Environmental Defense Institute

News on Environmental Health and Safety Issues

August 2014 **Volume 25 Number 8**

Perched Water and Aquifer Contamination Beneath the INL's ATR Complex

Hope Springs Eternal That Well Monitoring will Provide Early Warning

The US Geological Survey (USGS) monitors about 205 wells annually at Idaho National Laboratory (INL) which covers 890 square miles. All wells are sampled for tritium and selected wells are monitored for strontium-90, plutonium, americium, iodine-129 and other chemical and radioactive contaminants. The USGS website[1] provides links for water monitoring, groundwater and surface-water quality, reports and an online graphical interface map of USGS wells called the national water information system mapper which includes coverage of the INL. Monitoring is also conducted by the Idaho Department of Environmental Quality and by Department of Energy contractors.

The INL wells are monitored for radioactive and chemical constituents because the Department of Energy reactor operations, nuclear fuel reprocessing, dumping of INL wastes and dumping of Rocky Flats plutonium weapons factory waste have contaminated the aquifer. Despite scientific advice to the contrary, DOE had assumed that it would take 80,000 years for contaminants they started dumping in the 1950s to reach the aquifer. But it took less than 30 years.[2]

Idaho National Laboratory INTEC and ATR Complex.

[1] US Geological Survey website link: http://id.water.usgs.gov/projects/INL and INL bibliography at http://id.water.usgs.gov/INL/Pubs/INL_Bibliography.pdf

[2] National Research Council, Board on Radioactive Waste Management, Water Science and Technology Board. *Research Needs in Subsurface Science: U.S. Department of Energy's Environmental Management Science Program.*Washington, DC: National Academy Press. 2000. p. 30.

The eastern Snake River Plain aquifer covers about 10,000 square miles and the entire aquifer plane covers about 15,000 square miles and spans from the western boundary of Yellowstone National Park in eastern Idaho to the Idaho-Oregon border where the Snake River enters Hells Canyon. The 200 mile long by 50 to 70 miles wide eastern Snake River Plain aquifer is heavily used for agriculture and public use. Much of the discharge from the eastern plain is through springs, with two major spring discharge areas are near the American Falls Reservoir and the Thousand Springs area near Twin Falls, Idaho, about 100 miles southwest of the INL. But the aquifer is used for agriculture and public use by wells closer to the INL site, within 65 miles.

The basalt rock is relatively permeable because of the presence of fractures, fissures, and voids such as lava tubes. The aquifer flows through the basalt rock in a southwesterly direction. The velocity of the aquifer is generally reported as being between 2 and 20 ft per day, resulting in estimates that it would take from 70 to 700 years for water beneath the INL to reach the springs near Twin Falls, about 100 miles downstream.[3] Localized tracer tests at the INL have shown velocities as high as 60 to 150 ft per day,[4] however, the 1983 arrival of tritium to the southern boundary of the INL from INTEC and the ATR Complex indicated an average velocity of about 4 feet per day.[5] Despite decades of study, large uncertainties remain in estimating vertical transit time of contaminants from the soil to aquifer and in horizontal transit time from the point of contamination to the INL boundary and beyond.

Well monitoring in 1989 in Rupert Idaho prompted by elevated numbers of cancers in the area yielded 457 picoCuries per liter, well above expected background levels that would be below 150 picoCuries per liter, yet were dismissed by officials as unreliably measured.[6] A subsequent USGS study did not find elevated tritium levels, beyond levels expected from weapons testing fallout.[7] Tritium (half-life 12.3 years) and Iodine-129 (half-life 15.7 million years) have both been detected beyond INL boundaries.

---

[3] DOE/ID-22225, Iodine-129 in the Eastern Snake River Plain Aquifer at and near the Idaho National Laboratory, Idaho, 2010-12, Report 2013-5195. http://pubs.usgs.gov/sir/2013/5195/pdf/sir20135195.pdf

[4] ibid. DOE/ID-22225. p. 6.

[5] USGS Report 90-4090, L.J. Mann and L.D. Cecil, "Tritium in Ground Water at the Idaho National Engineering Laboratory, Idaho," June 1990. http://pubs.usgs.gov/wri/1990/4090/report.pdf

[6] Spokane Chronicle, "Tests on well water don't provide tritium present, lab says," AP, March 23, 1989. See http://news.google.com.

