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Office of the Secretary
Attn: Emile Julian
Adjudication and Rulemaking
U.S. Nuclear Regulatory Commission
Rockville, MD

Dear Emile,

On behalf of "Citizens for Clean Land, Air, and Water (CCLAW) and myself (Mervyn Tilden), I hereby submit the following documents ("Nuclear Workers Document on Cancer", "Impacts of Uranium In-Situ Leaching", [7 pages], "Message to Uranium Miner's Group" [by Rose Marie Cecchini, MM], and a letter to "Bruce Babbitt, Interior Secretary" [by Rose Marie Cecchini, MM])to be incorporated into the record of the proceedings in the Matter of Hydro resources, Inc. (HRI), Docket No. 40-8968-ML.

CCLAW is a newly formed organization in the Gallup, NM region and surrounding areas that is opposed to HRI's proposed in-situ leach operation in Church Rock and Crownpoint, NM. CCLAW's efforts are based on the spiritual and religious values of several faiths *and the Dine' Religion;* the protection of the sacredness of life and all living beings, including the earth (Mother) has prompted the formal organization of this group of people, many who are non-Navajos.

The address to Citizens for Clean LAW is: CCLAW P.O. Box 3682, Gallup, NM 87305. Thank you in advance for your response.

Mervyn Tilden

2-23-98

Mervyn Tilden
Petitioner to become an Intervenor
P.O. Box 457
Church Rock, NM 87311

Low doses of radiation have, in a new UCLA study, been proven to kill.

A landmark epidemiological study has recently been released on the DOE/Rocketdyne facility at Santa Susana near Los Angeles. Cancer deaths were more strongly linked to radiation exposure than found in previous studies. The study's Oversight Panel identified:

- **Cancer deaths were attributable to doses substantially below U.S. standards.**

- **The risk of "low-dose" radiation was at least 6 to 8 times greater than risks previously assumed.**

- **Older adults are more at risk from radiation for all cancers.**

The Oversight Panel has thus recommended:

- **Current limits for radiation exposure be reconsidered by all regulatory and advisory bodies responsible for radiation protection.**

- **Regulators should take age into consideration when establishing new standards of exposure.**

The grassroots effort that achieved the DOE-funded study--and the subsequent flood of news coverage--could be replicated in other areas. For more information, contact:
Physicians for Social Responsibility, Los Angeles (310)458-2694
Email: psrsm@psr.org
or
Committee to Bridge the Gap, (310) 478-0829, Email: cbglyon@aol.com.

Jonathan Parfrey
Executive Director
Physicians for Social Responsibility, Los Angeles

September 12, 1997
The Associated Press

Nuclear Workers Document on Cancer

SIMI VALLEY, Calif. (AP) - Nearly a third of nuclear workers who have died since being exposed to doses of radiation deemed safe by the government at a rocket engine testing facility died from cancer, according to a study released Thursday.

Impacts of Uranium In-Situ Leaching

(last updated 4 Dec 1997)

Contents:

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In the case of in-situ leaching (ISL), or solution mining, the uranium-bearing ore is not removed from its geological deposit, but a leaching liquid is injected through wells into the ore deposit, and the uranium bearing liquid is pumped from other wells. In-situ leaching gains importance for the exploitation of low grade ore deposits, for its low production cost. Many new projects for uranium in-situ leaching are being planned at present.

Existing and Proposed Uranium In-Situ Leaching Sites

The *USA* produced 1684 t U from in-situ leaching in 1996, this corresponds to 93% of all uranium produced in that year. The ISL operations are mainly located in Wyoming, Texas and Nebraska. For current U.S. ISL operations, see Operating Status of Nonconventional Uranium Plants and U.S. Uranium Mine Production (US DOE).
New ISL projects are being proposed for Texas, Wyoming, and New Mexico.

In Eastern *Germany*, an underground mine converted to an in-situ leaching facility was in operation at Königstein near Dresden until the end of 1990. It produced a total of 18,000 t U, 30% of which were from ISL with sulfuric acid.

In the *Czech Republic*, in-situ leaching with sulfuric acid was used on a large scale at Stráz pod Ralskem in North Bohemia: The ore deposit is located in Cretaceous sandstones with grades of 0.08 - 0.15% uranium. In an area of 5.6 km^2, 9340 wells were drilled from the surface into the deposit. The total production to 1994 was 13,835 t U.

