

Forensic History: Ending Pollution at Canada's Britannia Mine

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Abstract

The abandoned Britannia copper mine near Vancouver, British Columbia was until 2005, Canada's largest point source of metal pollution. Open mine workings in mountainous terrain and high precipitation caused adit flows to approach 1000 litres per second. High concentrations of copper and zinc sterilized marine receiving waters. This contamination continued for decades after the American-owned mine stopped production in 1974. Ending the pollution required an exhaustive compilation of the mine's management and ownership history. This history enabled government to find persons "absolutely, retroactively and jointly and separately liable" for cleanup costs including both present *and past* mine owners. The restored Britannia site now hosts the Britannia Mining Museum, and the adjacent receiving waters have been restored to productivity.

Canada's provinces have responsibility for their natural resources while federal laws prohibit pollution of fish habitat. A federal prosecution was ruled out given how long the pollution had been occurring and the 1998 mine owner's insolvency. Instead, the province took regulatory action based on powers it obtained in 1997. Its *Contaminated Sites Regulation* applied the "polluter pays" policy to contamination resulting from previously permitted mining practices. Finding past owners liable raises issues of fairness, but subsequent Canadian court decisions have upheld a legislature's right to assign retrospective liability.

The province and all past mine owners reached an agreement in April 2001. The province discharged former owners' liability by receiving a payment of CDN \$30 million, and a later agreement with the owner returned most of the mine lands to Crown ownership. The total cleanup cost including the net present value of perpetual water treatment exceeds \$75 M. The British Columbia Cabinet decision to accept the lesser amount and avoid possible litigation remains questionable. Despite this, the Britannia example may inform other countries' efforts to end pollution from long-abandoned or legacy mines through tracing ownership history, assigning retrospective liability, and participating in structured negotiations to fund remediation.

Introduction

Canada's Britannia copper mine (1905-1974) was once the largest copper mine in the Commonwealth. In its best year, 1929, it mined and milled 5500 tonnes per day from several underground headings, and paid more in dividends that year than any other British Columbia mine.¹ Always American-owned, the last owner, Anaconda Canada Ltd, closed it in 1974 due to rising costs from aging equipment and a precipitous drop in United States copper prices from their post-Depression peak.² The mine's town site, Britannia Beach, remained as a rental community under a single owner, while the mining properties became largely derelict. The mine property is only forty kilometres from Vancouver, beside Highway 99 connecting Vancouver to venues of the 2010 Winter Olympics at Whistler, a fact that fostered the site's transformation into today's tourist destination (see Figure 1).

For decades, toxic drainage from the mine's workings sterilized the shoreline of Howe Sound. Its closure marked the end of mining practices like unconfined discharges which were acceptable when the mine started. Its drainage became pollution, and the subsequent owner failed to comply with a provincial pollution abatement orders. Beginning in 1995, the federal and provincial governments cooperated in studies characterizing the source and effects of the pollution. Subsequently, heavy investment by government, present and former mine owners, and industry and private donors allowed construction of a treatment plant and other restoration work. The shore line ecology continues to recover, and the now-attractive community hosts the popular Britannia Mining Museum.³

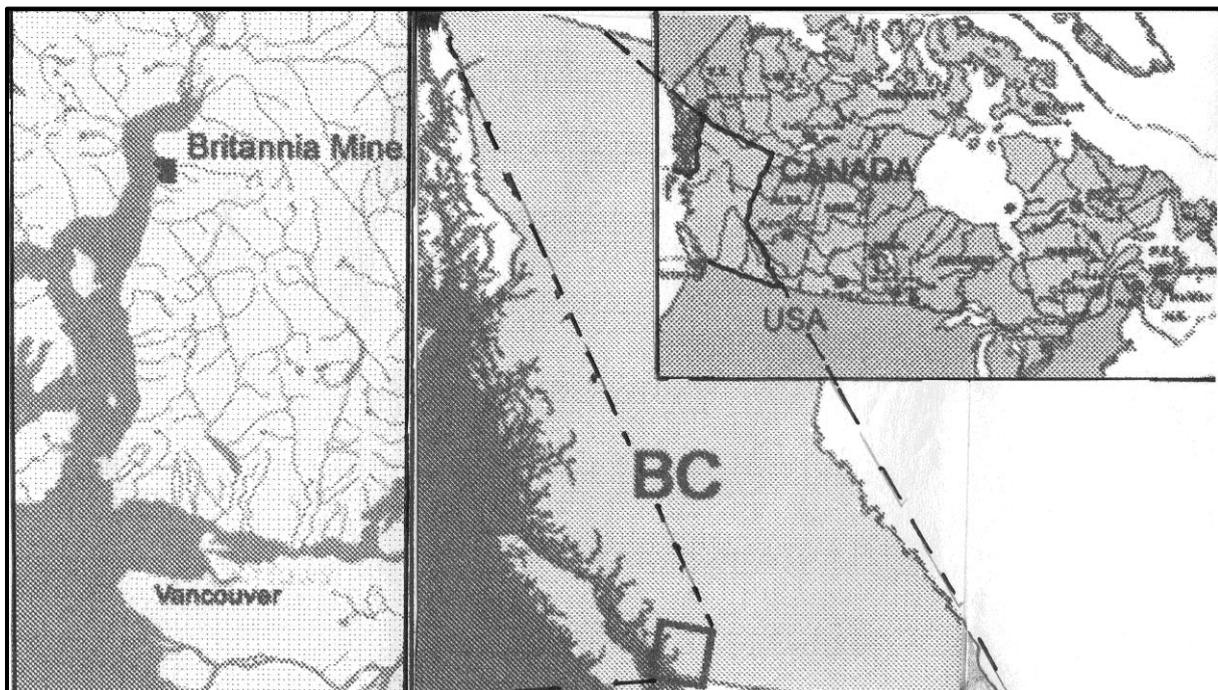


Figure 1: Location of Britannia Mine, BC, Canada

¹ British Columbia, *Annual Report of the Minister of Mines* 1929 (Victoria: Kings Printer, 1930) p. 11, 12.

² Svedberg, Peter and John E. Tilton, *World Development* Vol. 34, No. 3; Figure 2, p. 510.

³ Information on Britannia occurs at websites; <http://www.agf.gov.bc.ca/clad/britannia/index.html> and <http://www.britanniamuseum.ca/> (As of Mar. 2012).

