SOURCE PROVENANCE OF OBSIDIAN ARTIFACTS FROM PUEBLO SALADO, CENTRAL ARIZONA

by

M. Steven Shackley, Ph.D.
Director
Archaeological XRF Laboratory
University of California, Berkeley

Report Prepared for

Center for Desert Archaeology
Tucson, Arizona

15 February 2006
INTRODUCTION

The analysis here of 215 stone artifacts from Classic contexts at Pueblo Salado in the Lower Salt River Valley, central Arizona, while indicating a very different obsidian source provenance assemblage than the pre-Classic contexts in this area, is remarkably similar to other Classic and Late Classic contexts in the Lower Salt River Valley. A dominance of local Sonoran Desert sources and a de-emphasis on the Coconino Plateau in the late period is a primary difference in procurement between the two periods.

LABORATORY SAMPLING, ANALYSIS AND INSTRUMENTATION

This assemblage was analyzed on a Spectrace/Thermo QuanX energy-dispersive x-ray spectrometer at the Archaeological XRF Laboratory, Department of Earth and Planetary Sciences at the University of California, Berkeley. All samples were analyzed whole with little or no formal preparation. The results presented here are quantitative in that they are derived from “filtered” intensity values ratioed to the appropriate x-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The spectrometer is equipped with an electronically cooled Cu x-ray target with a 125 micron Be window, an x-ray generator that operates from 4-50 kV/0.02-2.0 mA at 0.02 increments, using an IBM PC based microprocessor and WinTrace™ reduction software. The x-ray tube is operated at 30 kV, 0.14 mA, using a 0.05 mm (medium) Pd primary beam filter in an air path at 200 seconds livetime to generate x-ray intensity Kα-line data for elements titanium (Ti), manganese (Mn), iron (as FeT), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Weight percent iron (Fe₂O₃T) can be derived by multiplying ppm estimates
by 1.4297(10^-4). Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). Further details concerning the petrological choice of these elements in Southwest obsidians is available in Shackley (1992, 1995, 2003; also Mahood and Stimac 1990; and Hughes and Smith 1993). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1, SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLO-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, and BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France, and JR-1 and JR-2 obsidian standards from the Japan Geological Survey (Govindaraju 1994). In addition to the reported values here, Ni, Cu, Zn, Th, and Ga were measured, but these are rarely useful in discriminating glass sources and are not generally reported.

The data from both systems were translated directly into Excel™ for Windows software for manipulation and on into SPSS™ for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. An analysis of RGM-1 analyzed during each run is included in Table 1. Source nomenclature follows Shackley (1988, 1995, 1998a, 2005a). Further information on the laboratory instrumentation can be found at: http://www.swxrflab.net/. Trace element data exhibited in Table 1 are reported in parts per million (ppm), a quantitative measure by weight (see also Figures 1 and 2).
This assemblage, unlike some of the others, contained a number of samples that were near the smallest size that can be reliably analyzed with EDXRF (see Davis et. al. 1998; Table 1 here). It is likely that, at least some, if not all those sources that could not be assigned to source ("unknown") could be from known sources, but the elemental concentrations are too low to confidently assign to source. Similarly, the source assignments with question marks (?) are just outside the source standard elemental concentrations, and cannot as confidently be assigned to source. Nevertheless, the general pattern seems consistent with Classic and Late Classic obsidian source provenance in the Lower Salt River Valley.

DISCUSSION

Recent research of pre-Classical Hohokam obsidian procurement indicates that three of the “tool traditions” elucidated by Hoffman (1997) produced obsidian artifacts from very different sources (Shackley 2005). In the “Solares Tool Tradition” area that includes those pre-Classical sites along the Lower Salt River and surrounding areas, obsidian projectile points and other artifacts were produced from a nearly even mix of Vulture and Coconino Plateau (Government Mountain, RS Hill, Partridge Creek) sources. Indeed, some of the projectile point types were nearly identical to those produced on the plateau, and were all produced from Government Mountain obsidian (Shackley 2005:167-168). In the late period assemblage here from Pueblo Salado, similar to Las Colinas, only about 4% of the obsidian artifacts were produced from Coconino Plateau sources while the remainder (91.5%) were produced from western Arizona-Sonoran Desert sources Los Vidrios, Saucedo Mountains, Vulture, Superior, and Tank Mountains (Tables 1 and 2; see Shackley 2005b). The remaining 3.8% (n=8) could not be reliably assigned to source as discussed above. Certainly, the procurement “direction” changed dramatically between these two periods in the Lower Salt, potentially due to changes in the relationship with groups on the Coconino Plateau and continuing control of the Sonoran Desert.
territories. This “control” may have involved the continued relationship with the Patayan (proto-Yuman) groups in western Arizona, here recalling the “Patayan Barrio” reported at Las Colinas in the pre-Classic (McGuire 1992; Shackley 1998b, 2004, 2005; Shaul and Andresen 1989).

Parenthetically, I am concerned that the Government Mountain samples were indeed all originally from these late contexts. It is possible that at least some of the Coconino Plateau obsidian in this assemblage could be scavenged from pre-Classic trash or other contexts at Pueblo Salado or other contemporaneous sites. It’s worth keeping the possibility in mind.

REFERENCES CITED

Davis, M.K., T.L. Jackson, M.S. Shackley, T. Teague, and J. Hampel

Govindaraju, K.

Hampel, Joachim H.

Hildreth, W.

Hoffman, C.M.

