Mining
Perspectives & Opinions
Tax Day 2006

by

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INTRODUCTION

Spring brings a stay on a farm in Iowa and the need to pay taxes in the states, provinces, and countries where we have resided and worked. Iowa provides the opportunity to collate diverse writings that have earned the money to pay the expenses of living a simple life on 160-acres of corn & beans. In honor of the taxes that have to be paid, I select April as the end point of a year’s worth of work and hence the termination point of text selected and collated here.

These writings are edited from the Bin Items (as I call them) that I posted on TechnoMine and InfoMine up to tax day 2006. The original Bin Items are accessible somewhere and somehow on TechnoMine; they contain a great deal more than you will find here. In this e-book, I ruthlessly cull and retain only the original bits & pieces that interest and amuse me. I hope you find something that interests and amuses you; for that is the only purpose of this collection.

I have not included text I wrote for any of the reviews posted on TechnoMine. Those reviews are readily accessible and there is no point replicating text from them here.

I have added linking text—this introduction is an example. But for the greater part, the words are as originally written. Unfinished ideas remain unfinished, disconnected thoughts remain disconnected, and the thread of ideas is random. I have grouped the pieces by theme, but that is not the way they were generated nor were there themes underlying their compilation. I just sat at the computer each day and wrote what popped up. Hence this is a subjective collection. It reflects my growing up on a mine and my access to the mining industry via conferences, magazines, and that vast world of the internet via Google. So here is a personal corner of the world of mining in 2006.
PERSONAL HISTORIES

Fluid Flow in Jointed Rock Masses

My Master’s thesis was called *Determination of the Hydraulic Potential Distribution in Jointed Rock Masses*. I have a faded copy of the typed script somewhere in the attic, but who would want to read it now. There are so many excellent free publications on the internet on this topic that old documents and books and paper you have to pay for might as well not exist. On the topic of fluid flow in jointed rock masses and hence impact on rock slope stability I recommend a look at these two documents that come to your computer at no cost and no effort:

- Fluid Flow Simulation in Fractured Reservoirs by Sarkar, Toksoz, and Burns of MIT.

Google lists three papers that are frequently quoted on the topic of fluid flow in jointed rock masses. I tried accessing these papers; I needed a password for one, I needed to send money to get the next, and the third provided text of horrific complexity—while nevertheless summarizing the field and topic. I understood it because of my master thesis and a training in law, but I did not read the rest of the paper. Life is too short to read badly written pomposity.

Iowa: Belle Plaine

In *Words of Wisdom* an old paper from BiTech’s Geotechnical News, posted in the InfoMine Library, are quotes from the writing of Ralph B. Peck. Here are some, as background to a second paper on desiccation-crack-induced increases of clay permeability:

- Those who try to force nature into a pattern by simplifying assumptions of theory will be courting disaster.
- The most fruitful research grows out of practical problems.
- I doubt if guidelines, regulations, or even the best of specifications can take the place of personal interaction between designers and field forces.

The second paper is from 1997, and so I know we are now all aware of this phenomenon. At least we should be, although I still see papers that seem to think that the infiltration though a constructed cover will be less than through a similar natural soil sequence.

To the geotechnical engineer trying to close the mine’s waste disposal facilities, it would be good to read these papers and then to walk & work the fields of the farm where I write this piece: what is written about in the papers and what is happening here will soon enough happen at the mine’s covered pile and waste rock dump. Calculations notwithstanding, nature will do its thing, and the poorly graded pile and cover will erode, the compacted clay will equilibrate with cycles of drying & wetting and freezing &
thawing, the infiltration will be as the surrounding landscape, and seepage will occur along preferential flow paths at changes of soil type.

For example, the clays of this Iowa farm were scraped down from eastern Canada by glaciers and compacted by great weights of ice. My wife dumped some soil into a pot yesterday and could not get the water to drain from it, so low is the permeability of this fat, black clay. But after a rain storm the water drains away soon enough. Books on the agricultural potential of the area tell of ten thousand years of prairie grasses dying and mixing in with the soil to create the ideal growing medium. The clay hydraulic conductivity is controlled as much by its soil gradation, as by the included decaying roots and leaves, as by summer desiccation and winter freeze-thaw.

Erosion is controlled by topography and land disturbance. On the high ridges, the clay erodes away fast enough once the grass is disturbed, the land inappropriately ploughed, and the corn cut to expose the bare soil. Just over the road, the sandy ridge that once edged a glacier’s retreat is now devoid of clay and the soil that took thousands of years to form. Soon this will be wasteland and suitable only for the poetry of the bleaker British poets.

There are two ponds formed by un-engineered clay embankments. Both embankments are in trouble: the lower one is raveling back as the winter’s ice and spring thawing loosen the edge of an over-steep slope resulting from dredging too deep, too close to the edge. And the upper one is leaking along the contact between the natural landscape and the embankment. Where the seepage emerges, the hillside is piping and collapsing and eating back. Left to their own, they will soon enough be gone, proving only that perpetual monitoring and maintenance are required once we create a geotechnical form at odds with nature.

