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I, Adam J Jones, hereby submit this original work as part of the requirements for the degree of Master of Science in Geology.

It is entitled:

Sediment Routing and Provenance of Shallow to Deep Marine Sandstones in the Late Paleozoic Oquirrh Basin, Utah

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Sediment Routing and Provenance of Shallow to Deep Marine Sandstones in the Late Paleozoic Oquirrh Basin, Utah

A thesis submitted to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements of the degree of

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In the Department of Geology of the McMicken College of Arts and Sciences

by

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Abstract

The Oquirrh basin is a Pennsylvanian to early Permian mixed clastic and carbonate basin in northwestern Utah. The basin is the northwesternmost expression of the Ancestral Rocky Mountains (ARM) orogeny, and locally contains up to 9 km of sediment. Depositional facies range from shelf carbonates to deep marine turbidites, debrites, and hybrid flow deposits, with a general deepening from basin initiation to the early Permian; however, the tectonic drivers and sediment source(s) for the basin are poorly constrained. To better understand the subsidence and tectonic history of the Oquirrh basin, tectonic subsidence analysis was performed on 10 published stratigraphic sections across the basin. Two phases of tectonism are interpreted to have occurred on either side of the basin, forming distinct depocenters during the middle Pennsylvanian and early Permian. Pennsylvanian subsidence is interpreted as a flexural response to a crustal load east of the basin coeval with the ARM, whereas Permian subsidence in the western part of the basin may be related to the uplift and unconformity sequence documented in the Antler Overlap basins of northeastern Nevada. Unlike other ARM basins, no basin-bounding fault or highland has been identified.

To test links between sediment provenance and tectonism, 26 thin-sections were analyzed from 8 locations in a northwest to southeast transect across the basin. Gazzi-Dickinson point counting was used to determine composition and provenance. Samples fell into three mature compositional categories: quartz arenite, sublitharenite, and quartz wacke indicating cratonic interior and recycled orogenic provenances. Petrographic analysis of middle Pennsylvanian sediments revealed very well sorted, finer-grained sandstones in the southeast and northwest parts of the basin versus moderately well sorted, coarser-grained sandstones in the basin center. Permian sediments have decreasing sorting and increasing variability in grain size toward the southeast. Published paleocurrent data indicate a prevailing

southward ocean current suggesting sediment derivation and transport from the Laurentian craton to the north throughout.

U-Pb ages for 845 individual detrital zircon grains in six samples of shallow marine sandstones from the Oquirrh basin shed light on late Paleozoic sediment dispersal across Laurentia. Zircon age populations resemble that of Cordilleran passive margin basins to the north and south. Age groupings reflect derivation from Paleozoic, Neoproterozoic, and Grenvillian sources within the Appalachian orogen or its sedimentary cover. In order to facilitate transport of Grenvillian-aged zircon grains (approximately 21% of total grains), a westward flowing transcontinental river system must have existed, at times, from the Late Neoproterozoic to the Permian. The fluvial system would have taken grains from the southeastern part of Laurentia and released them into a marine environment off the coast of western Laurentia, similar to how the Amazon River transports sediments from the Andes Mountains. Released into the neritic zone, sediment was transported southwards via longshore drift, and deposited into the Oquirrh basin.

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Introduction

Deformation from plate-scale collisions is concentrated at plate boundaries. However, geometric configuration between plates, the type of plate boundaries, and inherited basement structures can facilitate intraplate deformation far from plate collision zones (e.g., Kluth and Coney, 1981; McBride and Nelson, 1999; Soreghan et al., 2012; Sturmer et al., 2018). For example, digital elevation maps from Horton (2012) indicate Andean deformation can be seen in Bolivia, approximately 750 km east of the subduction zone. Dickerson (2003) suggests the Tien Shan (central Asia) intraplate mountain chain has accommodated ~40% of crustal shortening due to the India-Eurasia collision despite being 2000 km north of the collisional boundary. This study focuses on the Oquirrh basin, a basin in western Laurentia that formed in an intraplate deformation zone during the late Paleozoic.

