UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the matter of	)	
	)	
POWERTECH (USA) INC.	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium	)	
Recovery Facility)	)	

OPENING WRITTEN TESTIMONY OF LINSEY MCCLEAN

My name is Linsey McLean. I am a biochemist residing at 840 Husker Place, Piedmont, SD 57769, biochemist@vitaroyalproducts.com

I will be addressing the Oglala Sioux Tribe's and Consolidated Intervenors' CONTENTION 3: ***The DSEIS Fails to Include Adequate Hydrogeological Information to Demonstrate Ability to Contain Fluid Migration and Assess Potential Impacts to Groundwater***,

Through use of a powerpoint presentation and narrative, I will show that according to the permit application Powertech has submitted, and Contention 3, no permit should be issued:

*The land application for wastewater is destined for environmental contamination that will never be able to be remediated. Heavy metals never degrade into harmless substances. Those lixiviant solubilized toxic heavy metals will eventually migrate into groundwater aquifers or surface water via streams, floods, melting snow runoff and storms.

*Reclamation of the affected land is not physically or economically feasible.

*Heavy metals, most notably: Selenium, Molybdenum and Arsenic will be generated in soluble forms that are highly toxic to all living things, and are able to be concentrated even further by bioaccumulation up the food chain.

*No ISL mines have ever have proven to be safe and free of excursions, or been able to be properly decommissioned with the mined aquifer restored to baseline chemistry levels, so that the water is drinkable in quality.

*Humanity has continuously failed to clean up our mining messes throughout history, as evident from all the superfund sites of total and complete loss of any use all over the country and the world, not to mention the over 10,000 other old uranium mines that should be super funds and are not, due to lack of funding for remediation/burial. It is likely that this mine will join the current open pit mines that should be superfund right next door.

*The more dangerous the mined materials, the more toxic the residual mess left. In this case, mining of uranium, a toxic heavy metal in itself, also brings an additional risk of radiation from radon gas and lixiviant solubilized radioactive heavy metals of vanadium, thorium, strontium and radionuclides.

*Large amounts of contaminated wastewater are generated, according to a report on ISL mining prepared for the Larimer County Commissioners by The Larimer County Environmental Advisory Board, in WY, they say:

“Due to the nature of ISL mining, quite large volumes of wastewater are created, which are often highly saline and contain toxic levels of heavy metals, process chemicals, and radionuclides. Excess ISL process water that is not re-injected is typically either directed to an evaporation pond, or injected into a deep disposal well to an aquifer below the uranium deposit and domestic aquifers.”

Fig 1 shows the Mineral Wheel - a graphic of how minerals and metals interact with each other. You can see that, following the arrows from one to another, that an excess of one will create a deficiency of another. This is important in the health of all life, as minerals both fuel and direct enzymatic biochemical reactions in the living body. When high levels of heavy metals offset and upset the biochemistry of the living body, severe compromises to health are set in motion, including hormone imbalances. Heavy metals will not only create deficiencies of essential minerals but also exhibit toxicity by their very presence in the living body. Thus they are doubly toxic.

Further, heavy metals are known to be “xenoestrogens”, a hormone mimic of estrogen, the female and growth hormone. Estrogenic toxicity causes cancer, skin lesions, obesity, fertility problems, accelerated aging, liver problems, learning problems, mood disorders, metabolic syndrome, blood sugar irregularities, blood fat irregularities, increase in breast tissue and size in both males and females, smaller or even undeveloped male genitalia and higher anger and anxiety responses to daily life situations. Mineral imbalances caused by high levels of toxic heavy metals themselves, also are known to cause hormone imbalances of insulin, thyroid, testosterone, progesterone, estrogen and cortisol.

We see those very problems exemplified in the most toxic areas of the world, and in increasing statistics overall in the world, as environmental pollution moves around the world. All of the heavy metals studied so far, that are common exposures to man, have shown to be “xenoestrogens”, including those that are expected to be generated from the rock strata at Dewey- Burdock. The increase in obesity of animals and humans over the last several decades is directly correlated to the increase of environmental toxins that are known to be fat soluble and deposited in body fat, including heavy metals.

Looking at just one of those toxic heavy metals, selenium, well known as a common mining pollutant in the Black Hills and elsewhere, we find that according to studies done at the Smith Ranch and the Highlands Uranium Mine in Converse County, Wy, selenium was found to bioaccumulate in the environment and wildlife of the area where in situ wastewater was used to irrigate grasslands. In this case, the in situ wastewater was applied to grasslands as irrigation water, one option that Powertech has offered for consideration in its permit application.

http://link.springer.com/article/10.1007/s00244-001-0037-y#page-2

In this study, mean selenium concentrations in grasses, grasshoppers, red-winged blackbirds eggs and livers were 5.8 to 30 times higher at the study area than at the reference site. Elevated selenium collected from soil, water, and wildlife demonstrate that selenium is being mobilized and is bioaccumulating in the food chain. This can eventually affect livestock grazing in the area and can then enter the human food chain.

