REPORT TO THE GOVERNOR AND GENERAL ASSEMBLY

POTENTIAL IMPACTS OF GOLD MINING AND PROCESSING IN THE COMMONWEALTH

Submitted by the Secretariats of Commerce and Trade, Natural and Historic Resources, and Health and Human Resources

December 1, 2022

Table of Contents

Introduction

Gold is a yellow, dense, and soft metal. Its chemical symbol is Au, and it is found most commonly as free gold in nature, often associated with quartz, pyrite and other sulfide minerals. It may be found as little more than a trace within other minerals or may be alloyed to a small extent with other metals such as silver. It is ductile, malleable, and sectile, a good conductor of heat and electricity, and is unaffected by air and most reagents. Gold has many applications, primarily investing, but also photography, dentistry, electronics, plating, jewelry, currency, and as an international monetary standard.

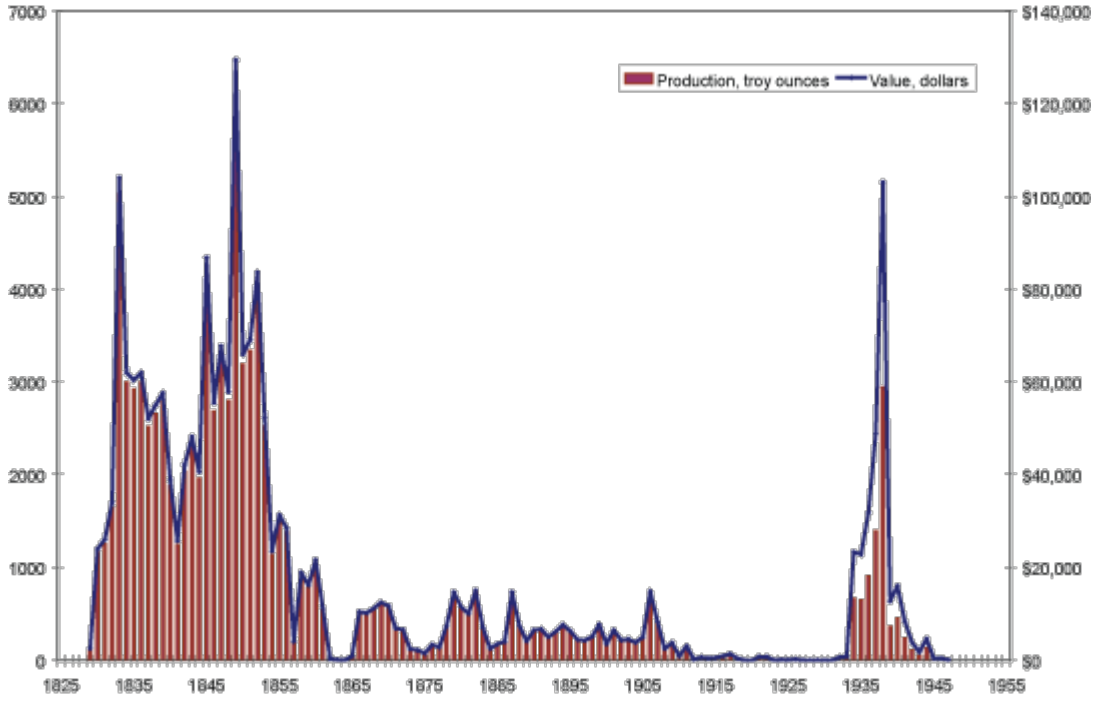
Fast Facts on Gold in Virginia

Year of first production in Virginia: around 1804
Location of first production in Virginia: Whitehall Mine, Spotsylvania County (first lode deposit)
Year of last production in Virginia: 1947
Location of last production in Virginia: Spotsylvania County
Total cumulative production in Virginia: more than 98,600 troy ounces

Abandoned Mineral Mine Lands in Virginia
Gold In Virginia Fact Sheet

Gold was mined extensively in Virginia from the early 1800s until the peak of gold production in 1849. In that year, major gold discoveries in California had a negative impact on Virginia's gold mining industry, and production declined rapidly. Commercial gold mining continued on a smaller scale until 1947, when gold production was last recorded in Virginia.

In Virginia, gold was mined from near-surface lode deposits, veins, mineralized zones, and placer deposits. Most of Virginia's gold mining was in the "Gold-pyrite belt", a nine-mile to sixteen-mile-wide, nearly 140 mile-long northeast trending volcanic-plutonic belt that extends from Fairfax County to southwestern Buckingham County. The largest concentrations of historical gold mines are in Buckingham, Fluvanna, Louisa, Goochland, and Spotsylvania counties. Other abandoned gold mines and prospects are scattered widely in the Blue Ridge and Piedmont provinces.



Historical gold production in Virginia by year. (Source: Virginia Energy)

Currently, there is only one active gold mine operation in the Commonwealth. Located in Goochland County, the Moss mine operates on a restricted permit issued by Virginia Energy. The Code of Virginia allows restricted permits to be issued when the mine disturbs less than one acre of land and removes less than 500 tons of minerals. The Moss operation "remines" at a legacy gold mine. Gold that was technically infeasible to mine originally is collected and mechanically separated from the leftover rock and legacy contaminants are remediated.

In 2021, the General Assembly passed HB2213 due to increased gold prospecting taking place in Buckingham County. The only gold exploration prospecting that I am aware of is that by Aston Bay Holdings. Another company had previously done exploratory drilling on the site 9n 2016. This bill directed Secretariats of Commerce and Trade, Natural and Historic Resources, and Health and Human Resources to study the potential impacts of gold mining and processing in the Commonwealth. The Secretariats were directed to form a stakeholder work group and report its findings to the General Assembly by December 1, 2022. The stakeholder group was required to contain "experts in mining, hydrology, toxicology, geology, and public health; environmental organizations; representatives of potentially affected communities in localities with significant deposits of gold; and residents of Native American communities…"

To fully meet these requirements, Virginia Energy divided the work group into two parts. The first part consists of independent technical experts from the National Academy of Sciences, Engineering and Medicine (NASEM). The second group consists of state agency representatives and other stakeholders, many from the Buckingham area. The list of participants from the "state agency component" (SAC) can be found here. Each group drafted its own scope of work and report. This document contains both reports.