Although reconstructions of paleogeography that include intraplate deformation are becoming more robust (e.g. Scotese, 2004; Blakey, 2013), older intraplate deformation can still be difficult to distinguish due to overprinting or obliteration by younger tectonic events (Baars and Stevenson, 1984; Budnik, 1986; Nelson and Lucas, 2011; Sturmer et al., 2018). Such is the case for many of the Paleozoic basins of western Laurentia, some of which have locally experienced multiple episodes of syn-depositional or younger contraction (Armstrong, 1968; Kluth and Coney, 1981; Kluth, 1986; Marshak et al., 2000), extension (Smith and Miller, 1990; Axen et al., 1993; Zandt et al., 1995; Fosdick and Colgan, 2008), and/or lateral motion (Budnik, 1986; McQuarrie and Wernicke, 2005; Piercey et al., 2012; Lawton et al., 2017). As ambiguous as late Paleozoic intraplate deformation may be in western Laurentia, the sedimentary basins that formed during this time record these events and can be used to better understand the kinematics and evolution of intraplate deformation.

One such basin that can be used to understand intraplate deformation is the Pennsylvanian to Permian Oquirrh basin. This basin is the northwesternmost expression of the Ancestral Rocky Mountains (ARM) orogeny (Kluth, 1986; Mahoney et al., 1991; Geslin, 1998). The basin is presently exposed in central to northwest Utah (Figure 1). The basin records on average, 4 - 4.5 km of limestone, sandstone, and conglomerate; locally thickening to 9 km toward the southeast (Baker, 1947; Erskine, 1997). In the basin, Pennsylvanian strata are characterized by a limestone-dominated basal portion with interbedded sandstone units, sandstone-dominated middle portion with interbedded limestone units, and a sandstone upper portion. Permian strata contain dominantly limestone units with a thick, Leonardian sandstone facies in the middle. Environments of deposition for the basin vary from eolian to deepwater with depths >600 m (Chamberlain and Clark, 1973; Jordan, 1980).

The tectonic driver(s) of subsidence for the Oquirrh basin is(are) poorly constrained. The Oquirrh basin had higher subsidence rates than most other ARM basins and has generally been considered a complex foreland with a subsidence profile like that of a basin responding to a fixed load (Johnson et al., 1992; Sturmer et al., 2018). However, unlike other ARM foreland basins, the Oquirrh basin does not have an adjacent uplift that would have caused a foreland-style crustal flexural response. Additionally, the Oquirrh basin lies far from hypothesized orogenic fronts for the ARM (Geslin, 1998; Dickinson and Lawton, 2003; Trexler et al., 2004; Leary et al., 2017). Sturmer et al. (2018) suggest that although northern ARM basins have subsidence profiles similar to foreland basins with fixed loads, transmitted stresses from more than one side of western and southern Laurentia are required to explain the observed deformation pattern. The steep tectonic subsidence curve for the Oquirrh basin resembles those from strike-slip basins more so than a foreland basin, but the Oquirrh basin subsided five to six times longer than typical strike-slip basins (e.g. Xie and Heller, 2009).

Figure 1. Late Paleozoic uplifts and sedimentary basins in southwest Laurentia (modified from Bissell, 1960; Sturmer, 2012; and Lawton et al., 2017; paleowind direction and paleolatitude from Lawton et al., 2017).

In this study I used multiple techniques to understand interactions between subsidence and sediment sourcing in the Oquirrh basin as causes of subsidence are enigmatic and previous provenance interpretations are inconclusive. Thanks to the rapid evolution and increased availability of ion probes and laser ablation inductively coupled plasma mass spectrometers (LA-ICP-MS), provenance determinations and maximum depositional ages of clastic strata can be efficiently determined. Initially we analyzed the subsidence history from published stratigraphic sections. These data guided sampling for a provenance

analysis transect, using sandstone point counting and detrital zircon U-Pb geochronology. The provenance data provide insight into strain distributions, sedimentary provenance, and the overall system response within the complex late Paleozoic western Laurentian plate margin.