Fish and aquatic organisms are especially sensitive to selenium levels and grasshoppers and other insects, salamanders and crayfish are key parts of the food chain at risk.

Fig. 2. shows fish affected by selenium toxicity.

A low concentration of selenium in water has the potential to increase by several orders of magnitude by the time it reaches fish and wildlife. For example, a water concentration of 10 ug/L (micrograms per liter or parts-per-billion) can increase to over 5,000 times that amount in fish tissues. Bioaccumulation causes otherwise harmless concentrations of selenium to reach toxic levels. This same principle applies to other heavy metals as well.

Fig 3 shows a graphic of how bioaccumulation works. The substance that exists in a low level amount in the environment, that was formerly thought to be so low as to be safe, is taken up by small and simple organisms such as algae, then eaten by animals, which in turn are eaten by other animals up the food chain, and the substance is further concentrated as it travels up the food chain, increasing its toxicity. Man, as the top predator, will suffer the most from bioaccumulation as we eat the animals in the food chain below us.

Although fish do take up some selenium directly from water, most of it comes from their diet. Therefore, in order to protect fish from selenium poisoning it is essential to keep waterborne selenium below levels that cause bioaccumulation in the food chain (Lemly and Smith 1987). There is nothing in Powertech's application that describes reducing heavy metal contamination of wastewater, no mitigation at all, and this is not addressed in the DEIS either.

Fig 4 shows mutations in brown trout from selenium toxicity near a mining zone in ID

Selenium can exist in many chemical forms, and some forms are more toxic for the amount of selenium exposure than others. Symptoms of selenosis, selenium toxicity, include a garlic odor on the breath, gastrointestinal disorders, hair loss, sloughing of nails, (hooves and claws in animals), fatigue, irritability, thyroid compromise, thyroid chemistry compromise, and neurological damage. Selenium in certain chemical forms, is not only non-toxic but absolutely essential to life. It fuels the enzyme that converts T4, the

storage form of thyroid hormone to T3, to the active form, that regulates the speed of all biochemical reactions in the body at the cell level. Extreme cases of selenosis can also result in cirrhosis of the liver, pulmonary edema, and death.

Fig 5 shows horse hooves affected by selenium toxicity

Fig 6 Here is a picture of sheep with selenium poisoning and cattle hooves

Fig 7 shows the mutagenic birth defects effects of selenium on ducks that had access to evaporation and holding ponds in mining, like the ones proposed by Powertech.

The same result of toxic bioaccumulation occurs for other known pollutants and products of ISL mining, such as arsenic. So that everything stated above for selenium can also be said for arsenic, manganese, chromium, copper, vanadium, and other heavy metals.

Fig 8 shows cancer lesions from chronic arsenic poisoning in humans

Metals cannot be broken down to other elements in Nature or the living body, and in fact, toxin exposure in continuous low levels, formerly thought to be safe, have now been shown to have additive or synergistic effects, where the end effects of a combination of toxin exposure produces more severe health compromises than those that would be expected from each toxin. The common example is that 2 +2 now equals 8. Since different chemical forms of minerals and metals can and do exist, and some are more toxic than others, and travel up the food chain at different rates. Different chemical forms of minerals and metals target different organs and tissues of the body.
Additionally, each individual toxin is shown to enter the body at levels under the body's detoxification radar of liver detoxification, thus allowing toxic levels of the pollutant to build up over time, until the body becomes so sickened that it cannot help itself anymore in a detox and elimination protective method.

Fig 9 shows cancer lesions from chronic arsenic exposure

Figure 10 shows the effects of accelerated aging and inflammation due to a compromised thyroid from a medical textbook. This picture shows the same person, on the left, with thyroid compromise before thyroid intervention and on the right, after thyroid intervention. I show this slide because more and more people today are showing effects such as this as arsenic rises in our food, water and air exposures. Thyroid compromise, with both hypothyroidism and thyroid autoimmune syndromes are epidemic today, and have been steadily rising in the last 5 decades as metals and other thyroid compromising toxins rise since WW2. Indeed, there are now over 1.5 million environmental chemicals in our environment, and over 80,000 of them have been shown to affect thyroid and the hormonal systems of the body. Thyroid takes the biggest hit of any organ or tissue in the body.