Please keep in mind I love the ponds, the rippling water over which our silly little wooden boats are blown by the wind, the muddy banks where the kids slip and slide and turn pink from the sun and black from the mud, and the geese that swoop down at sunset. But this is not nature: far from it. This is as unnatural as any mine, and requires as much thought and action and respect for field processes as any mine, now and in the long term, if we are to enjoy the benefits of our creations.
UNITED STATES PERSPECTIVES

Moab Uranium Mill Tailings

Wondering the by-ways of the Internet, this news release caught my eye: More than 12 million tons of radioactive waste will be moved away from the Colorado River, which provides drinking water for more than 25 million people across the West. The Department of Energy said the radioactive tailings about 750 feet from the river near Moab in southeastern Utah will be moved, predominantly by rail, to a proposed holding site at Crescent Junction, Utah, about 30 miles from the Colorado River.

The 94-foot-tall waste pile came from Moab's rich uranium deposits, which were mined in the 1950s. The Uranium Reduction Co. sold its mill in 1962 to Atlas Corp., which ran it sporadically until declaring bankruptcy in 1998. The Energy Department took over the site in 2001.

At the storage facility in Crescent Junction, the waste would be covered and buried in a hole, lined with a protective layer to keep the material from seeping into the groundwater. Cleanup and moving the pile is estimated to cost more than $300 million.

Critics of moving the waste argued that it has been there for decades with little effect. They contended the area is rich in uranium, leading to natural erosion and leaching of radioactive materials into the water, to which the waste added little.

I once saw this pile on the banks of the Colorado River. Its stands squat on a bank that pushes into the path of the river, and my vivid imagination saw other floods I had witnessed bearing down on the sands to mingle them with the rich sediment load of the river. My eldest daughter, a civil engineer in California, once heard that flooding could bring this pile down the river and into the drinking water supplies of Huntington Beach. No amount of engineering/scientific fact argument could convince her otherwise.

And so it was with a kind of memory-relief that I read the decision to move the pile. In a saner, poorer world, this is a crazy decision. Maybe moving will be deferred pending cleanup of New Orleans. But the decision is not without precedent. On the UMTRA project we moved (if I recall correctly) at least ten of the piles to new, suitable sites. A suitable site is one that is geomorphically stable. In the west, with a good geologist who specializes in geomorphology, it is easy to appreciate the sites that have not eroded much in thousands of years and which will probably stay the way they are for thousands more.

The lessons learnt for current mine developers: find a geomorphically stable site away from a river—certainly not in a river if you want to be sure of staying out of court—and build for the long haul. Because if you do not, somebody, someday will have to undertake a long haul.

Open Pit Backfilling

California has legislated backfilling of mine open pits. As stated in the findings and declarations of the Surface Mining and Reclamation Act of 1975 "reclamation of mined
lands…will permit the mining of minerals and will provide for the protection and subsequent beneficial use of the mined and reclaimed land.”

We are all familiar with the quarries that are now gardens, the pits that are landfills, the landfills that are playing fields, the lakes that dot the reclaimed mines, and the tourist wonders that we travel far to see. I am always as much fascinated by the big pit at Butte, Montana as I am by the wonder on the faces of those in the well-appointed visitor center. The future: maybe as is described in the August 29, 2005 New Yorker—we will be using the natural beauty of a reclaimed mine or nature preserve buffer as a cemetery for the burial of the rich who want perpetual peace and quiet.

Other interesting case histories on the use of mines for disposal and backfill reclamation include the following: (1) Eagle Mountain in southern California where for many years proposals to fill the pit with refuse have been opposed by those who value the desert tortoise and nearby Joshua Tree; and (2) upland disposal in one or more of the many gravel mine pits of the Azusa area of dredged contaminated marine sediments from the harbors of LA and Long Beach.

**LA Waste Disposal**

The first formal disposal of municipal solid waste (refuse) in Los Angeles was in 1873 when the City established a “garbage and dead animal plot for burial three feet below ground”. Until well into the 1950s, Los Angeles residents burnt their garbage in backyard piles—as I still do on the farm in Iowa. There followed the period of construction and operation in the later part of the twentieth century of the great LA landfills including the OII Landfill that rises 300 ft above the freeway and just down the way the Puente Hills landfill which is the most wooded site in LA with more deer per acre than the midwest. Within the next decade LA will run out of landfill space—but not to worry, for by then refuse will be transported by rail out into the desert and to the old Mesquite Mine where there is space for hundreds and even thousands of years of LA garbage.

**Landfilling Mines**

Professor Robert Lee Aston in his fascinating book “Surface Mining Law and Reclamation by Landfilling” examines the history, the law, and the practice in the United Kingdom, the United States, and Canada of mining, landfilling, and using old mines as landfills. Just a half mile from my Huntington Beach home is an old gravel quarry developed in the early part of the twentieth century; in the fifties and sixties the quarry was filled with municipal solid waste; and in 2005 a new playing baseball field and sports complex was opened on the reclaimed site. Professor Aston does not describe that out of the way California site—he is a professor at the university of Missouri-Rolla—but the Gothard Street landfill proves his point that old mines can and should be filled with refuse if society is to get the minerals it needs and is to dispose of the garbage that everyday living generates.
**Uranium Mill Tailings Consolidation**

As a regulator focusing on the mining industry you will carry a heavy societal responsibility. You will have to be more technically informed than the miners and their consultants, you will have to be more detailed oriented than those impatient to dig and bring the ore to the ground, and you will need a crystal vision of the long-term future as you approve a mine closure plan. You will need political skills to balance extreme demands, legal acumen to apply imprecise laws, and tact to say no.

I wrote this after reading Louis Miller and David Range describe the cover of the Title II Program Exxon Highland Reclamation Project: three-and-a-half feet of compacted clay and six inches of topsoil. Their paper describes what in 1989 was pretty revolutionary, namely the use of wick-drains to speed up consolidation of the uranium mill tailings to avoid damage to the cover.

