Appendix 1. Stratigraphic section descriptions.

This appendix presents descriptions of three stratigraphic sections of the Lava Creek B ash near Interstate 40, west of the Rio Puerco. Colors of sediment are based on visual comparison of dry samples to the Munsell Soil Color Charts (Munsell Color, 2009). Grain sizes follow the Udden-Wentworth scale for clastic sediments (Udden, 1914; Wentworth, 1922) and are based on field estimates. Sand textures are abbreviated as follows: very fine-lower, vfL; very fine-upper, vfU; fine-lower, fL; fine-upper, fU; medium-lower, mL; medium-upper, mU; coarse-lower, cL; coarse-upper, cU; very coarse-lower, vcL; very coarse-upper, vcU. Grain composition and percentages interpreted using a hand lens. Pebble sizes are subdivided as shown in Compton (1985). The term "clast(s)" refers to the grain size fraction greater than 2 mm in diameter. Clast percentages are estimated using percentage charts. Descriptions of bedding thickness follow Ingram (1954). Soil horizon designations and descriptive terms follow those of the Soil Survey Staff (1994) and Birkeland (1999). Stages of pedogenic calcium carbonate morphology follow those of Gile et al. (1966) and Birkeland (1999). Each stratigraphic section was measured upsection from unit 1 using a Jacob staff and Abney level. Numerical unit designations were established up-section for measured section, but are listed in descending stratigraphic order. GPS localities for sites are in UTMs (NAD 27, zone 13), errors for the sites are 4-6 m.

Eastern stratigraphic section of the Lava Creek B ash west of the Rio Puerco and north of Interstate 40. Measured and described by Daniel Koning and Colin Cikoski on January 18, 2013, and March 11, 2013, using an abney level and jacob staff. All UTM coordinates are in Zone 13 and NAD 27.

Unit	Description	Thickness (m) (Unit)	(Total)
9	**Pebbly sand (Unit 6A2a)**: Laminated to thinly, tabular bedded. Sand is pale brown (2.5Y 7/3) and very fine- to very coarse-grained (mostly fine- to medium-grained). 20% pebbly beds that are very thin to thin and lenticular. Outcrop is weakly to strongly cemented by calcium carbonate and locally forms ledges. Poorly exposed. Sharp lower contact.	6	11.1
8	**Ash**: White to very pale brown (10YR 8/1-2). Moderately cross-laminated, with amplitudes up to 10 cm, in thin beds up to 10 cm thick. 30% detrital silt to fine-grained sand. Ash is clearly fluvially reworked. More prominent alluvial structures than in unit 2. @1.90-2.10 m: Slightly more orange in color than underlying strata (10YR 8/1-2 to 10YR 8/3-4). @1.95-2.10 m: Cross laminae become less distinct, although still are present. Very sparse evidence of burrows or roots. Uppermost 20 cm is slightly orange in color. Very weak soil development.	0.85	5.1
7	**Clay-silt:** wavy laminated.	0.15	4.25
6	**Ash:** Similar to unit 1, with more (1-5% detrital non-ash silt and very fine-grained sand).	0.4	4.1
5	**Ash**: Fluvially reworked; horizontally planar laminated to ripple-laminated (up to 1 cm amplitude). <1-1% detrital non-ash silt and very fine-grained sand.	0.3	3.7
4	**Ash:** Horizontally planar laminated. Possible primary ashfall deposit. **Sample LMN130118-east taken from middle of unit.**	0.4	3.4
3	**Rio Puerco or side stream sand (Unit 6A1b):** Light yellowish brown (2.5Y 6/4) and low-angle cross-laminated to cross-very thinly bedded. Sand is vfL-vcU and poorly sorted. Outcrop is not cemented.	1.1	3.0
2	**Rio Puerco sand (Unit 6A1a):** White (2.5Y 8/1) and low-angle cross-laminated to cross-very thinly bedded. Sand is mL-cL and well sorted. Outcrop is weakly to	0.4	1.9