Geologic Setting

The global backdrop in the late Paleozoic consists of Gondwana, Laurentia, and various other terranes colliding and coalescing to form the supercontinent Pangea. Pangea began to assemble in the Mississippian and eventually broke apart in the late Triassic (Ziegler, 1989; Trappe, 2000; Stampfli et al., 2013). Deformation from late Paleozoic events were centered around the eastern and southern margins of Laurentia where collisions were head-on, oblique, or transform (Sturmer et al., 2018). Along the western margin of Laurentia, subduction with back-arc spreading (Miller et al., 1992; Colpron and Nelson, 2009) and sinistral translation and convergence (Trexler et al., 2004; Colpron and Nelson, 2009; Lawton et al., 2017) were occurring. Few kinematic records of late Paleozoic deformation in southwest Laurentia are preserved at the surface today, but intraplate deformation is recorded by sedimentary basins of southwestern Laurentia (Leary et al., 2017) and regionally by deformation associated with the Ancestral Rocky Mountains orogen (ARM) (Kluth and Coney, 1981; Houseknecht, 1986; Ye et al., 1996; Geslin, 1998; Marshak et al., 2000; Dickinson and Lawton, 2003; Sturmer et al., 2018).

Ancestral Rocky Mountains orogen

The ARM were part of a complex, intraplate response to one or more events that may have featured the Appalachian-Ouachita-Marathon collision zone, the western Laurentian margin (modern western Nevada), and/or the southwestern Laurentian margin (modern Sonora, Mexico) (Figure 2). The events resulted in approximately 20 northwest-trending, basement-cored uplifts and many thrust-bound structures (Eardley, 1951; Kluth and Coney, 1981; Barbeau, 2003). ARM activity was broadly coeval with the Alleghenian orogeny (Dickinson and Lawton, 2003) and apparent into the Early Permian (Mallory, 1958), but with gradually decreasing tectonic deformation. The ARM were tectonically quiet by the end of the Permian, when the Sonoman orogeny began along the western Laurentia margin (Gilluly, 1967). Evidence for the uplifts are seen in unconformities and signature coarse arkosic sediment in adjacent basin-fills (Mallory, 1958; Jordan and Douglass, 1980; Kluth, 1981; Johnson et al., 1992; Lawton et al., 2015). The uplifts disrupted Cordilleran sedimentation trends that extend back into the Late Proterozoic and resulted in deformation and exposure of previously deposited shelf sedimentary units (Curtis, 1958).

Most ARM tectonic models invoke stresses from collision along the Ouachita-Marathon belt as the primary driver for ARM tectonism (Kluth and Coney, 1981; Dickinson and Lawton, 2003; Marshak et al., 2003; Leary et al., 2017). The Ouachita-Marathon collision zone experienced complex, oblique, and distributed shear stress (Kluth and DuChene, 2009). The first front to deform was centered along the eastern Ouachita region and was most active in late Atokan to Desmoinesian time (Dickinson and Lawton, 2003). Middle Pennsylvanian tectonics incorporated the western Marathon deformation zone, along with continued deformation to the east in the Ouachita region. Suturing in the Late Pennsylvanian was centered around the Marathon front, deforming areas in New Mexico and west Texas until the early Permian (Wolfcampian [Dickinson and Lawton, 2003]).

Figure 2. Map of Ancestral Rocky Mountain basins and uplifts (Dickinson and Lawton, 2003; Sturmer et al., 2018). Western margin element (blue arrow) adapted from Lawton et al. (2017), southwestern margin element (light green) adapted from Leary et al. (2017), and southeastern margin elements (dark green) adapted from Kluth and Coney (1981). Basins: Ak, Arkoma; An, Anadarko; AP, Appalachian foreland; BW, Black Warrior; De, Delaware; EBSB, Ely-Bird Spring; E/C, Eagle/Central Colorado trough; FC, Forest City; FW, Fort Worth; Ha, Havallah; Ho, Holbrook; Mf, Marfa; Mi, Midland; Og, OroGrande; Oq, Oquirrh; Pa, Paradox; PD, Palo Duro; Pe, Pedregosa; Ta, Taos trough; VK, Valverde-Kerr; WR, Wood River. Uplifts: AW, Amarillo-Wichita; CB, Central Basin platform; FR, Front Range; KS, Klamath-Sierra Arc terrane; Ne, Nemaha Ridge; Pd, Pedernal; P/E, Piute/Emery; rAu, remnant Antler uplift; Un, Uncompahgre; ZD, Zuni-Defiance.