Hughes, Richard E., and Robert L. Smith

Mahood, Gail A., and James A. Stimac

McCarthy, J.J., and F.H. Schamber

McGuire, Randall H.

Schamber, F.H.

Shackley, M. Steven


Shaul, David L., and J.M. Andresen
Table 1. Elemental concentrations and source assignments for the archaeological specimens. All measurements in parts per million (ppm).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Ti</th>
<th>Mn</th>
<th>Fe</th>
<th>Rb</th>
<th>Sr</th>
<th>Y</th>
<th>Zr</th>
<th>Nb</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSO-149</td>
<td>753</td>
<td>623</td>
<td>8196</td>
<td>107</td>
<td>82</td>
<td>17</td>
<td>75</td>
<td>57</td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-669</td>
<td>1667</td>
<td>371</td>
<td>6767</td>
<td>130</td>
<td>38</td>
<td>16</td>
<td>126</td>
<td>26</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-718</td>
<td>1225</td>
<td>290</td>
<td>12119</td>
<td>247</td>
<td>11</td>
<td>65</td>
<td>216</td>
<td>29</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-729</td>
<td>1145</td>
<td>223</td>
<td>10309</td>
<td>224</td>
<td>13</td>
<td>66</td>
<td>212</td>
<td>22</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-82</td>
<td>1687</td>
<td>456</td>
<td>9510</td>
<td>150</td>
<td>80</td>
<td>32</td>
<td>189</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-669</td>
<td>16854</td>
<td>413</td>
<td>8529</td>
<td>150</td>
<td>67</td>
<td>23</td>
<td>175</td>
<td>17</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-10</td>
<td>1471</td>
<td>233</td>
<td>9638</td>
<td>179</td>
<td>7</td>
<td>43</td>
<td>167</td>
<td>28</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-105</td>
<td>1403</td>
<td>406</td>
<td>9302</td>
<td>147</td>
<td>75</td>
<td>28</td>
<td>196</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-110</td>
<td>1383</td>
<td>399</td>
<td>8501</td>
<td>137</td>
<td>64</td>
<td>31</td>
<td>180</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-111</td>
<td>1584</td>
<td>447</td>
<td>9815</td>
<td>152</td>
<td>81</td>
<td>31</td>
<td>196</td>
<td>27</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-12</td>
<td>1407</td>
<td>276</td>
<td>10556</td>
<td>200</td>
<td>22</td>
<td>64</td>
<td>193</td>
<td>27</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-13</td>
<td>2158</td>
<td>281</td>
<td>7744</td>
<td>124</td>
<td>66</td>
<td>30</td>
<td>144</td>
<td>4</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-138</td>
<td>1527</td>
<td>412</td>
<td>8673</td>
<td>134</td>
<td>68</td>
<td>24</td>
<td>185</td>
<td>14</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-139</td>
<td>1512</td>
<td>408</td>
<td>9246</td>
<td>151</td>
<td>73</td>
<td>34</td>
<td>182</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-14</td>
<td>1512</td>
<td>454</td>
<td>9602</td>
<td>160</td>
<td>82</td>
<td>30</td>
<td>194</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-143</td>
<td>859</td>
<td>174</td>
<td>10017</td>
<td>220</td>
<td>12</td>
<td>65</td>
<td>210</td>
<td>34</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-146</td>
<td>1421</td>
<td>401</td>
<td>9796</td>
<td>159</td>
<td>74</td>
<td>35</td>
<td>200</td>
<td>12</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-147</td>
<td>1759</td>
<td>375</td>
<td>8351</td>
<td>143</td>
<td>66</td>
<td>21</td>
<td>178</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-148</td>
<td>1721</td>
<td>386</td>
<td>9719</td>
<td>158</td>
<td>70</td>
<td>27</td>
<td>183</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-15</td>
<td>874</td>
<td>652</td>
<td>7871</td>
<td>97</td>
<td>72</td>
<td>14</td>
<td>74</td>
<td>66</td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-159</td>
<td>1168</td>
<td>245</td>
<td>10820</td>
<td>227</td>
<td>12</td>
<td>64</td>
<td>210</td>
<td>20</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-17</td>
<td>2223</td>
<td>320</td>
<td>5842</td>
<td>94</td>
<td>28</td>
<td>16</td>
<td>94</td>
<td>23</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-172</td>
<td>738</td>
<td>624</td>
<td>7797</td>
<td>102</td>
<td>74</td>
<td>14</td>
<td>68</td>
<td>54</td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-175</td>
<td>2623</td>
<td>412</td>
<td>9427</td>
<td>146</td>
<td>69</td>
<td>28</td>
<td>179</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-176</td>
<td>1358</td>
<td>375</td>
<td>7727</td>
<td>131</td>
<td>39</td>
<td>20</td>
<td>124</td>
<td>13</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-177</td>
<td>1581</td>
<td>363</td>
<td>6971</td>
<td>121</td>
<td>43</td>
<td>15</td>
<td>126</td>
<td>20</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-18</td>
<td>1265</td>
<td>268</td>
<td>4802</td>
<td>55</td>
<td>19</td>
<td>4</td>
<td>57</td>
<td>25</td>
<td>not obsidian</td>
</tr>
<tr>
<td>PSO-181</td>
<td>1413</td>
<td>406</td>
<td>8818</td>
<td>151</td>
<td>70</td>
<td>34</td>
<td>191</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-186</td>
<td>1958</td>
<td>385</td>
<td>8041</td>
<td>130</td>
<td>46</td>