The initial discovery occurred in 1898. Prospectors staked (pegged) five claims over massive sulphide mineralization found on a mountain at an elevation of 1220 metres, 6 kilometres east of the shoreline.⁴ By 1900 the site attracted American capital which underwrote its development. Ore shipment began in 1905 with ore delivered by tramline to a concentrator built at the beach. In its 70 year life, the mine processed 48 million tonnes, yielding over 500 million kilograms of copper and associated zinc, silver and gold.⁵ Development had revealed a chain of sulphide ore bodies from the mountain summit, plunging steeply to the west and extending below sea level. The mine had a vertical extent of 1800 metres, with access to the workings through at least six adits or levels, but only one shaft. The mine cannot be sealed.⁶

The Pollution Problem

Water pollution at the Britannia mine posed an intractable technical problem for three reasons; its rocks, its architecture, and its climatic setting. Britannia ores have high sulphide content. They formed in volcanic flows and marine shales altered by heat and pressure from contact with younger intrusive granitic rocks. Its mineralization is characteristic of a “volcanic massive sulphide” or VMS ore deposit. The intrusives form part of a very large mass of granitic rocks which define the Coast Mountains of British Columbia and Alaska, on the northwest coast of North America. This rugged, heavily forested coastline has very deep fjords gouged by continental glaciation ending about 10,000 years before present era.

VMS deposits have abundant iron sulphide minerals like pyrites and pyrrhotite, and their oxidation causes the characteristic rust stain in rocks all over the world. Given enough sulphides, oxygen and water, acid rock or acid mine drainage will occur. The sulphide changes to acid which dissolves minerals containing copper, zinc or other heavy metals. The resulting acid rock drainage and metals leaching occur at many mines in every continent, and may pollute receiving waters. At Britannia exposure of sulphide mineralization to air and water occurred in workings throughout the mine and acidified its drainage. During peak mining periods, copper concentrations approached 200 milligrams per litre (mg/l), a level high enough to allow copper recovery by cementation on scrap iron.⁷ Since copper in mine effluent cannot exceed regulatory limits of 0.3 mg/l, Britannia obviously needed an effluent treatment plant to achieve compliance.⁸

The mine’s unusual architecture causes the second difficulty. The initial mine workings occurred at high elevations on the eastern and southern walls of a glacial cirque called Jane Basin. The original basin floor was probably about 20 hectares in extent from its edge back to talus below the basin’s walls. Adits driven into those walls connected to raises driven later, from lower levels, as the mine developed

⁴ British Columbia Archives, Britannia MS1221, Box 120, File 38, “A History of Britannia Beach and Surrounding Area,” Anon, December 5 1966.

⁵ British Columbia, Ministry of Energy and Mines, <http://minfile.gov.bc.ca/searchbasic.aspx> search for MINFILE 092GNW003 (As of Mar. 2012).

⁶ Plugging the lowest adit would cause the dammed water to rise and spill out of the next higher level, or raise hydraulic pressure behind the plug to the point of causing its catastrophic failure.

⁷ British Columbia Archives, Britannia MS1221, Box 120, File 38, “Copper Precipitation at Britannia,” Anon, December 3 1966.

⁸ Canada, *Metal Mining Effluent Regulations* <http://laws.justice.gc.ca/eng/regulations/> (As of Mar. 2012).

downward.⁹ Workings below the floor of Jane Basin reached up the surface through draw points or glory holes. In time these holes enlarged into basins filled with high sulphide waste rock. The trapped rain and melting snow helps to oxidize the waste by carrying the resulting salts down into the mine workings. Sealing the basins would be very difficult, especially since the slopes above are undermined and unstable. The acid rock drainage cannot be stopped at its source.

High precipitation at Britannia area is the third difficulty. The nearby town of Squamish receives an average of 2400 millimetres of precipitation per year.¹⁰ At Jane Basin, 950 metres elevation, precipitation probably exceeds 3500 mm, of which one third would fall as snow.¹¹ All precipitation falling on the mine openings reports to the mine workings, which for decades, drained out into the environment from two adits. When site reclamation began in 2001, a concrete plug was constructed in the uppermost, 2200 Level. This diverted its flow deep inside the mine to plunge 580 metres down connecting raises and ore passes to the lower, 4100 Level. See Figure 2.

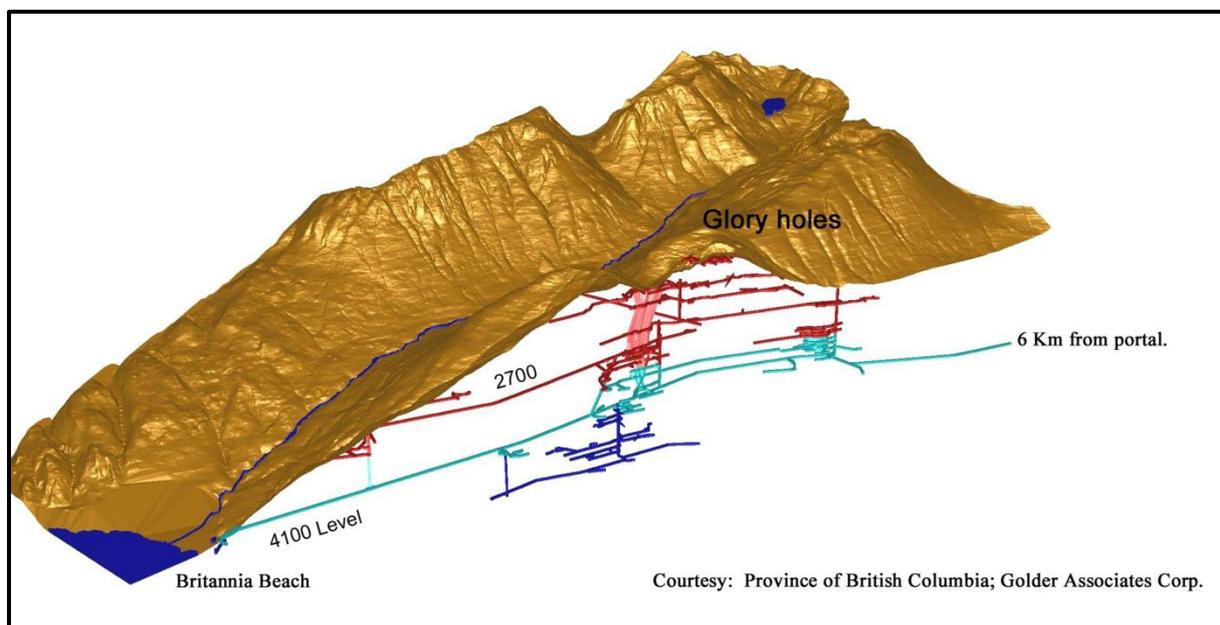


Figure 2: Apparent 3D view of Britannia Mine

The 4100 Level portal is about 50 metres above the sea, beside the large Britannia mill building. Started in 1916 as the main haulage level, for the next thirty years it advanced eastward, deep below the Jane Basin workings, to the shaft of the Victoria mine, over six kilometres from the portal. After mining ended it was fitted with a concrete plug and large valves which remain open. Today, it drains groundwater

⁹ Britannia levels numbered downward, from the summit at 100 Level to the lowest level, 5950, approximately 1500 feet below sea level. Jane Basin was approximately 1000 Level.