Arsenic, in particular, is extremely dangerous in the world today, and especially North America, because arsenic opposes iodine on the mineral wheel, meaning that high arsenic causes iodine deficiency. Current research has shown that we need far more iodine than we thought we did for health, and we are not getting it in food or water, even as we used to decades past, when iodine was used in food processing and water purification.

Arsenic has been rising in our environment and food supply because of the legal dumping of it into commercial fertilizers from mining and ore smelting waste since 1976 when it became legal to do so. In the 1980's President Reagan increased to legal limit of arsenic in public drinking water because the levels were rising so high, and arsenic is both difficult and expensive to remove from water, as mining reclamation efforts have shown.

Mother Nature, of course, does not necessarily agree that so much arsenic is safe! Arsenic compromises thyroid. Thyroid disease has escalated epidemically in the last 50 yrs since iodine was reduced in our food and water supplies. And today, as relevant for accelerated aging, each generation is not expected to live as long as its parents, and higher and higher statistics of formerly "old age" ailments are evident in younger and younger segments of the population, severely compromising our health care.

Fig 11 shows chronic arsenic and selenium poisoning. There is no specific treatment for either poisoning. Once it has been identified, further exposure should be avoided. Recovery may take weeks or months after exposure is stopped, or not at all. Effects on the nervous system may take months and in

some cases a complete recovery is never achieved. But how do you stop exposure if you live there?

I submit a study:
Combined Toxic Exposures and Human Health: Biomarkers of Exposure and Effects

Int. J. Environ. Res. Public Health 2011, 8, 629-647;
doi:10.3390/ijerph8030629

These toxic metals will be concentrated in the area of waste water discharge for time immemorial and due to the large volume of wastewater generated and also the large surface area contaminated, no effective and safe economical method of remediation and reclamation of the land's original purpose is possible. Application of wastewater to grasslands from this uranium mine is not a good idea, and not a safe and efficacious solution for disposal of this highly contaminated waste water. The subsequent plants grown, if they are able to grow at all from the toxicity, would be far too contaminated to be used for any feeding.

Substantial disposition of sediment in stream or lake beds, landslides, or water pollution cannot feasibly be prevented;

Containment of toxic wastewater load is not feasible in a leach pond designed to be large enough to be a lake bed, contrary to Powertech's plan to fence out Nature. No fence will last the lifetime of the toxins being contained here: ie; the lifetime of radiation left behind and accumulation of heavy metals that never die or degrade, in sediments of a pond. It is not possible to adequately fence off Nature. Powertech plans to fence off mammals, however, there is no fence for the rest of Nature, insects and other small crawly things, small mice, salamanders, snails, etc., at the bottom if the food chain, that would leave the pond and be eaten by their predators, to have their toxins then bioaccumulate up the food chain.

Seasonal weather changes bringing heavy rains, winds, blizzards and floods will cause the borders of the pond to be overrun, taking toxins away from the pond, toward streams and rivers, and giving access to Nature, the environment and wildlife. Further, seasonal drying in summer and drought conditions will allow exposure to the winds of dried sediments on the pond's edge, adding to

air pollution which can be carried for miles. Migrating birds and other animals will carry toxins to far away places, while it damages their bodies for survival, and contaminates game birds that are hunted and eaten by man.

Further, with the high drainage capabilities of areas of the Black Hills such that domestic leach beds for septic systems often drain too fast, this water with its toxins will permeate the Earth and eventually contaminate the waters below. This is how Nature works to recharge its aquifers, after all. And gasses produced like radon, will be taken by the wind with other by toxic byproducts yet to be seen.

The problem with ponds

1. Ponds are shallow design, not more than a few feet deep. This allows for more contact between the highly chemically active waste water and the plastics in the liners, facilitating faster degradation. And all plastics do degrade over time, even without this chemical exposure. The high levels of oxidizing chemicals will speed degradation dramatically. This is what these chemicals do and why they are used in the ISL process to degrade rocks.

2. The plastics used in the liners are polypropylene and polyethylene, common plastics we use every day. These plastics are so easily degraded that they are the principle plastics used in the food and bottled water industry and easily recycled by adding chemicals to degrade and disintegrate, and hence the ones we recycle.

The warranty by the manufacturer is only 1 yr for the polypropylene and 2 yr for the polyethylene, and the project is supposed to last 20 yrs. And the strips of plastics will be bonded together by seams of heat and or glue, and these have been shown in other EPA tests to leak.

3. The plasticizers that are integral in all plastics to give them their softness and pliability, are well known endocrine disruptors and hormone mimics, and also are well known to leach into foods. Hence the warnings of plastic bottled juices, foods and waters.