In *Bulgaria*, in-situ leaching was in use at many locations. The first uranium mines in Bulgaria were underground mines. From 1979, in-situ leaching was also applied, using wells, drilled from the surface. The leaching agent used in most cases was sulfuric acid. From 1981, in-situ leaching was also used to increase the yield from mined out conventional underground mines [Tabakov1993]. From 1981, 23 ore deposits were mined by conventional underground mining techniques, 17 by in- situ leaching from the surface, and 11 by in-situ leaching in combination with conventional mining techniques. In 1990, 70% of the uranium produced was from in-situ leaching of ore deposits with very low grades of 0.02 - 0.07% of uranium [Kuzmanov1993]. In the years 1991 - 1992, 14,000 wells in 15 in-situ leaching fields were in operation [OECD1994]. The total area used for in- situ leaching comprised 6 km^2 [Vapirev1996]. The total production from in-situ leaching to 1994 was 5,175 t U [OECD1996].

In *Ukraine*, ISL has been used at the Devladove, Bratske, and Safonovskoye sites from 1966 - 1983.

In *Russia*, a new ISL project is being proposed for Dalmatovkoye in Western Siberia.

In *Kazakhstan*, in-situ leaching is being used at the Kandjugan, Uvanas, Mynkuduk, Karamurun sites. In 1994, the production from ISL was 1580 t U, a 70% share in the country's uranium production; the total production from ISL to 1994 was 19,961 t U [OECD1996]. The new projects of Muyunkum and Inkay are also planned for exploitation by ISL.

In *Uzbekistan*, in-situ leaching (with sulfuric acid) is being used at the Uchkuduk, Zarafabad, and Nurabad deposits, covering a total area of 13 km^2. Since 1995, all production is from ISL (3050 t U annually) [OECD1996].

In *China*, ISL is being used at Tengchong and Yining.

In *Australia*, new ISL projects are being proposed for Beverley and Honeymoon in South Australia.

Environmental Impacts

The leaching liquid used for in-situ leaching contains the leaching agent ammonium carbonate for example, or - particularly in Europe - sulfuric acid. This method can only be applied if the uranium deposit is located in porous rock, confined in impermeable rock layers.

> View images: ISL general arrangement (19k) □ ISL detail (7k) (WMA/Cogema)

The advantages of this technology are:

- the reduced hazards for the employees from accidents, dust, and radiation,
- the low cost;
- no need for large uranium mill tailings deposits.

The disadvantages of the in-situ leaching technology are:

- the risk of spreading of leaching liquid outside of the uranium deposit, involving subsequent groundwater contamination,
- the unpredictable impact of the leaching liquid on the rock of the deposit,
- the impossibility of restoring natural groundwater conditions after completion of the leaching operations.

Moreover, in-situ leaching releases considerable amounts of radon, and produces certain amounts of waste slurries and waste water during recovery of the uranium from the liquid.

In the case of Königstein (Germany), a total of 100,000 tonnes of sulfuric acid was injected with the leaching liquid into the ore deposit. At present, 1.9 million m^3 of leaching liquid are still locked in the pores of the rock leached so far; a further 0.85 million m^3 are circulating between the leaching zone and the recovery plant. The liquid contains high contaminant concentrations, for example, expressed as multiples of the drinking water standards: cadmium 400x, arsenic 280x, nickel 130x, uranium 83x,

etc. This liquid presents a hazard to an aquifer that is of importance for the drinking water supply of the region.

Groundwater impact is much larger at the Czech in-situ leaching site of Stráz pod Ralskem: 28.7 million m^3 of contaminated liquid is contained in the leaching zone, covering an area of 5.74 km^2. This zone contains a total of 1.5 million tonnes of sulphate, 37,500 tonnes of ammonium, and others. In addition to the chemicals needed for the leaching operation (including 3.7 million tonnes of sulfuric acid, among others), 100,000 tonnes of ammonium were injected; they were a waste product resulting from the recovery of uranium from the leaching liquid.
Moreover, the contaminated liquid has spread out beyond the leaching zone horizontally and vertically, thus contaminating another area of 28 km^2 and a further 235 million m^3 of groundwater. To the southwest, the groundwater contamination has already reached the second zone of groundwater protection of the potable water supply of the town of Mimon. In southeastern direction, the contaminated groundwater is still at a distance of 1.2 - 1.5 km from the second zone of groundwater protection of the Dolánky potable water wells, which supply 200 l/s for the city of Liberec [Andel1996]. The migration of the contaminated liquids in an easterly direction towards the Hamr I underground mine is at present intercepted by a hydraulic barrier: decontaminated water is injected into a chain of wells to prevent further migration of the contaminated groundwater.

