

SUPPLEMENTAL FILE 1

CRITICAL DATA FOR OUTFLOW IGNIMBRITE COOLING UNITS IN SELECT STRATIGRAPHIC SECTIONS IN THE CENTRAL NEVADA IGNIMBRITE FIELD

Section descriptions begin in “outflow alley” between the Indian Peak-Caliente and Central Nevada caldera complexes on the east and progress westward into the Central Nevada complex. For additional data (locations, complete chemical and modal analyses, etc.) see other Supplemental Files in this article and in Best et al., [2013b].

Explanation of terms

Stratigraphic unit: Name of the stratigraphic unit or brief description if not named. Units erupted from the Central Nevada caldera complex unless otherwise noted--(I) from the Indian Peak-Caliente caldera complex described in Best et al. (2013b); and (wNV) for Western Nevada field (Henry and John, this themed issue). The Wells Station section contains the Nine Hill Tuff (formerly unit D of Bates Mountain Tuff) which has a source in western Nevada (Deino, 1985)

Sample: For stratigraphic units in the Central Nevada field, the first letter denotes the stratigraphic unit (see Table 1 for letter symbols); the second and any additional letters/numbers are specific for that sample/site. Letters are capitalized for an unquestionable stratigraphic identity or correlation (e.g., YG); lower case for uncertain or only possible correlation/identity (yj). For stratigraphic units derived from the Indian Peak-Caliente caldera complex, sample numbers are mnemonic for the topographic quadrangle followed by a number for the sample site and a letter for position in the stratigraphic sequence, beginning at the base (e.g., SHNG-1E is sample in the Shingle Pass quadrangle at site 1, fifth unit up from base of section).

PM sample: Paleomagnetic sample site from Gromme and Hudson (this themed issue).

Thick: Thickness in meters of the entire cooling unit at the site. Measured in the field by M.G. Best where no geologic map is available. Where only a partial section is exposed, the thickness in meters is indicated as, e.g., >24. Where the thickness is variable as, e.g., ~30. Where the identity of the unit is uncertain as, e.g., 45?

Mode: Modal proportions (volume % of phenocrysts) are listed in the following order: plagioclase/quartz/sanidine/biotite/hornblende/clinopyroxene/orthopyroxene/opaques//volume % of total phenocrysts in whole rock. Mode is underlined if it is an average for unit; otherwise mode is specific for sample in this stratigraphic section. Modes for the Lower Tuff Member of the Shingle Pass Formation include 1-2 % altered Fe-rich olivine. Modes for the Lund Formation and Silver King Tuff include a trace of titanite.

Age: $^{40}\text{Ar}/^{39}\text{Ar}$ ages in millions of years referred to Fish Canyon Tuff sanidine irradiation monitor at 28.20 Ma. If \pm (one sigma) is indicated, the age is for the sample from this section; otherwise, cited age is weighted mean for unit from Table 1.

SUPPLEMENTAL TABLE 1.1

Stratigraphic section in Milk Ranch Canyon in the southern Egan Range on the Brown Knoll, Nevada 7.5 minute topographic map at approximately 38° 45' 20" N, 114° 54' 20" W.

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM</u> <u>sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|---|---------------|----------------------------|--------------|--|------------|
| Sandstone and conglomerate, clasts of Paleozoic rocks | | | | | |
| Pahrnagat Formation | AE | 0-20 | | <u>31/28/35/5/0/0/0/1//20</u> | 22.93 |
| Sandstone and conglomerate, clasts of Paleozoic rocks | | | | | |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member (?) | zc | | <10 | <u>54/<1/32/8/1/1/1/2//8</u> | 26.36 |
| Lower Tuff Member of | XD | | 35 | <u>34/10/48/2/<1/1/2/3//14</u> 27.16 | |
| Wah Wah Springs Formation (I) | | 4L121 | 0-30 | <u>59/5/0/10/19/3/0/4//32</u> | 30.06 |
| Cottonwood Wash Tuff (I) | | | ~ 5 | <u>55.6/11.6/2.6/12.2/12.1/0.8/0/5.1//39.1</u> | 31.13 |
| Windous Butte Formation | WE | 4L113 | 90 | <u>51/20/13/10/3/1/<1/2//30</u> | 31.73 |
| Intermediate composition lava flows | | | >100 | | |
| Conglomerate, clasts of Paleozoic rock | | | ~5 | | |
| Stone Cabin Formation | | | | | |
| Upper Tuff Member | SA | 4L129 | | <u>31/42/20/7/0/0/0/<1//33</u> 35.77 | |
| Middle Tuff Member | SP | | ~60 | <u>36/29/27/7/0/0/0/<1//29</u> 35.87 | |
| Bedded tuff, limestone, and conglomerate of Paleozoic rocks | | | | | |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.2

Stratigraphic section at Shingle Spring in the southern Egan Range on the Shingle Pass, Nevada 7.5 minute topographic map at approximately 38° 33' 00"N, 114° 56' 00"W.