[7] Larry J. Mann and LeRoy L. Knobel, "Radionuclides, Metals, and Organic Compounds in Water, Eastern Part of A & B Irrigation District, Minidoka County, Idaho," USGS Report 90-191, June 1990. http://pubs.usgs.gov/of/1990/0191/report.pdf

A few of the springs at Thousand Springs in southwest Idaho.

The aquifer lies from 200 to 900 ft below ground underneath the Idaho National Laboratory and about 450 ft below what is now called the Advanced Test Reactor Complex, formerly known as the Test Reactor Area. The aquifer has been contaminated by numerous radionclides and chemicals released in past INL operations at facilities, most notably the Radioactive Waste Management Complex (RWMC) used for dumping Rocky Flats transuranic waste and INL radioactive wastes, but also INTEC (formerly the "Chem Plant" used for Naval nuclear fuel reprocessing), and Test Area North where the nuclear aircraft engine tests and depleted uranium for military tank armor resulted in radioactive and extensive hazardous chemical waste dumping.

Dumping of plutonium at RWMC included about 17,100 Ci of plutonium-238, 64,900 Ci of plutonium-239, 17,100 Ci of plutonium-240, and 183,000 Ci of americium-241 between 1952 and 1999.[8] But, as bad or even worse was the dumping of carcenogenic chemical wastes at RWMC including 24,000 gal of carbon tetrachloride; 39,000 gal of lubricating oil; and about 25,000 gal of other organic compounds including trichoroethane, trichloroethylene, perchloroethylene, toluene, and benzene.[9] Efforts to remove portions of the buried waste and to vacuum extract portions of volatile chemicals are ongoing and are documented in INL "superfund" documents.[10]

[8] DOE/ID-22226, Scientific Investigations Report 2013-5214, US Geological Survey, "An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Idaho, Emphasis 2009-11," 2013.p. 21.

[9] ibid, DOE/ID-22226, p. 21.

[10] See administrative documents at ar.inel.gov.

This article focuses on the ATR Complex where various radionuclides such as tritium and strontium-90, and chemicals such as chromium-6 have been injected directly into the aquifer or have leaked from percolation ponds or other leakage into soils above the aquifer from past and current reactor operations, including the Advanced Test Reactor.

Bodies of underground water above the aquifer known as "perched water" have formed from waste-water disposal practices such as those at the ATR Complex. The worst of the past practices at the ATR Complex have ceased: unlined reactor waste water percolation ponds and well injection of the toxic corrosion inhibitor chromium-6 (or hexavalent chromium). But tritium and various wastes, in addition to spent fuel, continue to be generated by reactor operations.[11]

Ion exchange resins used to reduce the radioactivity of ATR warm waste water effluent had been buried at RWMC and since 2008 were shipped out of state to Nevada's NNSS. A new burial ground is proposed at the ATR Complex to accept the radioactive resins and also reactor core internals that are replaced in periodic core internal changeouts.[12]

Past Dumping of Chromium-6

An estimated 55,000 lb of chromium-6 were injected in a well or discharged to percolation ponds before the use of chromium-6 at the ATR Complex was discontinued in 1972. Remember the movie "Erin Brockovich"? It depicts Pacific Gas and Electric's use of chromium-6 that contaminated wells and resulted in a large legal settlement for residents of Hinkley, California who had become ill.

In July 2014, California passed a maximum contaminant level (MCL) for chromium-6 of 0.01 mg/L or 10 ppb.[13] The EPA standard for maximum concentration of chromium-6 remains 10 times higher at 0.1 milligrams per liter or 100 parts per billion (ppb). As with many EPA standards, the MCL is not protective of health or the environment. The INL aquifer well monitoring has typically been less than 0.001 milligrams/L. But, 2006 to 2008 deep perched groundwater monitoring at the ATR Complex found values as high as 0.125 mg/L.[14]

[11] ibid, DOE/ID-22226, p. 20.

[12] DOE/EA1793, "Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site, December 2011. http://energy.gov/nepa/downloads/ea-1793-final-environmental-assessment

[13] See http://www.valleywater.org/services/chromium-6.aspx

[14] DOE/ID-22212 USGS report 2010-5197, An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Emphasis is 2006-08, U.S. Geological Survey, 2010, p. 65.