Unit	Description	Thickness (m) (Unit)	(Total)
	moderately cemented.		
1	**Rio Puerco sandstone and conglomerate (Unit 6A1a):** Cross-laminated; about subequal sand compared to gravel. Foresets are up to 1.4 m thick. Gravel consist of pebbles with ~10% cobbles. Clast imbrication gives a SE to SW flow direction. Clasts are subrounded (mostly) to rounded and poorly sorted. Estimated clast composition: 60-65% chert, 10%Mesozoic sandstone, 5-10% quartzite, 7-10% light gray, fine-grained volcanic rock, 7% red granite, 3% dark gray, vesicular basalt. Sand is light gray (10YR 7/2), very fine- to very coarse-grained (mostly medium- to very coarse-grained), subrounded, poorly to moderately sorted, and a lithic arenite (slightly more lithic grains than feldspar grains). Strongly cemented. **Cerro Conejo Formation:** Pink (7.5YR 7/3), fU-mL-cU sandstone (mostly mL-cU). Moderately consolidated and non to weakly cemented. Poorly exposed. *Base of section at the following UTM coordinates: 319996 m E, 3877925 m N.*	1.5	1.5

Central stratigraphic section of the Lava Creek B ash west of the Rio Puerco and north of Interstate 40. Measured and described by Daniel Koning and Colin Cikoski on January 18, 2013, using an abney level and jacob staff. All UTM coordinates are in Zone 13 and NAD 27.

Unit	Description	Thickness (m) (Unit)	(Total)
5	**Paleovalley margin sand and gravels (Unit 6A2b):** Weakly horizontal-planar laminated fine sands to medium pebbles. Very pale brown to yellow (10YR 7/4 to 7/6) color. Sands are fine to coarse-grained, ~1% very coarse grains; no obvious glass shards (ash). Laminae decrease in abundance up-section, while pebble abundance increases. Non-indurated, moderate effervescence, no obvious burrows. Gradational basal contact.	2.4+	8.5+
4	**Paleovalley margin sand and gravels (Unit 6A2a):** Horizontal-planar laminated fine sands to medium pebbles. Very pale brown (10YR 7/4) color. Sands are fine- to coarse-grained; only 3-5% glass shards (ash). Gravels occur in planar, continuous beds and in isolated, weakly cross-laminated channels up to 20 cm thick. Weakly indurated, moderately effervescent. Basal contact is gradational over 20 cm.	1.6	6.1
3	**Pedogenically modified, paleovalley margin sandy ash and intercalated pebbles (Unit 6A2p):** Indistinctly cross-laminated ash and channel-fills of granules to fine pebbles. Very pale brown (10YR 7/4) color. Fines are mainly fine sand-sized, with up to 10% medium sand-sized grains; 30-40% detrital non-ash grains. About 5% paleo-burrows and burrow casts and Stage I carbonate horizon morphology throughout. Moderately strong effervescence. Pebbly channel-fills are up to 15 cm thick and more common than below (as much as 5% of the unit). Indistinct, conformable base.	1.35	4.5
2	**Pedogenically modified, paleovalley margin sandy ash (Unit 6A2p):** Indistinctly horizontal planar- and cross-laminated sandy ash, with fine sand to fine pebble channel-fills. Very pale brown (10YR 7/4) color. Fines are mainly fine-grained sand with up to 10% medium grains; 30-40% detrital non-ash grains. ~3% pebbly channel-fills that are up to 15 cm thick and discontinuous. ~30% paleo-burrows that are 0.5-1.0 cm wide. Stage I calcium carbonate morphology, with moderately strong effervescence in hydrochloric acid. Wavy, sharp base with 4 cm of relief.	0.65	3.15
1	**Lava Creek B ash:** White, cross-laminated, and silt to 0.2 mm in size. Foresets are up to 60 cm thick. Sparse coarse sand to pebbles in channel-fills. Channel-fills are thin (0-10 cm thick) and discontinuous, with gravels up to fine pebble in size. Fines bear 1-3% detrital non-ash material. No effervescence in hydrochloric acid. Basal contact exhibits 30 cm of paleo-topographic relief. **Sample LMN130118-center taken from middle of unit.** @0-0.45 m and 2.0-2.5 m: Indistinctly cross-laminated ashes associated with pebbly channels @0.45-2.0 m: Single strongly cross-laminated ash bed, with no associated pebbles. *Base of section at the following UTM coordinates: 319926 m E, 3877988 m N.*	2.5	2.5