I still believe that if you are a Republican you will want rock as the top layer of your closed mine waste facility, and if you are a Democrat you will want soil and vegetation. I do not know the political affiliation of the authors, but I am convinced that their cover design reflects a philosophy rather than a science. To further explain: on the UMTRA Title I uranium mill tailings piles we had to place rock and more rock. In spite of much thinking and writing on the differences between the way the regulators dealt with Title I and Title II covers, the only rationale explanation I can offer is a difference of political outlook. Maybe subjective factors are just as important as technical factors in making engineering decisions and this is one example?

**Pebble Mine**

The Pebble Project is in southwestern Alaska, about 380 kilometers from Anchorage and 95 kilometers from tidewater Cook Inlet. The property comprises 22,580 hectares. The property’s website claims that the deposit is the largest gold deposit and the second largest copper deposit in North America.

Developing the property won’t be without difficulties. As reported by the Peninsula Clarion, Sen. Ted Stevens, visiting the Kenai Peninsula for the opening ceremonies of the Arctic Winter Games, announced his opposition to a plan by the Canadian corporation Northern Dynasty Mines Ltd. to open the Pebble Mine. His opposition is based on the region’s other natural resource: salmon, which are already depleted, according to the senator.

Somewhat at odds with this opposition to mining, the senator vowed a continued fight to open the Arctic National Wildlife Refuge to oil drilling and urged state legislators to create a climate for investment in Alaska. I suppose he is a successful politician, all things considered.
CANADIAN PERSPECTIVES

Canadian Abandoned Mines

An everyday occurrence: failure to agree on how to do things between Canada and the United States. That is but one of the features of a comprehensive report and the associated powerpoint presentations available for free download at www.abandoned-mines.org. The primary document is the Workshop Proceedings of the National Orphaned/Abandoned Mines Initiative (NOAMI) Workshop on Assessing Liabilities and Funding Options held in Ottawa, Ontario in November 2005.

Jim Kuipers of Kuipers Associates outlined the United States approach to characterization and remedy selection for abandoned mine cleanup that have been used for the past 20 years. He notes that the approach is simple. Having used these approaches often myself, I concur: they are logical, comprehensive, inclusive, and tied & trusted & true. They work.

By comparison a number of Canadian consultants outlined their personal approaches/recommendations, that are probably based on what they have done for clients. Their approaches differ considerably one from the other. Some reek of the smoky back room, others of the transparent parent. Not to say the Canadian approach does not work. For example, $64 million of taxpayer money has gone into the Britannia Mine cleanup and “there are substantial outstanding liabilities that may impact budget.”

The conclusions of the meeting are typically Canadian:

- “There is benefit in a structured, disciplined approach to site characterization.” (Unspecified)
- “Community involvement in site assessment and characterization is critical.”
- “It is important to look at broader models of assessing health and broader health implications that incorporate cultural, social, and spiritual aspects.”
- “It is important for information dissemination to be culturally sensitive and specific.”
- “One of the implications of federal funding is it may give the federal government certain rights to establish standards.”
- “A participant noted that national standards for reclamation (as opposed to remediation) would not be appropriate.”
- “Future panel discussions should include Aboriginal representation.”

Canadian Tailings

The drains of the first major slimes dam that I designed, blocked within three month of start of operations. (I use the terminology we used back then.) I never conceived of this happening; it was a major embarrassment. Luckily my best friend worked for the contractor and he managed to clean out the gunk with much manual labor. The same
thing happened three month later, and six month later, and then I called in Adrian Smith. He came up with the geochemical explanation, but to the best of my knowledge drain cleaning continued for a long time.

I had forgotten this incident, but was reminded of it when I read a paper I have just added to the Infomine library from a 1984 copy of Geotechnical News. In the paper Adrian Smith describes the conditions that give rise to blocked drains. He writes: “The most widely experienced drain blockage process is the precipitation of iron species. Iron, in solution in its ferrous state, is oxidized to its less soluble tri-valent ferric state when interstitial liquids come into contact with free oxygen in the drain. The result is precipitation with its attendant drain-blocking potential. Eventually, complete blockage of the drain can result.” He was being kind: complete blockage does occur, believe me.

King Coal: BC Coal Heritage

The site carries a stern warning: *This digital collection may only be used for educational non-commercial purposes including any fair dealing for the purposes of private study or research, or use in schools.* I suspect that I can mention the site because its funding is provided by the tax payers of British Columbia.

King Coal: BC’s Heritage describes open pit mines in British Columbia for Grade 5 and Grade 10 school children. They tell us why open pits are preferred to underground mines: Open-pit mining has taken the place of underground mining in British Columbia because it costs less and is much safer.

Wonderful how location changes perspective! California has legislated backfilling of mine open pits. I know of a proposed open pit mine in Argentina that is now being planned as an underground mine in order to address the concerns of environmentalists.

Regardless of the differences between attitude as you pass over the equator or an international border, I recommend a look at the BC Heritage site for what they say about open pits, about the life of the miner, about BC history, and about the physical processes of mining. I wonder how many children will be tempted to become miners by this site and what the return on tax payers’ money is?

Ontario Mining Development

The Ontario Minister of Northern Development and Mines is reported by Mineweb to be “Moving to enhance the mineral sector’s global competitiveness” by promoting sustainable development, environmentally sound exploration and mining, clarifying stewardship of mineral resources, and promoting community development and opportunities for all.