In Bulgaria, a total of 2.5 million tonnes of sulfuric acid was injected into the ore deposits exploited by in-situ leaching. It is estimated that about 10% of the surface area used for ISL could be contaminated from solution spills. This is of concern, since the area is to be returned to its previous owners for agricultural use.
After termination of the ISL operations, the contaminated groundwater spreads offsite. Some in-situ leaching facilities (for example Bolyarovo, Tenevo/Okop) are located close to drinking water wells. [Vapirev1996]
The impacts of ISL on surface and groundwater are catastrophic:

> "Very high concentrations of sulfate ions are measured in surface water and even in wells of private owners as a result of accidental spilling of solutions in sites of in-situ leaching. At the site "Cheshmata" (Haskovo), in the valley downstream from the sorption station, the measured content of sulfates is 1400 mg/l, free H2SO4 is 392 mg/l and pH is 2.2 (5.5 - 8.5 for 3-rd category ..ater). A similar case has been recorded in Navusen where in a valley the sulfate concentration is 13362 mg/l and almost 5 g/l H2SO4, which means that actually the water is leaching solution.
> In the underground water of such sites the salt content is >20 g/l, from which the sulfates are 12-15 g/l." [Dimitrov1996]

The Devladovo site in Ukraine was leached with sulfuric and nitric acid. The surface of the site was heavily contaminated from spills of leaching solutions. Groundwater contamination is spreading downstream from the site at a speed of 53 m/year. It has traveled a distance of 1.7 km already and will reach the village of Devladovo after 24.5 years. [Molchanov1995]

For the incidents, occuring during business as usual at in-situ operations, the latest U.S. NRC Event Reports for Christensen Ranch, Wyoming, including surface spills and underground solution excursions, can be regarded as typical examples.

Reclamation Concepts After In-Situ Leaching

After termination of an in-situ leaching operation, the waste slurries produced must be safely disposed, and the aquifer, contaminated from the leaching activities, must be restored. Groundwater restoration is a very tedious process that is not yet fully understood. So far, it is not possible to restore groundwater quality to previous conditions.

The best results have been obtained with the following treatment scheme, consisting of a series of different steps [Schmidt1989], [Catchpole1995]:

- Phase 1: Pumping of contaminated water: the injection of the leaching solution is stopped and the contaminated liquid is pumped from the leaching zone. Subsequently, clean groundwater flows in from outside of the leaching zone.
- Phase 2: as 1, but with treatment of the pumped liquid (by reverse osmosis) and re-injection into the former leaching zone. This scheme results in circulation of the liquid.
- Phase 3: as 2, with the addition of a reducing chemical (for example hydrogen sulfide H_2S or sodium sulfide Na_2S). This causes the chemical precipitation and thus immobilization of major contaminants.
- Phase 4: Circulation of the liquid by pumping and re- injection, to obtain uniform conditions in the whole former leaching zone.

But, even with this treatment scheme, various problems remain unresolved:

- Contaminants, that are mobile under chemically reducing conditions, such as radium, cannot be controlled,
- if the chemically reducing conditions are later disturbed for any reasons, the precipitated contaminants are re-mobilized,
- the restoration process takes very long periods of time,
- not all parameters can be lowered appropriately.

Most restoration experiments reported refer to the alkaline leaching scheme, since this scheme is the only one used in Western world commercial in-situ operations. Therefore, nearly no experience exists with groundwater restoration after acid in- situ leaching, the scheme that was applied in most instances in Eastern Europe. The only Western in-situ leaching site restored after sulfuric acid leaching so far, is the small pilot scale facility Nine Mile Lake near Casper, Wyoming (USA). The results can therefore not simply be transferred to production scale facilities. The restoration scheme applied included the first two steps mentioned above. It turned out that a water volume of more than 20 times the porevolume of the leaching zone had to be pumped, and still several parameters did not reach background levels. Moreover, the restoration required about the same time as used for the leaching period [Nigbor1982] [Engelmann1982].

Reclamation Projects

In USA, the Pawnee, Lamprecht, and Zamzow ISL Sites in Texas were restored using steps 1 and 2 of the above listed treatment scheme [Mays1993]. Relaxed groundwater restoration standards have been granted at these and other sites, since the restoration criteria could not be met (see details).

