

EXH 122  
Rec'd  
P17 on  
10/24/24  
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Gales Ferry, CT

## Planning and Zoning Hearing: 10-24-24

### Topic:

"The Health Risks of Excavation Operations Major of a Quarry"

### Excavation / Quarry Operations/ Geology

*Hazard Definition: Any source of potential damage, harm or adverse health effects on something or someone.*

### Introduction

Inorganic vs. Organic Chemistry: Inorganic compounds have no carbon atoms present in their structure as molecules. Synthetic or natural organic molecules have carbon atoms which are built upon synthetically to develop medicine. For this presentation, I'll concentrate on the inorganic molecules chemistry which are the Mt. Decatur compounds, proceed with their health risks, discuss zoning regulations, and end with my comments and conclusions. The health risks I'll be discussing encompass and include inhalation, and ingestion hazards, plus stress disorders.

### Avolonian Continental Terrane / Hope Valley Belt (Eastern CT, alaskite granite gneiss); CT Geological Survey <sup>1,2</sup>

### Granite Gneiss Sample: Analytical Results (Mr. Slade) <sup>3</sup> Bedrock Mineralogy & Chemistry (Page 16, GFI Presentation to P & Z)

#### Analytical Methods: X-Ray Fluorescence and X-Ray Diffraction

Quartz: crystalline silicon dioxide or silica (90-97%)	33% wt.
K-Feldspar: Crystalline $KAlSi_3O_8$ (pink color)	35% wt.
Plagioclase Feldspar: Mixture; crystalline, Na, Ca (Al) $Si_3O_8$	25% wt.
Mica: Alumina Silicates	< 5% wt.
Unknown	< 5% wt.

**Crystalline Silica/Silicone Dioxide:** Found in Rocks, granite, clay, Feldspar, Al silicates, sand, stone, bricks, tile, concrete, and gravel.<sup>4</sup> Silicon dioxide makes up approximately 60% of the earth's crust.

**Crystalline Silica: Group I Carcinogen , < 10um Inhalation Hazard** (International Agency for Research on Cancer). <sup>7</sup> It's harmful when breathed into your lungs and each exposure from a release no matter how small, contributes to lung damage. <sup>2</sup> **It is a known human carcinogen.**<sup>17</sup> The health effects are silicosis, pulmonary disease, reduction in lung function, fertility problems, and heart disease. <sup>6</sup>

**The silica dust and crystalline feldspar is created from blasting and crushing the granite from Mt. Decatur as it enters the surrounding air and wind currents. Crystalline particles have geometry and sharp points that are called crystal lattice or arrangement of particles that will stick to the inside of your lungs and start irritation immediately.**

**Silica / Feldspar Dust: (0.5 – 10 um) Microscopic** – Your bodies defense mechanisms of >10um prevents dust from entering the lungs. The process of excavation and quarry operations, blasting, digging, mining, drilling, transporting, and crushing in the removal of this aggregate will cause microscopic particles that can enter the lungs as silica dust (< 10um) and to be airborne possibly up to 12 days depending on the diameter of the particle. <sup>5</sup>

**Examples** <sup>6</sup>

Human Hair:	50 – 70um
Beach Sand:	90um
Dust, pollen, mold:	10um
Combustible Particles, metals, silica, silicates:	2.5um

**Crystalline Potassium, Sodium, Calcium Feldspar (60% Aluminum Silicates)**

Inhalation hazard that can be toxic: Inorganic molecules  
Breathing in potassium, sodium, and calcium feldspar dust short term will cause coughing and shortness of breath, plus it acts as an immediate eye and skin irritant. Long term effects can cause silicosis, chronic lung disease, and cancer. <sup>17</sup>

When you blast, crush, move or transport bedrock, dust forms and it's composed of silica and feldspar that are 0.5 to 5 um. ~100x smaller than beach sand, microscopic particles. <sup>5</sup>

Blasting, drilling and crushing can generate (particulate matter) PM2.5 < 2.5um diameter to PM10 particles that one cannot see. One cannot completely control these particles from entering the air by mitigation or by wetting down the rock face; therefore, as these particles become airborne, breathing in these particles is possible and presents itself as an exposure. These particles can bypass the nose and throat and penetrate your lungs.

Long term exposure (10 years) PM2.5 can cause respiratory problems and can trigger asthma, and chronic bronchitis. <sup>13</sup>

Children and the elderly are more susceptible to lung disease from this dust.