No additional details are given. The Mineweb article continues with the following, which hardly constitutes detail:

“Bartolucci said the Ontario Provincial Government will examine ways to improve permitting processes and approval requirements, and to maintain a strategic tax system and a top-quality and available labor force. The government also vowed to continue government-sponsorship of mine hazard rehabilitation programs, as well as the
development of tools to remove legal barriers to voluntary rehabilitation of abandoned mines.

Bartolucci said the government's agenda also includes improving access to mining lands, addressing the impacts on traditional aboriginal activities, determining the government's role in meeting constitutional obligations, and facilitating the participation of Aboriginal peoples in the benefits of mineral development activities near their communities. "We are proposing an Aboriginal engagement process that could provide us with guidance on how to promote Aboriginal opportunities--both in the Far North and throughout the province--and suggest how we can best support future government initiatives to enable Aboriginal people to share fairly in the benefits of natural resource development," he stressed.

To get more information I sought out and received a copy of an expensively produced booklet entitled Ontario’s Mineral Development Strategy. It adds little except more words and beautiful photos. One must, however, be impressed by this commitment from a government agency to the principles set forth, and in particular to the avid support for the mining industry. If only they had not wasted so much money by making an upside-down book, with the one half in English and the other half in French. I shudder to think of the trees felled to give me a repeat in a second language—surely two separate volumes would have saved money and demonstrated, rather than merely talked about, a commitment to environmental stewardship and sustainable development.
AFRICAN PERSPECTIVES

Mining in Libya

How the world changes. My father regaled us with stories of being a young foot-soldier in the eight army in Libya, his exploits in Tripoli (a name that still triples off the lounge) and his survival of the battle of El Alamein. The death toll was horrendous: 25,000 of Rommel’s troops, and 13,000 Allied troops.

InfoMine has no county page on mining in Libya. I found only one 1996 news item that tells of Ashanti Goldfield entering into an agreement to acquire the Ghana Libyan Arab Mining Company—probably no longer relevant to anything. There is but one paper in our Library on Libyan mining and I quote: “In 2003, the Government proposed to privatize about 360 state-owned companies by 2008.”

Now InfoMine is proud to add to our consulting database Gargaf Geoservices. They note that they “can be particularly helpful to new international firms seeking involvement in the Libyan earth resources market, by providing technical consultations and services, as well as logistic support such as applying for visas and arranging accommodations, transportation, and office space in Libya.”

Their website is still under construction, but may well be worth watching as it grows. We wish them all success.

Zimbabwe Mining Law

The government of Zimbabwe wants a fifty-one percent ownership of the country’s mines. Reuters, South Africa reports that the Zimbabwe mines ministry has drafted amendments that would give the government a fifty-one percent stake in all the country’s mines. This law is aimed at boosting local black involvement in the country’s mining industry.

In the mid-fifties, my father drove the family up to the copper-belt (as it was then called) to explore leaving the South African gold mine on which he worked to join the copper mines. In a 1949 Mercury we negotiated the main roads which consisted of but two strips of asphalt winding through the brush and bush. Every time another car approached, we swung off the two strips, using one and leaving the other to the opposing traffic. We stayed with his old friend already an employee on a local mine. His kids, my sister, and I spent our days sliding down a huge anthill that soared up to the sky. And in the evenings the adults drank.

We visited Zimbabwe Ruins and wondered at its origin. Only many years later while studying archeology at Wits, did I come to read the full story of the gold mining that sustained these great ruins, the center of a trade route that brought product from as far away as South Africa and sent it to the coast and hence transport by traders to the east. Seems as though the locals have always struggled for control of the resources of the lands they inhabit. A salutary lesson is the reason the stone city was abandoned in about 1450: not because of war, but because the hinterland could no longer provide food for the
10,000 inhabitants and deforestation made it necessary to go farther and farther for firewood.

In light of the ancient struggles to control the land and the mineral resources of this part of Africa, the currently proposed changes to the law might seem trivial and transitory. If indeed the changes result in more social progress and less deforestation, they will be for the better. If they simply result in change of control from one upper class to another upper class that continues deforestation, or its modern equivalent of environmental impact, the change is nugatory and illusory. Maybe the emphasis should be on the issues of responsible mining and sustainable development and not on ownership per se.

P.S. We never emigrated to the copper belt. My mother refused to become part of what she judged to be too hard-drinking a society. She is not the last to avoid the country. As Mineweb reports: “In Zimbabwe, “indigenous ownership” means handing over assets to supporters of president-for-life Robert Mugabe. Doug Verden, an executive director at the Zimbabwe Chamber of Mines, pointed out how deterring such statements are to foreign investors. “They will be a little more reluctant, to put it mildly, to invest in the country.”

**Crime Security Consultant**

On one of my two computer screens is the home page of C.R.I.M.E Security Consultant run by Neville Murrish who has over twenty years experience in the security industry, having spent fourteen looking after security for a South African platinum mining company. On the other screen is an announcement from Mineweb bewailing the sad fact of corruption and mayhem in the South African mining industry.

The newspaper (Globe and Mail) headlines Oby Ezekwesili, the Nigerian Mining Minister saying that she wants to make Nigeria a “mining destination nobody can resist.” She notes that some government officials have been arrested and one governor has been impeached—evidence that Nigeria is “serious about cleaning up its act”.