Multiple models have been proposed to explain the evolution of the ARM orogen due to obscured basin-bounding structures (Sturmer, 2018). Himalayan-style escape tectonics proposed by Kluth (1986) and Kluth and Coney (1981) requires northwest displacement of an irregularly bounded peninsula of the Laurentian craton due to closure of the Ouachita-Marathon belt. Laramide-style thick-skinned deformation proposed by Ye et al. (1996) requires flat-slab subduction along the southwest Laurentian margin. Reactivation of preexisting Proterozoic basement faults has been proposed to facilitate local ARM

and Laramide uplifts (Budnik, 1986; Stevenson and Baars, 1986; Marshak et al., 2000). Dickinson and Lawton (2003) propose a wrenching effect on Laurentia due to continued subduction in the western Marathon region while Laurentia and Gondwana had locked in the eastern Ouachita region. Soreghan et al. (2012) propose that the largest ARM highlands have high-density upper crustal roots that, in a compressional setting, reactivated preexisting Proterozoic structures to form ARM basement-cored uplifts. These models don't account for timing differences in basin initiation (Ye et al., 1996; Dickinson and Lawton, 2003), northwest-southeast orientation of structures (Ye et al., 1996; Leary et al., 2017), or some of the largest amounts of tectonic subsidence in basins farthest from hypothesized tectonic drivers (Sturmer et al., 2018); however, two recent models seek to address these concerns.

One new model by Leary et al. (2017) suggests a three-sided orogen to explain the timing and kinematics of ARM uplifts and basins. Transpression from the Sonoran margin with convergence along the Nevadan margin could have produced eastward- and northeastward-directed stresses of such magnitude that faults associated within Proterozoic rifts were reactivated (Marshak et al., 2000), allowing northwest-directed Ouachita-Marathon stresses to generate basement-cored uplifts. Transpression resulted from oblique left-lateral convergence of the Panthalassan plate with the Laurentian plate along the Sonoran margin from approximately 320 Ma to 280 Ma (Leary et al., 2017). This model helps to explain the northeast-southwest shortening seen in the numerous ARM uplifts that can't be explained by northwest-directed transpression. After 280 Ma, the Sonora margin shifted from transpression to subduction, thereby removing northeast-directed transpressional forces from the Laurentian craton (Dickinson and Soreghan, 2000; Dickinson and Lawton, 2003; Leary et al., 2017).

The other recent model comes from Lawton et al. (2017) who focus on the progressive evolution of the western margin and basin formation. Lawton et al. (2017) suggest transcurrent activity along the western margin produced observable phenomenon such as long-term deformation events, diachronous basin development, continent-scale margin-parallel sediment provenance, and paleogeographic

rearrangement of crustal blocks along southwest Laurentia. The southward-propagating (Colpron and Nelson, 2009; Dickinson, 2013; Linde, 2016; Linde et al., 2017) sinistral-transpressive plate boundary was active from 390 to 260 Ma (Cocks and Torsvik, 2011).

Oquirrh Basin

The Pennsylvanian to Permian Oquirrh basin is the principal late Paleozoic sedimentary basin in central to northwest Utah (Figure 3). The intermediate location of the Oquirrh basin between two large Paleozoic transpressional plate margins to the west and southeast may account for the unusually thick deposits (Sturmer et al., 2018), with up to 9 km of Oquirrh Group strata (Baker, 1964a; Johnson et al., 1992; Erskine, 1997). The basin is bounded to the east by the Las Vegas-Wasatch tectonic hinge, to the west by the northeast Nevada and western Utah highlands, to the north and northeast by the Wyoming Shelf and Laurentian craton, to the southeast by the Uncompahgre uplift, and to the south by the Piute/Emery positive area (Figure 1; Bissell, 1974). The basin deepened to the west and preserves cyclical packages of thick transgressive limestone and regressive shallow marine sandstone deposits (Johnson et al., 1992). Some of the basin deposits were transported east of the Wasatch hingeline on the Charleston-Nebo thrust during the Sevier orogeny beginning in the Middle Jurassic (Roberts et al., 1965; Tooker and Roberts, 1971).