Children have faster breathing rates and smaller airways and a developing immune

system. The elderly may have pre-existing conditions, and a weakened immune system making them more vulnerable.

**Arsenic Metal (Mr. Slade's Analytical Sheet, <20 ppm As)**

The level of toxicity is determined by the various oxidized forms of arsenic. However, all forms of arsenic whether it comes from an ore [Arsenopyrite,  $(\text{FeAs}^1\text{-S})$ ], oxidized form [(arsenate V, arsenic acid  $(\text{H}_3\text{AsO}_4)$ ], or [(arsenite III, arsenic trioxide,  $\text{As}_2\text{O}_3$ ; Arsenous Acid  $(\text{H}_3\text{AsO}_3)$ ] is toxic. The ore is deadly if inhaled and when exposed to oxygen and water converts to arsenite which is the most toxic form.<sup>10</sup> The act of blasting, drilling, crushing mobilizes the arsenic and solubilizes that oxidized form into water.

Sulfur: S: 0.05% = 500ppm ( $0.0005 \times 1,000,000 = 500$ )

According to the US Geological Survey for 7% of **private wells** in Connecticut (2013-2015), there is 20ug/L arsenic present in the "Hope Valley Alaskite Gneiss" terrane which exceeds the EPA guidelines for drinking water of 10ug/L.<sup>2</sup> The maximum allowable level is 10 ppb. Arsenic can leach out of the soil and into groundwater during the excavation and erosion processes which will accelerate the process to enter groundwater and wells, wetlands, and possibly the Thames River. Arsenic is also toxic to plants and fish at the ppb level.

**Units:**

1000 ppb = 1 ppm Therefore, (19 ppm = 19,000 ppb)

**EPA Maximum Allowable 10 ppb ~ 0.010 mg/L** (0.05% of 19,000 ppb As is at the EPA Guidelines of 10ppb)

**Typical (As) Well Report:** Result. < 0.001mg/L or 1ppb

**pH 7.5: Basic Conditions Enhance Arsenic Deposits in Wells** [Non Acid forming Rocks (NAF) Drainage]; As becomes mobile in ground water pH 6.5 – 8.8

Arsenic gets into the drinking water through rocks, and soil that contain arsenic. The excavation and quarry processes accelerate that process by increasing the surface area of the arsenic containing molecules and increasing the rate of reactions to form water soluble arsenic. There are oxidation reactions over time that convert arsenic to arsenic V and reduced to arsenic III (arsenite); both forms are toxic; however, arsenite is considered more toxic due to its higher reactivity within the body. Over time, weather conditions, quarry operations increase surface area, water, oxygen and the oxidation processes and biological processes promotes arsenic forming molecules in wells. <sup>9,12</sup>

### **PTSD (Post Traumatic Stress Syndrome)**

Post-traumatic stress disorder is a mental illness. One can develop it after experiencing something that you find traumatic. This can include seeing or hearing about something traumatic.

Residents that live close to this operation from long term blasting that will cause ground vibrations, noise from machinery, and fly rock can lead to and generate mental health effects such as PTSD, anxiety, increased pulse rates, loss of sleep, fatigue, and excessive contraction of pupils.<sup>14</sup> These quarry operations could lead to a need of anti-depressant medications in addition to other physical developments.

### **Health Effects of Breathing Silica / Aluminum Silicates (Feldspar) Dust**<sup>16</sup>

Arsenic is highly toxic. Initial exposure can result in discoloration of the skin, stomach pain, headaches, drowsiness, diarrhea, vomiting. Over time, chronic exposure symptoms are severe stomach pain, numbness in the extremities, convulsions, paralysis, blindness, chronic lung disease, development anomalies, and some cancers can develop.<sup>11</sup>

They contain an inorganic compound called crystalline silicone dioxide (SiO<sub>2</sub>) or silica. When silica dust enters the lungs, it causes inflammation which over time can develop into scar tissue that makes breathing difficult and in most cases is irreversible.