<td>25</td>
<td>156</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-188</td>
<td>1361</td>
<td>423</td>
<td>9018</td>
<td>150</td>
<td>70</td>
<td>30</td>
<td>186</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-19</td>
<td>2159</td>
<td>464</td>
<td>9367</td>
<td>138</td>
<td>64</td>
<td>19</td>
<td>150</td>
<td>14</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-194</td>
<td>1317</td>
<td>436</td>
<td>9143</td>
<td>156</td>
<td>74</td>
<td>29</td>
<td>188</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-195</td>
<td>1902</td>
<td>447</td>
<td>9518</td>
<td>151</td>
<td>73</td>
<td>24</td>
<td>184</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-199</td>
<td>1468</td>
<td>364</td>
<td>9306</td>
<td>158</td>
<td>72</td>
<td>25</td>
<td>203</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-20</td>
<td>1233</td>
<td>432</td>
<td>6997</td>
<td>126</td>
<td>43</td>
<td>12</td>
<td>127</td>
<td>24</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-200</td>
<td>879</td>
<td>259</td>
<td>10843</td>
<td>236</td>
<td>13</td>
<td>67</td>
<td>218</td>
<td>28</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-201</td>
<td>1444</td>
<td>372</td>
<td>9772</td>
<td>162</td>
<td>78</td>
<td>31</td>
<td>205</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-203</td>
<td>1225</td>
<td>443</td>
<td>7366</td>
<td>142</td>
<td>39</td>
<td>13</td>
<td>128</td>
<td>22</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-204</td>
<td>1393</td>
<td>405</td>
<td>9435</td>
<td>155</td>
<td>77</td>
<td>32</td>
<td>195</td>
<td>16</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-21</td>
<td>1053</td>
<td>231</td>
<td>11274</td>
<td>236</td>
<td>9</td>
<td>62</td>
<td>219</td>
<td>38</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-212</td>
<td>1599</td>
<td>393</td>
<td>8998</td>
<td>146</td>
<td>71</td>
<td>28</td>
<td>177</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-213</td>
<td>1519</td>
<td>409</td>
<td>9268</td>
<td>150</td>
<td>65</td>
<td>31</td>
<td>190</td>
<td>28</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-218</td>
<td>1327</td>
<td>304</td>
<td>11217</td>
<td>218</td>
<td>14</td>
<td>67</td>
<td>195</td>
<td>23</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-22</td>
<td>1377</td>
<td>460</td>
<td>7482</td>
<td>131</td>
<td>42</td>
<td>17</td>
<td>118</td>
<td>21</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-221</td>
<td>1500</td>
<td>424</td>
<td>9193</td>
<td>157</td>
<td>76</td>
<td>35</td>
<td>191</td>
<td>30</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-222</td>
<td>1795</td>
<td>414</td>
<td>8347</td>
<td>135</td>
<td>64</td>
<td>31</td>
<td>176</td>
<td>33</td>
<td>Sauceda Mts?</td>
</tr>
<tr>
<td>PSO-224</td>
<td>1009</td>
<td>225</td>
<td>11555</td>
<td>242</td>
<td>14</td>
<td>63</td>
<td>221</td>
<td>30</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-225</td>
<td>2548</td>
<td>379</td>
<td>8122</td>
<td>126</td>
<td>57</td>
<td>35</td>
<td>156</td>
<td>19</td>
<td>Sauceda Mts?</td>
</tr>
<tr>
<td>PSO-23</td>
<td>1413</td>
<td>342</td>
<td>9380</td>
<td>146</td>
<td>102</td>
<td>29</td>
<td>178</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-231</td>
<td>1417</td>
<td>438</td>
<td>9321</td>
<td>159</td>
<td>71</td>
<td>30</td>
<td>198</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>Sample</td>
<td>Ti</td>
<td>Mn</td>
<td>Fe</td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Source</td>
</tr>
<tr>
<td>---------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>------------</td>
</tr>
<tr>
<td>PSO-232</td>
<td>1358</td>
<td>385</td>
<td>8573</td>
<td>144</td>
<td>71</td>
<td>33</td>
<td>184</td>
<td>17</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-235</td>
<td>974</td>
<td>276</td>
<td>11564</td>
<td>232</td>
<td>12</td>
<td>60</td>
<td>220</td>
<td>24</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-236</td>
<td>1022</td>
<td>194</td>
<td>11064</td>
<td>226</td>
<td>16</td>
<td>65</td>
<td>205</td>
<td>25</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-237</td>
<td>1435</td>
<td>398</td>
<td>8658</td>
<td>144</td>
<td>68</td>
<td>39</td>
<td>183</td>
<td>26</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-239</td>
<td>1494</td>
<td>459</td>
<td>7282</td>
<td>133</td>
<td>42</td>
<td>10</td>
<td>128</td>
<td>24</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-24</td>
<td>1259</td>
<td>450</td>
<td>8689</td>
<td>117</td>
<td>42</td>
<td>17</td>
<td>114</td>
<td>21</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-240</td>
<td>982</td>
<td>262</td>
<td>11350</td>
<td>244</td>
<td>11</td>
<td>66</td>
<td>219</td>
<td>23</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-243</td>
<td>1333</td>
<td>343</td>
<td>8619</td>
<td>148</td>
<td>74</td>
<td>27</td>
<td>180</td>
<td>11</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-244</td>
<td>1123</td>
<td>216</td>
<td>10375</td>
<td>217</td>
<td>12</td>
<td>61</td>
<td>209</td>
<td>27</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-249</td>
