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EQC STAFF MEMORANDUM

FROM: Larry Mitchell, staff
SUBJECT: Current status of mines using/have used cyanide
DATE: October 23, 2004

The Cyanide "Ban" - CI-137, approved November 1998.

Current law states:

82-4-390. Cyanide heap and vat leach open-pit gold and silver mining prohibited. (1) Open-pit mining for gold or silver using heap leaching or vat leaching with cyanide ore-processing reagents is prohibited except as described in subsection (2).

(2) A mine described in this section operating on November 3, 1998, may continue operating under its existing operating permit or any amended permit that is necessary for the continued operation of the mine.

The current law is actually an amended version of the citizen's initiative CI-137 that was approved by the electorate in November 1998. The 1999 legislature, through passage of SB345 (Shea), made the following amendments to the initiative language.

Section 1. Section 82-4-390, MCA, is amended to read:

"82-4-390. Cyanide heap and vat leach open-pit gold and silver mining prohibited. (1) Open-pit mining for gold or silver using heap leaching or vat leaching with cyanide ore-processing reagents is prohibited except as described in subsection (2).

(2) A mine described in this section operating on November 3, 1998, may continue operating under its existing operating permit, ~~but the permit may not be amended to allow its operations to be expanded or~~ any amended permit that is necessary for the continued operation of the mine."

Section 2. Effective date. [This act] is effective on passage and approval.

This amendment effectively allowed the Golden Sunlight mine near Whitehall and the Majesty Mine near Norris to continue using cyanide in future expansions of the mines. Technically, since the permits were still valid, the law could have allowed continued and expanded mining at Canyon Resources' CR Kendall mine had it not been mined out and at Pegasus's mines at Zortman and Landusky, Beal Mtn, and Ten Mile\Basin Creek had they not gone into bankruptcy. In reality, only

Golden Sunlight and Majesty were the intended beneficiaries of the amendment. The legislative amendment was not vigorously opposed by environmental groups that supported passage of CI-137. Testimony was offered stating that it was not the intention of CI-137 proponents to ban existing cyanide operations despite the original language of CI-137 which stated that "the permit may not be amended to allow" for expansion.

How is Cyanide Used in Gold Recovery?

Simplistically, a weak cyanide solution, usually sodium cyanide at 0.1 percent (1000 ppm or milligrams per liter), is placed in contact with gold bearing ores which have been either finely ground for processing in an enclosed vat, or coarsely blasted, minimally crushed, and piled in a heap on top of lined leaching pads. The solution combines with up to 97% of the available gold particles and forms a "pregnant solution" that is drained out of the leaching pads or vats and captured for processing. The gold is then extracted from the pregnant solution by running it over activated carbon and the cyanide solution is reused or stored in lined pits for reuse or disposal. For a brief but sufficiently detailed explanation of the process, see the following website.
http://www.emersonprocess.com/raihome/documents/Liq_AppData_3300-08_200408.pdf

The vat leaching process is faster but more expensive because it requires crushing or grinding the ore to smaller sizes. The heap leach process is slower, and it does not require as much ore preparation. Lower grade ores are usually separated in a heap leach process. For example, the typical grade of ore at the Zortman-Landusky heap leach mines was about 0.02 ounces of gold per ton of ore (Supplemental Environmental Impact Statement, page 3-5).

Current Status of Montana Mines that Use(d) Cyanide

The Pegasus Properties (went into Chapter 7 bankruptcy, January 1999)

Zortman and Landusky mines - Both mines were open-pit heap leach mines. The Montana Department of Environmental Quality (DEQ) and federal Bureau of Land Management (BLM) have been using bond money collected from surety companies (\$32.7 million for dirt work and \$13.9 million for short-term water treatment) and supplemental state and federal funding from BLM to reclaim the sites and treat water. To date, the BLM has contributed \$6,144,500 for additional reclamation, additional water treatment costs, historic tailings removals, and EIS costs at Zortman and Landusky. The state of Montana has contributed \$1,697,000 for work at the Zortman and Landusky mines and the federal Environmental Protection Agency (EPA) has contributed \$340,000.¹ These figures do not include considerable staff time and costs. The surety bonds for dirt work are nearly spent. Much more dirt work has been accomplished than originally thought possible, mostly because of contractor cooperation and a large infusion of BLM funding (see Environmental Quality Council (EQC) Zortman-Landusky report and Metal Mine Bonding Status reports http://www.leg.mt.gov/css/lepo/2003_2004/default.asp). Inadequate funding for both short-term and, especially, long-term water treatment is still a major issue. Also, any additional reclamation work or water treatment work that may be required to address water quality problems in Swift Gulch on the north side of the Landusky mine could be very costly and is totally unfunded.