Unlimited Contamination When Labeled an "Industrial Use Area"

Unlined reactor waste water percolation ponds for at the ATR Complex once served three reactors, the MTR, ETR, as well as the currently operating ATR. The pond for ATR was replaced with a lined pond in 1993 and reactor waste water treatment practices were improved over the years.

When the Record of Decision was issued in 1997 [15] it was expected that underground water contamination levels would decrease and perched water would decline. "The perched water zones underlying TRA are **contaminated from infiltration of wastewaters from the system of ponds**. An investigation of the two perched zones (shallow and deep) was conducted. The ROD for the TRA Perched Water System, OU 2-12 was issued in December 1992.[16] It was determined in the ROD that no remedial action was necessary to ensure protection of human health and the environment. That decision was based on the results of human health and ecological risk assessments (ERAS), which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected or future use of the SRPA beneath the deep perched water system at TRA. One of the assumptions for the no-remedial-action decision was that groundwater monitoring would be conducted to verify that contaminant concentration trends follow those predicted by a groundwater computer model."[17]

Despite this infiltration of contamination from the ponds, the Department of Energy added to the contamination from decades of operating reactors at the ATR Complex by **moving radioactive soil from other parts of the INL to an out-of-service pond at the ATR Complex.** The 1997 Record of Decision describes the how radioactive material from other CERCLA Operable Units was moved to the ATR complex and dumped into out-of-service pond, the 1957 cell, "including soil contaminated with Cs-137 from the Argonne National Laboratory stockpile, soil contaminated with Cs-137 from the Boiling Water Reactor Experiment, soil contaminated with Cs-137 from the Experimental Breeder Reactor, soil contaminated with several radionuclides including strontium (Sr)-90, europium (Eu)-152, americium (Am)-241, Cs-137, Eu-154, and CO-60 from the TRA North Storage Area, soil contaminated with Cs-137 and Sr-90 from Test Area North Area B, and soil contaminated with Cs-137 and Sr-90 from the Technical Support Facility. Again, **0.5 ft (0.15 m) of clean fill was placed over these materials.**" [18] They

[15] DOE/ID-10586, Final Record of Decision, Test Reactor Area, Operable Unit 2-13, Idaho National Engineering Laboratory, U.S. Department of Energy, Environmental Protection Agency, Idaho Division of Environmental Quality, December 22, 1997. http://ar.inel.gov/owa/getimage_2?F_PAGE=1&F_DOC=DOE/ID-10586&F_REV=00

[16] EGG-WM-10002, "Remedial Investigation Report for TRA Perched Water System Operable Unit 2-12," June 1992. http://ar.inel.gov/owa/getgif_2?F_DOC=EGG-WM-10002&F_REV=00&F_PAGE=2&F_GOTO=1

[17] DOE/ID-10586, Final Record of Decision, Test Reactor Area, Operable Unit 2-13, Idaho National Engineering Laboratory, U.S. Department of Energy, Environmental Protection Agency, Idaho Division of Environmental Quality, December 22, 1997, p. 5-16.

[18] ibid., DOE/ID-10586, p. 5-4.

placed 0.5 ft of soil and some rocks over the contamination and called it good because no one is living or farming at the ATR Complex.

To understand why this moving of radioactive waste took place, read DOE's statement of progress from EM's FY 2011 Congressional Budget report: "Of the 689 [CERCLA] sites identified as being potentially contaminated, 89 percent (612) sites have been cleaned up and have been determined not to pose any risk to a current of future resident, **or resides within an Industrial Use Area under future governmental control** . . ." If you can't clean it up, put it in an area deemed an Industrial Use Area and keep assuming the contamination won't move migrate far.

Monitoring of wells can tell us if contaminants are migrating, but at that point, there may be little that can be done about it. In addition, the maximum contaminant levels (MCLs) are not protective of human health.

While the cleanup progress at the INL is significant, the communication has been aimed at minimizing the appearance of a continued threat to the aquifer. Little or no emphasis is placed on communicating how much contamination will remain after "cleanup" and how many hundreds or thousands of years must elapse before the contamination is gone.

