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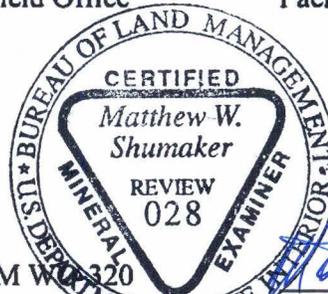
April 20, 2017

Memorandum Report

To: David Hawes  
 Field Manager, Hassaympa Field Office

*D. Ravnigher Hawes*  
 4/27/2017  
 I acknowledge receipt

Through: Matthew Shumaker  
 Chief Mineral Examiner, BLM W-220  
 Certified Review Mineral Examiner



*Matthew W. Shumaker*  
 4/20/2017  
 I concur

From: Jeff Garrett  
 Geologist, AZ920  
 Certified Review Mineral Examiner 040



*J. Garrett*  
 5/20/17  
 Signature

Subject: Kirkland Tuff Deposit

## **Introduction**

Kirkland Mining Company (Kirkland) intends to file a plan of operations with the Bureau of Land Management (BLM) to develop its tuff deposit on the unpatented Capital association placer mining claim (subject claim) in Section 28, Township 13 North, Range 4 west, Gila and Salt River Meridian, Yavapai County, Arizona. The BLM regulations at 43 CFR 3809.101 (a) require that the BLM complete a mineral examination report to determine whether the subject mineral is locatable under the 1872 Mining Law, as amended, before BLM can process a plan of operations. The company proposes to produce pozzolan<sup>1</sup> for use in cement and concrete manufacturing.

## **Purpose**

The mineral examination report (Burch, 2017) is meant to address the question of whether the tuff deposit meets the criteria for an uncommon variety of mineral and is, thus, locatable. The report is not to be used for any other purpose than the one stated, and the conclusions are limited to the action prompting the report. The report is not a determination as to the validity of any mining claim.

The Burch report and attachments contain proprietary information from the proponents and cannot be made available to the public. The Burch report is not subject to the Freedom of Information Act (FOIA) in the current form, due to this information.

The purpose of this memorandum is to document my review of the Burch report, providing concurrence or non-concurrence with the report's findings and my rationale therefor.

## **Background**

Al Burch (retired and inactive CRME#031) was contracted by Kirkland to provide the BLM with a mineral report to support a common/un-common variety determination concerning Kirkland's tuff deposit. This memorandum will systematically reference the Burch report which has been written in conformance with applicable BLM manuals and handbooks.

The Burch report addresses the tuff deposit where encumbered by the 160 acre Capital association placer claim (AMC367119). The Capital mining claim was located in 2005 in the SW<sup>1</sup>/<sub>4</sub> of Section 28, by an association of eight locators. Kirkland has an active Notice under 43CFR3809.301 to conduct drilling on the Capital and adjacent placer claim. Kirkland is preparing to file a plan of operations pursuant to 43CFR3809.401, to mine pozzolan from the Capital mining claim.

## **LAND STATUS AND RECORD DATA**

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<sup>1</sup> Pozzolans include natural pozzolans such as volcanic glasses, opal, clay materials and zeolites, and artificial pozzolans including fly ash, silica fume and blast furnace slag. Incorporation of pozzolan with portland cement improves the resistance of concrete to chemical attack, reduces the concrete's porosity, reduces the heat of hydration, may improve flowability of concrete, among other possible advantages. The production of Portland cement results in the emission of carbon dioxide gas into the atmosphere. Substituting pozzolan for a portion of the Portland cement that would otherwise be used in cement products reduces carbon dioxide gas emissions.

See Burch, 2017, p. 13.

## **LOCATION AND ACCESS**

See Burch, 2017, p.13.

## **REGIONAL GEOLOGY AND MINING HISTORY**

See Burch, 2017, p. 17.

## **SITE GEOLOGY AND MINERAL DEPOSITS**

See Burch, 2017, p. 18.

## **LOCATABLE MINERALS**

In the Federal regulations at 43 CFR 3830, minerals have been defined as subject to mining claim location in part as follows:

### **§3830.12**

(a) Minerals are locatable if they meet the requirements in Sec. 3830.11 and are:

- (1) Recognized as a mineral by the scientific community;
- (2) Found on Federal land open to mineral entry.

(b) Under the Surface Resources Act, certain varieties of mineral materials are locatable if they are uncommon because they possess a distinct and special value. As provided in *McClarty v. Secretary of the Interior*, 408 F.2d 907 (9th Cir. 1969), we determine whether mineral materials have a distinct and special value by:

- (1) Comparing the mineral deposit in question with other deposits of such minerals generally;
- (2) Determining whether the mineral deposit in question has a unique physical property;
- (3) Determining whether the unique property gives the deposit a distinct and special value;
- (4) Determining whether, if the special value is for uses to which ordinary varieties of the mineral are put, the deposit has some distinct and special value for such use; and
- (5) Determining whether the distinct and special value is reflected by the higher price that the material commands in the market place.

In the McClarty case, the court also ruled that the distinct and special value also may be reflected by a reduction in the cost or overhead to produce the deposit in question. The unique property must be an intrinsic characteristic of the deposit (e.g., compressive strength of stone) and not extrinsic (e.g., proximity to market).