¹see BLM website-- http://www.mt.blm.gov/ldo/zortman/AC_ZL_fundingSources.pdf

In late June 2004, the BLM filed papers asserting its authority as a federal land management agency over facilities on BLM property to address the mine sites under the federal Superfund Program (CERCLA). The BLM will be using funds from its abandoned mine program to assist in remediating the sites.²

Beal Mountain mine - This cyanide heap leach mine on (mostly) U.S. Forest Service land near Anaconda had stopped producing ore, but it was still recovering and processing pregnant solution from the heap when Pegasus went into bankruptcy. The state and the USFS collected \$6.3 million from the surety, but there have been major reclamation cost overruns that exceed this amount due to the presence of a previously unsuspected treatment-resistant cyanide compound (thiocyanate) in 155 million gallons of solution still contained within the heap at mine closure. According to now dated information in the EQC *Metal Mine Bonding* report, the Forest Service has provided \$2.8 million and the DEQ has provided \$2,575,000 in hardrock mine bonds and RIT money in additional funds for reclamation, mostly to pay for the unanticipated need for long-term water treatment. There will be additional future costs.

The heap was capped in an attempt to restrict, or at least limit, the infiltration of precipitation, the cyanide leaching solution in the heap was emptied, treated, and land applied, with some resulting unanticipated impacts on ground and surface water. The ore heap now appears to be filling with water again at a rate greater than predicted for simple draindown. The Forest Service, which as landowner of an abandoned and bankrupt mine, is now acting as the primary responsible party and declared its intention to address the site under CERCLA provisions, as did the BLM in the Zortman and Landusky case. Among other things, this action essentially voids the need for MPDES water quality discharge permits under the Clean Water Act and provides the agency with some flexibility regarding how, when, and, in some cases, to what extent the agencies must comply with state and federal water quality standards. The mine operating permits are also canceled. Long-term treatment of selenium in water from contact with waste material and natural bedrock may be a problem. DEQ states that there is a recovering cutthroat population downstream.
http://www.clarkfork.org/programs/beal_mountain.html

Basin Creek/Ten Mile mine - This mine complex southwest of Helena straddles the Basin Creek drainage and the Ten Mile Creek drainage. This was an open-pit cyanide heap leach mine. The property was an economic failure for Pegasus according to the DEQ. The mine had already been under reclamation by the company for several years at the time of the bankruptcy. Pegasus had reclaimed one heap when Pegasus declared bankruptcy. The state then settled with the company's surety for \$3.8 million and installed cover material over a second heap. The mine site is now part of the Ten Mile national priorities list (NPL) federal Superfund site. The EPA has converted the former open pit to a regional repository for abandoned mine wastes in the area. Responsibility for the site now rests with EPA, the U.S. Forest Service, and DEQ's Abandoned Mine Land program.

Diamond Hill - This former Pegasus property, as well as Montana Tunnels below, was reorganized under bankruptcy and reemerged as a subsidiary of the Apollo Gold company. It is an underground mine operation near Townsend. It is a relatively low-tonnage high-grade deposit.

²http://www.mt.blm.gov/ldo/zortman/ZL_ActionMemo_Hyperlinked.pdf

Cyanide was not used at this operation. The sulfide-rich ore was trucked from the mine to the Montana Tunnels operation near Jefferson City south of Helena where it was batch-processed in a flotation mill. Attempts to leach the first few batches of concentrates with cyanide were not as effective as the flotation process.

The Diamond Hill mine has been recently mined out and is closed except for maintenance operations. The mine disturbance is largely unreclaimed. The DEQ holds a \$632,000 reclamation bond on the mine. There is potential for the development of additional mineral reserves, but not until an extensive exploration program is initiated. DEQ does not anticipate any water quality problems at this mine.