Recent Leakage of Radioactive Contaminants at the ATR Complex

Despite optimistic projections, the first five-year review[19] showed several perched water wells with increasing contaminant levels. Several possibilities were considered and a closer look found that an underground warm waste pipe to the lined pond had been leaking, in addition to the leaky retention basin. An estimated 1.7 million gallons of treated warm waste had leaked into the ground undetected[20] from Advanced Test Reactor operations that produce about 9000 gallons per day. This treated warm waste contains about 0.3 Curies of tritium per day which cannot be removed by conventional waste water treatment. Various radionuclides such as cobalt-60 and cesium-137 remain even following radioactive water treatment to reduce the radioactivity. Ion exchange resins used for removing the radionuclides had also apparently been flushed through with the treated waste water and leaked into the soil.

[19] DOE/ID-11099, "First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory," Revision 0, September 2003.

http://ar.inel.gov/owa/getimage_2?F_PAGE=1&F_DOC=DOE/ID-11099&F_REV=00

[20] DOE/NE-ID-11139, "Track 1 Decision Documentation Package for TRA-605 Warm Waste Line," January 2005. http://ar.inel.gov/images/pdf/200503/2005030300231KAH.pdf

The 1.7 million gallon leak of radioactive contamination was successfully kept from receiving public attention, while emphasizing that the new lined pond was keeping radionuclides from being added to the aquifer.

And while DOE contractors at INL facilities were required to report concentrations of radioactive and chemical wastes for 1976 to 1998, since 1999, no formal program has been in place to compile annual amounts of constituents discharged at each facility.[21] About 31,810 Ci of tritium was discharged to wells and ponds at INL from 1952 to 2000; but no records are available since 2000 [22] presumably because the tritium is being released for evaporation rather than to the ground. Between 1952 and 1993, 8,920 Ci of tritium were discharged to percolation ponds at the ATR Complex.[23]

Although tritium levels at the INL and in the perched water below the ATR Complex have generally declined, there continued to be tritium level increases in some wells even in 2012. Tritium levels have exceeded EPA's generous 20,000 pCi/L standard and this is almost 20 years after installing the lined pond and 15 years after discovering the warm waste leakage that became a CERCLA site labeled TRA-63.[24]

Table 1 shows some of the perched water contamination levels at selected wells at the ATR Complex. After the lined evaporation pond was installed at the ATR Complex in 1993, tritium levels fell in perched water USGS well 55 from a high of 74,800 pCi/L in 1990 to 900 pCi/L in 1994. But, in 1997, tritium levels in well 55 jumped up to 77,400 pCi/L with levels staying high through 2003. Tritium levels stayed around 6000 pCi/L and then were measured above the 20,000 pCi/L drinking water standard in 2007, 2010, and 2012. Background tritium at the INL is below 150 picoCurie/Liter (pCi/L).

This tritium spiking in well 55 created a mystery. But, DOE and USGS believe that when normal cold waste water contributions decrease, more concentrated perched water seeps into monitoring wells, resulting in increased tritium levels in some perched water wells.[25] Tritium plumes underground in the perched water zones spread horizontally underground due to layers of basalt rock and ultimately progress downward toward the aquifer. Fortunately, the 12.3 year half-life of tritium allows natural radioactive decay to diminish the quantities of tritium significantly within a hundred years.

Naturally occurring tritium is rare. But nuclear weapons testing increased background levels across the country, and operating reactors can generate over a thousand curies of tritium

[21] DOE/ID-22226, Scientific Investigations Report 2013-5214, US Geological Survey, "An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Idaho, Emphasis 2009-11," 2013. (p. 19.)
[22] ibid, DOE/ID-22226, p. 34.
[23] ibid, DOE/ID-22226, p. 20.
[24] ibid, DOE/NE-ID-11139.
[25] 2014 communication with USGS Roy Bartholomay.

Table 1. Advanced Test Reactor Complex Perched Ground Water Monitoring

Selected data from USGS reports on Perched Water Zones (shallow perched < 50 ft; Deep Perched < 150 ft) following the Final Record of Decision Test Reactor Area with DOE, IDEQ, EPA. [26]