The SAC held 10 public meetings between December 2021 and November 2022. Every meeting was held in Buckingham County and was livestreamed over the internet. All recordings are available on Virginia Energy's website.[1] Additionally, Virginia Energy created a forum on the Regulatory Town Hall website[2] and a dedicated email address to receive public comment. A summary of comments received can be found below and the actual comments are contained in an appendix to this report. The contents of this report are based upon the state agency component's Statement of Task on which the members of the SAC came to consensus.[3]

STATE AGENCY COMPONENT STATEMENT OF TASK

The SAC agreed to focus on:

- Environmental justice concerns of potentially impacted (including downstream) communities.
- Environmental, ecological and human health concerns of potentially impacted (including downstream) communities.
- Reviewing existing state permitting processes related to the mining and processing of gold.
- Detailing local land use and zoning procedures and requirements

Executive Summary

Though gold prospecting activity has taken place in Buckingham County, it is not at all a certainty that a gold mine will be proposed. As NASEM noted in its report, only 1 in 1,000 to 1 in 10,000 of prospected sites will become a productive mine.[4] The likelihood that gold mining will take place in Virginia increases significantly with the increase in the market value of gold.

Only recently did the Virginia General Assembly establish the promotion of environmental justice as the policy of the Commonwealth. As such, state agencies have had little time to amend their regulations to fully integrate environmental justice into its permitting processes. Given that many EJ communities are located in or near the Gold-pyrite belt or could be affected by mining operations, it

[1] See https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml
[2] See https://townhall.virginia.gov/L/comments.cfm?generalnoticeid=2368
[3] The SAC was not able to come to consensus on whether to recommend a moratorium or an outright ban on gold mining.
[4] See NASEM Report, page 46.

is important that the bedrock EJ principles of fair treatment and meaningful involvement are incorporated into potential gold mining permitting, unlikely though it may be to occur.

As the Gold-pyrite belt and the location of exploration activities in Buckingham County are in close proximity to the James River, it is important to note potential impacts from gold mining and processing could be felt far from the boundaries of the mine.

Virginia currently has 427 mineral mine permits located across the Commonwealth. Most of these sites produce sand and gravel, aggregate and crushed stone. As such, Virginia's existing regulatory scheme does not ~~contemplate~~ address the mining and processing of gold, which has not taken place at a large scale since before World War II.

Virginia is a Dillon's Rule state. This means that localities only have authority that is granted to them by the state legislature. The Virginia General Assembly has given localities the authority to regulate or prohibit mining. Additionally, localities can generally affect mining operations through their zoning authority. Thus, state and local approvals are necessary before any mining activity can take place in the Commonwealth. This does not preclude the Virginia General Assembly from taking this authority back from the localities.

Environmental Justice Concerns of Potentially Impacted Communities

Environmental Justice Statutory Framework

The Virginia Environmental Justice Act ("VEJA") established that "[i]t is the policy of the Commonwealth to promote environmental justice and ensure that it is carried out throughout the Commonwealth, with a focus on environmental justice communities ("EJ communities") and fenceline communities."[5] The VEJA defines environmental justice as "the fair treatment and meaningful involvement of every person . . . regarding the development, implementation, or enforcement of any environmental law, regulation, or policy."[6] The VEJA goes on to define fair treatment as "the equitable consideration of all people whereby no group of people bears a disproportionate share of any negative environmental consequence resulting from an industrial, governmental, or commercial operation, program, or policy."[7] The VEJA defines an EJ community as "any low-income community or community of color."[8] The VEJA further defines a low-income community as one in which at least 30 percent of the population is classified as low income.[9] In addition to the VEJA, the Virginia Department of Environmental Quality's ("DEQ") policy statement includes a commitment to furthering environmental justice "in the regulatory and permitting process."[10]

[5] Va. Code § 2.2-235.
[6] Va. Code § 2.2-234.
[7] *Id.*
[8] Va. Code § 2.2-234.
[9] *Id.*
[10] Va. Code § 10.1-1183 (B)(4).

Beyond the VEJA and DEQ's policy statement, HB2213 also requires the work group to consider whether existing air and water quality regulations are sufficient to protect air and water quality from gold mining and processing. It's my professional opinion that the existing regulations do not adequately protect the environment (air, water, soil, plants and animals) from the mining that is currently taking place. Mining companies that violate the regulations, which are minimum requirements, are not fined for violations. They are only charged with correcting the items that led to the citation of noncompliance. Most mining operations need to be inspected more than two times a year, which is mandated by the current regulations. Gold/metal mining would compound this problem significantly even if enhanced gold/metal mining regulations were to be adopted. This component of the study also has environmental justice implications. Air and water quality regulations are promulgated to protect human health and the environment and while these regulations are generally meant to protect all populations from pollution, there are certain pollutants that may result in adverse health effects even at exposures within or under existing standards.[11] Also, certain communities, including EJ communities, may have existing health concerns that may necessitate more stringent pollution controls. Courts evaluating environmental justice considerations and the protectiveness of National Ambient Air Quality Standards ("NAAQS") have determined that simply relying on NAAQS to conclude there are no disproportionate impacts where a proposed air pollution source will affect an EJ Community is insufficient.[12] Rather, an assessment of potential impacts to surrounding communities must consider the risks of pollutant exposure faced by the community in question.[13]

The Existing Environmental Justice Regulatory Framework in Virginia

While Virginia is fortunate to have the policy guidance and definitions provided by the VEJA, there is currently no regulatory framework to implement the requirements of the Act in any agency relevant to potential gold mining in the Commonwealth. In December 2021, then-Virginia Attorney General Mark Herring issued an opinion stating that the VEJA is self-executing and noting that, under it, agencies are required to consider environmental justice in permitting actions.[14] Without a systematic process for agencies to incorporate meaningful involvement of EJ communities in decision making processes, and without clear guidance for evaluating whether pollution authorized under a permit will cause disproportionate impacts, the VEJA alone does not provide sufficient detail regarding implementation of fair treatment and meaningful engagement for EJ communities. Additional EJ policy, guidance or regulatory revisions should be addressed if Virginia were to allow gold mining and processing to occur.

---

[11] *See e.g. Am. Trucking Ass'Ns v. EPA*, 283 F.3d 355, 360 (D.C. Cir. 2002) (noting that EPA lacks a threshold concentration for PM2.5 below which PM2.5 is known to be harmless); Nat'l Ambient Air Quality Standards for Particulate Matter: Proposed Rule, 61 Fed. Reg. 65,638, 65,651 (Dec. 13, 1996) ("The single most important factor influencing the uncertainty associated with the risk estimates [for PM] is whether or not a threshold concentration exists below which PM-associated health risks are not likely to occur.")

[13] *Friends of Buckingham v. State Air Pollution Control Board,* 947 F.3d 68, 92 (2020) ("The Board rejected the idea of disproportionate impact on the basis that air quality standards were met. But environmental justice is not merely a box to be checked, and the Board's failure to consider the disproportionate impact on those closest to the Compressor Station resulted in a flawed analysis.")

[14] Applicability of Va. Code §§ 2.2-234–235, Op. Att'ys Gen. 20-064 (2021).