The Oquirrh and Wood River basins appear to be sub-aqueously connected (Jordan and Douglass, 1980; Bissell, 1974; and Larson, 1979). Paleogeographic reconstructions by Blakey (2013) also depict that both basins were sub-aqueously connected. The Oquirrh basin has been tectonically associated with the Wood River Basin in southern Idaho (Figure 1; Geslin, 1998); however, sediment composition and

subsidence analysis suggest these basins evolved under different conditions (Sturmer et al., 2018). Reactivated thrusting within a segment of the Mississippian Antler orogenic belt in east-central Nevada and Idaho caused subsidence of the Wood River basin (Geslin, 1998); and is reflected in a stair-stepped, concave-upward tectonic subsidence curve indicative of a flexural response to a migrating load (Sturmer, 2018). Tectonic subsidence curves for the Oquirrh basin appear to result from a flexural response to a fixed-load, lacking the stair-stepping pattern seen in the Wood River Basin (Johnson et al., 1992 and Sturmer, 2018).

Biostratigraphic bathymetry interpretations by Chamberlain and Clark (1973) suggest the center of the Oquirrh basin experienced an increase in water depth from Pennsylvanian to early Permian time. Bathymetric interpretations are based on the vertical succession of trace-fossil assemblages, from *Cruziana* to *Zoophycos* to *Nereites* (Chamberlain and Clark, 1973; Larson, 1979; Jordan and Douglass, 1980; Jordan, 1981). Biostratigraphic correlations by Jordan and Douglass (1980) using fusulinids confirms the basin hosted a variety of depositional environments. Sediment was deposited in an organically productive, shallow marine environment (<100 m) in the Middle Pennsylvanian that deepened to 400 m during the Upper Pennsylvanian (Jordan and Douglass, 1980). Jordan (1981) also identified five deep-water lithofacies of uncommon density-driven current origins in the Upper Pennsylvanian (Virgilian) and lower Permian (Wolfcampian) sandstone and limestone units of the Oquirrh Group. Lower Permian (Wolfcampian) sandstones from the eastern part of the basin appear to be aeolian sands deposited in a shallow marine environment (Allard, 1997). Lower Permian (Leonardian) sandstones show shoreline facies that include subaerial eolian deposition (Allard, 1997). The eolian deposits are less common west of the Wasatch Fault than they are in the easternmost part of the basin (Johnson et al., 1992).

Previous work on sediment transport into the basin is largely limited to petrographic studies (Jordan and Douglass, 1980; Allard, 1997; Konopka, 1985) and structural mapping, where possible. Sand transport during the Lower to Middle Pennsylvanian was to the south off of the Wyoming Shelf (Konopka

Figure 3. Tectonic subsidence curves for Ancestral Rocky Mountain basins (modified from Johnson et al., 1992; Geslin, 1998; and Sturmer et al., 2018).

and Dott, 1982; Konopka, 1985). The Wyoming Shelf remained tectonically stable and undeformed by ARM tectonism through the late Paleozoic (Chamberlain and Clark, 1973; Johnson et al., 1992) and well-sorted quartz sand was likely introduced into the Oquirrh basin from this area (Chamberlain and Clark, 1973). Bissell (1974) suggests that a significant amount of material was derived from Montana and Wyoming, swept southward by neritic currents and then westward into the Oquirrh basin. Jordan and Douglass (1980) hypothesize that the Uncompahgre uplift to the southeast could have been a source of

sediment for the Oquirrh basin. The Strawberry Accessway, a trough east of the basin, may have been a transport route for Uncompahgre sediment into the basin (Bissell, 1960; 1962b). The Gold Hill Accessway may have delivered sediment to the basin from the west, navigating the eastern Nevada and western Utah Highlands (Steele, 1960; Bissell, 1962b; Yochelson and Fraser, 1973; Stokes, 1979) though any significant contribution seems unlikely due to paleocurrent directions (Figure 1). As petrographic studies are sparse and provenance interpretations inconclusive for the Oquirrh basin, this study addresses both of these issues by examining lower Pennsylvanian to lower Permian clastic units.