¹⁰ Canada, Environment Canada, Climate Normals for Station 1047672, Squamish, 15 km north of Britannia. http://www.climate.weatheroffice.gc.ca/climate_normals/index_e.html (As of Mar. 2012).

¹¹ Precipitation increases with elevation. This estimate is corroborated by three years of current but patchy Jane Basin precipitation data, and a worse case, in Britannia's Annual Report for 1933, when Tunnel Camp (2200 Level) measured 348 inches of precipitation (8.8 meters!): British Columbia Archives MS 1221, Box 2, File 15.

and rain and snow collected by glory holes at Jane Basin, Victoria, and other openings. During unusual springtime flows in June 1999, 4100 drainage probably exceeded 1000 litres per second of contaminated water.¹² During peak flows, the mine released up to two tonnes per day of dissolved copper and zinc into Howe Sound.¹³ This was world class pollution, far exceeding any other Canadian point source of metals pollution.¹⁴

Britannia's Pollution Compared to Other Sites

Britannia deserves comparison to better known problem mines at Wheal Jane in Cornwall; Iron Mountain in California; and Mount Lyell in Tasmania.¹⁵ The shafts and ramps of the Wheal Jane mine are a few miles south of Truro, Cornwall, in farming lands with low relief. Its underground workings connect to other mines which also flood from groundwater inflows, forming a wide-spread reservoir with a comparatively low fluctuation in water level. The last operator, Rio Tinto Zinc plc stopped tin mining in 1991 and let groundwater inflows flood the mine. Four months later, a temporary dam at one portal failed and the resulting outburst of contaminated water damaged the Carnon River and the Fal Estuary.¹⁶ The Environmental Agency then contracted a private operator to design, build and operate a treatment plant, which came on line late in 2000.

Wheal Jane groundwater levels are maintained below discharge elevation by pumping up from a shaft, 110 to 330 litres per second, a flow comparable to Britannia's. Before treatment, mine water iron and zinc concentrations were much higher but since copper was less than Britannia, the mines had comparable heavy metals releases. The UK government built the treatment plant and pays the annual operating costs of £1.5 million because it did not pursue cost recovery from former mine owners and operators.¹⁷

The former Iron Mountain copper and pyrite mine is 14 km northwest of Redding, in the mountains of northern California. Its workings exposed very large masses of iron sulphides, and its oxidation is famous among specialists for causing extremely high natural acidity.¹⁸ Its metals-laden drainage caused repeated fish kills in the Sacramento River. Copper and zinc concentrations in Iron Mountain drainage were ten and one hundred times higher respectively than Britannia drainage, but mine flows were much less. Their releases of dissolved copper and zinc into the receiving

¹² From the author's measurement of the depth, width and velocity of water of 4100 Level flows, which by then had flooded a measurement weir and staff gauge, and did not include 2200 Level flows.

¹³ Britannia technical reports are posted at <http://www.agf.gov.bc.ca/clad/britannia/> (as of Mar. 2012). Average Cu-18 mg/l, Zn-21mg/l, peak flow 0.578 l/sec. See "Historical Water Quality and Flow Data," 4100 Level.

¹⁴ Nearly all of Canada's mines are located in areas of low relief so flows to the environment would be absent or very small in comparison. Metals concentrations in municipal sewage are typically very low.

¹⁵ Butte MT is excluded because its contaminated groundwater originates from many interconnected mines: see <http://www.mbmgt.mtech.edu/env/env-berkeley.asp> (As of Mar. 2012). Similar polluting mines in continental Europe, Africa, and South America cannot be considered here.

¹⁶ Coulton, Richard *et al*, "Wheal Jane Minewater Active Treatment Plant – Design, Construction and Operation," *Land Contamination and Reclamation* II(2), 2003, p. 245 – 252.

¹⁷ United Kingdom, House of Commons, Research Paper 99/10 (2 February 1999), "Treatment of Acid Mine Drainage," p. 14. The U.K. Coal Authority manages the site (e.mail to author Jan 9 2012).

¹⁸ See for example, Nordstrom, D. Kirk; "Advances in the Hydrogeochemistry and Microbiology of Acid Mine Waters," *Environmental Geology Review* Vol 42, 2000, p. 504.

environment were similar averaging about one metric tonne of copper and zinc per day.

In 1983, the United States Environmental Protection Agency declared Iron Mountain to be a “Superfund” site, describing its pollution, which was finally controlled in October 1994, as “one of the nation’s toughest, costliest cleanup challenges.”¹⁹ In December 2000, it settled with former mine owners for payment of US \$160 million to maintain water treatment in perpetuity, in “the largest settlement with a single potentially responsible party in EPA history.”²⁰

Drainage from the Mt Lyell copper mine is similar to Iron Mountain’s, with very high iron and copper, but its low zinc concentrations are comparable to Britannia’s.²¹ This is another site with massive sulphide ore bodies, in the rugged terrain of northwest Tasmania at Queenstown. Total mine site discharges averaging 225 litres per second release into the two receiving rivers, almost two tonnes of dissolved copper per day but much less dissolved zinc. Remediation of Mt Lyell is planned but remains unfinished, in part because the mine is presently operating, and the Government of Tasmania granted the current mine operator an exemption from liability for earlier pollution.²² It seems likely the site’s relative isolation will postpone its remediation compared to Wheal Jane, Britannia, and Iron Mountain.

The mines deserve brief comparison in their environmental effects. The groundwater draining from Britannia’s 4100 Level was slightly warmer than ambient surface waters. This made it relatively buoyant over salt or brackish marine receiving waters, forming a layer or zone of contamination which sterilized the intertidal zone. This copper contamination prevented growth of algae and marine invertebrates along a kilometre of shoreline, and posed a risk to juvenile salmon migrating through the zone.²³ At Wheal Jane, the high concentrations of iron and other, more toxic metals caused fish kills and highly visible iron staining in the Fal Estuary, making its remediation an urgent political obligation. Iron Mountain’s pollution resulted in, “levels of copper, zinc, and cadmium exceeding lethal concentrations for aquatic life periodically occur(ing) in the Sacramento River.”²⁴ The pollution from Mount Lyell sterilizes the King River and poses risks to the valuable aquaculture industry in Maquarie Harbour, on Tasmania’s west coast.