For the Königstein (Germany) in-situ leaching mine, there are still no large-scale proven methods to remove the remaining leaching liquid from the deposit and to inhibit continued leaching of uranium

and other contaminants. The impact is rather severe, as the mining activities damaged an aquifer used for the drinking water supply in the Dresden area.
At present, it is planned to flood the Königstein mine (which is an underground mine converted to in-situ leaching in some areas), up to a certain groundwater level, to wash the leaching blocs. The flooding should be halted and the flooding waters be contained and treated, until their contaminant concentrations would only be marginal. It must be anticipated, though, that this procedure might take long periods of time, as the leaching zone is no longer washed under pressure, unlike during the leaching action.

The situation is even more difficult in the Czech in-situ leaching facility of Stráz pod Ralskem: the goal of restoring groundwater quality in the leaching zone to background has been abandoned as unrealistic.
The restoration goal for the upper aquifer above the leaching zone (used for potable water supply), however, is the drinking water standard, to be achieved by pumping of contaminated waters. The goal seems to be attainable for this aquifer, although some contaminants, as aluminium, exceed the standard up to 1000-fold.
But, for the leaching zone and its surroundings, the goal of reaching the potable water standard is regarded as absolutely unrealistic. For this aquifer, the goal is defined that anticipated contaminant migration to the upper aquifer shall not worsen the water quality in this aquifer beyond potable water standards. But it is still unclear, which contaminant level in the lower aquifer is sufficient to achieve this goal. According to modeling results, a level of total dissolved solids of 10 g/l will be reached in the year 2014, and a level of 1 g/l in 2032, after continuous pumping.
> View details on Stráz groundwater restoration project.

In Bulgaria, a restoration attempt using recirculation of the solution without addition of acid failed: the tubes and filters of the sorption columns plugged, and all restoration attempts were stopped [Vapirev1996]. In some cases, heavy metals and rare earth elements (V, W, Mo, La) were detected in groundwater due to the recycling of solution [Dimitrov1996]. At present, the installations at the surface of the ISL sites are being decommissioned, and all pipes are being removed. But, there is no groundwater restoration: the ISL wells are being plugged; and the groundwater is submitted to "natural restoration".

The restoration of the Devladovo ISL site in Ukraine was limited to soil cleanup at the surface. Some heavily contaminated soil was replaced, while deep ploughing was the only remedy used at the major part of the site. Cleanup was finished in 1975. Subsequently, the site has been used for agriculture. Surveys performed in 1991 have shown that the radionuclide concentrations in the soil had not decreased at all, and that the anticipated self-cleaning of the soil had not taken place. Effective dose equivalents of up to 0.2 mSv/year were calculated for the members of the local population consuming the wheat grown on this soil. [Molchanov1995]

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Further Information

Further Reading

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Industry Information

- Wyoming Mining Association (WMA), USA
- Uranium Information Centre (UIC), Australia
- In situ leaching method of extracting uranium, Appendix 1.1 of the Report of the Senate Select Committee on Uranium Mining and Milling, Canberra, Australia, May 1997
- Crow Butte (Cameco)

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compiled by:
WISE Uranium Project (home)

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<u>Message to Uranium Miners' Group</u>

Church Rock, New Mexico
February 14, 1998

Rose Marie Cecchini, MM

My message to each one of you is from the heart. It's a message fleshed out by the 25 years I lived in Japan. It comes from my own journey of awakening and growing realization of the horrors of nuclear weapons and the death dealing effects of radiation diseases. This awareness came mainly through the men and women I met who had personally experienced the hell-on-earth created by the A-bomb dropped over Hiroshima, August 6, 1945 and the hydrogen bomb over Nagasaki, August 9th, 3 days later.

Today, by your very presence in this meeting place, you're making an important choice. It's a choice for life over death. It's also a choice to help create a culture of life, rather than being passive victims of a culture of death.

The culture of death thrives on secrecy and deception. Economic profit for the few at any cost is the driving force of a death culture. Human life, health, the earth and her limited resources are all sacrificed upon the altar of greed and profit-making for the power brokers of society and the world.

On the other hand, the culture of life thrives on truth and the quest for justice and peace. Respect for human life, all life, the value of good health, care of our earth, respect for limited natural resources as the Divine Creator's gifts to us are basic values in a culture of life.

The secrets and deception that promote a death culture need to be exposed to the bright sunlight of day if we are to create a culture of life for ourselves, our communities and the earth. Here's an example I'd like to share with you. Have you ever heard of the U.S. Atomic Bomb Casualty Commission set up in Hiroshima in 1945 by the U.S. Military Occupation Forces? It remained entirely under U.S. control until 1975. Now it is called Radiation Effects Research Foundation and is a private nonprofit Japanese Foundation supported equally by the Japanese government and U.S. government. U.S. financial aupport is channeled through the National Academy of Sciences under contract with the U.S. Energy Research and Development Administration.

