on County Road Y- 11 and equivalent Ra-226 concentrations (calculated from exposure rates) ranged from 0 to 20.2 pCi/g (0 to 0.75 kBq/kg).

County Road Y- 11 is currently owned by Montrose County. Institutional controls agreed to by Montrose County, BLM and DOE will control future integrity of the road. Since it is a County Road, the public will have access and use of this road.

A risk assessment and ALARA analysis was conducted for this area. Five exposure scenarios were evaluated ranging from day hiker to road maintenance worker. The risk assessment shows that the maximum exposure would be to a fisherman (1.36 mrem or 13.6 μSv per year) who uses the road to access the river bank and then fishes along the river bank. It should be noted that additional soils were removed subsequent to the risk assessment in 1998, making the source terms smaller and the risk assessment more conservative.

Table 4. County Road Y-11.

Criteria	Result (Yes, Somewhat, No)	Comment
Does the alternate standard achieve a level of stabilization and containment?	Yes	Materials are buried and under an institutional control
Does the alternate standard achieve a level of protection for public health,	Yes	Meets dose and risk levels and supplemental standard

Criteria	Result (Yes, Somewhat, No)	Comment
safety, and the environment from hazards that are equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by EPA (supplemental standards)?		criteria.
Does the alternate standard take into account local or regional conditions, including geology, topography, hydrology and meteorology.	Yes	Roadway
Does the alternate standard prevent misuse of the tailings?	Yes	Material is buried and under institutional control
Does the alternate standard control radon emissions from tailings for long periods of time?	Somewhat	Radon emissions in a roadway are of little concern; borrow ditches would have higher emanation rates than the compacted road surface.
Does the alternate standard area fall within an exclusion area can be maintained indefinitely?	Yes	Road will be under an institutional control through DOE, BLM and the County.
Public health or safety would be unavoidably endangered by otherwise required remedial actions.	No	Little reduction in dose if further remediation to occur.
Remedial actions would cause significant environmental damage, in comparison to the environmental and health benefits that would result from satisfying the standard.	No	Environmental damage would be minimal, mostly in the borrow ditch along the river.
The costs of land cleanup would be unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.	Yes	County does not want to expend funds for limited reduction in dose.
The remedial action costs for buildings are clearly unreasonably high relative	NA	No buildings

Criteria	Result (Yes, Somewhat, No)	Comment
to the benefits.		
Radionuclides other than those upon which the standards are based cause significant hazards.	No	Thorium is in relative equilibrium to radium.
There are no known remedial actions available.	No	This alternate standard is predicated on cost savings.

Conclusion: County Road Y-11 through the mill site shall be subject to the following alternate standard: CCR 1007-04§61.3 for restricted release (< 25 mrem/y above background to the reasonably maximally exposed individual). The site shall remain under institutional control and not be developed for human habitation.