¹⁹ Iron Mountain flows and concentration data were derived from Table 2 in Attachment A in the “Five-Year Review of the Superfund Remedial Action at Iron Mountain Mine” dated October 8 1998, downloaded from <http://www.epa.gov/region9/superfund/> (As of Mar. 2012).

²⁰ See Iron Mountain Mine description at <http://www.epa.gov/region9/annualreport/04/land.html> in the 2004 Annual Report (As of Mar. 2012).

²¹ Australia, Department of Sustainability, Environment, Water, Population and Communities, Supervising Scientist Report 126, “Mount Lyell Remediation: Final Report” (Commonwealth of Australia, 1997), Table 5.1, p. 21. Available at <http://www.environment.gov.au/ssd/publications/ssr/pubs/ssr126-contents.pdf> (As of Mar. 2012).

²² See above, p. 3; also, *Copper Mines of Tasmania Pty. Ltd* (Agreement) Act 1999, and *Mt Lyell Acid Drainage Reduction Act 2003* at <http://www.thelaw.tas.gov.au/index.w3p> (As of Mar. 2012).

²³ Britannia’s environmental effects are described in: Canada, Department of Environment, Regional Program Report; 03-06 “Nearshore Contaminated Sediment Investigations at Britannia Beach, British Columbia,” as .pdf on <http://www.agf.gov.bc.ca/clad/britannia/index.html>, under “reports”.

²⁴ “EPA Superfund Record of Decision: Iron Mountain Mine; EPA ID: CAD980498612 OU 01, Redding, CA, 10/03/1986” at <http://www.epa.gov/region9/superfund/superfundsites.html> (As of Mar. 2012).

Britannia's pollution may have been less obvious than other mines, but the site's appearance beside a major highway embarrassed a province inclined to boast about its natural environment, and it detracted from efforts by Canada's aggressive mining industry to appear environmentally responsible. Whatever their political climate, Britannia, Wheal Jane, Iron Mountain, and Mt Lyell all need perpetual treatment of their drainage. How is this to be obtained? Who will pay for it? The US government's approach at Iron Mountain, modified and imported into British Columbia for Britannia, suggests a way forward for similar mining pollution problems in other countries.

The Failure of Pollution Control Laws

Despite Britannia being among the worst sources of water pollution in Canada, even the oldest of the nation's laws could not bring it into compliance. The original *British North America Act* of 1867 which created Canada assigned to the federal head of power, authority over "sea coast and inland fisheries."²⁵ The Canadian federation recognized provincial control over their own natural resources like land, water, minerals, property and commerce, while other areas of governance like communications, railways, banking and fisheries became federal.²⁶ The first laws passed by Canada's new Parliament included a prohibition against depositing "deleterious substances" into fisheries waters.²⁷ The law received many amendments over the next 144 years, but today's *Fisheries Act* has the same prohibition.²⁸ Despite the act's long history, it has been useless in achieving action on dossiers like Britannia, for three reasons.

The first reason is duplication. The provinces own and control water and also issue permits or approvals that prohibit pollution. Over the past twenty years, provincial approvals for sectors like mining have finally begun to align with the long-standing federal prohibition of "deleterious" substances, which today means that which makes an effluent toxic in a laboratory bioassay of an undiluted sample. The duplication in federal and provincial regulating power has always been obvious. Provincial laws ignored Britannia's toxic effluent until very late in the mine's life, despite the pollution being illegal under federal laws. Common Law allows those affected by duplication or ambiguity in laws to receive court interpretations that are "fair, large and liberal."²⁹ For federal officials to side-step provincial authority over mining, and prosecute under the *Fisheries Act* would have soured federal-provincial relations; or, even if they did obtain a conviction in British Columbia's provincial court, it might have awarded an ineffective penalty, like a suspended sentence, or a negligible fine.

The second reason is discretion. For a few years, the *Fisheries Act* explicitly allowed the Minister of Fisheries to grant an exemption for pollution if he had the opinion that, "its enforcement is not requisite in the public interest."³⁰ The federal government's

²⁵ 30-31 Victoria c. 3, sect. 91(12).

²⁶ Canada's northern territories, the Yukon Territory, Northwest Territories, and Nunavut, have limited control over otherwise federal resources.

²⁷ Canada, Parliament, 31 Victoria (1868) c. 60, Sect. 14.

²⁸ Canada, *Revised Statutes 1985* c. F-14, sect 36: <http://laws.justice.gc.ca/eng/acts/> (As of Mar. 2012).

²⁹ Sullivan, Ruth, *Sullivan on the Construction of Statutes* 5th ed. (Markham, ON, Lexis, 2008), p. 195.

³⁰ Canada, *Revised Statutes 1886*, c. 95, sect. 15.

environmental prosecutors often allow themselves the same opinions today, although such power is not stated in that act, and its use seems wanting in transparency. For whatever reason, both levels of government seem to ignore egregious examples of water pollution, like ineffective municipal sewage treatment, to prosecute, as in recent British Columbia example, a mushroom farm that spilled its waste into a creek.³¹

A third factor that allowed Britannia pollution to continue is that if the law changes to make illegal a long-standing practice, for example allowing the discharge of toxic effluent one day, but prohibiting it the next, then judges will presume the law does not apply retroactively. The law “ought not to change the character of past transactions carried on upon the faith of the then existing law.”³²

This third factor will be discussed below; for now, they explain why pollution prevention laws could not bring Britannia into compliance. Obviously, this limitation applies only to historic pollution; both levels of government enforce modern regulations, permits and approvals intended to prevent industrial pollution.

Land, Contamination and Liability

Ending Britannia’s pollution came through solutions to problems in the assessment, management and transfer of contaminated land. This very important field of professional practice has evolved due to increasing populations and a growing demand for land. In the 1960s, two separate problems brought attention to soil contamination; leakage of thousands of buried, old single-walled storage vessels containing petroleum products, and the discovery of adverse environmental effects of persistent organic pollutants, like PCBs, dioxins, and DDT.³³ Contaminated soils below petrol filling stations or adjacent to leaking pipelines made the land unfit for use and caused rancorous disputes between buyers and sellers. Soils contaminated with toxic organic compounds, and heavy metals like lead, arsenic or cadmium presented the same problems. Growing costs and delays of litigation and a lack of standards forced governments throughout North America to set rules for managing contaminated land. Tracts of industrial land that remain vacant (i.e. “brownfields”) in most cities show the difficulties of selling and developing such land, especially when its remediation costs would outweigh any profit from its redevelopment.