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM</u> <u>sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|---|---------------|----------------------------|--------------|--|------------|
| Pahranagat Formation | AZ | 7L435 | 20 | 31/29/34/5/tr/0/0/1//18 | 22.96±0.05 |
| Condor Canyon Formation (I) | | | | | |
| Bauers Tuff Member | | 7L425 | 10 | <u>49/0/44/6/0/<1/0/1//15</u> | 23.07±0.08 |
| Conglomerate, clasts of Wah Wah Springs Formation | | | ~10 | | |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | ZX | 7T533, 7T541 | 40 | 51-57/<1/27-31/8-10/2-3/2-4/0/2-4//5-6 | 26.34±0.09 |
| Lower Tuff Member | XU | 7T415, 7T525 | 35 | 26-35/9-14/51-55/0/<1/<2/1-2/1//13 | 27.16 |
| Wah Wah Springs Formation (I) | | 7T517 | 60 | <u>59/5/0/10/19/3/0/4//32</u> | 30.06 |
| Cottonwood Wash Tuff (I) | | 7L405 | 120 | <u>55.6/11.6/2.6/12.2/12.1/0.8/0/5.1//39.1</u> | 31.13 |
| Windous Butte Formation | WAP | 7L389 | 165 | 48/10/16/16/6/<1/0/3//17 | 31.81±0.10 |
| | WAQ | 7L396 | | 39/32/19/7/2/0/0/1//44 | |
| Conglomerate, clasts of Paleozoic rock | | | ~400 | | |
| Dacitic lava flow | | 7L378 | ~200 | | |
| Currant Tuff(?) | | | ~80 | | |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.3

Stratigraphic section east of Wells Station in the eastern Grant Range on the Currant, Nevada 15 minute topographic map at approximately 38° 36' 20"N, 115° 16' 20"W.

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM</u> <u>sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|-------------------------------|---------------|----------------------------|--------------|---|------------|
| Nine Hill Tuff (wNV) | CRNT-1E | | >5 | 1/<1/88/<1/0/6/0/4/3 | 25.48 |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | ZF | 7T501 | 10 | <u>54/<1/32/8/1/1/1/2//8</u> | 26.36 |
| Hancock Tuff Member | HC | | 5 | <u>31-40/18-32/35-36/2-4/0-1/0/0/1//11-23</u> | 26.82 |
| Lower Tuff Member | XG | 7T509 | 10 | <u>34/10/48/2/<1/1/2/3//14</u> | 27.16 |
| Wah Wah Springs Formation (I) | CRNT-1A | 7L368 | 60 | <u>59/5/0/10/19/3/0/4//32</u> | 30.06 |
| Windous Butte Formation | WG | 7L346, 7L358 | 280 | <u>51/20/13/10/3/1/<1/2//30</u> | 31.73 |
| | WH | 7L325 | >260 | | |
| Stone Cabin Formation | | | | | |
| Upper Tuff Member | SD, SEaup | 7L336, 2P053 | >120 | <u>15/47/33/3/<1/0/0/<1//36</u> | 35.76±0.07 |
| Middle Tuff Member | SQ | 2P041, 2P049 | 180 | <u>37/37/18/8/<1/0/0/<1//35</u> | |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.4

Stratigraphic section in the Golden Gate Range at approximately 38° 13'N, 115° 18'W. See also Figure 7 in Best et al. (2013a).