While some state agencies, including DEQ, have stated goals of incorporating the requirements of the VEJA into their permitting programs, no state agency that may regulate potential gold mining and processing currently has a formal structure for implementing the VEJA. To be sure, DEQ has considered environmental justice in certain specific permitting contexts, but it still lacks any policy, guidance, or regulatory framework for considering environmental justice for each of its regulatory and permitting programs. DEQ has created an Office of Environmental Justice tasked with ensuring "the fair and meaningful involvement of all people into the development, implementation and enforcement of environmental laws, regulations and policies across all DEQ programs."[15] The Interagency Environmental Justice Working Group established by the 2020 Budget Item 372 #1c (SNR), accompanying SB406 and HB704, should be reconvened or a new body established to evaluate and develop additional EJ policy, guidance or regulatory revisions for implementation by all Virginia agencies.

Environmental Justice Considerations

Gold prospecting has recently occurred in Buckingham County, an area that is home to several EJ communities. EPA's EJScreen tool shows that no portion of Buckingham County falls outside of the low-income classification.[16] In fact, some portions of Buckingham County are classified in the 93rd percentile of low-income for Virginia.[17] Given that prospecting company Aston Bay has expressed a desire to resume exploration activity in Buckingham[18], Virginia must recognize that the need to evaluate public health protections and the sufficiency of Virginia's air and water regulations is more than just a hypothetical exercise. Many examples exist of open-pit gold mines polluting nearby rivers even when there is no accidental release of toxic mine waste[19]. As the James River is only two miles away from the site where gold prospecting has occurred and serves nearly 2.7 million Virginians[20], there is a threat to the public health of those living in Buckingham County as well as those residents living in other geographical regions in the state in the ~~unlikely~~ likely event that mining were to occur and the protection systems fail. This ~~could~~ would result in the release of chemicals and by-products from mining activities into the James River and the air.

While gold prospecting has occurred in Buckingham County, the Gold-pyrite belt has a broad geographic range in Virginia, including crossing or being upstream from many Virginia EJ communities. Though there are currently no other known exploratory activities for gold underway at this time, there is a potential for gold mining and processing sites to intersect with and potentially affect many EJ communities throughout the Commonwealth. In order to meet their statutory

[15] *Environmental Justice*, DEQ, https://www.deq.virginia.gov/get-involved/environmental-justice (last visited September 16, 2022).
[16] *EPA's Environmental Justice Screening and Mapping Tool (Version 2.0)*, EPA, https://ejscreen.epa.gov/mapper/ (last visited September 16, 2022).
[17] *Id.*
[18] https://www.farmvilleherald.com/2022/09/aston-bay-says-work-is-still-in-the-early-stages/
[19] *See e.g.* South Carolina Department of Health and Environment Control's Board of Health and Environmental Control Enforcement Report (Nov. 10, 2021) (citing the Haile Gold Mine, Inc. for unpermitted discharges of free cyanide (CN) and total cadmium (Cd)) *available at*: https://scdhec.gov/sites/default/files/media/document/EA_EnforcementReport_November2021.pdf
[20] https://www.friendsofbuckinghamva.org/friends/press-release-gold-mining-pollution-threatens-buckingham-county/

obligations under the VEJA, state agencies must incorporate EJ considerations into their permitting programs to regulate gold mining. The current policy, guidance, and regulatory framework for all state agencies does not include sufficient detail to guarantee EJ communities like Buckingham County meaningful involvement and protection from disproportionate potential impacts of pollution from gold mining and processing.

Environmental, Ecological & Human Health Concerns of Potentially Impacted Communities

Potential risks to the environment and to human health ~~can~~ frequently occur at every stage of gold mining and processing[21] and these risks can potentially compound each other. Therefore, while this section will list various and separate risks that may occur during an industrial gold mining and processing operation, it should be understood that any such operation may simultaneously produce several of the risks discussed. Chapter 4 of the NASEM Report also discusses potential human health and environmental impacts.

Climate

Virginia's climate is significantly different from that of many Western states with active gold mining industries.[22] Virginia receives substantially more annual rainfall than many of these states, and climate change is expected to increase intensity, frequency, and duration of precipitation in the Southeast.[23] Best management practices (BMPs) that are utilized in Western states, such as the standards developed by the Initiative for Responsible Mining Assurance (IRMA), may not be appropriate in Virginia given these differences. Very few mining operations are ~~being held to~~ required to fully comply with BMP's. Mining and environmental regulations are not BMPs. Regulations are minimum requirements that the mining companies are supposed to meet. Utilization of BMPs does not guarantee that no environmental damage will occur. Additionally, increased precipitation in areas with historic metal mining has been shown to increase the mobility of legacy contaminants, like mercury and lead, as floodwaters take-up and transport toxins,[24] and preliminary research shows a connection between extreme storm events and increases in concentrated releases of acidic drainage produced by mines (also known as acid mine drainage, or AMD).[25]

Failure to account for climatic conditions at a mining site and to adequately plan for vulnerabilities to, and changes in, extreme precipitation, drought, and temperature that are associated with climate change presents a significant risk to gold mining operations and the health of surrounding communities and ecosystems.

---

[21] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 4 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).
[22] *Id.* at 14–15.
[23] For a summary of impacts especially relevant in the Southeast, see LYNNE CARTER ET AL., IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT, VOL. II, 245–808 (Reidmiller et al., eds. 2019).
[24] S. Foulds et al., *Flood-Related Contamination in Catchments Affected by Historical Metal Mining: An Unexpected and Emerging Hazard of Climate Change*, 165 SCI. TOTAL ENV'T 476–77 (2014).
[25] Krik Nordstrom, *Acid Rock Drainage and Climate Change*, 100 J. OF GEOCHEMICAL EXPLORATION 97 (2009).

Water Contamination and Usage

Mine drainage often contains toxic materials and eroded soil. and unplanned releases from mining operations ~~can~~ frequently contaminate the surrounding environment. Contamination of mine drainage occurs due to the attributes of the mineral deposits and surrounding geology, as well as from the use of chemicals during mining operations.[26] Contamination also occurs from the methods of operation used to mine the material, accidents and interactions with unknown or unexpected conditions such as abandoned and unsealed drill holes, and shear/fault zones in the rock. This drainage can be referred to as acid mine drainage (AMD) or acid rock drainage (ARD). The severity of, and impacts from, AMD/ARD are primarily a function of the mineralogy of the rock material and the availability of water and oxygen.[27]

Many of the mineral deposit types present in Virginia can result in AMD, and AMD has already occurred at previous mine sites in the state,[28] though NASEM notes in its report that "[w]ithout comprehensive site-specific acid-base accounting and kinetic geochemical testing of relevant geologic materials, it is not possible to make a definitive assessment of the likelihood of acid rock drainage occurring in Virginia gold mines broadly."[29] I would rephrase this to read "without comprehensive site-specific acid-base accounting and kinetic geochemical testing of relevant geologic materials prior to any mining act1ivities, it should be assumed that AMD is likely to occur."