Montana Tunnels - Another Apollo Gold/former Pegasus property located south of Helena near Jefferson City, this is an operating open-pit mine that uses a conventional ore grinding and flotation process mill similar to that at the copper/molybdenum mine at Butte to extract gold, zinc, lead and silver from low-grade ore. The mill has a permitted cyanide circuit, but according to DEQ, this has apparently not been used for years. Some of the concentrates were formerly processed at ASARCO's East Helena Smelter, but they are now shipped to Cominco's smelter at Trail, B.C., and elsewhere. Apollo recently submitted a major expansion plan that would extend the mine life from 2007 to the year 2011, and expand the pit area by 62.8 acres and the permitted mine disturbance from 1,176 acres to 1,347 acres. DEQ is currently reviewing the plans. The state holds a reclamation bond totaling \$16,156,585 which includes a property bond.
http://www.apollogold.com/Apollo_Gold/RIGHT/operations/montanatunnels.htm

Golden Sunlight mine - A subsidiary of Placer Dome, this is an operating open-pit gold mine near Whitehall. The operation and reclamation issues surrounding this mine have, in a very large part, been at the focal point of state metal mine regulatory policy in Montana for the past 10 or more years. For example, pit backfill requirements at the mine have been the subject of court challenges and several legislative policy efforts. The DEQ and the BLM are currently working on a draft SEIS that will address closure options, including any need for pit backfill and perpetual water treatment. The mine is an open-pit vat leach cyanide mine. The process mill was shut down at the end of 2003. The operation is currently stripping rock for a pit expansion that should give the mine another five years of operational life. The current Golden Sunlight reclamation bond posted with the state under the existing reclamation plan is \$54,380,000.
<http://www.placerdome.com/operations/goldensunlight/goldensun.html>

CR Kendall mine - A subsidiary of Canyon Resources Inc., this is an inactive open-pit cyanide heap leach mine north of Lewistown. The mine has been completed and some reclamation has occurred. The DEQ has been working on an EIS for two years at state cost to develop a revised mine reclamation and closure plan based on the need to address water quality concerns at the mine. A revised bond amount will also be calculated once the record of decision is made on the revised reclamation plan. Canyon has refused to pay for the EIS, arguing that its initial reclamation plan and bond is adequate.

The state began reclamation bond forfeiture procedures in November 2000, but Canyon signed a settlement agreement that gave its \$1.9 million reclamation bond proceeds to the state. Those funds are currently being held by the state and are earning interest pending future reclamation

needs. Canyon regraded some leach pads in 2004. DEQ has put further reclamation on hold pending the EIS record of decision, which should establish what the most effective reclamation alternatives will be. The company is involved in ongoing civil litigation with neighbors over water quantity and quality issues. Thallium is the principal contaminant problem according to the DEQ. <http://www.kendallmine.com/>

Majesty Mining - This is a small and underfinanced (but properly bonded at \$53,300 according to DEQ) open-pit heap leach gold mine operation near Norris. This operating permit was the last cyanide permit that was granted before the CI-137 election of 1998. After some initial small-scale heap leaching, the owner has left the operation lying dormant. It has been inspected frequently, and there are no known or expected water problems. Since the permit was grandfathered under CI-137, this mine and the Golden Sunlight mine are open-pit cyanide mines that are allowed to expand under current law. Other mining companies have looked at the Majesty property, but the geologic and economic potential for an expansion are not well known.

TVX Mineral Hill - The mine property is owned by Kinross Gold, the world's seventh largest gold producer. This is a now-closed underground gold mine near Gardiner, Montana (Jardine), that was reclaimed over a several year period by the operator. An arsenical gold ore was mined and milled on-site to produce a concentrate that was cyanide leached in vats. Mineral Hill was not impacted by CI-137 because it was an underground mine. A fairly low volume of ores were actually milled. The waste dumps and tailings have been capped and the workings were closed. The Montana Pollution Discharge Elimination System (water quality) permit is still in place. The reclamation is relatively complete according to DEQ except for fine-tuning the water treatment process. The state is holding what it comfortably believes to be sufficient bond of \$5.7 million. <http://www.deq.mt.gov/press/press2003/pr041403a.asp>

ASARCO mines - The underground silver/copper Troy mine and the Black Pine mine near Philipsburg have not used cyanide. The Troy mine is a copper-silver deposit. The operating permit is held by ASARCO, but the property has been sold to Sterling Mining, now Revett Silver, which proposes to reopen and operate the mine under the name Genesis. The bond is estimated to be short by about \$10 million because the DEQ believes that some long-term water treatment will be necessary. The operator disagrees, and the bond amount is a matter of debate. The mine is not operating. When it was, ore was processed by conventional grinding and concentration by flotation, and the concentrate was shipped offsite for smelting. No cyanide was used other than possible minor amounts used as a reagent in milling. Some water issues need to be resolved mostly involving exceedences of aquatic copper standards.