When these plasticizers are leached from the plastics, the plastics become brittle and will break and then leak. I would expect leaks fairly quickly in the these ponds because of the contact with these highly active oxidative chemical waste waters facilitating that leaching of plasticizers and degradation.

4. The clay liner underneath will not be impervious to the leakage, as we have found with clay pits of old that are now deemed superfund sites. Clay leaks too.

I have just given numerous reasons that conditions for land reclamation and prevention of contamination cannot be met with Powertech's mining application.

None of this data has been considered by NRC in its environmental assessment.

The moral of the story is that once you severely contaminate an environment, it cannot be taken back. The initial financial rewards enjoyed for a relatively short time become horribly costly in the end, much more so than the initial rewards.

And science now understands that exposure of just one generation of individuals, will have their genetics impacted in a negative way for the next 5 generations, even if that individual is removed from the contamination. This is HUGELY significant! This means that birth defects from environmental toxins can last up to 5 generations afterward.

Contamination of our water, land and air with radiation and toxic chemicals released in uranium mining and processing cannot be taken back...not in our lifetime, nor the lifetimes of the next 5 generations. In fact, it cannot be taken back at all.

Civilization has been shaped over time by science and scientific discoveries. Indeed, this is how we grow and develop as humanity. New observations by man are incorporated into the standard paradigm which change our world views and shape and direct our actions for the future. We learn from our mistakes, or are supposed to. When new observations come into conflict with the standard paradigm, there is always outrage and denial, as the status quo is challenged. However, for man to progress forward, these new observations must be incorporated into our leaning curve so that civilization can progress forward. We must keep learning about our environment, our surroundings and our place in it to survive and maintain and improve our quality of life on Earth.

In decades past, we thought that butter was the best treatment for burns. In fact, even hospitals put butter on burns. It wasn't until an oils tanker burned and sank in the north Atlantic, leaving the crew with burns up to 80% of their bodies, and floating in the cold ocean for 14 hours until help arrived, that we discovered that cold water was the superior treatment for burns. When the crew was plucked from the cold ocean water they were in remarkable shape. This new discovery, by tragedy, changed our paradigm of burn treatment forever. Yes, it caused the expected denial and outrage by the traditionalists, but further studies comparing different treatments of burns further proved the new discovery and a paradigm shift was accomplished.

Today, with ISL mining, we are now seeing the same traditionalist beliefs that have shown us that ISL mining cannot be contained, aquifers cannot be restored to baseline, and the mining toxic wastes cannot be disposed of in a safe and economical way. So we professionals in various fields of expertise testifying here for you today, are giving you the latest research and information to use for the opportunity to right a grave wrong, to upgrade our paradigm for the good. Understanding that those who came before you, permitted ISL technology with the understanding that with a totally reduced zone of mining area, that other areas exhibit, any excursions would just go out and hit the reduced zone and turn back into rock and be contained for safety. History has shown us otherwise. Now, with the experience of history and the research we have given you, you have the opportunity to upgrade our mining scientific paradigm and uphold your agency's commitment to guarding the environment and safety of the American people and deny this permit.

Dewey-Burdock is totally different than any site permitted in the past, in that its core is already in an oxidized state, like that of an already mined area. Any disturbance down there will likely result in an environmental disaster of epic proportions, affecting downstream aquifers and surface waters down the Cheyenne River drainage area, into the Missouri River, the Mississippi River and into the Gulf of Mexico, with every community along the way. I urge you to not allow ISL mining in Dewey Burdock.

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Amino acid chelated compositions for delivery to specific biological tissue sites
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Assignee: Albion International, Inc.
Inventors: Harvey H. Ashmead, H. Dewayne Ashmead, Darrell J. Graff

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Int. J. Environ. Res. Public Health 2011, 8, 629-647; doi:10.3390/ijerph8030629 Combined Toxic Exposures and Human Health: Biomarkers of Exposure and Effects

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EDUCATION

1967-1972 University of Michigan, full paid academic scholarship, AB in science

1974-1975 Michigan State University and Eastern Michigan University to complete specialty in Clinical Microbiology and Clinical Mycobacteriology on full paid scholarship from employer Hurley Medical Center, Flint, Michigan

1975 to present- Continuing education programs as they become available.

Pursuing a PhD brought to my attention that universities would "own" my work and preclude my getting a patent on ideas and prior work on subjects that I and already heavily financially invested in and studies I had done to support them, so I opted out of that route, and made a business decision to pursue US Patents and not a PhD. I now have 7 US and one Canadian patent.

WORK EXPERIENCE

1972 to 1973 Clinical Chemistry in private medical lab, routine blood samples with CDC licensing unknowns.