<td>1405</td>
<td>287</td>
<td>6789</td>
<td>123</td>
<td>61</td>
<td>18</td>
<td>154</td>
<td>31</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-25</td>
<td>2300</td>
<td>314</td>
<td>5180</td>
<td>79</td>
<td>23</td>
<td>18</td>
<td>73</td>
<td>15</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-251</td>
<td>1545</td>
<td>449</td>
<td>10058</td>
<td>168</td>
<td>76</td>
<td>26</td>
<td>192</td>
<td>24</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-256</td>
<td>1241</td>
<td>292</td>
<td>12665</td>
<td>247</td>
<td>16</td>
<td>65</td>
<td>210</td>
<td>29</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-257</td>
<td>1750</td>
<td>263</td>
<td>6954</td>
<td>100</td>
<td>76</td>
<td>21</td>
<td>150</td>
<td>26</td>
<td>Government Mtn?</td>
</tr>
<tr>
<td>PSO-258</td>
<td>1796</td>
<td>411</td>
<td>9337</td>
<td>157</td>
<td>75</td>
<td>29</td>
<td>204</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-28</td>
<td>1808</td>
<td>404</td>
<td>9347</td>
<td>132</td>
<td>91</td>
<td>24</td>
<td>163</td>
<td>12</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-282</td>
<td>1381</td>
<td>443</td>
<td>7202</td>
<td>140</td>
<td>41</td>
<td>17</td>
<td>119</td>
<td>22</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-283</td>
<td>1231</td>
<td>370</td>
<td>6884</td>
<td>126</td>
<td>42</td>
<td>22</td>
<td>122</td>
<td>29</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-29</td>
<td>1092</td>
<td>607</td>
<td>6939</td>
<td>69</td>
<td>57</td>
<td>19</td>
<td>67</td>
<td>31</td>
<td>Government Mtn?</td>
</tr>
<tr>
<td>PSO-301</td>
<td>1325</td>
<td>453</td>
<td>7041</td>
<td>136</td>
<td>42</td>
<td>11</td>
<td>123</td>
<td>28</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-307</td>
<td>2143</td>
<td>422</td>
<td>5669</td>
<td>109</td>
<td>22</td>
<td>16</td>
<td>92</td>
<td>20</td>
<td>Superior</td>
</tr>
<tr>
<td>PSO-317</td>
<td>1291</td>
<td>411</td>
<td>6948</td>
<td>139</td>
<td>37</td>
<td>11</td>
<td>122</td>
<td>28</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-330</td>
<td>1603</td>
<td>174</td>
<td>4985</td>
<td>78</td>
<td>35</td>
<td>17</td>
<td>101</td>
<td>16</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-336</td>
<td>1634</td>
<td>335</td>
<td>8708</td>
<td>141</td>
<td>63</td>
<td>18</td>
<td>187</td>
<td>32</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-338</td>
<td>1333</td>
<td>391</td>
<td>8867</td>
<td>152</td>
<td>71</td>
<td>27</td>
<td>197</td>
<td>29</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-34</td>
<td>1358</td>
<td>250</td>
<td>10823</td>
<td>218</td>
<td>15</td>
<td>61</td>
<td>205</td>
<td>27</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-340</td>
<td>1466</td>
<td>422</td>
<td>9686</td>
<td>164</td>
<td>73</td>
<td>25</td>
<td>197</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-341</td>
<td>1258</td>
<td>525</td>
<td>7514</td>
<td>102</td>
<td>77</td>
<td>13</td>
<td>78</td>
<td>46</td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-342</td>
<td>2313</td>
<td>367</td>
<td>4541</td>
<td>74</td>
<td>13</td>
<td>28</td>
<td>52</td>
<td>12</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-343</td>
<td>1375</td>
<td>386</td>
<td>8848</td>
<td>147</td>
<td>74</td>
<td>30</td>
<td>193</td>
<td>26</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-348</td>
<td>1486</td>
<td>463</td>
<td>9794</td>
<td>156</td>
<td>74</td>
<td>35</td>
<td>194</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-35</td>
<td>951</td>
<td>234</td>
<td>9572</td>
<td>201</td>
<td>14</td>
<td>68</td>
<td>203</td>
<td>26</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-351</td>
<td>1550</td>
<td>369</td>
<td>8661</td>
<td>134</td>
<td>68</td>
<td>34</td>
<td>189</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-355</td>
<td>1690</td>
<td>385</td>
<td>8504</td>
<td>143</td>
<td>70</td>
<td>22</td>
<td>186</td>
<td>28</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-357</td>
<td>1875</td>
<td>465</td>
<td>6455</td>
<td>75</td>
<td>59</td>
<td>9</td>
<td>47</td>
<td>30</td>
<td>Government Mtn?</td>
</tr>
<tr>
<td>PSO-36</td>
<td>1380</td>
<td>230</td>
<td>10036</td>
<td>218</td>
<td>16</td>
<td>57</td>
<td>191</td>
<td>35</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-361</td>
<td>1895</td>
<td>420</td>
<td>8359</td>
<td>134</td>
<td>53</td>
<td>31</td>
<td>164</td>
<td>19</td>
<td>small</td>
</tr>
<tr>
<td>PSO-362</td>
<td>1159</td>
<td>290</td>
<td>11094</td>
<td>208</td>
<td>28</td>
<td>74</td>
<td>197</td>
<td>27</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-363</td>
<td>1225</td>
<td>464</td>
<td>5587</td>
<td>102</td>
<td>17</td>
<td>24</td>
<td>78</td>
<td>31</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-364</td>
<td>1422</td>
<td>420</td>
<td>9367</td>
<td>138</td>
<td>73</td>
<td>36</td>
<td>187</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-367</td>
<td>4864</td>
<td>373</td>
<td>8709</td>
<td>152</td>
<td>70</td>
<td>33</td>