“Tsotsi” won the Oscar for best foreign film. I saw it the week before the Oscars in a tawdry movie house surrounded by drunks and the drug-addicted and panhandlers who pleaded for a few cents for coffee. Well I recall those early days in South Africa when we put up the bars each night before going to bed, and letting the dog scout the house before we entered on our return. I had the same feeling of fear in Lima and in the movie house. From now on I watch only Hollywood blockbusters; that is why I bought the new Harry Potter DVD today.

If you are in the mining industry in Africa, I can only recommend looking at Neville’s site where he tells us that for seven years he has provided security services to corporate clients, housing estates, research institutes, and semi-government institutes. He provides high-end access control and CCTV systems to the banking, industrial, and mining sector.
LEGAL MUSINGS ET AL

South African Mining Law

Growing up on a mine in South African and studying law at the University of the Witwatersrand, I never thought I would read anything like the follow definition from the Mineral and Petroleum Resources Development Act, 2002. It needs no comment other than its noting and the thought that it may be a model for other countries:

“broad based economic empowerment” means a social or economic strategy, plan, principle, approach, or act which is aimed at:

(a) redressing the results of past or present discrimination based on race, gender or other disabilities of historically disadvantaged persons in the minerals and petroleum industry, related industries and in the value chain of such industries;

(b) transforming such industries so as to assist in, provide for, initiate or facilitate:

(i) the ownership, participation in or the benefiting from existing or future mining, prospecting, exploration or production operations;

(ii) the participation in or control of such operations;

(iii) the development of management, scientific, engineering or other skills of historically disadvantaged persons;

(iv) the involvement of or participation in the procurement chains of operations;

(v) the ownership of and participation in the beneficiation of the proceed of the operations or other upstream or downstream value chains in such industries;

(v) the socio-economic development of communities immediately hosting, and affected by the supplying of labor to the operations;

(vii) the socio-economic development of all historically disadvantaged South Africans from the proceeds or activities of operations.

International Law

My professor of jurisprudence questioned whether so-called international law was indeed law.

➢ It is not duly promulgated by any accepted regulatory body

➢ There is nobody with the courts or police to enforce it and punish transgressors

My professor of International Law of course claimed that international law is valid law in that it is a body of agreed conduct based on fundamental principles of moral and ethical conduct.

I know of no mining company that “obeys” international law in the same way as it obeys national and local laws. But I do know of those shining examples where the miner acts in
accordance with the moral and ethical principles that are set out by Marcos Orellana in his paper on Indigenous Peoples, Mining, and International Law. Apart from the thorny issue of “who is indigenous?”, he makes a persuasive case that contemporary international law is evolving towards a recognition that indigenous peoples have the right to own, develop, control and use the lands and territories, including the total environment of the lands, air, waters, coastal seas, sea-ice, flora and fauna and other resources which they have traditionally owned or otherwise occupied and used.

I worked for many years with the Navaho and Hopi in Arizona and New Mexico to remediate uranium mill tailings piles that were the legacy of atomic bomb development. We were not influenced by any notion of international law but were able to concentrate on meeting a simple national law that mandated a remediated pile stable for at least one thousand years. My project colleagues from these two nations stood solidly behind this long design life.

But I was much disconcerted when I went to Spain to help close a uranium pile and they laughed at me for thinking 1,000 years a long time. As my host pointed out, a Spaniard had been emperor or Rome at least two thousand years before, the bridge we were standing on was 1,600 years old, and the family in the 1,200 year old castle were still considered strange by the village, for the count who built the castle threw his first wife from the tower the day after it was completed. The indigenous Spanish villagers demanded a much longer design life than the Hopi or Navaho, and were firm in the belief that that was consistent with historical law.

**Containment Zones**

The California State Water Resources Control Board by Resolution 92-49 adopted a policy that an area of contaminated groundwater where cleanup cannot be achieved may be designated a Containment Zone. To date no mine in the state has been designated a containment zone, but such a designation would bring clarity and closure to many of the vexing and contentious issue surrounding mine closure in California. This is why.

Consider a mine where you would expect it: in a zone of mineralization. The same natural conditions that lead to formation of the ore body are why pre-mining background water quality exceeds local groundwater quality standards. During mining the pit draws down the site’s water table and waste rock dumps and tailings impoundments change the inflow and recharge over large areas. The result is a change of groundwater flow patterns and constituent distribution. Application of standard regulations would indicate the need to “cleanup” the site by:

- Removing the source, i.e., the waste rock or tailings piles; and/or
- Control discharge by building covers over waste units; and/or
- Remove pollutants from the “contaminated” groundwater by pump & treat; and/or
- Get an NPDES permit and meet its limits by treating surface water if necessary.

Now assume that cost-effective & technically-practical covers are in place, that nobody would ever let you move rock or tailings from the site, that the wetlands result in NPDES
compliance, and natural geology prevents off-site migration of the groundwater that is affected as much by the natural geology as by mining. Assume that you pump and treat to deal with the small part of the groundwater pollution that is from mining; nothing happens—there is no improvement of groundwater quality; and your consultant tells you that natural conditions swamp any improvement potentially wrought by pump & treat. To avoid the claws of the bring-a-suite lawyers and to eliminate the monthly meetings in Sacramento, what law do you seek to have applied?