Western stratigraphic section of the Lava Creek B ash west of the Rio Puerco and north of Interstate 40. Measured and described by Daniel Koning and Colin Cikoski on January 18, 2013, using an abney level and jacob staff. All UTM coordinates are in Zone 13 and NAD 27.

Unit	Description	Thickness (m) (Unit)	(Total)
7	**Younger eolian and sheetflood deposits:** Not described		
6	**Rio Puerco axial sands and gravels (Unit 6A5):** Not described in detail. Generally similar to unit 3.	1.0	9.9
5	**Rio Puerco floodplain, clayey-silty fine sand (Unit 6A4):** Very pale brown (10YR 7/3), clayey-silty very fine- to fine-grained sand. Trace gastropod shells and 1% calcium carbonate nodules. Lower contact is planar and gradational over 20 cm.	2.3	8.9
4	**Rio Puerco floodplain, sandy channel-fill (Unit 6A4):** Pale brown (10YR 6/3) sand that is fU-mU, subrounded, well-sorted, and composed of quartz, ~5% feldspar, and 10% lithic grains. Vague, very thin to medium, tabular beds. Basal contact is planar and abrupt but still conformable (about 10 cm gradation).	1.6	6.6
3	**Rio Puerco axial sandy gravels (Unit 6A3):** Very thin to medium bedding is exposed to north and is tabular, lenticular, or cross-stratified. 70-85% pebbles up to 6 cm across that are poorly sorted and composed of chert, quartzite, quartz sandstone, intermediate volcanics, sparse basalt, and sparse granite. Sands are fine- to very coarse-grained, poorly sorted, subangular to rounded, with colors from 7.5YR 7/3 to 10YR 7/3. Irregular (channelized) basal contact.	3.0	5.0
2	**Paleovalley margin sands and pebbles (Unit 6A2):** Silty fine to medium sands with local pebbly channels. Very pale brown (10YR 7/4) color. Fines are silty very fine to fine sands with 1-5% medium grains, with 35-50% detrital non-ash grains, that are poorly sorted and subangular to subrounded. Massive to weakly thinly bedded. Pebbles are up to 4 cm across, subangular to rounded, of chert, quartzite, basalt, intermediate volcanics, and sparse granite, occurring in discontinuous channels up to 4 cm thick. Rare pores 1-4 mm across may be burrows or roots. Planar sharp basal contact.	0.8	2.0
1	**Ash:** White (7.5YR 9.5/1). Silt- to 0.1-0.2 mm in size. Mainly angular grains of glass shards (ash), with 1-3% detrital non-ash grains, and sparse medium to coarse sand. Sparse (<<1%) pebbles (up to 5 cm across) in ash matrix, concentrated at base of deposit, of basalt and intermediate volcanic rocks. Sparse masses of clay (altered ash) up to 6 cm across. Rare (up to 1%) ellipsoidal features up to 1 cm across that may be burrows. Local basal contact-parallel laminae at base, but otherwise massive. Non- to weakly effervescent. Wavy to irregular basal contact. **Sample LMN130118-east taken about 40-50 cm above base of unit.** @1.1-1.2: White (2.5Y 9/2), weakly effervescent top 10 cm, with 10-25% detrital non-ash grains. Possible weak ped development. *Base of section at the following UTM coordinates: 319789 m E, 3878057 m N.*	1.2	1.2

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