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|-------------------------------|---------------|------------------|--------------|--|------------|
| Mafic lava | | | | | |
| Pahranagat Formation | AAG | | ~60 | 36/26/31/5/1/1/0/1//29 | 22.93 |
| Condor Canyon Formation (I) | | | | | |
| Bauers Tuff Member | WATERNE-1J | | 15 | <u>49/0/44/6/0/<1/0/1//15</u> | 23.04 |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | ZU | | 30 | <u>54/<1/32/8/1/1/1/2//8</u> | 26.36 |
| Hancock Tuff Member | HJ | | 116 | <u>31-40/18-32/35-36/2-4/0-1/0/0/1//11-23</u> | 26.82 |
| Lower Tuff Member | XR | | 40 | 31-38/14-17/40-49/0/0/<1/<1/2-4//12-14 | 27.16 |
| Monotony Tuff | MO | | 55 | <u>60/15/7/18/6/4/1/2//34</u> | 27.57 |
| Lund Formation (I) | WATERNE-1-12m | | 100 | 53/4-15/3-6/13-16/10-17/0/0/5//10-18 | 29.20 |
| Silver King Tuff (I) | WATERNE-1C | | | | |
| | 1P380, | | 50 | 45-61/15-28/3-7/13-16/2-4/0/0/2-3//27-37 | 29.40 |
| | 1P388 | | | | |
| Wah Wah Springs Formation (I) | | 1P372 | 30 | <u>59/5/0/10/19/3/0/4//32</u> | 30.06 |
| Cottonwood Wash Tuff (I) | | 1P364 | 20 | <u>55.6/11.6/2.6/12.2/12.1/0.8/0/5.1//39.1</u> | 31.13 |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.5

Stratigraphic section about 0.7 km southeast of Hancock Summit at the north end of the Pahranaagat Range on the Hancock Summit, Nevada 7.5 minute topographic maps at approximately 37°26'N 115°22'W. The section parallels Nevada State Highway 375. Going down stratigraphically through the gently north-dipping units, the section extends from about the 1800 m contour on the north side of hill 1841 to its top and then down the south side to the gully at the bottom of the hill. See also Figure 49.

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|---------------------------|---------------|------------------|--------------|---|-------------|
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | ZM | 7T853 | ~100 | 48-73/0-4/19-38/4-11/1-2/<1/1/2-5//5-11 | 26.36 |
| Tikaboo Tuff Member | YG | 7T845 | 32 | 55-58/1-4/20-32/6-14/0-2/0-3/1/1-4//7-9 | 26. XX±0.06 |
| Hancock Tuff Member | HF | 7T804, 7T812 | 64 | 31-40/18-32/35-36/2-4/0-1/0/0/1//11-23 | 26.82 ±0.09 |
| Lower Tuff Member | XK | 7T820 | 40 | 26-33/10/48-60/<2/<1/1-2/<1/2-6//12-16 | 27.16 |
| Isom Formation | | | | | |
| Bald Hills Member (I) | | 7T828 | 6 | <u>83/<1/<1/0/0/4/8/5//13</u> | 27.90-27.25 |
| Monotony Tuff | MI | 7T836 | 120 | 57/16/5/13/8/1/0/1//45 | 27.69±0.09 |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.6

Stratigraphic section southeast of Coyote Summit on Nevada State Highway 375 on the Tempiute Mountain South, Nevada 7.5 minute topographic map. Beginning about 300 m east of the summit, the contact of paleomagnetic unit A of the Monotony Tuff with underlying Paleozoic rocks lies about 150 m north of the highway. The section proceeds southward stratigraphically upward in the gently south-dipping units along a longitudinal meridian of about 115° 39' 53" W for about 1.3 km to a saddle wherein lies a fault, then offsetting 0.5 km to the west and continuing southward towards the top of hill 5581.

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|---------------------------------------|---------------|------------------|--------------|---------------------------------------|-------------|
| Dacitic lava flow | | | | | |
| Pahranagat Formation | AAC | 1P346 | 60 | 19-31/33-50/22-37/1-3/0/0/0/<1//26-32 | 22.93 |
| Tuff of Lunar Cuesta | | | | | |
| High-silica rhyolite facies | BE | | ~20 | 38/32/21/8/0/0/0/1//22 | 25.70 |
| Shingle Pass Formation | | | | | |
| Sawmill Canyon Tuff | TEMPMS -1A | | | | |
| Member(?) | | 1P342 | 20 | 34/14/49/2/0/0/0/0//17 | 25.99±0.05 |
| Upper Tuff Member, upper cooling unit | ZYu | | ~10 | 65/0/19/14/1/0/0/1//4 | 26.35±0.04 |
| Bedded tuff | | | | A few cm | |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member, lower cooling unit | ZY1 | 1P334 | ~15 | 56/0/33/8/1/0/0/3//6 | 26.42 ±0.04 |
| Tikaboo Tuff Member | YR | 1P326 | ~75 | 48/2/19/8/20/3//13 | 26.78 ±0.04 |
| Hancock Tuff Member | HK | | 60 | 22/46/28/3/0/0/0/<1//32 | 26.82 |
| Isom-type tuff | IL | 1P318 | 1 | <u>83/<1/<1/0/0/4/8/5//13</u> | 26.87±0.06 |
| Shingle Pass Formation | | | | | |
| Lower Tuff Member | XW | 1P310 | 60 | 38/17/42/0/0/0/0/3//13 | 27.16 |
| Monotony Tuff | | | | | |
| Unit B | MQ | 1P294 | ~125 | 60/14/2/15/5/3/<1/2//44 | 27.56±0.06 |
| Unit A | MP | 1P302 | 250 | 53/18/6/13/6/4/0/2//54 | 27.64 |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.7
 Composite stratigraphic section in the Lunar Crater, Nevada quadrangle
 (Snyder et al., 1972; see also Askren, 1992, and Askren et al., 1997).