Right now there is none that I know of—if you know please tell me. The containment zone policy was not truly designed for the mining situation I postulate. Rather it was designed and has been applied to the following case which is quaintly described on the internet:

South Bay site where a PRP built an adequate pump and treat system, operated it for years at significant expense, demonstrated decreasing mass removal that reached an asymptotic level for several years, turned off the system (with RWQCB permission) and demonstrated no change in contaminant levels (i.e. it did not increase), is required to continue monitoring, would have to turn the P&T on again if the plume threatens to migrate offsite (it's still beneath the PRPs property), no drinking water source is threatened.

But maybe, just maybe, the Containment Zone policy—or at least the fundamentals of its approach—should be applied or be applicable to my postulated mine. There is nothing further that can be done to eliminate the source, it is not possible to stop discharges from the waste piles, groundwater pollutants will never be reduced or eliminated by pumping and treating (you cannot fight the whole of nature) and neither groundwater nor surface water leaving the site changes downgradient receiving waters. Why not call this a Containment Zone and bring closure, finality, and certainty to a site which is what it is and which never can be made significantly different. Sure it is polluted in common parlance, but then the job of laws is to make it possible for societies to function sanely and effectively for the benefit of its citizens in the face of nature’s vicissitudes. We do not live in a Platonic republic but rather in one beset by planes, bombs, hurricanes, nature’s caprice, and a desire for the material goods resulting from mining.
ECCENTRIC OPINIONS

Mining Ethics (Written with a Friend)

When we were growing up the miner was the hero. Now in our fifties, the miner is the villain. Has mining changed, has the world changed, have we changed? We answer these questions by examining the ethics of mining from our two different perspectives: one of us is a devout & practicing Christian, one of us is an atheist/non-believer, one of us is an American and one of us is an Australian. We both grew up in South Africa and forsook fatherland and patriotism for our children. We both became geotechnical engineers and have spent the better part of our careers dealing with mine waste disposal.

You may well ask: is there such thing as an ethical aspect to mine waste disposal? And you may well answer: simply follow the law and all is well. This begs the questions: (1) is there a law?; (2) is the law logical, rational, and reasonable?; (3) is the law based on political expedient, compromise, and absence of technical profundity?: and (4) what if the law just plain leads to the wrong solution?

The only principles we can offer for the geotechnical designer is: choose the right site—one that has low permeability foundations, poor quality groundwater, and a stable geomorphic environment. If you cannot find these, maybe you should recluse yourself. Or prepare a conservative design that will probably get you fired. This idea was tried out on a young Canadian biologist the other evening. She was unfazed and simply replied that even though her bosses in the leading Canadian geotechnical company she works for had pleaded with her, she had simply refused to work on a project that would have lead to development in protected forests. Maybe the world has changed.

The slimes dam is in furious operation, and the slimes are pouring into the reservoir. There is a problem: there is always one with an operating dam. You are called to provide advice and solve the problem. We guarantee there will be a choice between an expensive & proper solution and a cheap & marginal solution. What is the geotechnically ethical thing to do? In America with its adversarial regulator system, the answer is easy: honestly and in-depth analyze both the cheap & the expensive solution and put both forth in a professional way. Like the much maligned United States lawyer, you are in a way an officer of the public charged with presenting a case. Society reserves the right to decide. If your jurisdiction works in smoky back rooms, you have to choose between difficult options: if good men do not act, bad men will prevail; or the alternative, blow the whistle; or the alternative, fall sick and fall out of sight. Both of us have left countries beset by emotions of moral indigestion, so we support your decision to leave a job.

Now it is time to close the slimes dam. There is no way out; you have to do the work. We have walked the ten sites to which old uranium mill tailings piles were relocated. The idea was to confirm that the area is geomorphically stable and to understand the landforms so they could be replicated in the relocated pile. That was ethically satisfying. Even in Utah where a cry of this is beautiful country was met with a Mormon’s reply:
this is the arm-pit of the world.

It is not so easy in the Australian outback where an abandoned pile demands action but there is no money other than taxpayer money – the owners and generators of the piles long gone. Is it paternalistic to impose your vision & environmental morals on a local population with other needs? Maybe let the wind blow and in another sixty thousand or so years nature will prevail again.

We are stewards of the earth for future generations of people and while as baby boomers we ride on the benefits of past environmental injustices when the mining industry was the engine driving the way forward towards a better education and a better way of life, the simple fact is that these injustices ought not to continue. Ignorance is one thing, deliberate abandonment of responsibility something else.

**Ralph B. Peck on Specialization**

My office in the tallest building in Albuquerque looked out over the suburb in which Ralph B. Peck lives. I met and chatted with him at local engineering functions where his intellect and charm complimented the PhDs and warmth that is the typical New Mexican -jokingly categorized as an Indian PhD in nuclear physics. (Actually I met such a person, but he refused to become the State’s poster boy).

The point of typical New Mexicans, posters, civil engineer & geologists is that they are but categories and Nature & Reality are not like that. The February 6, 2006 of the New Yorker notes that pit bulls, recently banned from living in Ontario, are no more likely to kill people than Dobermans, Great Danes, German Shepherds, or Rottweilers. The New Yorker makes the point that there is a greater correlation between a dog’s potential to attack a human and the extent to which its owner is a social misfit and aggressive than there is between the dog’s breed and its potential to attack humans. Another case of the misuse of simplistic categories.

**BiTech 1991**

Growing flowers and vegetables in underground mine hydroponic gardens; new ways to design tailings impoundments in seismic areas; Alaska as a sleeping giant with no mines but vast potential. This is not a list of topics at next year’s conference. These are the topics of three papers from 1991 and 1992 issues of International MineWaste Management News and Environmental Mining.