Canada’s provinces cooperated in developing policies for contaminated land through the Canadian Council of Ministers of Environment, a consultative body for “develop(ing) national strategies, norms, and guidelines that each environment ministry across the country can use.”³⁴ CCME was aware of the US law, the *Comprehensive Environmental Response, Compensation, and Liability Act*

³¹ Sewage from over 100,000 people in Victoria, BC receives no treatment at all, and treated Vancouver sewage frequently fails toxicity tests. The prosecution of the mushroom farm appears at <http://www.dfo-mpo.gc.ca/media/npress-communique/2008/pr28-eng.htm> (As of Mar. 2012).

³² Driedger, Elmer A, *The Construction of Statutes* (Toronto, Butterworth’s, 1983) p. 185, quoting *Phillips vs. Eyre* (1870) L.R. 6 Q.B. p.23.

³³ PCB (polychlorinated biphenyl); dioxins (polychlorinated dibenzodioxins); and DDT (dichloro diphenyl trichloroethane) are man-made compounds which are strictly regulated due to their environmental persistence and their risk of causing tissue damage and cancer in humans and animals.

³⁴ See <http://www.ccme.ca/about/> (As of Mar. 2012).

(CERCLA) and its more recent amendments.³⁵ This 1980 law assigns liability for the costs of remediation of sites using the “polluter pays” principle, even if the polluter was a past owner of the property. An early test of a legislature’s right to assign cleanup costs retroactively was upheld in a well-known 1983 case (“Ventron”), in New Jersey’s Supreme Court.³⁶

CCME’s 1989 National Contaminated Sites Remediation Plan affirmed the polluter pays principle, and also coordinated federal, provincial and industrial funding for site assessments and cleanup of orphan, high risk sites.³⁷ Policy for assigning liability was an obvious focus. Industry feared exposure to cleanup costs of unforeseen contamination, and governments wanted to protect taxpayers from paying for poor environmental practices of the past.³⁸

The CCME’s first principle is polluter pays, implying retroactive application. The second is “fairness,” meaning the rules should balance risks, benefits and certainty, and not necessarily focus on “deep pockets,” the party having the most resources. Other principles should offer transparency, avoid enrichment of a beneficiary, and include environmental, human health and economic considerations. The council’s paper advised that a “broad net” should be cast to find “potentially responsible persons,” then reduce their number by exempting persons like lenders and trustees. Incorporating “polluter pays” into law raises questions of fairness. Why should a former owner pay for cleanup costs when the resulting benefit goes to the new owner? No doubt legislatures considered this point, but they also wanted to empower ministers to protect the environment, and allocate liability between past and present owners.

These powers were tested in Canadian courts when a large oil company challenged a Quebec minister’s powers to assign retroactive liability. Quebec’s *Environment Quality Act*, stated that the minister could make determinations of responsibility for contamination “before 22 June 1990” making explicit the law’s retroactive nature. In 2003, Canada’s Supreme Court upheld the provincial minister’s powers, stating;

The Quebec legislation reflects the growing concern on the part of legislatures and of society about the safeguarding of the environment. That concern does not reflect only the collective desire to protect it in the interests of the people who live and work in it, and exploit its resources, today. It may also be evidence of an emerging sense of inter-generational solidarity and acknowledgement of an environmental debt to humanity and to the world of tomorrow.³⁹

This strong defence of retrospective environmental legislation came too late to lend its weight to the provincial government’s negotiations with responsible parties.

³⁵ See: <http://www.epa.gov/superfund/policy/cercla.htm> (As of Mar. 2012).

³⁶ The case tested the state’s authority to collect cleanup costs of 50 years of mercury pollution of a tidal estuary, in *New Jersey Department of Environmental Protection vs Ventron Corp*; 94 NJ 473 (1983); it is available at several internet sites reporting US court judgments.

³⁷ “Guidance Document on the Management of Contaminated Sites in Canada,” CCME, April 1997, p. 1; found under “Contaminated Sites” at <http://www.ccme.ca/publications/> (As of Mar. 2012).

³⁸ “Recommended Principles on Contaminated Sites Liability,” p. 1, as above. This replaced the first study on liability completed in 1993.

³⁹ Canada, Supreme Court; *Imperial Oil Ltd. v. Quebec* (Minister of the Environment), [2003] 2 S.C.R. 624, 2003, accessed at <http://www.scc-csc.gc.ca/decisions/index-eng.asp> (As of Mar. 2012).

First Steps Towards Declaring Britannia a Contaminated Site

The British Columbia Government attempted to limit pollution at the Britannia mine beginning in 1970, by negotiating with the mine operators. In 1974 it issued an order to Anaconda Canada Ltd, the last operator of the mine, to collect and treat the mine's drainage.⁴⁰ The order required the drainage entering Britannia Creek from the upper, 2200 Level to be diverted internally to flow down into the 4100 Level, then through beds of scrap iron and steel into a marine outfall discharging well below the low tide level. This deep discharge would have reduced the mine's adverse environmental effects in the productive surface layer along the shoreline, but the effluent would have remained acutely toxic. Anaconda took some steps towards compliance before selling the mine in 1977 to a private company, Copper Beach Estates Ltd (CBEL), which became responsible for compliance.

CBEL was then receiving a modest income from the rentals of houses and lands in the mine's privately-owned town site, but it failed to make payments on a large mortgage, let alone comply with an environmental order. Arguably, CBEL's financial issues and its insistence on participation in all discussions made the fourth intractable Britannia problem, along with its reactive rocks, glory holes, and high precipitation described above. Despite this CBEL was later to have a pivotal role in identifying parties responsible for cleanup costs.

The mortgage default led to CBEL's properties becoming subject to a Court-ordered sale in 1991, but the lender found no buyers. In the same year, Environment Canada, a department of the federal government, and the British Columbia Ministry of Environment began their fruitful, joint approach to solving the Britannia pollution problem. Numerous government-funded studies and tests made between 1991 and 2001 to define the problem, measure its effects and assess solutions need no description here, as all reports are readily available.⁴¹ By April 1998 this work was the basis for a consultants' estimate that a water treatment plant would cost \$4.3 million, with annual operating costs of \$0.78 million.⁴² Since no private party seemed ready to build the plant, the provincial government decided to implement its new "polluter pays" rules by declaring the mine a contaminated site and issuing new cleanup orders.