<td>194</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-368</td>
<td>1826</td>
<td>260</td>
<td>10244</td>
<td>204</td>
<td>8</td>
<td>46</td>
<td>178</td>
<td>30</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-37</td>
<td>1133</td>
<td>274</td>
<td>10749</td>
<td>221</td>
<td>14</td>
<td>62</td>
<td>209</td>
<td>29</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-370</td>
<td>1232</td>
<td>206</td>
<td>10191</td>
<td>218</td>
<td>15</td>
<td>60</td>
<td>198</td>
<td>33</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-371</td>
<td>1515</td>
<td>406</td>
<td>9545</td>
<td>160</td>
<td>79</td>
<td>30</td>
<td>195</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-374</td>
<td>956</td>
<td>229</td>
<td>11305</td>
<td>241</td>
<td>12</td>
<td>73</td>
<td>220</td>
<td>28</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-389</td>
<td>2005</td>
<td>441</td>
<td>4612</td>
<td>72</td>
<td>36</td>
<td>0</td>
<td>95</td>
<td>0</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-39</td>
<td>977</td>
<td>242</td>
<td>10773</td>
<td>213</td>
<td>14</td>
<td>51</td>
<td>209</td>
<td>22</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO390</td>
<td>1334</td>
<td>394</td>
<td>8985</td>
<td>151</td>
<td>73</td>
<td>32</td>
<td>205</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>Sample</td>
<td>Ti</td>
<td>Mn</td>
<td>Fe</td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Source</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>PSO-391</td>
<td>1191</td>
<td>298</td>
<td>11944</td>
<td>245</td>
<td>9</td>
<td>69</td>
<td>216</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-393</td>
<td>977</td>
<td>284</td>
<td>12272</td>
<td>241</td>
<td>17</td>
<td>70</td>
<td>227</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-396</td>
<td>1425</td>
<td>492</td>
<td>10146</td>
<td>163</td>
<td>82</td>
<td>30</td>
<td>214</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-397</td>
<td>1528</td>
<td>468</td>
<td>9718</td>
<td>155</td>
<td>75</td>
<td>33</td>
<td>200</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-403</td>
<td>882</td>
<td>257</td>
<td>10376</td>
<td>218</td>
<td>11</td>
<td>63</td>
<td>217</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-405</td>
<td>697</td>
<td>517</td>
<td>7411</td>
<td>93</td>
<td>76</td>
<td>20</td>
<td>78</td>
<td></td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-406</td>
<td>1034</td>
<td>279</td>
<td>11497</td>
<td>224</td>
<td>21</td>
<td>73</td>
<td>218</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-415</td>
<td>1578</td>
<td>497</td>
<td>492</td>
<td>10146</td>
<td>163</td>
<td>82</td>
<td>30</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-417</td>
<td>1039</td>
<td>420</td>
<td>6642</td>
<td>130</td>
<td>39</td>
<td>11</td>
<td>119</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-421</td>
<td>1364</td>
<td>361</td>
<td>8626</td>
<td>150</td>
<td>73</td>
<td>35</td>
<td>195</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-423</td>
<td>1138</td>
<td>263</td>
<td>11156</td>
<td>232</td>
<td>12</td>
<td>70</td>
<td>223</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-426</td>
<td>1536</td>
<td>437</td>
<td>9307</td>
<td>152</td>
<td>74</td>
<td>26</td>
<td>186</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-428</td>
<td>1536</td>
<td>411</td>
<td>9709</td>
<td>158</td>
<td>76</td>
<td>32</td>
<td>203</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-430</td>
<td>2648</td>
<td>316</td>
<td>5972</td>
<td>87</td>
<td>48</td>
<td>6</td>
<td>104</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-433</td>
<td>997</td>
<td>236</td>
<td>10731</td>
<td>235</td>
<td>8</td>
<td>70</td>
<td>215</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-434</td>
<td>1373</td>
<td>392</td>
<td>8889</td>
<td>149</td>
<td>76</td>
<td>24</td>
<td>185</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-435</td>
<td>1013</td>
<td>258</td>
<td>11017</td>
<td>240</td>
<td>14</td>
<td>66</td>
<td>220</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-441</td>
<td>1530</td>
<td>420</td>
<td>9199</td>
<td>156</td>
<td>70</td>
<td>24</td>
<td>195</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-444</td>
<td>1676</td>
<td>387</td>
<td>8918</td>
<td>154</td>
<td>72</td>
<td>20</td>
<td>190</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-446</td>
<td>1595</td>
<td>430</td>
<td>9688</td>
<td>154</td>
<td>77</td>
<td>32</td>
<td>203</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-447</td>
<td>1085</td>
<td>266</td>
<td>12226</td>
<td>247</td>
<td>26</td>
<td>62</td>
<td>221</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-449</td>
<td>1170</td>
<td>336</td>
<td>8147</td>
<td>146</td>
<td>67</td>
<td>28</td>
<td>183</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-450</td>
<td>1011</td>
<td>261</td>
<td>11426</td>
<td>235</td>
<td>15</td>
<td>66</td>
<td>223</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-451</td>
<td>1472</td>
<td>396</td>
<td>9480</td>
<td>163</td>
<td>77</td>