The Kirkland tuff falls under §3830.12(b). The report required by 43 CFR 3809.101(a) is a determination as to whether the subject deposit is a common or uncommon variety deposit.

## **APPLICATION OF THE MCCLARTY PRINCIPLES**

Data provided in Burch, 2017, indicate that the Kirkland deposit is a pumiceous rhyodacitic volcanic tuff with variable amounts of glassy matrix and clasts. Analytical data from certified laboratories and industry experts indicate that the Kirkland tuff is variable in composition but meets the requirements to be used as a natural pozzolan and meets or exceeds the specification and performance requirements of ASTM C618, the industry guidance for a class N natural pozzolan.

Kirkland is conducting tests to see if the material can be used in other specialty applications besides pozzolan. However, data is not adequate at this time to evaluate markets other than the natural pozzolan market. Because Kirkland has focused on the natural pozzolan market, the Burch report focuses on the higher value natural pozzolan commodity because sufficient data is available for consideration of the deposit as a natural pozzolan.

A summary of the Burch report's application of the McClarty principles is given below.

### **Comparison**

The reason for the comparison is to determine whether the deposit hosts some unique, intrinsic characteristic that sets it apart from widespread deposits of commonly occurring and commonly used materials.

The Kirkland tuff was compared with other volcanic and volcanoclastic deposits. In addition Kirkland tuff was compared with other deposits of pozzolanic materials. Because the Kirkland tuff meets all the requirements for a natural pozzolan and pozzolan is an extender for cement and concrete, the Kirkland tuff was also compared generally with aggregates of any kind that extend cement and concrete. Such deposits are widespread and include sand, gravel, cinders, diatomaceous earth, shale, clay, impure limestone, crushed stone, and the like. Deposits used for comparison can be seen in Burch, 2017, p. 53, Table 10.

### **Unique physical property**

The Kirkland deposit has physical and chemical characteristics that allow it to be classified as a natural pozzolan. The unique physical property of the Kirkland tuff is that a pozzolanic chemical reaction occurs when this material is finely ground and placed in the presence of calcium hydroxide and water. The material from the subject claim would be used because of the chemical reaction of the pozzolan and because of the properties the pozzolanic chemical reaction imparts to the concrete and related products. No nonpozzolanic mineral can be substituted for this purpose.

### **Distinct and special value**

The pozzolanic chemical reaction is the property that gives the material from the Capital claim its distinct and special value. Because the volcanic tuff deposit is pozzolanic, exceeding the ASTM criteria, it has a distinct and special value for use in the portland cement, mortar, ready-mix concrete, and related industries. The pozzolanic property makes the deposit on the subject claim more valuable than other volcanic deposits that are not pozzolanic.

### **If put to uses to which ordinary varieties of the mineral are put, the deposit has some distinct and special value for such use**

The material from the subject claim will not be used for purposes for which ordinary varieties of the mineral may be used. The mineral will be used for industrial, chemical, and manufacturing processes as a pozzolan. Likewise, common variety volcanic rocks cannot be used to obtain the desired pozzolanic reaction.

### **Higher Market Price or Reduced Production Costs**

In the present market context, pozzolans are either valued as a cost-effective replacement for a portion of Portland cement or for unique properties desired in the concrete application. A comparison with common mineral material prices clearly shows that the pozzolan from the Capital claim has special value that is reflected in the price the material commands in the market. The price for pozzolan is substantially higher than the price of common variety mineral materials.

In addition, because the material from the subject claim does not require calcining, it can also out-compete more expensive natural pozzolans.

### **CONCLUSION**

I reviewed the Burch report including references and appendices. I also reviewed related case law and other information and reports on pozzolan and related industry trends. I visited the project area while it was being drilled in February and March of 2016, while accompanied by Kirkland personnel and contractors. Based upon this review, I conclude that the claimants provided prima facie evidence that the Capital claim contains material that has an excellent combination of chemical and physical characteristics for high-quality pozzolan.

The pozzolanic chemical reaction is the property that gives the material from the Capital claim its distinct and special value. Because the material is a pozzolan that meets the ASTM criteria, it is a unique type of mineral that can be used in Portland cement, mortar, ready-mix concrete and related industries. The pozzolanic property makes the deposit on the subject claim more valuable than similar deposits that are not pozzolans. Because the material does not require calcining, it is more cost effective to cement and concrete producers for replacing Portland cement.

Overall, the Kirkland tuff occurrence on the subject claim has an excellent combination of chemical and physical characteristics for high-quality pozzolan. Kirkland's tuff is an uncommon variety of tuff but only if it is actually used as a pozzolan in the cement or concrete industry- i.e., an application that utilizes its distinct and special value.

## **RECOMMENDATION**

If a plan of operations is submitted pursuant to 43 CFR 3809 it should be processed in accordance with §3809 regulations and HB 3809-1. If the proponent proposes disposing of material from the property that is not used for pozzolonic purposes, it should be disposed of in accordance with 43 CFR 3600 or another common variety determination should be conducted specific to the intended use of the tuff.

## **References**

Burch, A.L., 2017, Supplemental Mineral Report, Common Variety Determination, Kirkland Tuff Deposit, Yavapai County, Arizona Capital Association Placer Mining Claim, AMC 367119: confidential unpublished report prepared for Kirkland Mining Co. for submittal to the Bureau of Land Management, Hassayampa Field Office, 241 p.