British Columbia's legislature first amended the Waste Management Act in June 1993 to regulate contaminated sites.⁴³ Four years of studies and public consultation followed before the act's amendments and the enabling *Contaminated Sites Regulation* became law by proclamation, in April 1997. The enabling amendment of the act, later renamed the *Environmental Management Act*, included in Section 47:

"A person who is responsible for remediation of a contaminated site is absolutely, retroactively, and jointly and separately liable to any person or

⁴⁰ British Columbia, Ministry of Environment, "Reasons of Decision for Issuance of Remediation Order OE-16097, Effluent Discharge Permit PE-12840 and Refuse Discharge Permit PR-15938" Sept. 8 1999, at http://www.env.gov.bc.ca/epd/remediation/high_profile/britannia/orders/index.htm (As of Mar. 2012).

⁴¹ British Columbia, Ministry of Forests, Land and Natural Resource Operations, Crown Land Division, at <http://www.agf.gov.bc.ca/clad/britannia/index.html> see "Reports" (As of Mar. 2012).

⁴² "Treatment of Acid Drainage at the Anaconda - Britannia Mine" H.A. Symons Ltd, March 1998, at "Reports" <http://www.agf.gov.bc.ca/clad/britannia/index.html>. (As of Mar. 2012).

⁴³ The law is summarized in British Columbia, Supreme Court Reports 2000, *Beazer East Inc vs. Environmental Appeal Board*, http://www.courts.gov.bc.ca/search_judgments.aspx (As of Mar. 2012).

government body for reasonably incurred costs of remediation of the contaminated site.”⁴⁴

Shortly after this enactment, the Ministry of Environment searched for companies tied to Britannia’s operation. Over a year later, the ministry discovered that Anaconda Canada Ltd, the last operator of the mine, had Canadian affiliates. The ministry advised those companies that the government regarded them as “potentially responsible persons” and invited them to discuss the matter.⁴⁵ In July 1998, it sent a similar letter to the very large oil company, ARCO (Atlantic Richfield Company) which had purchased Anaconda and its affiliates. The letter “proposed a cooperative round table discussion to resolve the issues at Britannia.”⁴⁶ Six weeks later ARCO replied it was not responsible because it did not buy Anaconda until 1977, three years after the mine closed.

In November 1998, the Ministry of Environment called a meeting with all parties with an interest in Britannia’s cleanup, including the parties which denied any responsibility.⁴⁷ The company representatives said they were not prepared to make submissions of fact or law, and were there to listen. The province’s counsel told them an agreement between the responsible parties would make it unnecessary for the government to include them in the pollution abatement order issued to Copper Beach Estates Ltd. They considered this, but complained there was no representative from the successor to the Howe Sound Company, which operated the mine for sixty years. They also expected a financial contribution from the British Columbia government, which, they said, “must put some of its own skin in the game.” The province’s first attempt to discuss retroactive liability ended in a stalemate.

At this time the federal government’s research and advisory role in ending Britannia’s pollution received criticism from a totally unexpected direction. The North American Commission on Environmental Cooperation (CEC) received a complaint in June 1998 from Canadian environmental groups that Canada was failing to enforce the *Fisheries Act* against Britannia.⁴⁸ The intent behind the tripartite (Canada, US, Mexico) 1994 *North American Agreement on Environmental Cooperation* was to limit the parties’ ability to gain an unfair trade advantage by avoiding national environmental standards. The commission’s subsequent, 234-page “factual record” on Britannia pollution noted only that federal prosecutors had discretion in launching prosecutions. The record receives mention here because its compilation of Britannia events until 2002 is exhaustive, and greatly exceeds this paper’s summary.

Delays and Setbacks in finding Responsible Parties

While the province searched for responsible parties, CBEL came forward with a plan to end the pollution. It would use Jane Basin glory holes as a disposal site or tip for contaminated soil, and apply tipping fees towards building and operating a multimillion dollar water treatment plant. Early in 1999, it applied to the provincial

⁴⁴ British Columbia Statutes 2003, C. 53, at <http://www.BritishColumbiaLaws.ca/default.html> (As of Mar. 2012).

⁴⁵ British Columbia, Ministry of Environment, File 26250-20/0517/96-97; Binder 1, 27 May 1998.

⁴⁶ British Columbia, Ministry of Environment, File 26250-20/0517/96-97; Binder 1, 28 July 1998.

⁴⁷ The author attended the meeting representing Environment Canada.

⁴⁸ Commission on Environmental Cooperation, see “Factual Record BC Mining” SEM-98-004, p. 132 available at <http://www.cec.org/> (As of Mar. 2012)

government for the necessary effluent and solid waste permits. Provincial and federal officials accepted the applications for review as the only feasible way known at the time by which private funding could end the pollution.

In public meetings in May and June, company representatives and officials from both governments held public meetings in three communities and at Britannia Beach to explain the applications.⁴⁹ The proposal and the public meetings attracted significant media interest, and more support than criticism, so in September 1999, the province issued permits for its planned work.⁵⁰ The province also suspended its search for other responsible parties, believing CBEL would meet its commitments, and take on the task of identifying former owners and compelling them to contribute towards the planned work.

CBEL retained specialized consultants based in Seattle, Washington and very experienced with United States' contaminated sites law. This experience enabled them to document a site's history to a level of proof required by US courts to determine facts and establish liability, hence the term forensic history. The consultants sent a team to the British Columbia Archives in Victoria, where they searched a very large collection, 127 boxes of mine records and files, donated by mine's last operator, Anaconda Canada Ltd.⁵¹ They copied documents concerned with the mine's development and management, and wrote a history of the mine.

A separate line of research led CBEL consultants to identify several present-day companies as successors to the Howe Sound Company.⁵² These were later found to include ALCOA, which today bills itself as the world's largest aluminum company. ALCOA offered a second set of "deep pockets," ARCO having been identified previously as Anaconda's successor. CBEL now had the facts to launch an action in US courts, and compel participation by both companies, but over the winter of 1999 - 2000, its momentum faltered. It became apparent to the regulator that the company lacked the resources to support its ambitious plans.