<td>27</td>
<td>202</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-452</td>
<td>847</td>
<td>221</td>
<td>10562</td>
<td>216</td>
<td>18</td>
<td>67</td>
<td>210</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-453</td>
<td>1229</td>
<td>239</td>
<td>11248</td>
<td>242</td>
<td>13</td>
<td>69</td>
<td>220</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-473</td>
<td>803</td>
<td>235</td>
<td>9778</td>
<td>219</td>
<td>11</td>
<td>64</td>
<td>197</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-474</td>
<td>1500</td>
<td>451</td>
<td>10002</td>
<td>163</td>
<td>79</td>
<td>36</td>
<td>215</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-476</td>
<td>1016</td>
<td>236</td>
<td>11259</td>
<td>232</td>
<td>13</td>
<td>66</td>
<td>218</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-477</td>
<td>1298</td>
<td>417</td>
<td>9007</td>
<td>150</td>
<td>66</td>
<td>26</td>
<td>196</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-478</td>
<td>1492</td>
<td>485</td>
<td>9904</td>
<td>165</td>
<td>73</td>
<td>30</td>
<td>205</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-479</td>
<td>985</td>
<td>217</td>
<td>11248</td>
<td>231</td>
<td>13</td>
<td>70</td>
<td>224</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-480</td>
<td>875</td>
<td>172</td>
<td>9434</td>
<td>210</td>
<td>15</td>
<td>52</td>
<td>189</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-481</td>
<td>984</td>
<td>263</td>
<td>11211</td>
<td>232</td>
<td>13</td>
<td>62</td>
<td>224</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-490</td>
<td>897</td>
<td>253</td>
<td>10989</td>
<td>229</td>
<td>14</td>
<td>62</td>
<td>220</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-495</td>
<td>1229</td>
<td>371</td>
<td>9020</td>
<td>154</td>
<td>71</td>
<td>26</td>
<td>183</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-496</td>
<td>958</td>
<td>231</td>
<td>11629</td>
<td>242</td>
<td>14</td>
<td>63</td>
<td>204</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-5</td>
<td>1288</td>
<td>456</td>
<td>7240</td>
<td>136</td>
<td>36</td>
<td>21</td>
<td>127</td>
<td></td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-500</td>
<td>1022</td>
<td>251</td>
<td>11924</td>
<td>245</td>
<td>12</td>
<td>72</td>
<td>232</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-507</td>
<td>930</td>
<td>219</td>
<td>10835</td>
<td>237</td>
<td>12</td>
<td>71</td>
<td>222</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-51</td>
<td>1983</td>
<td>430</td>
<td>9788</td>
<td>167</td>
<td>78</td>
<td>20</td>
<td>182</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-52</td>
<td>2103</td>
<td>236</td>
<td>9157</td>
<td>187</td>
<td>12</td>
<td>48</td>
<td>164</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-526</td>
<td>958</td>
<td>267</td>
<td>11451</td>
<td>230</td>
<td>13</td>
<td>71</td>
<td>215</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-532</td>
<td>1787</td>
<td>338</td>
<td>7348</td>
<td>115</td>
<td>52</td>
<td>28</td>
<td>150</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-541</td>
<td>1407</td>
<td>409</td>
<td>9069</td>
<td>151</td>
<td>81</td>
<td>25</td>
<td>194</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-543</td>
<td>1202</td>
<td>392</td>
<td>8161</td>
<td>134</td>
<td>67</td>
<td>29</td>
<td>184</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-546</td>
<td>1328</td>
<td>409</td>
<td>9251</td>
<td>158</td>
<td>75</td>
<td>27</td>
<td>189</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-551</td>
<td>1247</td>
<td>433</td>
<td>9039</td>
<td>154</td>
<td>71</td>
<td>28</td>
<td>197</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-552</td>
<td>1012</td>
<td>251</td>
<td>11334</td>
<td>235</td>
<td>17</td>
<td>62</td>
<td>218</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-559</td>
<td>1994</td>
<td>309</td>
<td>6656</td>
<td>109</td>
<td>57</td>
<td>16</td>
<td>148</td>
<td></td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-56</td>
<td>2453</td>
<td>297</td>
<td>7699</td>
<td>118</td>
<td>57</td>
<td>28</td>
<td>151</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-562</td>
<td>962</td>
<td>236</td>
<td>10802</td>
<td>232</td>
<td>11</td>
<td>62</td>
<td>212</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-563</td>
<td>1139</td>
<td>238</td>
<td>10362</td>
<td>229</td>
<td>13</td>
<td>56</td>
<td>198</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>Sample</td>
<td>Ti</td>
<td>Mn</td>
<td>Fe</td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Source</td>
</tr>
<tr>
<td>PSO-565</td>
<td>1237</td>
<td>267</td>
<td>11557</td>
<td>242</td>
<td>18</td>
<td>61</td>
<td>207</td>
<td></td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>Sample</td>
<td>Ti</td>
<td>Mn</td>
<td>Fe</td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Source</td>
</tr>
<tr>
<td>--------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>---------</td>
</tr>
<tr>
<td>PSO-566</td>
<td>1363</td>
<td>411</td>
<td>9571</td>
