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### Title

AN ENERGY-DISPERSIVE X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS FROM FOUR ARCHAEOLOGICAL SITES IN SOUTHEASTER NNEW MEXICO

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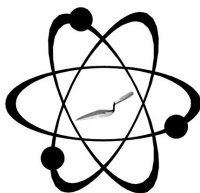
Shackley, M. Steven

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GEOARCHAEOLOGICAL XRF LAB  
A GREEN SOLAR FACILITY

GEOARCHAEOLOGICAL X-RAY FLUORESCENCE SPECTROMETRY LABORATORY  
8100 Wyoming Blvd., Ste M4-158  
USA

Albuquerque, NM 87113

## ***LETTER REPORT***

# **AN ENERGY-DISPERSIVE X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS FROM FOUR ARCHAEOLOGICAL SITES IN SOUTHEASTERN NEW MEXICO**

20 August 2020

Lillian Ponce  
Versar, Inc.  
4725 Ripley Drive, A  
El Paso, TX 79922

Dear Lillian and Myles:

The source provenance of the artifacts is dominated by Jemez Mountains sources (Table 1 and Figure 1; see Shackley 2016). Cerro Toledo Rhyolite obsidian is available as secondary deposits in Rio Grande Quaternary alluvium at least to Las Cruces, but Valles Rhyolite (Cerro del Medio) has not been found south of Albuquerque, and only as a few small diameter samples (Church 2000; Shackley 2005, 2013, 2020). One sample was at or below the optimal size for EDXRF non-destructive analysis so the elemental concentrations are somewhat below source standards, but the assignment is likely correct (Table 1 and Figure 1). Two samples were not obsidian. Specific instrumental methods can be found at <http://www.swxrflab.net/analysis.htm>, and Shackley (2005) or Shackley et al. (2019). Source assignment was made by comparison to source standard data in the laboratory. Analysis of the USGS RGM-1 standard indicates high machine precision for the elements of interest (Table 1 here).

Sincerely,

M. Steven Shackley, Ph.D.  
Director

VOICE: 510-393-3931  
INTERNET: shackley@berkeley.edu  
<http://www.swxrflab.net/>

## REFERENCES CITED

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2011 Factors Affecting the Energy-Dispersive X-Ray Fluorescence (EDXRF) Analysis of Archaeological Obsidian. In *X-Ray Fluorescence Spectrometry (XRF) in Geoarchaeology*, edited by M.S. Shackley, pp. 45-64. Springer, New York

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2005 *Obsidian: Geology and Archaeology in the North American Southwest*. University of Arizona Press, Tucson.

2013 The Secondary Distribution of Archaeological Obsidian in Rio Grande Quaternary Sediments, Jemez Mountains to San Antonito, New Mexico: Inferences for Paleoamerican Procurement and the Age of Sediments. Poster presented at the Paleoamerican Odyssey Conference, Santa Fe, New Mexico, October, 2013.

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2020 Distribution and Sources of Secondary Deposit Archaeological Obsidian in Rio Grande Quaternary Alluvium from Northern Through Central New Mexico, U.S.A. In preparation.

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2019 Elemental, Isotopic, and Geochronological Variability in Mogollon-Datil Volcanic Province Archaeological Obsidian, Southwestern USA: Solving Issues of Inter-Source Discrimination. *Geoarchaeology* 33:486-497.

Table 1. Elemental concentrations for the archaeological samples, and a USGS RGM-1 rhyolite standard. All measurements in parts per million (ppm).

| LA#-F#-CN     | Ti   | Mn  | Fe    | Rb  | Sr  | Y  | Zr  | Nb  | Ba  | Ce | Pb | Th | Source                       |
|---------------|------|-----|-------|-----|-----|----|-----|-----|-----|----|----|----|------------------------------|
| 20166-30-5    | 1593 | 532 | 13122 | 189 | 15  | 44 | 160 | 47  | 0   | 13 | 37 | 32 | Valles Rhy (Cerro del Medio) |
| 43414-110-153 | 908  | 366 | 10157 | 157 | 18  | 46 | 159 | 56  | 45  | 52 | 24 | 15 | Valles Rhy (Cerro del Medio) |
| 43414-110-166 | 749  | 169 | 5604  | 0   | 37  | 8  | 19  | 7   | 18  | 20 | 3  | 8  | not obsidian                 |
| 43414-404-79  | 1067 | 549 | 11697 | 214 | 11  | 60 | 170 | 89  | 39  | 26 | 36 | 28 | Cerro Toledo Rhy             |
| 43414-416-380 | 735  | 155 | 5900  | 0   | 38  | 7  | 16  | 1   | 144 | 20 | 0  | 4  | not obsidian                 |
| 43414-82-399  | 985  | 673 | 13629 | 218 | 10  | 58 | 154 | 77  | 3   | 18 | 47 | 28 | Cerro Toledo Rhy*            |
| 132924-15-2   | 895  | 544 | 11487 | 229 | 9   | 60 | 182 | 100 | 35  | 35 | 44 | 29 | Cerro Toledo Rhy             |
| 132962-8-1    | 1099 | 490 | 10774 | 208 | 11  | 62 | 179 | 93  | 6   | 12 | 35 | 22 | Cerro Toledo Rhy             |
| RGM1-S4       | 1598 | 297 | 13366 | 152 | 108 | 24 | 217 | 9   | 803 | 23 | 20 | 20 | standard                     |

\* This sample is smaller than the optimal dimensions for confident source assignment by EDXRF, but likely from this source (Davis et al. 2011).

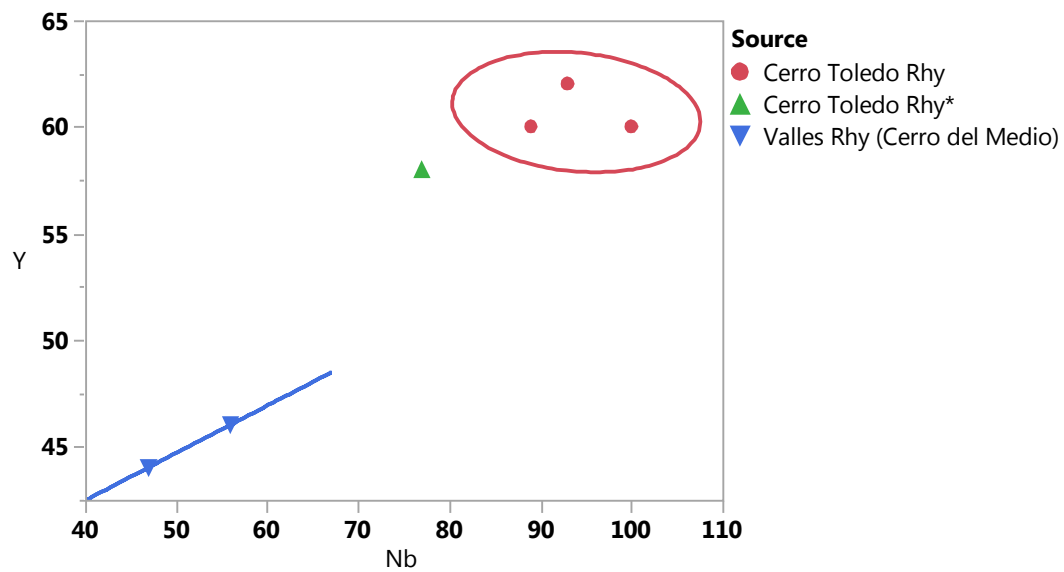


Figure 1. Nb/Y bivariate plot of the archaeological samples. Confidence ellipse and line at 95%.