In April 2000 the provincial government revived its request for submissions from the responsible parties it had already identified.⁵³ Over the next six months a torrent of paper changed hands between the named parties and the provincial and federal governments. The government consolidated the submissions and supporting documentation into multiple sets of large three-ring binders sent to all the named potentially responsible persons. The papers and submissions grew to include; all recent government correspondence, orders and reasons for decision; corporate agreements for sale, registrations and changes of name; land title documents; court filings; and US and Canadian case law concerned with corporate mergers and the transfer of liability, and contaminated sites rulings.⁵⁴ This made the foundation for

⁴⁹ The author attended these meetings representing Environment Canada.

⁵⁰ For the permits and reasons for decision see footnote 38, above.

⁵¹ British Columbia Archives, Britannia MS1221.

⁵² In November 1999, at Copper Beach's request, the author heard a briefing by its consultants. ALCOA had not been identified as a successor to the Howe Sound Company, at that time.

⁵³ British Columbia, Ministry of Environment, File OE-16097, letter date April 6, 2000 posted at http://www.env.gov.bc.ca/epd/remediation/high_profile/britannia/orders/index.htm.

⁵⁴ British Columbia, Ministry of Environment, File 26250-20/0517/96-97 included seven binders.

serious negotiation or even court action: millions of dollars were at stake, quite all apart from the separate urgency of ending the mine's pollution.

By October, Copper Beach's research had persuaded the provincial government's manager to add ALCOA and other successors to the Howe Sound Company to the list of potentially responsible persons.⁵⁵ But some companies caught in the manager's big net protested that the Ministry of Environment was itself a responsible party, because of emergency flood relief work the ministry performed at Britannia in 1991. The same parties alleged that Canada was also implicated because its wartime purchases of Britannia copper at a fixed, subsidized price meant it managed the mine.⁵⁶ The ministry's representation immediately changed to another officer who took on responsibility for regulating the cleanup order in isolation from all other potentially responsible parties. Canada simply denied any responsibility. Waiting for responses from all the named parties set the stage for another meeting.

The Britannia Settlement

Acting as regulator, a Ministry of Environment official set a December deadline for replies by the successor companies to Anaconda and Howe Sound, but the companies asked for a month's delay. They needed time to negotiate an agreement that would let them buy their way out of any liability by making payments only to the province; they did not want CBEL complicating the negotiations.⁵⁷ Knowing of their plans to meet with the province later in the month, the regulator postponed his deadline.⁵⁸

Meantime, provincial and federal scientists and engineers who had been working on Britannia issues for years had reason to be optimistic that an agreement was possible. The difficulty lay in divergent expectations of the size of the settlement. Senior officials seemed headed to indemnify the former mine owners without knowing the cost of Britannia's cleanup, or what the province would later pay from general revenues; that is, by the province's taxpayers.

Late in 2000 events occurred too quickly to revise the capital and operating costs of a treatment plant beyond the 1998 consultant's estimate of \$4.2 million capital cost, and \$0.78 million per year to operate. The technical officers met briefly on November 28 and discussed a preliminary estimate of \$53 million, with operating costs of \$1.2 million per year, to clean up the mine's contamination including the treatment plant.⁵⁹ This was the best estimate as a basis for negotiations.

There were good reasons for believing Britannia's cleanup costs would be higher. The treatment plant's size was not determined; the levels and location of land contamination were unknown; and the mine site presented obvious risks to public safety. The cost of a water treatment plant is very sensitive to the volume of water it has to treat - its hydraulic capacity. The mine's unregulated drainage flows vary by a

⁵⁵ British Columbia, Ministry of Environment, File OE-16097, letter dated October 4, 2000 posted at http://www.env.gov.bc.ca/epd/remediation/high_profile/britannia/orders/index.htm.

⁵⁶ As above, letter to Canada dated October 4 2000.

⁵⁷ British Columbia, Ministry of Environment, File 26250-20/0517/96-97; 14 Nov. 2000.

⁵⁸ British Columbia, Ministry of Environment, File OE-16097, letter dated 15 Nov., 2000 posted at http://www.env.gov.bc.ca/epd/remediation/high_profile/britannia/orders/index.htm.

⁵⁹ The author attended this Britannia meeting, and those of 30 November and 1 December 2000.

factor of ten, high during snowmelt, low in late summer.⁶⁰ Meeting permit limits needed the plant to treat high flows but its capacity would not be used most of the year, which would be very inefficient. Drainage from the 4100 Level flowed through large valves set into a concrete plug that Anaconda installed inside the adit after mining ended in 1974. Partially closing the valves could store peak flows so a smaller, less costly plant could be built, however the plug's safety was unknown. Its "as built" construction drawings were missing and its possible failure under pressure from dammed water could cause a catastrophic outburst flood.

Another important unknown cost concerned copper contamination of the mine site shoreline from spilled concentrate and other pollutants. It was obvious that the mill site's groundwater was contaminated, but no one knew how much leached into the sea along the shoreline. Other unknown costs included annual disposal of the lime sludge resulting from water treatment; contamination near other mine openings; and the lack of sewage treatment for the mine community. Similarly, there were known risks to public safety from possible debris torrents, open and unsafe mine workings, failures of old dams, and from a possible landslide in unstable parts Jane Basin. Clearly even \$52 million was too low.

The first meeting with the responsible parties occurred in the evening of November 30. A senior officer of the British Columbia government acting as chairman told the former owners' representatives that he was prepared to negotiate, *at that meeting* (author's emphasis), the amount they would pay to secure indemnification, meaning the one-off payment they would make in return for the province's guarantee it would not make any further claim against them. He also said he could not guarantee any agreement because it had to be approved by the government's regulator. An ARCO representative immediately offered \$6 million for a release: the other parties were more circumspect. The meeting resumed on the morning of 1 December and ended the same day when the provincial negotiator accepted a combined payment of CDN \$15 million from the former operators.

The province's representatives accepted this amount in settlement even though they knew that two months before, the US Environmental Protection Agency agreed to a "structured settlement (which) provides, through an insurance vehicle, coverages totaling approximately \$337 million for the first thirty years of the (Iron Mountain Superfund) Site activities."⁶¹

It did not take long for a consensus within both government and industry, to which the information had been leaked, to conclude that the December 2000 settlement of \$15 million was far too low. In fairness, one could guess that political advice to the responsible minister for the deal's acceptance may have reflected to fears of protracted litigation; not until 2003 did retroactive liability receive Canadian Supreme Court approval.

Two months later the settlement amount had increased to \$30 million. Questioned on this point two years later, the responsible manager from the ministry attributed the

⁶⁰ Footnote 13 describes access to technical information on Britannia mine flows.