John Gadsby of BiTech publishers took me deep into the vaults of a dreary building in the far reaches of Vancouver and let me loose in his archives. There I chanced upon the nine issues of this now lost magazine that was published fleetingly in 1991 and 1992. It was a dream walk through the past, a window on ideas that came and went, on the origins of enduring concept and practices.

I do not know if flowers are still grown in BC mines. I leave you to decide if there have been any advances in seismic design of impoundments in fifteen years. We all know what has happened in Alaska, so at least this article was a successful harbinger of the future. Actually, I am rather grateful that the predictions in most of the papers were wrong; they
were pessimistic in those days!

**Geotech & Green Cards**

The story is from an impeccable source: The New Yorker, but there is something missing, something wrong. Help me find the answer. The story is told in detail in the article at [http://www.newyorker.com/fact/content/articles/060123fa_fact](http://www.newyorker.com/fact/content/articles/060123fa_fact).

In summary the story goes thus: A geotechnical engineer working on the stability of the slopes of the Tintaya Copper mine in Peru wins a visa to the United States in the Green Card Lottery. He comes to the United States with his wife and child and now he is working in Turco’s Super Ranch Market in Yorktown Heights, New York and earning $9 an hour.

This at a time when the mining industry is crying out for people and even an old retired man like me gets calls from head-hunters each day who promise great jobs for me, my daughter, and my son-in-law, all of us geotechnical engineers.

Maybe he only speaks Spanish; maybe he does not know how to tap into the job market; maybe the mining and geotechnical market is not as hot as word-of-mouth tells; maybe there are other subtle, politically incorrect reasons. Regardless, this is my attempt to help a fellow geotechnical engineer who like me is an immigrant. Maybe you too can help.

**Mine Ore Processing Facility Modeling**

One of the nicest things about a mine mill is when it is silent. There is an eerie calm hanging about the still machines and the calm air. Then one can walk and look and think without an aural assault. Poetic as this quiet is, it is equally the nightmare of the processing facility operators. Those head-office managers are always screaming for a reduction of downtime, and to the mill folk that is the quiet they seek.

But how do you reduce downtime? Of course more money & newer equipment, more staff & more maintenance would help. But like everything, everything is limited. So you decide to model the system, simulate the impact of differing probabilities of failure of each piece of equipment & the impact on operations, and hence decide where best to spend limited resources to keep management as blissfully still as a non-operating mill.

I cannot but believe that using a computer code will help. One possibility that caught my attention as I surface the web on a lazy Friday pm was this description:

A [GoldSim](https://www.goldsim.com) model was constructed to simulate the performance of a mine’s crusher system. Each of the main components was represented using reliability elements with their specific failure modes defined as Weibull distributions. Operating rules for the different components were represented in the model, and a number of Monte Carlo realizations were carried out to study the dynamics of the system. In each realization failures of the components were randomly simulated, along with repairs, and the overall impacts on the throughout of the crusher complex were simulated.
And when you are done with the code, pass it on to the rest of the mine. The code can be used for mine situations ranging from modeling the sediment dam to quantifying the impact of discharge on fish populations.

**Computer Codes**

Twenty years ago an old consultant told me: “Young men do testing to find out what they do not know; old men do testing to prove what they know.” Yesterday a salesman of rock slope stability and open pit mine evaluation software told me: “I can teach you to use the program in twenty minutes; I can never teach you what to model or what to do with the answers.”

In the movie Hitchhikers Guide to the Galaxy two beautiful quasi-humans ask a supercomputer what the answer is. The computer tells them to return in seven million years, which they do only to be told the answer is 45. Understandably disgruntled they argue with the computer only to be told to return in ten million years when it will supply the question.

These vignettes urged me to caution as I set myself the task of writing about the best computer codes for open pit mine engineers and operators. I asked a cross-section of folk whose opinions I respect what they thought are the best programs for rock slope stability and open pit mine evaluation. I was driven to the old Latin observation: quot iudices, tot sententia, they all had a different answer.
STORIES: SEVEN UP PETE

If you read the news releases this is the story you get: a Colorado mining company spends $70 million developing a Montana gold mine. The voters of Montana approve a law forbidding the use of cyanide in mining. Thus the mine cannot go ahead. And so the Colorado company sues the State for $500 million in damages. This case goes all the way to the Supreme Court. But the court declines to hear the issue, thereby confirming the Montana Court’s decision to refuse the mine anything. Once again environmentalists and liberal courts foil noble miners.

Is the story as simple as this? I downloaded the petition to the Supreme Court from the Attorney General of Montana. Here are some interesting tidbits from his brief:

- In 1986 the State of Montana, through its Department of State Lands (DSL) entered into ten-year mineral leases with a predecessor company to the Colorado company that sued.
- In 1991 Seven Up Pete Venture (Venture) took over the mineral leases and undertook to compile an Environmental Impact Statement (EIS) and apply for a mine operating permit under the Montana Metal Mine Reclamation Act.
- In 1993, the Venture entered a Memorandum Of Understanding with DSL to prepare an EIS for a mine that would involve heap leaching to extract gold, silver, and other trace metals from ore.
- In July 1998, after the Venture failed to pay their consultants certain fees relating to preparation of the EIS, DEQ issued a stop-work order at the property.
- In November 1988, Montana voters approved Initiative 137, a statewide ban on open-pit mining for gold and silver using the cyanide heap leaching process. Because the Venture had never obtained an operating permit for the McDonald project, it was subject to the prohibition.
- In December 1998, the Venture paid the consultants, but failed to fund a standing account balance for future work on the uncompleted EIS.
- In February 2000, the DNRC notified the Venture that the mineral leases had terminated of their own accord—ten years had passed.
- In April 2000, the Venture filed a complaint in the U.S. District Court for Montana alleging that Initiative 137 was an unconstitutional taking of property without compensation and was therefore in violation of the Fifth Amendment of the United States Constitution. They sued for a half-a-billion dollars worth of damages.