Well Number Well Depth	Date Sampled	Tritium pCi/L MCL = 20,000	Strontium-90 pCi/L MCL= 8 pCi/L	Reference A (pg. 32)
PW 8 (DP) 166 Ft.	4-11-07 4-14-08 4-13-09 4-29-10 4-4-11	410 280 240 200 60	7.5 7.8 7.9 9.3 6.9	A A B B B
PW 9(DP) 200 ft.	10-30-06 10-23-07 10-06-08 10-14-09 10-27-10 10-05-11	16,300 **24,400** **28,700** 18,300 **22,800** 14,500	-0.7 -1.2 2.1 0 1.9 1.2	A A A B B B
USGS 54 DP 82 ft.	10-26-06 10-4-07 10-6-08 10-22-09 10-28-10 10-11-11	50 100 220 180 140 30	48.8 33.9 40.1 34 36.4 32.3	A A A B B B
USGS 55 DP 81 ft.	4-25-06 5-01-07 4-29-10 4-15-08 4-13-11 4-9-12	5,600 **40,200** 4,880 **25,000** 2,580 **28,100**	70 55.1 49.4 42.2 34.7 N/A	A A B B B C
USGS 56 DP 80 ft.	10-26-06 10-17-11	9,490 2,940	36.1 65.5	A B
USGS 70 DP 100 ft.	4-13-09 4-12-10 4-14-11	3,290 3,490 710	36 31.5 28.2	B B B

Table notes:

1. MCL = Maximum Contaminant Level, U.S. Environmental Protection Agency (2001) standard.
2. Tritium, symbol T or H3, is a hydrogen atom with two extra neutrons. It has a radioactive half life of 12.3 years and is a pure beta emitter.
3. Strontium-90, symbol Sr-90, has a radioactive half life of 29.1 years and is primarily a beta emitter.

Table References:

A: An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Emphasis is 2006-08, U.S. Geological Survey, Scientific Report 2010-5197, 2010. (DOE/ID-22212)

[26] DOE/ID-10586, Final Record of Decision, Test Reactor Area, Operable Unit 2-13, Idaho National Engineering Laboratory, U.S. Department of Energy, Environmental Protection Agency, Idaho Division of Environmental Quality, December 22, 1997. http://ar.inel.gov/owa/getimage_2?F_PAGE=1&F_DOC=DOE/ID-10586&F_REV=00

B: An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Plain Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Emphasis 2009-11, U.S. Geological Survey, Scientific Report 2013-5214, 2013. (DOE/ID-22226)

C: Final Record of Decision, Test Reactor Area, Operable Unit 2-13, Idaho National Engineering Laboratory, U.S. Department of Energy, Environmental Protection Agency, Idaho Division of Environmental Quality, December 22, 1997. (DOE/ID-10586)

each year. Based on the waste water radionuclide contamination discussed in DOE/NE-ID-11139, it would appear that ATR sends about 116 Curies per year of tritium in its waste water. INL annual monitoring reports for airborne effluents indicate tritium (H-3) released from the ATR Complex may range from 97 to 487 curies annually.[27]

For illustration, one hundred curies of tritium would be enough to contaminate five billion liters of water (or more than 1.3 billion gallons) to the EPA limit for drinking water of 20,000 picoCuries per liter. One Curie of tritium weighs about 0.0001036 grams. Tritium effluent amounts are often estimated rather than measured. So, when pipe leakage occurs resulting in waste water effluent, if it isn't expected, it's not included in annual reports. ATR warm waste effluent that isn't going to the aquifer is being evaporated from the lined warm waste pond into the atmosphere to be inhaled or ingested. Tritium can be taken into the body via skin penetration, inhalation and ingestion, as tritium, like normal hydrogen, bonds with oxygen to form water, making "tritiated water" which is radioactive.

The EPA drinking water standard of 20,000 pCi/L limits the annual dose to 4 mrem/yr and is presented by the nuclear industry as protective. But because of numerous animal studies,[28] independent experts believe it is not protective of human health because when taken into the body due to the high number of disintegrations per second that cause damage to chemical bonds in the body. Tritium can be deposited in the gonads and in the DNA and RNA.

Radioactive tritium can be excreted from the body like water or can be used in the human body to build DNA, then destroy the DNA by its radioactive decay. Nuclear industry comparisons to external radiation dose misrepresent the internal hazards of radionuclides incorporated into the body. The radiation does not need to have much penetrating power to cause significant damage, especially to a growing fetus. And the nuclear industry assertion that everyone gets an annual CAT scan (about 150 mrem) and additional medical radiation allows them to double the annual radiation dose, implying that these additional environmental doses from nuclear operations are inconsequential.[29]

[27] Annual Site Environmental Report for 1997 to 2012. http://www.gsseser.com/publications.htm

[28] D.J. Mewissen, A.S. Ugarte, Department of Radiobiology and Franklin McLean Memorial Research Institute, University of Chicago, "Cumulative Genetic Effects From Exposure of Male Mice to Tritium for Ten Generations," IAEA-SM-237/67, 1979.