I first heard about the U.S. Atomic Bomb Casualty Commission from A-bomb survivors I interviewed in Hiroshima while researching my dissertation. These A-bomb victims were required by U.S. Occupation forces to report regularly to the Center and were falsely led to believe by U.S. medical personnel that they were receiving specialized treatment for the cure of their A-bomb related radiation diseases and illnesses.

But the historic facts now reveal that for 15 years, from 1945 to 1960, U.S. medical personnel and scientists on the U.S. Atomic Bomb Casualty Commission were in fact collecting scientific data on the health effects of radiation exposure from the A-bomb by conducting experimental tests upon tens of thousands of A-bomb survivors. The Atomic Bomb Casualty Commission (ABCC) was collecting scientific data for military purposes. Never made public, all documentation and research records from the experimentation and investigations were sent in top-secret boxes to Washington, D.C. The findings were never applied to the treatment of radiation diseases. Rather, this abundant scientific data in the hands of U.S. military specialists was utilized in perfecting designs for more effective nuclear weapons.

This is just one example of secrecy and deception that promotes the culture of death. Therefore, in your struggle to speak out the truth, demand justice and rightful compensation for radiation exposure in uranium mining, causing damage to health, long-term mental and physical suffering, loss of life and loved ones - you are steadily carving out a culture that upholds life as the highest value; that respects the earth, natural resources and insures a healthy environment - without which life is not possible. Also, resistance to proposed plans to resume uranium mining that threatens to use and poison the sole water source for all people in this desert region is saying "no" to another death-cycle, that would reap profits for outsiders and cause another environmental catastrophe for the people and creatures who call these lands home.

Today, we're also talking about the health of our souls. If we allow death and evil to triumph, we allow this poison to undermine the very foundations of our democratic society. And we kill any hope in ourselves or in our communities for creating a more human and just society, with reverence for Mother Earth.

As never before, we are called to live examined lives, to be aware of what our cherished values are and what we truly want to commit ourselves to in this life. We need to express and share our reflections, our experiences of solidarity in promoting a culture of life with others. It is a spiritual journey we are walking together. And the true source of our power comes from the compassionate and loving Source of All Creation.

In closing, I leave you with these words from Deuteronomy 30:19:

> "I call heaven and earth to witness the choice you make. I set before you life or death, blessing or curse. Choose life, then, so that you and your descendants may live."

Citizens for Clean Land, Air and Water
P. O. Box 457
Church Rock, NM 87311

February 2, 1998

Interior Secretary Bruce Babbit
U. S. Department of the Interior
Washington, DC 20510

Dear Mr. Babbit,

I am writing on behalf of CITIZENS FOR CLEAN LAND, AIR and WATER, an alliance of concerned citizens in Gallup and Church Rock, New Mexico.

We wish to bring to your attention an environmental and health issue of major concern for our area: the proposed plans of Hydro Resources, Inc., based in Dallas, TX, to resume uranium mining in the Morrison acquifer at Church Rock, utilizing an experimental and risky in-situ leach mining process within the sole water source for 50,000 people in this desert region.

As the enclosed articles and documents indicate, Hydro Resources, Inc., is pursuing its project fully aware of the potential threats from "anticipated deep well breaks," "spills," "population doses" and injected lixiviates which will dangerously contaminate by high levels of radiation the sole water source for the entire region. In this mining process, 4,000 gallons of water per minute will be extracted from Morrison acquifer by Hydro Resources, Inc. To date, their fanciful claims that all water thus utilized will be restored to its original safe, useable quality for the population have never been substantiated by any scientifically conducted research made public by named laboratories or qualified scientists. Their burden of proof has never been demonstrated to the people of this area.

We are also alarmed by numerous glaring anomalies and deviations apparent in the mode of operation of Hydro Resources, Inc: their noncompliance with laws guaranteeing human rights, due process of people in the decision making process, environmental protection; disregard for Navajo Nation sovereignty, bypassing their governmental agencies; disdain for Navajo Nation culture and religious beliefs.

As a group of concerned citizens, we request that your Office investigate Hydro Resources, Inc., and its relations with the Nuclear Regulatory Commission. In particular, we express our concern for the absence of any due process to date, excluding the participation and voice of tens of thousands of people whose lives and environment will be most seriously impacted by proposed in-situ leach mining of uranium within the Morrison acquifer, our only water source for life. Thank you for your concern and assistance in this matter.

Sincerely,

Rose Marie Cecchini

Rose Marie Cecchini, Ph.D.

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