⁶¹ United States, Environmental Protection Agency, Region 9, Superfund site: Iron Mountain. Follow links from <http://www.epa.gov/region9/programs-region9.html> Fact Sheet 10/1/00. See footnotes 19 and 20.

increase to the cost of treating contaminated groundwater.⁶² The same official settled with CBEL for its future contributions from its land sales and transfer.⁶³ Both agreements went to the provincial cabinet for review, and on 12 April 2001, the government announced both parts of the Britannia contamination settlement; a \$30 million payment from the former mine owners and \$5 million from CBEL as valued in land to be transferred to the province, and future payments from the proceeds of developing uncontaminated mine lands.⁶⁴

Subsequent actions

With \$30 million in hand, the responsible ministry, now renamed as the Ministry of Sustainable Resource Management, retained a project manager from an international firm of consultants, who began dozens of engineering and managerial tasks and contracts related to the mine's cleanup.⁶⁵ Initial work focused on a general assessment of site contamination including groundwater, pilot plant testing of water treatment, and an analysis of the flows and chemistry of the mine's drainage. An important aspect was testing the placement and hydraulic strength of the 4100 Level plug. Not until March 2004, three years after the settlement agreement, was the province able to issue its "Request for Expression of Interest" for a public-private partnership to design, build and operate the plant, followed two months later with a request for proposals.⁶⁶ Later that year the government reached agreement with the selected plant builder and operator. In March 2005 the contractor broke ground for the new treatment plant, and in October 2005, placed it in service, thus bringing the mine's discharges into compliance with both provincial and federal effluent requirements.

The ownership of CBEL and its properties changed in 2003, when after a long delay, the mortgage holder foreclosed and took possession. The new owner transferred most of the mine lands to the province, including a location of the treatment plant, and received a credit for \$5 million.⁶⁷ The 2004 agreement imposed an "environmental levy" up to \$5,500 each on future sales of 224 building lots, and additional levies on commercial land development.⁶⁸

The new owners gave CBEL's former tenants preferential treatment in purchasing their formerly-rented homes, an action which together with other improvements succeeded in converting a near-derelict company town into an attractive small community. At the same time, through separate appeals for funding, the Britannia

⁶² Commission on Environmental Cooperation, see "Factual Record BC Mining" SEM-98-004, p. 120, available at <http://www.cec.org/>.

⁶³ Later repudiated by the subsequent owner of CBEL, and replaced in 2003; see footnote 67.

⁶⁴ British Columbia, Press Releases, <http://www.news.gov.bc.ca/archive/pre2001/default.htm>, search "Britannia", 2001.

⁶⁵ O'Hara, Gerry, "Water Management Aspects of the Britannia Mine Remediation Project, British Columbia, Canada" *Mine Water and the Environment* Vol 26, No. 1, p. 46-54 has a detailed description of all the remediation work; see also footnote 13 for technical reports.

⁶⁶ It is important to note that provincial negotiators were at this time in contact with officials of the UK's Environment Agency in Exeter, to learn about the management of the Wheal Jane treatment plant under a public-private partnership agreement.

⁶⁷ British Columbia, Ministry of Environment, Land Remediation, High Profile sites, Britannia, see http://www.env.gov.bc.ca/epd/remediation/high_profile/britannia/orders/index.htm, for "Voluntary Remediation Agreement" May 25 2004.

⁶⁸ New owner information at http://www.macdevcorp.com/britannia_beach.html (as of Mar.2012).

Mining Museum raised enough to rejuvenate the vast mill building and later, to open a new museum office and gift store.

The 2004 agreement also stated; “The total cost of remediation is estimated to be \$75 million.”⁶⁹ The province’s exposure to reclamation costs depends on the discount rate and inflation, but it obtained less than half the amount needed from the present and former owners. Although this leaves the settlement open to question, the provincial government and its industry partners did achieve their goals. In February 2010, thousands of visitors attending the 2010 Winter Olympics drove right past the old mine. They would have seen no reason to guess the site was, four years previously, a source of world class pollution.

Conclusions

Legislatures in Canada and the United States determined that both present and former owners of contaminated sites are “absolutely, retroactively and jointly and separately liable” for cleanup costs. In 2001, application of this law at Canada’s Britannia Mine led to ending one of world’s largest point sources of metals pollution. In negotiations with former owners, the Government of British Columbia accepted CDN \$30 million in granting a perpetual indemnity from further claims. This amount was less than half of the total needed to build and operate a water treatment plant and pay for other restoration work, but the settlement itself catalyzed the site’s reclamation and unquestionably, has had a positive outcome.

Closed historic mines in many countries pose threats to public safety and the environment. In jurisdictions where legislatures have *explicitly* assigned retrospective liability for contamination, the government can follow the Britannia example and encourage if not compel both present and former mine owners to contribute towards ending the contamination.

The process used at Britannia suggests the following checklist, for approaching similar problems;

- a) For the mine in question, document the history of its ownership as filed with the jurisdiction’s corporate and land title registries and archives, and the registries and archives of other jurisdictions, so as to identify, to a high level of proof, the mine’s chain of ownership and management.
- b) Characterize the risks to public safety, and the contamination sources, fate and effects; identify environmental targets and possible mitigation methods; and attempt to quantify those risks; e.g. losses of environmental services.
- c) Determine to a feasibility level (i.e. plus or minus twenty-five percent) the costs of ending these risks to public safety and the environment and meeting the environmental targets.
- d) The department or ministry responsible acting as environmental regulator should then formally notify all the companies identified in a) that they are potentially responsible persons, and provide them with the results of b) and c).

⁶⁹ This is “net present value”; a former provincial official advised the writer that it could increase to \$100 million in inflated dollars for the first twenty years, with annual costs of 2 million in 2012 dollars.

- e) Invite those companies to an initial meeting with the Regulator, to discuss the contamination problem at a conceptual level. The Regulator should not attempt to attribute or apportion any liability at that time, but encourage the parties to agree on a path towards further problem definition, the desired outcomes, and ultimately the negotiations process towards sharing costs.

Beyond this point, the negotiation process would need clear political direction, to;

- State a willingness to avoid litigation,
- Encourage multi-party agreement on outcomes, milestones and costs,
- Offer certainty to potentially responsible parties as perpetual indemnities, and
- Anticipate the government accepting some portion of the cost.

It is hoped that this history of mitigating the pollution from Canada's Britannia Mine will assist South Africa's work towards mitigating the adverse effects of its brilliant mining legacy.

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