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|--|---------------|------------------------|--------------|---|------------|
| Quaternary basaltic lava flows and cinder deposits | | | | | |
| Pahrnagat Formation | AH | 7T869 | 110 | 20-25/30-50/20-40/b/tr/tr/0/0.5//20-30 | 22.91±0.06 |
| Isom-type tuff of Black Beauty Mesa | | | | | |
| Upper cooling unit | ICd | 8P725 | 30 | 75-85/0-2/0/0/tr/0-6/10-12/5//15-17 | |
| Lower cooling unit | ICc | 8P717 | 30 | 69-80/2-6/0-2/tr/tr/0-7/6-10/4-10//11 | |
| Tuff of Buckwheat Rim | | | | | |
| Upper cooling unit | JA, JB | 9P034 | 0-110 | 50-63/6-19/0-1/11-16/9-17/tr/0/2-3//30-44 | 24.74±0.11 |
| Lower cooling unit | JC | 9P042 | 0-40 | 35-64/3-13/9-43/3-12/4-7/2/0-1/2-4//20-36 | 24.68±0.06 |
| Andesite lava and flow breccia of Citadel Mountain | | | 0-365 | 69-75/0/0/0/0/16-22/7//8-30 | |
| Dacite lava and flow breccia of Citadel Mountain | | | 0->215 | 24-50/15-25/0-36/15/1-20/0/0/2//30-55 | |
| Tuff of Buckskin Point | | | | | |
| Upper part | KA | 9P026 | 75 | 50-61/13-20/0-1/11-16/10-12/0/0/2//30-40 | |
| Lower part | | | | 63-80/0-3/0-15/2-7/2/4-7/3-5/3//9-16 | |
| Tuff of Lunar Cuesta | LB | 9P050 | 120 | 45-75/12-20/7-15/10-15/3-6/0/0/2//20-35 | 25.67±0.05 |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | Zgm | 8P500 | 30 | 30-35/15/25-47/7/1-2/<1/0/1//12-32 | 26.36 |
| Isom-type tuff | IE | 8P492 | 10 | | |
| Shingle Pass Formation | | | | | |
| Tikaboo Tuff Member | YF | 8P468, 8P476, 8P484 | 30 | 50-65/0/25-37/4-8/1/0/0/1//9 | |
| Monotony Tuff | ME | 8P709 | 200 | 46-63/10-32/5-12/15/2/0-5/0/<1//30-55 | 27.57 |
| Tuff of Palisade Mesa | ED | 8L211 | 160 | 32-46/25/18-33/7/0-3/tr/0/<1//23-47 | 30.04±0.06 |
| Tuff of Hot Creek Canyon | TH | 8L201 | >170 | 20-41/21-45/26-42/1-10/1/0/0/<1//23-41 | 30.00 |

SUPPLEMENTAL TABLE 1.8

Composite stratigraphic section in the Moore Station, Nevada quadrangle map (Ekren et al., 1973a).