The Black Pine mine was an underground silver and copper mine on private and Forest Service land. The mine did not use cyanide. There are no heaps or cyanide leaching processes. The mine is dormant. The main waste rock dump has been regraded and partially capped over the last two summers by ASARCO using money from the nationwide \$100 million trust fund set up by ASARCO under the direction of EPA and federal Department of Justice (DOJ). Reclamation is expected to be completed by 2005. The DEQ is waiting to see results of capping before reevaluating the need for long-term water treatment.

Stillwater PGM - Nye and East Boulder mines. These two mines are active underground operations for platinum and palladium. No cyanide is used in the milling process. Ore is

concentrated at the mines using a flotation process and then shipped to Columbus, Montana, for refining.

Montana Resources, Inc. - The open-pit mine at Butte is operational for copper, molybdenum, and other metals. Cyanide is not used in the metal recovery process. The minerals are recovered through a flotation process at the concentrator at Butte and shipped out for further refining.

Small mines in Montana

The Metal Mine Reclamation Act exempts small hardrock mines (less than 5 acres of unreclaimed surface disturbance) from most of the regulations of the act. However, if the operation uses cyanide, then a state permit is required. Since 82-4-390 prohibits the use of cyanide at open-pit mines (not underground mines) that use heap or vat leach cyanide operations, it's possible that some small mines that are open-pit operations and that used cyanide in heap or vat leaching of gold or silver ore and that pre-dated the November 3, 1998 ban could still be operational. The DEQ states that on that date, there were nine grandfathered small miner operations that used cyanide in their mine processes. This means that they could continue to use cyanide and, like Golden Sunlight and Majesty Mining, they could expand their operations. Reportedly, only two of these nine are still operational and likely to be using cyanide. These two are very small on-and-off operations that process ore in barrels in garages (Drummond) or in relatively small tanks or vats (Dillon). The other mines are either not operational or have been reclaimed.

SUMMARY

MINE	CYANIDE USE	MINE TYPE	IMPACTED BY CI-137	GOLD RECOVERY PROCESS ¹	OPERATING	RECLAIMED
Zortman	yes	open pit	yes	heap leach	no	in progress
Landusky	yes	open pit	yes	heap leach	no	in progress
Beal Mtn	yes	open pit	yes	heap leach	no	in progress
Basin/Ten Mile	yes	open pit	yes	heap leach	no	in progress
Diamond Hill	no	underground	no	flotation	no	no
Montana Tunnels	no	open pit	no	flotation	yes	--
Golden Sunlight	yes	open pit	yes	vat leach	yes	--
CR Kendall	yes	open pit	yes	heap leach	no	in progress
Majesty Mining	yes	open pit	yes	heap leach	no	--
TVX Mineral Hill	yes	underground	no	vat leach	no	in progress
ASARCO Troy	no	underground	no	flotation	no	--

MINE	CYANIDE USE	MINE TYPE	IMPACTED BY CI-137	GOLD RECOVERY PROCESS ¹	OPERATING	RECLAIMED
ASARCO Black Pine	no	underground	no	flotation	no	in progress
Stillwater PGM (Nye and E Boulder)	no	underground	no	flotation	yes	--
Montana Resources Inc.	no	open pit	no	flotation	yes	--
Small miners (2)	yes (?)	??	??	vat leach	??	--

Websites for more information on cyanide gold processing, mining in Montana, and on CI 147 include
<http://www.geocities.com/siyanurlealtin/archive.html>
<http://www.yeson147.com./index.htm>
<http://www.meic.org/i137attack.html>
<http://www.nocyanide.org>

1. Mines shown in dark gray are not gold mines or the cyanide process is not relevant.