[29] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html

There is progress on cleanup at the INL, but it isn't as rosy as DOE would have you believe. DOE, its INL contractors or even the State of Idaho's Department of Environmental Quality remain foremost cheerleaders for all things nuclear — minimizing and obscuring the still very long-term problems of radioactive contamination at INL.

Article by Tami Thatcher, former nuclear safety analyst at INL and a nuclear safety consultant and Chuck Broscious.

Department of Energy Whistleblower: Justice over Racial Discrimination and Ethics Violations in a Right To Work State (Human Resources Ethics and Concerns)

By Dennis Patterson (Author), Michael R. Strickland (Editor)

Book Description

Publication Date: May 18, 2014

"This book is a first-person account of a Department of Energy whistleblower who fought for fairness and justice at our nation's lead nuclear research facility, the Idaho National Laboratory (INL). At the time he became a whistleblower Dennis Patterson was the "Ethics Officer" and manager of the Employee Concerns Program at the INL. Dennis was responsible for promoting high ethical standards and being an advocate for employee rights. The office was designated a "safe haven" for employees to report unethical or illegal conduct without fear of retaliation.

"While conducting an allegation of unfair termination Dennis soon discovered violations of company policy, regulations, and possible racial discrimination. During the investigation, management refused to cooperate, withheld evidence, manufactured evidence, and impugned Dennis' character. Nonetheless, justice was served and the employee was able to return to his job

at the INL. Given the serious acts of misconduct Dennis desired to meet with the company president. It was at this point that Dennis became the subject of repeated and ongoing harassment and retaliation.

"This book is about Dennis' fight to make the INL a better laboratory. You will read about his efforts to make his community a better place to live as Dennis shares personal stories of his faith, family and friends and the incredible people he met along the way.

Tami Thatcher review of the kindle book by Patterson:

Important Insights About Idaho National Laboratory's BEA and the DOE's Whistleblower Program, May 24, 2014

"It is important that Patterson shares his experience because honest people with a conscience don't expect the degree of shameless lying that goes on. You get a taste of how bringing a Department of Energy Whistleblower case subjects a person to BEA's shameless lying while BEA has an open DOE budget to pay for their legal costs.

"The book gives examples that help you understand why INL Ethics Offices, in general, are meaningless with regard to nuclear workers being threatened by management for not doing what management wants, which sometimes includes the cover-up of safety problems. Anyone with the illusion that DOE is not in bed with its contractors should read this book. [30]

Ralph Stanton's brother (J.L. Stanton) has made a face book group for following issues pertaining to the ZPPR plutonium event. And they are friends with Patterson. J.L. Stanton writes: "As the brother of Ralph Stanton, another whistleblower mentioned in this book, I cannot thank Mr. Patterson enough for his contributions and efforts to make nuclear operations in the United States as safe and as transparent as possible. Unfortunately, with contractors such as Battelle Energy Alliance running things, I fear for the industry's future. Falsification of type 1 work procedures as the standard, falsification of health records, falsification of exposure levels, perjury in depositions, dishonesty, and a total lack of concern for worker safety is how this company operates across the United States. Dennis' account is an amazing look at what goes on behind the scenes in the nuclear industry and how the Department of Energy is complicit in helping contractors cover up ethics violations. A must read."

Excerpt from the book: "In another matter the Post Register ran a headline on December 12, 2013, "EX-INL worker awarded $ 100,000." The jury found that the employee's "perceived mental disability" was a motivating factor for BEA to take adverse employment actions against him. The article noted that according to court records, management had allegedly asked the

[30] http://www.amazon.com/review/R17QKJY6BUEEJC

employee to “engage in behavior that he deemed unethical and inappropriate.” The employee was a nuclear engineer. He resigned in October 2011, “because of the hostile work environment and discrimination at INL.”

This nuclear engineer was involved with MFC and refused to falsify documents.

Peterson continues: “Over the past year I have been contacted by several former BEA employees for advice and assistance. Each of them had been recently terminated. All of them believed that their dismissal was either unjust and/ or retaliation for reporting misconduct.”