AMD can also be accompanied by leaching of metals and other mine-related contaminants. Lead is a contaminant of potential concern based on the gold deposits likely to be found in Virginia.[30] While mercury is not generally used in modern gold mining operations, naturally occurring mercury may become remobilized through mining activities.[31] The NAS Report notes (p. 57 and p. 105) that a potential impact from mining is an increase in nitrogen deposits to groundwater and surface water and potential downstream impacts including eutrophication and algal growth. If gold mining were to occur, increased nutrient discharges will make it more challenging for Virginia to meet its Chesapeake Bay Total Maximum Daily Load nutrient reduction goals under its Phase III Watershed Implementation Plan by the 2025 deadline.

---

[26] See ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 22–23 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia), for contaminants of potential concern for gold and base metal deposits in Virginia.

[27] See EPA's Abandoned Mine Site Characterization and Cleanup Handbook, p. 30.

[28] *See e.g.*, Hammarstrom et al., *Geochemical and Mineralogical Characterization of the Abandoned Valzinco (Lead-Zine) and Mitchell (Gold) Mine States Prior to Reclamation*, U.S. Geological Survey Scientific Investigations Report (2006).

[29] See NASEM Report at p. 93.

[30] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 23 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).

[31] State Agency Committee Meeting 2, Erica Schoenberger Presentation (Mar. 25, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml; State Agency Committee Meeting 4, Steven Emerman Presentation (May 16, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml; ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 18, 22–23 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).

Other constituents may be introduced into mine drainage through mining operations. Blasting, which is utilized at almost all gold mining operations and is regulated by Virginia Energy, may introduce ammonium nitrate-fuel oil into the environment as well as other blast related byproducts.[32]

Contaminated mine drainage is known to have adverse effects on human health and the environment, and mining operations and associated drainage can have widespread impacts on ecosystems. Some of the contaminants from commercial gold mining operations include antimony, arsenic, cadmium, lead, mercury, and thallium. These contaminants can cause numerous adverse human health effects, including neurological, gastrointestinal, and cardiovascular effects, as well as effects on skin, lungs, bladder, and thyroid.[33]

The hydrologic characteristics of Virginia mean that gold mining activities are likely to occur close to both groundwater and surface water resources, increasing the possibility of contamination. Drinking water intakes located downstream of Virginia's Gold-Pyrite Belt serve over 3.5 million Virginians,[34] and over 700,000 Virginia residences rely on drinking water from private wells that are not subject to drinking water testing or standards.[35] While some of the pollutants associated with gold mining have drinking water standards, some of these standards are secondary drinking water standards, including for sulfate, meaning they are non-enforceable guidelines.[36] If gold/metal mining does occur, contamination of surface and ground waters should be anticipated. A recent study found that 74% of gold mines in the U.S. caused pollution of ground and/or surface water. This figure would have been higher had not several of the mines been in arid/desert-like locations. It should be noted that mining never improves the quality of water and often introduces contaminants into the environment that were not present in pre-mining conditions.

AMD requires long-term wastewater treatment, and the most common type of water treatment used at mines with AMD is lime precipitation.[37] Lime precipitation, however, does not effectively remove many of the contaminants of concern associated with gold mining, including sulfate, nitrate, or ammonia; as a result, additional water treatment circuits would be required to remove uranium, selenium, and mercury.[38] In particular, Virginia's sulfate groundwater criteria may be difficult to maintain if sulfate ore containing gold is processed at an industrial scale in Virginia and adequate water treatment techniques are not employed. Long-term, if not perpetual, water treatment may be required when mined materials have moderate or high acid drainage and leaching potential, when there is a hydrological connection between mine water (for example, in pits or underground) and

---

[32] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 8–9 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia); State Agency Committee Meeting 5, Ann Maest Presentation (June 23, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

[33] National Academies of Sciences, Engineering, and Medicine. *The Potential Impacts of Gold Mining in Virginia*. Washington, DC: The National Academies Press. 97 (2022).

[34] *Id.* at fig. 6; *id.* at tbl. 2.

[35] State Agency Committee Meeting 3, Lance Gregory Presentation (Apr. 22, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

[36] EPA, *Drinking Water Regulations and Contaminants* (Feb. 17, 2022), https://www.epa.gov/sdwa/drinking-water-regulations-and-contaminants.

[37] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 23 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).

[38] *Id.*

surrounding water resources, when there are waste rock seeps, or when there are draining cyanide and acid heaps.[39] It should be noted that "perpetual" care or treatment of pollution of mining-affected land has never been provided for in regulations. Such care is almost always externalized, that is it has been left for the public to finance.

Gold mines are often large water users,[40] and there is limited oversight of well drilling and groundwater withdrawal in Virginia. Currently, a state groundwater withdrawal permit is only required in Eastern Virginia or Eastern Shore Groundwater Management Areas of Virginia for new groundwater withdrawals exceeding 300,000 gallons per month.[41] The Gold-Pyrite belt in Virginia does not intersect these Groundwater Management Areas, meaning groundwater withdrawals associated with gold mining would likely be unregulated. Surface water withdrawals are regulated by DEQ under its Virginia Water Protection Permitting Program.[42] However, the program includes a number of permitting exclusions. Changes in water flows due to gold mining-related withdrawals may also affect drinking water intakes downstream of mining operations. More information on DEQ requirements are discussed below and in the NASEM Report.

Virginia's mineral mining and water quality and quantity regulations require that mining activities "be conducted so that the impacts on water quality and quantity are minimized," but they currently lack any baseline monitoring and sampling provisions that would enable detection of changes to water quality and quantity.[43] Words such as "minimized" are frequently used in regulations, but without valid and sufficient baseline monitoring combined with rigorous oversight and codified limits, such words amount to little more than platitudes.

Cyanide Usage

Cyanide is likely to be used to separate gold from the ore by gold mining operations due to the presence of oxidized and sulfide-rich gold ores in the Commonwealth.[44] Cyanide solutions can have extremely high mercury concentrations, and uncontrolled cyanide releases have caused fish kills and contaminated downstream groundwater near gold mining sites.[45]

Virginia currently does not have specific regulatory requirements[46] for many of the chemicals used in gold mining and processing operations, including cyanide[47]. Montana[48] has banned the use of cyanide heap leaching in gold mining and processing operations.

---

[39] *Id.* at 31.

[40] Initiative for Responsible Mining Assurance, IRMA Standard for Responsible Mining, IRMA-STD-001, p. 131 (June 2018).

[41] 9 VAC 25-610-50(1).

[42] 9 VAC 25-210-300 et seq.

[43] 4 VAC 25-31-360.