The District Court rejected the Venture claim, stating in effect that none of the contracts between the State of Montana and the Venture obligated the State to allow open-pit mining, to allow the use of cyanide, or to allow the Venture to be exempt from changing environmental laws. The court also concluded that Venture had lost nothing because in effect the leases had expired of their own accord, and Venture had no permit to mine on
the property. The U.S. Supreme Court in effect concurs with the conclusions of the District Court.

This finding echoes the words of Justice Holmes who wrote in 1908: “one whose rights, such as they are, are subject to state restriction, cannot remove them from the power of the State by making a contract about them.” In brief a contract to do something illegal is no contract and is unenforceable.

Something more than this must have happened. Maybe the 1996 award winning movie Mining Seven-Up Pete can tell us more. The film, which I have not seen is billed thus:

MINING SEVEN-UP PETE is the story of the struggle to save the famed Blackfoot River in western Montana from what would be one of the largest cyanide heap-leach gold mines in North America. It documents the enduring but sad legacy of mining throughout the state of Montana—cyanide-laced groundwater, acid mine drainage, and the lost hope of a boom and bust economy. It speaks from the hearts and minds of real Montanans who are fighting to save their vanishing heritage.

They say that bad cases make bad law. Maybe this is one of those instances where the facts do not lead to clear-cut justice. Indeed some schools of American jurisprudence deny that there is such a thing as objective justice, saying that the personal perspective of the judge determines the outcome of the case. Don’t forget the court that rejected the Venture’s appeal is now headed by Justice Roberts and includes Alito, Scalia, and Thomas. Maybe as lawyers in private practice, their clients failed to pay their bills and this distant memory lingers? A ridiculous thought, I admit.
CONCLUSIONS: WIKIPEDIA ON MINES

I read that the information on Wikipedia is as accurate as the information in the Encyclopedia Britannica. I have never actually opened a single volume of the Encyclopedia Britannica or read a single article on its pages. A visit to their website demanded money, so with Wikipedia available for free, I guess my days of encyclopedia-deprivation are over.

Anybody can edit the Wikipedia entry. If you take umbrage at this description, don’t fret or fume—just go to their site and change the wording. Thus what you see above may not be the same when you turn to the site; any differences reflect rapidly changing notions, opinions, and the march of internet democracy.

Infomine does not yet have a wiki, so if you see anything on this site you do not like please use the old-fashioned approach and e-mail me at jcaldwell@infomine.com.

In the meantime, I am told I will have to seed these new places with contentious and challenging questions. In anticipation of the coming of new e-places, here is the first competition: list the uses of high-strength carbon or glass filaments in a polymer resin in retrofitting and rehabilitating mine facilities?

I suspect that the only constraints on production of a very long list are lack of time, failure of imagination, and absence of participation. As I sat in the small library in Belle Plaine, Iowa perusing www.hj3.com, my mind flew to all the places I could use their expertise and products: the roof that virtually holds up the 80-year old garage with its twisted and tilting frame, the crumbling sandstone basement walls, the rotting wood pillar that holds up the corner of the stairs, the kids’ bedroom ceiling that threatens any day to sigh and expire in a cloud of dust, and the shear walls and other frame components my knowledge of structures tells me should be reinforced to resist the occasional tornado that global warming brings our way.

As an utterly irrelevant aside, I record that the local farmers are most excited about global warming, for the weather here has been nicer than ever before and they have read a study that tells them that in Iowa the number of growing days will increase substantially as will the corn yields and the need for ethanol. It looks as though the economy can only benefit, and who can blame a farmer faced with the prospect of better weather. They seldom go to the coast or care about expensive beachfront property. After all here a nice house costs less than a garage in the areas to be flooded by rising sea levels.

To return to my library reveries regarding the use of fibers in resin as a neat way to fix and rehabilitate structures. To seed the discussion, here is an edited version of a piece sent to me by Christopher Colman of HJ# Composite Technologies in Tucson.

In the process plant of a copper mine, the tank-support columns were degraded and susceptible to structural failure as a result of electrolyte leaks through the ceiling and on to the column-to-beam connections. Exposure to electrolyte within the basement of the cell house had caused the steel reinforcement within the concrete columns to corrode.
The solution involved preparing the substrate of the R/C Columns by chipping out loose material and abrasive blasting the columns to rid the column of electrolyte. Then a polymer patching material that could withstand the acidic attack from the electrolyte was used to resurface the column. Pre-cured strips of S-Glass Laminate were placed against the surface of the column using a Tack Coat. Eight columns were repaired in two days. The tanks are back in action and the columns support the load by structural processes not envisaged by the original designers.

Hence, to repeat the premise of this piece: how many other applications can you list and share with us here at InfoMine for this fascinating way to fix and rehabilitate mine facilities and to dream of fixing old farm houses in the mid-west? Until the InfoMine wikis, etc are up, to repeat, e-mail your ideas to me at jcaldwell@infomine.com.