1972 to 1976 Class 5 CDC Reference Lab in Clinical Mycology and Mycobacteriology, routine samples with CDC unknowns for licensing

1977 to present- As an active biochemist for Vita Royal Products, Inc.,a company that I founded in 1977, most of my work is in human and animal research with chronic debilitative diseases. I formulate new supplements for commercial use, blend custom supplements for special cases, consult individual clients, doctors and veterinarians, and do research and teaching. Research includes extensive and ongoing monitoring of environmental status and its effects on normal biochemistry, monitoring and observing environmental syndromes manifesting in population statistics and how they are changing over the last 30 years, and adjusting nutritional programs to more properly address these pollution interferences on biochemistry.

TEACHING EXPERIENCE

1977 to 1998 –Taught various classes in nutrition for animals and humans for Mott College, Flint Mi.

1981 to present- Wrote many feature articles for national magazines including Dressage and Eventing, Equisport, Horse of Kings, Crabbett Arabian, and many others, and the Supplement section for the Whole Horse Catalogue

RESEARCH AND AWARDS

Her research work includes neurochemistry and sports medicine physiology, with cases ranging from hyperactive children and violent behaviors, to Gulf War Syndrome, to competition performance horses, neurological affective disorders such as Equine Protozoal Myeloencephalitis, obesity, Type 11 Diabetes and Syndromes X in both animals and humans as manifestations of environmental pollution.

1983 and 1984, Vita Royal Products was chosen as the official supplier of the United States Equestrian Team. Both custom and commercial supplements were formulated for the Olympic Team and they won a record number of gold and silver medals, a record yet to be equaled.

1986 -Invited to represent the United States as a Citizen Ambassador in Scientific and Technical Exchange for the People to People Program to New Zealand and Australia.
1988 – As above for Communist Bloc Countries.
1991 -In China traveling and studying Oriental medicine and acupuncture.

After eight years of clinical trials, granted two U.S. Patents in 1996 for environmental biochemistry. One was for the first nutritional diet program for weight loss in morbid obesity, normalizing blood sugar in Type II diabetes and lowering cholesterol using supplements and diet, without drugs. This is significant since there are over 28,000 diets registered in the U.S., none ever earning a U.S. Patent for efficacy. This research pioneered the low carb diets of today, of which there are many. The clinical trial subjects were all morbidly obese women living in SE Michigan, which at the time and still has, the reputation of the worst statistics for morbidity and mortality in the world. It also has record numbers of toxic landfills and industrial dumpsites as well as air pollution problems that cause the area to fail air quality standards. These people, I felt, were the most environmentally challenged population, with the most severely affected basal metabolism and provided the perfect population to work with.

1996- Another US Patent for a liquid composition with both nutritional and buffering abilities, without heavy metals or other potential toxins, to aid the increasing acidity in environmentally affected populations, both human and animal. Also included were ratios of cations to balance abnormal biochemistry from excess ratios of calcium to magnesium.

1999- Wrote an extensive information web site vitaroyalproducts.com for understanding and self help for Environmental Illness in humans and animals

1999- a continuation to the original diet program was awarded a U.S. Patent for treatment and control of all autoimmune diseases including Lupus, Fibromyalgia and Hashimoto's thyroiditis, as well as chronic fatigue and clinical depression. This patent addressed the hormonal interferences of environmental chemicals that mimic natural hormones, and supplementation of natural hormones to aid affected biochemistry. This patent was immediately picked up by ABC NEWS and featured on their web site.

1999- Three more U. S. Patents for additional biochemical formulations. One represents a dry formulation of the liquid Nutrient Buffer; the second addressed "leaky gut syndrome" with a special nutrient supplement blend, and the last defines a soothing, therapeutic bath salt compound.

1999-Christopher Columbus Award finalist, an award given for the best discovery of 1998 for the benefit of mankind.

2000- another patent was issued for "Leaky Gut Syndrome" protocol with application to horses affected by neurological syndromes including Equine Protozoal Myeloencephalitis

2000- present, research continues toward methods of normalizing affected biochemistry in Environmental Illness, and finishing a textbook and lay book called Environmental Health Connections.

SUMMARY STATEMENT

I will be happy to bring to this table and share nearly 30 yrs of data that I have collected on the degradation of the environment and how it has affected population statistics of morbidity, education problems, quality of life, and why our current nutritional and medical paradigms concerning the above need to be reformed. If the current pollution problems of the world continue to escalate, as I believe they will, then the information that I have collected living and working for over 55 yrs in the infamous

"I-75 Corridor" will become invaluable in setting upgraded nutritional standards and methods of remediation for the rest of the world.