[44] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 7 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia); State Agency Committee Meeting 5, Ann Maest Presentation (June 23, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

[45] *Id.*

[46] NASEM Open Session One, James Golden (December 15, 2021), https://www.nationalacademies.org/event/12-15-2021/potential-impacts-of-gold-mining-in-virginia-open-session-1

Impoundments

Gold mining operations produce large amounts of waste—on average, almost three tons of waste rock is produced for every ton of gold ore recovered.[49] This is a somewhat deceptive figure. Large, low grade gold mines frequently need to mine as many as 20 tons of ore to produce one troy ounce of gold. This figure does not include the tonnage of rock that must be removed, the overburden, to gain access to the gold-bearing ore. The stripping ratio is simply the amount of waste rock that must be removed divided by the amount of ore that can then be mined. Stripping ratios of 2:1 are quite common. Overburden is generally kept separated from processed ore waste. Overburden can contain AMD materials and other contaminants. Large-scale surface impoundments are used to store mining waste, and many are constructed from low-grade materials, including waste materials.[50] Once such waste is deposited it is seldom, if ever, removed, and becomes a permanent "earthen" structure susceptible to seismic events, erosion and unforeseen events. The saturated nature of the wastes held in many gold mine impoundments means they are similar to coal ash impoundments.[51] Recent studies have shown that 90% of coal ash waste structures contaminate the water and the environment. No data are available that indicate mine waste piles would be less likely to pollute. These impoundments are generally permanent facilities that require inspection, monitoring, and maintenance in perpetuity.[52] There is a risk of leakage, overtopping, and failure at gold mine impoundments given the long timescale over which they operate, and this may lead to catastrophic impacts to downstream and downstream communities.[53] Studies have shown that leaks from impoundments can contaminate surrounding groundwater and surface water regardless of whether the facilities is lined or unlined,[54] and overtopping of impoundments may become more frequent as precipitation increases due to climate change. Furthermore, 75 percent of mining disasters are due to catastrophic tailings dam failure.[55] It is my professional opinion that all mine waste dumps will fail, either grain by grain over many years or catastrophically, as so frequently happens. Virginia Energy regulates impoundments on mineral mine sites across the Commonwealth. More information on Virginia Energy's regulatory program can be found below and in Chapter 5 of the NASEM Report.

---

[47] DEQ's surface water quality standards do include cyanide. See https://law.lis.virginia.gov/admincode/title9/agency25/chapter260/section140/

[48] https://leg.mt.gov/bills/mca/title_0820/chapter_0040/part_0030/section_0900/0820-0040-0030-0900.html

[49] State Agency Committee Meeting 4, Steven Emerman Presentation (May 16, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

[50] Zongjie Lyu, *A Comprehensive Review on Reasons for Tailings Dam Failures Based on Case History*, 2019 ADV. CIV. ENG'G art. No. 4159306, 2 (2019).

[51] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 7 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).

[52] State Agency Committee Meeting 4, Steven Emerman Presentation (May 16, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

[53] ANN S. MAEST, THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF GOLD MINING IN VIRGINIA 7 (June 24, 2022) (submitted to the NASEM Committee on the Potential Impacts of Gold Mining in Virginia).

[54] *Id.*

[55] State Agency Committee Meeting 2, Erica Schoenberger Presentation (Mar. 25, 2022), https://energy.virginia.gov/mineral-mining/GoldMiningStudy.shtml.

Existing State Permitting Processes Relating to the Mining and Processing of Gold

The Virginia Department of Energy (Virginia Energy)

Virginia Energy's Mineral Mining program's goal is to provide for the safe and environmentally sound production of Virginia's non-fuel minerals.

The General Assembly enacted the first mine safety and reclamation laws in 1969. In 1985, the Department of Mines, Minerals and Energy (DMME) was formed as the result of a state government reorganization. The Division of Mineral Mining was located within DMME until the agency changed its name in 2021. The Mineral Mining program within Virginia Energy currently administers and enforces the Mineral Mine Safety Act and the Mineral Mine Reclamation Law under Title 45.2 of the Code of Virginia. As discussed in the introduction, large scale gold mining has not taken place since the 1940s. As such, existing mineral mine regulations were not drafted with gold mining in mind.

Some of the other state and federal regulatory agencies that oversee the development and operation of mineral mines are the Department of Environmental Quality (discussed below), the Virginia Department of Transportation, the Virginia Marine Resources Commission, the United States Army Corps of Engineers and the federal Mine Safety and Health Administration.

Statewide, there are currently 427 mineral mines covering about 76,000 acres. These include mines producing construction materials, industrial minerals, and other products. A large portion of the minerals mined in Virginia are extracted for the construction of roads and commercial and residential buildings. However, other minerals are produced for use in manufacturing, agriculture, industrial applications, food production, landscaping and jewelry. In 2021, over 72 million tons of non-fuel minerals in Virginia and contributed approximately $1.6 billion to the economy while providing over 6,600 direct jobs in the Commonwealth.[56]

The Mineral Mining program issues mining licenses and permits, and conducts regular environmental and safety inspections. If complaints or serious accidents occur at a mineral mine, Virginia Energy inspectors will conduct investigations to determine what happened and what can be done to prevent a reoccurrence of the problem. The agency also provides safety training and other assistance to mine operators, contractors, and stakeholders.

Before a mine license and permit are issued, applicants must provide suitable operations plans, drainage and sediment control plans, groundwater impact assessments, and reclamation plans for the proposed mine operation.

Operations plans must describe how the mineral will be mined and processed, and how waste will be disposed of while minimizing the effect on the surrounding environment. Regulations require the operations plan to facilitate integration of reclamation with mining operations according to the special requirements of individual mineral types. Operators are required to conduct mining such that the amount of disturbed acres are minimized, and reclamation is to be conducted simultaneously with

[56] https://energy.virginia.gov/geology/MineralResources.shtml

mining to the extent feasible. Regulations further require that mining activities must minimize the impact on water quality and quantity. Minimize needs to be codified with values to be enforceable.

The operations plan shall include a description of the proposed method of mining and processing; the location of top soil storage areas; overburden, refuse, and waste disposal areas; stockpiles, equipment storage, and maintenance areas; cut and fill slopes; and roadways. The operation plan shall address plans for the storage and disposal of scrap metal, scrap tires, used lubricants, coolants, and other equipment service products, batteries, process chemicals, trash, debris, and other hazardous materials. The operation plan shall also include all related design and construction data.

The drainage plan shall consist of a description of the drainage system to be constructed before, during, and after mining; a map or overlay showing the natural drainage system; and all sediment and drainage control structures to be installed along with all related design and construction data.