**Feldspar Dust:** Respiratory tract irritation, Shortness of breath, chest pain, eye and skin irritation, chronic cough, Cancer (Long term exposure)

**Silicosis:** "It's a documented interstitial lung disease caused by breathing in tiny bits of silica, a common mineral found in many types of rock and soil that I described previously."<sup>7,15</sup>

Symptoms: Persistent cough, shortness of breath, weakness, chest pain, reduced lung capacity, fever and fatigue.<sup>17</sup>

**Over years of breathing silica particles will cause permanent lung scarring, called pulmonary fibrosis.**

## **OSHA: Occupational Safety and Health Administration**

**Air monitoring PEL (Permissible exposure limit) 50ug/m<sup>3</sup> 8 hr.** <sup>4,18</sup>

**Action level for respirable crystalline silica at 25ug/m<sup>3</sup> 8hr.** <sup>8</sup>

**MSHA: Mine Safety & Health Administration (April, 2024)**

**Fact:** Approximately 2.3 million workers are exposed to silica dust in the workplace. Over 500 construction workers are believed to die from exposure to silica dust every year. <sup>17</sup>

### **Regulations Compromised:**

- 8.16 Excavation (filling or removal of soil, gravel, and stone)
- 8.16.D.2 The work will not be a source of dust, pollution and or siltation.
- 9.2.C.1 No dust, dirt, fly ash or smoke shall be emitted into the air so as to endanger the public health, safety, or general welfare.....
- 11.3.4.F that the proposed uses would not cause any unreasonable pollution, impairment or destruction of the air, water, and other natural resources of the state.

The regulations don't say or allow stipulations or a condition to proceed if one would mitigate the dust. Mitigation is partially controlling, not elimination. I have not heard testimony that dust will not be formed, only that it will not be a problem. The regulations meaning is quite clear to not allow quarry operations. In addition, the application before us is not just removing a few large boulders that would take a couple of days. This operation is going to proceed possibly as long as 10 years.

*Application to Gales Ferry Intermodal to Ledyard Planning: Special Permit PZ#24-8SUP & PZ#24-9CAM – 1737 and 1761 Connecticut Route 12 (Parcel IDs: 76-2120-1737 & 61-2120-1761) Special Use Permit*

### **Application: Construction Sequencing (Page 8, Section 17)**

#### **Review Dust Emissions Sources**

- Stone Crushers
- Conveyers
- Roadways
- Drilling and Blasting
- Stockpile Formations
- Trucks unloading / loading
- Screening operations

## **Potential Problems**

- There are no case study comparison results from other sites to view the calculated result vs. the actual measured result.
- American Styrenic's on site: They possibly use styrene monomer in their production procedure for polystyrene. If during blasting the tremors rupture a reactor or storage tank, a spill and release could happen.
- It is cancerous in animals. **Health Effects:** eye, skin, and throat irritation, headache, dizziness, and cancerous to animals. What safety procedures are in place if released into the air. <sup>20</sup> There are no safety protocols in the application.

## **Concerning Comments**

There were no specific written discussions regarding dust mitigation using specific volumes of water. Just mentioning it in a write-up or saying it is not going to be a problem is not a solution and it is not proving its validity or effectiveness. One stone crusher discussed in "The Zoning Compliance Manual" can use up to 21,000 gallons of water per day depending on the ring size nozzle attached to a rock crushing machine.

If tens of thousands of gallons of potable water is used per day per piece of equipment to partially control dust, plus calcium chloride solutions sprayed from a truck to control road dust, then one has the problem of generating siltation, and over burdening the basins as was previously discussed in an 8-10-year period by Steve Trinkaus. In an area of 40 acres and one inch of rain can generate over one million gallons of water over burdening the basins. What plan is in place to dig out the contaminated solids in the basins.

Toxic metals and silica can flow into the river and contaminate and destroy biological life in wetlands. Calcium chloride is harmful to wetlands, plants and can cause death of some trees.<sup>15</sup> In addition, calcium chloride solutions being sprayed on the ground, this mud will be picked up by the trucks tires and spread on public roads, dry out, and eventually become airborne to spread silica dust beyond Gales Ferry's borders. <sup>21</sup>

In addition, fog cannons were not discussed to mitigate dust to partially control dust from the explosions of blasting the mountain. Fog cannons are the best method for dust controls as discussed in the reference I provided. <sup>22</sup> Wetting down the face of the mountain is not enough to control dust as described.

## **Conclusion:**

Based on the data that I presented, references, and incomplete information and data from the application and reference manual, and all the health risks involved, this special permit cannot be approved.

## **Thank You**

## **References**

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