<td>162</td>
<td>72</td>
<td>27</td>
<td>195</td>
<td>18</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-567</td>
<td>750</td>
<td>218</td>
<td>9178</td>
<td>192</td>
<td>15</td>
<td>65</td>
<td>182</td>
<td>25</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-569</td>
<td>960</td>
<td>233</td>
<td>10776</td>
<td>228</td>
<td>10</td>
<td>69</td>
<td>212</td>
<td>28</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-570</td>
<td>1592</td>
<td>413</td>
<td>9713</td>
<td>158</td>
<td>75</td>
<td>33</td>
<td>198</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-573</td>
<td>1512</td>
<td>477</td>
<td>9772</td>
<td>167</td>
<td>71</td>
<td>29</td>
<td>198</td>
<td>21</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-579</td>
<td>1392</td>
<td>353</td>
<td>8949</td>
<td>150</td>
<td>78</td>
<td>31</td>
<td>195</td>
<td>28</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-58</td>
<td>1578</td>
<td>476</td>
<td>9905</td>
<td>162</td>
<td>81</td>
<td>32</td>
<td>204</td>
<td>28</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-585</td>
<td>1410</td>
<td>416</td>
<td>9387</td>
<td>150</td>
<td>79</td>
<td>33</td>
<td>195</td>
<td>17</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-586</td>
<td>1344</td>
<td>436</td>
<td>9140</td>
<td>153</td>
<td>69</td>
<td>26</td>
<td>189</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-587</td>
<td>887</td>
<td>651</td>
<td>8184</td>
<td>110</td>
<td>77</td>
<td>20</td>
<td>80</td>
<td>44</td>
<td>Government Mtn</td>
</tr>
<tr>
<td>PSO-589</td>
<td>1488</td>
<td>410</td>
<td>9379</td>
<td>154</td>
<td>77</td>
<td>26</td>
<td>193</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-593</td>
<td>1757</td>
<td>171</td>
<td>8718</td>
<td>171</td>
<td>9</td>
<td>47</td>
<td>162</td>
<td>16</td>
<td>Los Vidrios?</td>
</tr>
<tr>
<td>PSO-594</td>
<td>1047</td>
<td>233</td>
<td>10397</td>
<td>220</td>
<td>14</td>
<td>55</td>
<td>205</td>
<td>41</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-599</td>
<td>1558</td>
<td>215</td>
<td>9654</td>
<td>187</td>
<td>17</td>
<td>47</td>
<td>173</td>
<td>33</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-6</td>
<td>1473</td>
<td>405</td>
<td>6850</td>
<td>114</td>
<td>33</td>
<td>13</td>
<td>104</td>
<td>11</td>
<td>unknown</td>
</tr>
<tr>
<td>PSO-600</td>
<td>2284</td>
<td>403</td>
<td>9841</td>
<td>140</td>
<td>79</td>
<td>28</td>
<td>187</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-601</td>
<td>1814</td>
<td>376</td>
<td>8642</td>
<td>143</td>
<td>72</td>
<td>27</td>
<td>178</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-603</td>
<td>1342</td>
<td>406</td>
<td>9101</td>
<td>150</td>
<td>68</td>
<td>35</td>
<td>195</td>
<td>28</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-604</td>
<td>1383</td>
<td>341</td>
<td>8523</td>
<td>147</td>
<td>69</td>
<td>33</td>
<td>176</td>
<td>15</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-605</td>
<td>1363</td>
<td>384</td>
<td>9134</td>
<td>150</td>
<td>76</td>
<td>32</td>
<td>192</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-61</td>
<td>1424</td>
<td>432</td>
<td>9035</td>
<td>155</td>
<td>69</td>
<td>29</td>
<td>196</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-611</td>
<td>1588</td>
<td>441</td>
<td>9645</td>
<td>156</td>
<td>75</td>
<td>34</td>
<td>196</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-614</td>
<td>1476</td>
<td>404</td>
<td>9239</td>
<td>153</td>
<td>70</td>
<td>28</td>
<td>187</td>
<td>16</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-615</td>
<td>1477</td>
<td>422</td>
<td>9272</td>
<td>155</td>
<td>79</td>
<td>33</td>
<td>189</td>
<td>23</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-619</td>
<td>1673</td>
<td>500</td>
<td>10256</td>
<td>175</td>
<td>78</td>
<td>27</td>
<td>205</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-62</td>
<td>978</td>
<td>198</td>
<td>11225</td>
<td>236</td>
<td>16</td>
<td>69</td>
<td>228</td>
<td>22</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-629</td>
<td>1413</td>
<td>423</td>
<td>9629</td>
<td>156</td>
<td>79</td>
<td>32</td>
<td>202</td>
<td>24</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-639</td>
<td>1076</td>
<td>277</td>
<td>12069</td>
<td>250</td>
<td>12</td>
<td>59</td>
<td>218</td>
<td>25</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-640</td>
<td>1443</td>
<td>434</td>
<td>9615</td>
<td>155</td>
<td>74</td>
<td>27</td>
<td>199</td>
<td>29</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-662</td>
<td>1582</td>
<td>328</td>
<td>8491</td>
<td>144</td>
<td>69</td>
<td>28</td>
<td>180</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-67</td>
<td>1442</td>
<td>430</td>
<td>9387</td>
<td>158</td>
<td>78</td>
<td>32</td>
<td>199</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-673</td>
<td>2372</td>
<td>354</td>
<td>6764</td>
<td>118</td>
<td>34</td>
<td>14</td>
<td>123</td>
<td>20</td>
<td>Vulture</td>
</tr>
<tr>
<td>PSO-683</td>
<td>1044</td>
<td>232</td>
<td>10876</td>
<td>233</td>
<td>12</td>