The reclamation plan shall include a statement of the planned land use to which the disturbed land will be returned through reclamation, the proposed actions to assure suitable reclamation, and a time schedule for reclamation. The method of grading; removal of metal, lumber, and debris, including processing equipment; buildings; and other equipment relative to the mining operation and revegetation of the disturbed area shall be specified. Reclamation plans for underground mines shall include plans for closing or securing all entrances to underground workings.

In addition to these plans, a permit application must also contain a map. The map must show required features on the mine site, and sensitive features within 500 feet of the permit boundary. Sensitive features include state waters, cemeteries, oil and gas wells, underground mine workings, public utilities and utility lines, buildings, roads, schools, churches, and occupied dwellings. For a small mine 500 feet is reasonable, but for a large mine this figure should be increased significantly.

The initial permit application requires that all property owners within 1,000 feet of the permit boundary be notified that a mine license has been requested. Those persons may request a public hearing as part of the permit review process. For a small mine 1,000 feet is reasonable, but for a large mine this figure should be increased significantly

Adjacent property owners often ask about screening and set-backs. Screening is required to improve the appearance of the mine site from public roads, public buildings, and occupied dwellings. Screening also helps to reduce the effects of noise and dust. Screening may be provided by earthen berms, walls, fences, planted barriers, or undisturbed forest. In addition, no cut or fill slopes are allowed within 25 feet of an adjacent property boundary without the written permission of the property owner and no disturbance of any kind is allowed within 5 feet of an adjacent property owner.

Upon review and approval of the mine operations plan, a performance bond must be furnished by the permittee to insure final reclamation of the mine site. The required bond is $3000 per disturbed acre. Bond must be posted before acreage is disturbed and will not be refunded until reclamation meets the approved post mining land use. This amount of bonding is insufficient in my opinion. The amount required should reflect actual reclamation costs including the perpetual treatment or provision of water if adversely affected.

Drainage and sediment controls must be installed before any other land disturbing activities. Internal roads and yards must be maintained to control dust and prevent tracking onto state roads. Blasting must be designed to prevent dangerous off-site effects, supervised by certified persons, and monitored with seismographs.

After permitting, the site is inspected for compliance with the approved mine operations plan and the mineral mining laws and regulations. In most cases, two inspections are made each year for safety and health and environmental compliance. In my opinion, two inspections per year are insufficient for anything but a small mine. The inspection frequency should be based upon the size of the mine and the damage potential the mine represents. The agency conducting the inspections should be required to audit each of its inspectors yearly to ensure they are conducting thorough inspections to the regulations and to identify areas where additional training is needed.

On-site impoundments are also regulated by the Mineral Mining program. Existing regulations establish different criteria impoundments must meet, depending on the size and potential storage volume of the impoundment.[57] There are currently 13 large impoundments that meet the most stringent regulatory requirements. These impoundments are inspected regularly and there has never been a large impoundment failure in Virginia. Other smaller impoundments must meet the requirements established in regulation.

The Mineral Mining program has:

- the right to access a mine for unannounced inspections,
- the ability to take enforcement actions to require compliance with the law and regulations, and
- the authority to revoke a permit and forfeit bond, if necessary.

These enforcement actions, regrettably, do not include fines for violating the regulations and polluting the environment. They only require that the noncompliant items noted be corrected. This would be like issuing "please slow down" citations to speeding motorists without any monetary fine. Soil erosion, and water and air pollution all cause harm to the environment and fines should be issues to remediate the pollution that occurred.

Mine employees and stakeholders have the right to contact the Mineral Mining program with safety or environmental complaints. Complaints must be kept confidential to protect the individuals making them. All complaints require an investigation by mine inspectors.

State laws and regulations allow Virginia Energy to oversee most of what takes place on a mine site, but they do not address things such as:

- Land use or zoning.
- Hours of operation.
- Offsite noise levels.
- Traffic on public roads.

These topics are generally regulated by the locality in which the mine is located. More information on local authority can be found below.

[57] See https://law.lis.virginia.gov/admincode/title4/agency25/chapter31/section500/

The Department of Environmental Quality (DEQ)

DEQ administers many of Virginia's environmental permitting programs. This includes programs under the Clean Air Act (CAA), Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA) which have been delegated to DEQ by the Environmental Protection Agency (EPA) and include essentially the same environmental requirements for regulated activities. These major delegated programs would address any regulated air emissions, point source (wastewater/stormwater) discharges to state waters, and solid and hazardous waste management, storage and disposal requirements. In addition to the federally delegated programs, DEQ also administers several state only permitting programs including the Virginia Water Protection Program (wetlands), Groundwater Withdrawal, and Virginia Pollution Abatement (VPA). Unlike the Energy Department, the DEQ does issue fines for noncompliance. Over the last 16 years the DEQ has averaged collecting $2 million per year in fines, a relatively small amount based upon its scope of work.

A specific gold mining project proposal and permit applications would be needed to accurately identify all required permits. Some likely permit programs that could apply to mining activity includes:

- Virginia Pollutant Discharge Elimination Program (VPDES) permit for any process or stormwater point source discharges to state waters. This permit process includes evaluation of proposed effluent pollutant concentrations, discharge volumes and treatment systems, and the proposed receiving stream conditions to develop protective permit limitations. These limitations can include technology based, industrial sector, best management practices and water quality based requirements to ensure protection of state waters.
- New Source Review (NSR) permit for any stationary sources emitting regulated air pollutants in quantities requiring permit coverage. This permit may contain requirements to control criteria, hazardous or toxic air pollutants as well as best management practices and operational controls. All NSR permits require stationary sources to utilize the best available control technology (BACT) for any regulated air pollutants.
- Virginia Water Protection Program (VWP) permit may be required depending on the location of a proposed operation and water use needs. If wetland areas are impacted, a permit is required to avoid and minimize impacts to the extent practicable and provide compensation for any wetland impacts. A permit may also be required if the operation proposes to withdraw surface water in volumes large enough to require regulation.
- Groundwater Withdrawal permit may be needed if an operation is located in the Groundwater Management Area (basically east I95) and proposes to withdraw groundwater in sufficient quantity to be regulated.
- RCRA requirements (subtitle I) may apply for petroleum products stored in sufficient quantities in tanks above or below ground. Additionally, any hazardous or solid wastes, depending on the use or management of the materials may require regulation under subtitle C or D).
- Virginia Pollution Abatement (VPA) permits may be utilized to authorize pollutant management activities including, but not limited to, animal feeding operations, storage or land application of sewage, sludge, biosolids, industrial waste or other waste; or the complete reuse

or recycle of wastewater. These permits do not authorize any point source discharge of pollutants to state waters.

DEQ regulatory requirements for any proposed mining operation are at least as stringent as federal requirements and would include the applicability of any additional state environmental program requirements.