| <u>Stratigraphic unit</u> | <u>Sample</u> | <u>PM sample</u> | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|--|---------------|------------------|--------------|--|--------------------------|
| Basalt lava | | | ~30 | | 10.2 ± 0.9 (K-Ar) |
| Rhyolite [lava] of Big Sand Springs Valley | | | <300 | | 25.8 ± 1.3 (K-Ar) |
| Tuff of Lunar Cuesta | | | >35 | 43-66/12-27/3-26/6-18/0-2/0/0-2//10-35 | 25.70 |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member(?) | zr | | 6 | 52-65/0-3/19-25/9-20/1-3/1/0/1-3//6-8 | 26.36 |
| Tikaboo Tuff Member | yj | | 22 | 25/25-34/36/3-9/0/0/0/3//8 26.78 | |
| Lower Tuff Member | XO | | 21 | 31-37/5-15/47-56/1/tr/0-2/0-2/1-2//9-15 | 27.16 |
| Tuff of Orange Lichen Creek | RB | 0P248 | 120 | 20-32/22-47/25-44/1-10/tr/0/0/0-2//15-40 | 27.11 |
| Tuff of Pott Hole Valley | | | 33 | 24/26/45/3/0/0/0/2//20 | 27.31 |
| Monotony Tuff | | | 0-305 | 50-60/15-28/5-12/10-20/3/3/0/1///40-55 | 27.57 |
| Tuffaceous rocks of slanted Buttes | | 0->305 | | | |
| Tuff of Palisade Mesa [tuff of Moore Station Buttes] | EC | 8P693 | 0-305 | 45-72/10-20/7-24/7-14/1-5/0-1/0-1/0-2//20-32 | |
| Tuff between tuff of Moores Station Buttes and tuff of The Needles | | | 0-275 | 30-52/23-43/11-30/1-10/1-7/0/0/tr-1//24-41 | |
| Tuff of The Needles | TC | | 0-305 | 15-25/41/27-36/1-5/tr/0/0/tr//28-41 | 29.99± 0.05 |
| Tuff and debris beds | | | <30 | | |
| Tuff of The Needles Area | TB | | >460 | 42-54/17-22/14-30/5-10/tr/0/0/tr//20-40 | 30.01± 0.06 |
| Lacustrine sedimentary rocks and tuff | | | ~90 | | |
| Brecciated tuff | | | >90 | | |
| Tuff of Hot Creek Canyon | TA, TD | 3P001, 0P240 | ~460 | 30-55/17-41/15-39/6/1-7/1/0/1//30-50 | 29.97±0.06 30.01±0.06 |
| Tuffs of Chaos Creek | | | 0-180 | | |
| Gilmore Gulch Formation (bedded sed. rocks) | | | >60 | | |
| Tuffaceous sedimentary rocks | | | >120 | | |
| Windous Butte Formation | WAC | | >2000 | 25-55/20-40/2-45/1-12/0-10/0-2/tr/0-2//25-55 | |
| Silicic lavas and tuff | | | <305 | | |
| Paleozoic rocks | | | | | |

SUPPLEMENTAL TABLE 1.9

Composite stratigraphic section in the Pritchards Station, Nevada quadrangle map (Dixon et al., 1972). The upper part of the section from the tuff of Cottonwood Canyon upwards is found in the northwestern part of the quadrangle on Crested Wheat Ridge and the part (lacking the Cottonwood Canyon) below the Windous Butte Formation lies near Pritchards Station in the south central part of the quadrangle. The Nine Hill Tuff was formerly unit D of Bates Mountain Tuff and has a source in the Carson Sink area in the Western Nevada field (Henry and John, 2013)

| <u>Stratigraphic unit</u> | <u>Sample</u> | PM | <u>Thick</u> | <u>Mode</u> | <u>Age</u> |
|---|---------------|--------|--------------|--|------------|
| Tuff of Clipper Gap | CE | 0P256 | 20 | 7/16/73/2/0/0/3//5 | 25.01±0.06 |
| Nine Hill Tuff | | 8P685 | 10 | 1/<1/88/<1/0/6/0/4//3 | 25.48 |
| Shingle Pass Formation | | | | | |
| Upper Tuff Member | ZV | 8P669 | 5 | 54/<1/32/8/1/1/2//8 | 26.36 |
| Lower Tuff Member | XS | 8L241 | 12 | 34/10/48/2/<1/1/2/3//14 | 27.16 |
| Tuff of Pott Hole Valley | VA | 8L221 | 100 | 23/21/51/2/0/0/3//16 | 27.31±0.07 |
| Tuff of Palisade Mesa | EE | | 150 | 39/26/23/7/3/2/0/<1//38 | 30.00±0.06 |
| [unit B of tuff of Crested Wheat Ridge] | | | | | |
| Wah Wah Springs Formation (I) | | | ~15 | 59/5/0/10/19/3/0/4//32 | 30.06 |
| Windous Butte Formation | WAE | 8L261 | 550 | 51/20/13/10/3/1/<1/2//30 | 31.72±0.06 |
| Tuff of Cottonwood Canyon | UA | 8L251 | 0-55 | 54/14/15/11/5/<1/0/2//23 | 32.41±0.07 |
| Tuff of Pritchards Station | UD | 7T901 | 0-150 | 55/22/5/13/4/<1/<1/1//33 | 34.46±0.07 |
| Intermediate composition lava flows | | | 100s | | |
| Stone Cabin Formation | | | | | |
| Upper Tuff Member | SW | | 150 | 22-35/22-39/31- 35/7/0/0-3/0/0//20-37 | 35.78±0.09 |
| Bedded tuff and rhyolite lava flow | | 0->150 | | | |
| Paleozoic rocks | | | | | |