<td>77</td>
<td>215</td>
<td>30</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-689</td>
<td>1450</td>
<td>413</td>
<td>9292</td>
<td>163</td>
<td>73</td>
<td>30</td>
<td>198</td>
<td>27</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-692</td>
<td>2772</td>
<td>336</td>
<td>7601</td>
<td>119</td>
<td>57</td>
<td>16</td>
<td>160</td>
<td>24</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-695</td>
<td>1805</td>
<td>455</td>
<td>9377</td>
<td>148</td>
<td>78</td>
<td>32</td>
<td>180</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-697</td>
<td>2460</td>
<td>255</td>
<td>3841</td>
<td>51</td>
<td>5</td>
<td>23</td>
<td>42</td>
<td>14</td>
<td>too small</td>
</tr>
<tr>
<td>PSO-7</td>
<td>1632</td>
<td>452</td>
<td>9335</td>
<td>146</td>
<td>74</td>
<td>34</td>
<td>186</td>
<td>14</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-700</td>
<td>2641</td>
<td>242</td>
<td>3597</td>
<td>29</td>
<td>11</td>
<td>8</td>
<td>46</td>
<td>9</td>
<td>too small</td>
</tr>
<tr>
<td>PSO-703</td>
<td>908</td>
<td>251</td>
<td>11334</td>
<td>229</td>
<td>16</td>
<td>63</td>
<td>215</td>
<td>31</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-705</td>
<td>956</td>
<td>219</td>
<td>10713</td>
<td>234</td>
<td>15</td>
<td>63</td>
<td>212</td>
<td>35</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-707</td>
<td>1602</td>
<td>401</td>
<td>9284</td>
<td>154</td>
<td>73</td>
<td>25</td>
<td>182</td>
<td>31</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-708</td>
<td>1472</td>
<td>437</td>
<td>9482</td>
<td>165</td>
<td>71</td>
<td>31</td>
<td>188</td>
<td>24</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-711</td>
<td>1719</td>
<td>331</td>
<td>7320</td>
<td>120</td>
<td>64</td>
<td>11</td>
<td>160</td>
<td>14</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-713</td>
<td>859</td>
<td>413</td>
<td>7982</td>
<td>135</td>
<td>133</td>
<td>31</td>
<td>116</td>
<td>22</td>
<td>Tank Mts</td>
</tr>
<tr>
<td>PSO-714</td>
<td>1254</td>
<td>254</td>
<td>11690</td>
<td>241</td>
<td>13</td>
<td>64</td>
<td>216</td>
<td>27</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-715</td>
<td>1763</td>
<td>381</td>
<td>8469</td>
<td>138</td>
<td>64</td>
<td>33</td>
<td>174</td>
<td>20</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-721</td>
<td>1594</td>
<td>395</td>
<td>9196</td>
<td>154</td>
<td>77</td>
<td>33</td>
<td>198</td>
<td>19</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-726</td>
<td>1564</td>
<td>437</td>
<td>9233</td>
<td>163</td>
<td>73</td>
<td>23</td>
<td>195</td>
<td>25</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-727</td>
<td>1664</td>
<td>440</td>
<td>8916</td>
<td>144</td>
<td>77</td>
<td>24</td>
<td>182</td>
<td>15</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-731</td>
<td>1590</td>
<td>412</td>
<td>8556</td>
<td>143</td>
<td>60</td>
<td>24</td>
<td>176</td>
<td>22</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>PSO-74</td>
<td>1414</td>
<td>394</td>
<td>9174</td>
<td>154</td>
<td>71</td>
<td>28</td>
<td>185</td>
<td>30</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>Sample</td>
<td>Ti</td>
<td>Mn</td>
<td>Fe</td>
<td>Rb</td>
<td>Sr</td>
<td>Y</td>
<td>Zr</td>
<td>Nb</td>
<td>Source</td>
</tr>
<tr>
<td>--------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>---------</td>
</tr>
<tr>
<td>PSO-8</td>
<td>1401</td>
<td>202</td>
<td>9627</td>
<td>200</td>
<td>13</td>
<td>54</td>
<td>177</td>
<td>37</td>
<td>Los Vidrios</td>
</tr>
<tr>
<td>PSO-83</td>
<td>1545</td>
<td>406</td>
<td>9665</td>
<td>160</td>
<td>77</td>
<td>30</td>
<td>207</td>
<td>29</td>
<td>Sauceda Mts</td>
</tr>
<tr>
<td>Source</td>
<td>Frequency</td>
<td>Percent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Mtn</td>
<td>7</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Mtn?</td>
<td>2</td>
<td>.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Vidrios</td>
<td>64</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Vidrios?</td>
<td>1</td>
<td>.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sauceda Mts</td>
<td>101</td>
<td>47.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sauceda Mts?</td>
<td>10</td>
<td>4.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>1</td>
<td>.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank Mts</td>
<td>1</td>
<td>.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unknown</td>
<td>8</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulture</td>
<td>16</td>
<td>7.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>211</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Frequency distribution of obsidian source provenance in late period contexts at Las Colinas.
Figure 1. Rb, Sr, Zr three-dimensional plot of the elemental concentrations for the archaeological specimens. See the Rb versus Sr biplot below for clarity in discriminating Saucedo Mountains and Vulture.
Figure 2. Rb versus Sr biplot of the elemental concentrations more effectively separating Vulture and Sauceda Mountains assigned artifacts.