The Virginia Department of Health (VDH)

Waterworks

VDH's Office of Drinking Water (ODW) implements the federal Safe Drinking Water Act (SDWA), 42 U.S.C. Section 300(F) et. seq, through the Virginia Waterworks Regulations (12VAC5-590). ODW provides regulatory oversight for public water systems (waterworks), which are defined as serving water to at least 25 persons 60 days out of the year. When this threshold determination is met, there are sampling, monitoring, and reporting requirements for certain drinking water contaminants.

The State Health Commissioner has authority to issue an emergency order to protect public health from imminent dangers. In most cases, emergency responses are left up to the waterworks owners and operators most familiar with the waterworks' design and operation, condition of infrastructure, system capabilities, and governing resources. ODW typically provides a supporting role by providing technical assistance, information to various entities and waterworks, and other compliance assistance as needed. Most incidents involve water main breaks, equipment failures, pressure loss, or boil water notices.

Private Wells, Springs, and Cisterns

Private water supplies serve a single user or occasionally a small group of users that do not qualify as a waterworks, and can be for either potable or non-potable uses. Private water supplies include residential water wells, agricultural wells, industrial wells, and geothermal wells. Developed springs and cisterns are also private water supplies but are not used as frequently in the Commonwealth.

The Office of Environmental Health Services (OEHS) and local health departments regulate private water wells under the provision of the Private Well Regulations (12 VAC 5-630-10 et seq.). Prior to 1982 there were no regulations for construction or location of private wells. From 1982 to 1990 VDH regulated the construction and location of private wells when installed in conjunction with an onsite sewage system. In 1990, the Board of Health promulgated the Private Well Regulations in response to amendments to 32.1-176.2 and 32.1-176.4 of the Code of Virginia. These regulations set minimum construction standards and horizontal setbacks from potential sources of contamination for all private water wells. Additionally, they require bacteriological testing of the water at the time of initial construction or rework for all private residential drinking water wells (Class III wells). Revisions adopted in 2012 include minimum storage capacity and yield requirements for residential drinking water wells.

VDH estimates there to be more than 700,000 private wells in the Commonwealth. VDH does not have a reliable inventory of all private water supplies because the construction of many private water wells predated the Board of Health's regulatory program.

The Private Well Regulations do not address the chemical or radiological quality of the water from private water wells or mandate periodic on-going testing of the water from private wells. The only water quality standard for private water wells in Virginia is the requirement that private drinking water wells are free of bacteriological contamination at the time they are approved for use.

Bacteriological requirements do not apply to non-potable private wells such as agricultural wells. VDH does not have the authority to implement additional water quality standards for private water supplies.

Developed springs and cisterns should only be considered when no other source of potable water is feasible. The VDH Sewage Handling and Disposal Regulations provide minimum separation distances between onsite sewage disposal systems and developed springs or cisterns. Minimum construction standards are meant to mitigate the risk of pollution in developed springs and cisterns. However, VDH does not have the authority to implement water quality standards, including bacteriological contamination, for developed springs and cisterns. Springs, undocumented (older) water wells and surface waters are important sources of potable water and water used for agriculture and livestock in the state of Virginia. The potential affect of mining on these sources must be documented through baseline studies and ongoing sampling and testing whenever potential problems occur.

Detailing Local Land Use and Zoning Procedures and Requirements

Virginia is known as a Dillon's Rule state. The Virginia Supreme Court has held that Dillon's Rule "provides that municipal corporations possess and can exercise only those powers expressly granted by the General Assembly, those necessarily or fairly implied therefrom, and those that are essential and indispensable."[58] Counties, cities and towns are authorized to adopt such measures as it deems expedient to secure and promote the health, safety and general welfare of its inhabitants which are not inconsistent with the general laws of the Commonwealth.[59]

Traditionally, zoning authority has been left to localities in the Commonwealth. Localities typically utilize this authority by enacting zoning ordinances. In its declaration of legislative intent regarding zoning ordinances, the General Assembly "….intended to encourage localities to improve the public health, safety, convenience, and welfare of their citizens and to plan for the future development of communities to the end…..that the need for mineral resources and the needs of agriculture, industry and business be recognized in future growth."[60] The General Assembly further established that zoning ordinances "…shall be for the general purpose of promoting the health, safety or general welfare of the public…"[61]

With respect to mining, the General Assembly granted the localities the ability to "…regulate, restrict, permit, prohibit, and determine….. [t]he excavation or mining of soil or other natural resources."[62] By taking these actions, the General Assembly established not only the importance of and need for mineral resources, but the importance of both state and local participation in the regulation of mining. It should be noted that the state could repeal such authority at any time and take over the approval of whether or not a mine can be developed/operated in a particular county.

[58] See *City of Richmond v. Confrere Club,* 387 SE 2d 471, (1980).
[59] See § 15.2-1200 of the Code of Virginia.
[60] See § 15.2-2200 of the Code of Virginia.
[61] See § 15.2-2283 of the Code of Virginia.
[62] See § 15.2-2280 of the Code of Virginia.

In addition, the Code of Virginia calls for each locality to adopt, following preparation by a Planning Commission, a Comprehensive Plan[63]. The locality's comprehensive plan dictates how the content of a locality's Zoning Ordinance is composed and amended, and the same applies to other ordinances that affect the objectives of the Zoning Ordinance (Subdivision Ordinance, Health and Safety Ordinance, Noise Ordinance, etc.).

The Code of Virginia states that, "[i]n the preparation of a comprehensive plan, the (planning) commission shall make careful and comprehensive surveys and studies of the existing conditions and trends of growth, and of the probable future requirements of its territory and inhabitants. The comprehensive plan shall be made with the purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the territory which will, in accordance with present and probable future needs and resources, best promote the health, safety, morals, order, convenience, prosperity and general welfare of the inhabitants, including the elderly and persons with disabilities."[64]

The Zoning Ordinance is a vehicle by which the Comprehensive Plan's goals are carried out. This is done by designating certain portions of the geographic boundaries of the locality per their intended use in tandem with intentions with the Code of Virginia. Common zones or zoning districts defined in Zoning Ordinances are "agricultural," "industrial," "residential," or "commercial." Within each zone or district, there are various stages of intensity and use.

Each zoning district has specific allowable uses, or "by right" uses. Some allow for accessory uses, i.e. core sampling while others have uses that are allowable by conditional or special use permit, which require consideration by a Planning Commission and Board of Supervisors.

Mining is generally considered an industrial use in most localities. Localities may grant special or conditional use permits in order to enforce things like noise, traffic, and highway entrances. Special or conditional use permits contain "conditions" or stipulations regarding traffic, noise, sounds, etc.

Most, if not all rural localities, and some suburban localities, do not have the staff to ensure that set conditions, permits, inspections, stormwater and sediment control plans, groundwater monitoring and other local regulations are all adhered to per the special use or condition use permit with regard to a gold mine.

The same applies to local health departments in rural localities. For large scale projects, often counties will contract with external entities, such as a soil and water conservation district office or a private firm for stormwater management and erosion and sediment control plans. It should not be assumed that these entities have the expertise that would be needed to suitably protect the environment from the potential impacts of a gold mine.

Local approvals are separate and distinct from permits which may be required from state or federal agencies. In a mining context, prospective operators typically pursue available local approvals before seeking state permits, though no requirements exist directing the order in which these approvals are sought.

[63] See § 15.2-2283 of the Code of Virginia.
[64] See § 15.2-2223 of the Code of Virginia.

Summary of Public Comments Received

Consideration of public response to large-scale gold mining is integral to understanding the breadth of potential impacts to and concerns of communities across Virginia. Members of the public have commented via the Town Hall website (165), via email to Virginia Energy (8)[65], and during the public comment portion of State Agency Committee (SAC) meetings. All public comments received are included in an appendix to this report.

Public comments have expressed concern about the industry, or been in total opposition to the introduction of large-scale mining in Buckingham or Virginia. Comments focused on the impacts to Virginia's water resources, concerns about waste materials created by the mining process, the lack of sufficient bonding requirements for the industry and the impacts to local communities. No comment expressed support for large-scale gold mining in Virginia. Rather, over 82% or at least 136 of the 165 total Town Hall comments opposed large-scale gold mining or shared that allowing the industry is not worth the risk to the Commonwealth**.**

Likewise, of the eight emails received, five were from Commonwealth residents opposing gold mining. One highlighted gaps in the existing regulatory framework, one highlighted the concerns of some of Virginia's tribal communities, and one expressed concerns about the lack of specific environmental justice policies.

Water Quality Concerns

The issues most frequently raised by committee members and members of the public related to impacts on water quality and quantity from gold mining activities. At least 55% of Town Hall comments (91 individuals) referenced potentially negative impacts to water resources from contamination and water usage by gold mining operations. During State Agency Committee meetings, over 35 comments were made that related to mine drainage and water impacts.

Of the Town Hall Commenters, over 36% (61 out of 165) reference drinking water contamination and private water well contamination, at least 7% of written commenters (12 out of 165) discuss dewatering of aquifers or quantity impacts on groundwater, and 4% (7 out of 165) discuss increased risks due to high precipitation and climate change. Specific impacts to the James River and its watershed were mentioned by over 20 commenters.

Comments delivered at the State Agency Committee meetings included 12 comments regarding water pollution, 8 comments concerned with exploratory drilling impacting private drinking water wells, 6 comments regarding increased precipitation rates elevating risk. Additional concerns were groundwater management west of the 95 Corridor, and confusion as to what agency could assist with concerns about damage to drinking water wells.

Air Quality and Health Concerns

[65] Virginia Energy created a dedicated email address to receive public comments (goldstudy@energy.virginia.gov). The total of eight emails received does not include purely logistical questions related to the scheduling of public meetings or duplicates of comments posted on townhall.virginia.gov.

Air quality, air pollution and related health concern were expressed via written comment submission and in the SAC meetings. In Town Hall submissions at least 11 comments were concerned about public health, 9 comments were concerned about air pollution effects, and 3 comments concerned about worker safety.

During SAC meetings, commenters raised the issue of air pollution from blasting activities during meetings, with at least one raising concerns about particulate matter. Concerns were also raised about the health and safety of mine workers, as well as residents, pets, and livestock near the mine who may be impacted by particulate pollution from mining operations.

Processing and Waste Concerns

The toxicity of the processing used in large-scale gold mining operations and the storage of hazardous toxins was a major topic of the Town Hall submissions. Over 27% (46 of 165) raised concerns about cyanide, mercury, lead, long-term maintenance of tailings dams and the likelihood the storage facilities will fail.

In SAC meetings, several state agency committee members and members of the public raised concerns about the long-term storage of mining waste and the leakage or failure of tailings dams. Six commenters during meetings raised concerns that increased precipitation rates in Virginia will elevate the risk of toxic releases and other environmental impacts from gold mining operations.

Environmental Justice Concerns

In both Town Hall submissions and the SAC meetings, over 14 commenters specifically mentioned environmental justice and localized community concerns. As mining pollution can disproportionately impact environmental justice, low-income and rural communities, deep concern was expressed about the potential impact of this industry to communities along the Gold-Pyrite Belt. The need for consultation with Virginia Tribes and engagement in this review process was also shared via Town Hall and at SAC meetings.

Impacts to Local Community Infrastructure

Commenters raised a variety of concerns about impacts of a gold mining operation on nearby communities, including lack of public notice or participation in the permitting process; changes to the rural character and bucolic nature of communities; increases in community infrastructure costs, including increases in traffic; decreases in property value; and economic volatility or job loss once mining operations close due to the boom-bust cycle of the extraction industry.

Concerns about Bonding, Closure and Reclamation

Town Hall commenters shared concerns that bonding will be insufficient to protect communities, that fines and penalties for violations should be increased, or that there may be enforcement issues related to limited staffing capacity or agency resources. Over 25% of commenters referenced that current regulations specific to gold mining are insufficient or expressed concern with mine abandonment. Over 16 commenters called for stronger financial assurances or less financial risk to taxpayers. At least 5 commenters also recognized the distinction between small scale mines and large scale industrial mines.

During SAC meetings, 16 commenters raised concerns with the closure and reclamation of mining sites, as well as the adequacy of Virginia's current financial assurance requirements for mineral mine operators.

Additional Concerns and Recommendations

Additional concerns discussed via Town Hall and at SAC meetings included: habitat or ecosystem destruction and insufficient opportunities for public input. Recommendations suggested in Town Hall submissions at SAC meetings included a moratorium or ban on mining permits, implementation of "Prove it First" policies, prioritizing abandoned mine closure, banning the use of cyanide, pre-mining water testing, increased involvement from VDH and prohibiting pooled bond funding.

Conclusion

As noted throughout the NASEM Report and this report, Virginia's existing statutory and regulatory framework is not appropriate for gold mining and processing as large scale operations have not occurred in the Commonwealth for approximately 75 years. It should be noted that the historic gold mines were all relatively small by today's standards. Though questions remain as to whether permit applications will ever be filed for a gold mine, it is generally understood that any such project remains years away. As such, there is ample time for the General Assembly to consider updating existing frameworks, should it choose to do so.

Acknowledgments

The SAC would like to thank the NASEM committee and staff for their cooperation and assistance during the study. Additionally, the SAC would like to thank Todd Shumaker and Wendy Spivey from the Buckingham County Recreation Department for their hospitality and invaluable assistance in hosting the SAC's public meetings.

Appendix