Units of the Oquirrh Basin

This study uses the stratigraphic hierarchy synthesized by Clark et al. (2012, 2016) and Constenius et al. (2011) from sedimentary sections exposed in the Rush Valley, Tooele Valley, and Provo Quadrangles, respectively (Figure 4).

Global			N. America		Sections in the Oquirrh Basin							
Ma	Period	Epoch	Period	Epoch	GM	CM	LM	SR	SM	WM	N	HC
275	Permian	Kungurian	Permian	Leonardian	Sandstone, limestone, and dolomite			Diamond Creek Sandstone	Diamond Creek Sandstone and Kirkman Limestone	Diamond Creek Sandstone	Diamond Creek Sandstone	Diamond Creek Sandstone
280								Kirkman Limestone		Kirkman Limestone		
285		Artinskian		Wolfcampian	Sandstone and Limestone unit	Freeman Peak and Curry Peak Formations	Freeman Peak and Curry Peak Formations	-- Fault --	Freeman Peak Formation	Freeman Peak Formation	Kirkman Limestone	Granger Mountain Member
290		Sakmarian						Curry Peak Formations	Curry Peak Formation	Curry Peak Formation		
295		Asselian										
300	Carboniferous	Gzhelian	Pennsylvanian	Virgilian	Sandstone unit	Bingham Mine Formation	Bingham Mine Formation	Bingham Mine Formation	Bingham Mine Formation	Bingham Mine Formation	Oquirrh Group Undifferentiated	Wallsburg Ridge Member
305		Kasimovian		Missourian								
310		Moscovian		Desmoinesian	Sandstone, limestone, and dolomite	Butterfield Peaks Formation	Butterfield Peaks Formation and West Canyon Limestone	Butterfield Peaks Formation	Butterfield Peaks Formation	Butterfield Peaks Formation		Bear Canyon Member
315				Atokan								
320		Bashkirian		Morrowan		West Canyon Limestone	West Canyon Limestone	West Canyon Limestone	West Canyon Limestone	Bridal Veil Limestone Member		
		Serpukhovian		Ms.	Chesterian		Manning Canyon Shale	Manning Canyon Shale	Manning Canyon Shale	Manning Canyon Shale	Manning Canyon Shale	Manning Canyon Shale

Figure 4. Stratigraphy at sections sampled for sandstone petrographic analysis. Sections: GM, Grassy Mountains; CM, Cedar Mountains; LM, Lakeside Mountains; SR, Stansbury Range; SM, South Mountain; WM, West Mountain; N, Nebo; HC, Hobble Creek. Gray sections indicate unit is missing at locale. Units for the Grassy Mountains, Lakeside Mountains, and Stansbury Range are found in the Tooele Valley Quadrangle by Clark et al. (2016); Cedar Mountains and South Mountain units are found in the Rush Valley Quadrangle by Clark et al. (2012); West Mountain and Hobble Creek units are found in the Provo Quadrangle by Constenius et al. (2011); and the Nephi units are found in the Nephi Quadrangle by Bick (1991).

Butterfield Peaks Formation

The Butterfield Peaks Formation is early Pennsylvanian (late Morrowan to Desmoinesian) in age and is approximately 2766 m thick at Butterfield Peaks in the central Oquirrh Mountains (Clark et al., 2016). The formation consists of very fine- to fine-grained thin to medium bedded quartzose sandstone and calcareous sandstone units. The formation also contains fossiliferous carbonate units (Konopka and Dott, 1982) that have locally abundant brachiopod, bryozoan, *Chaetetes* coral, and *Fusulina* and *Beedeina* fusulinid fauna. Chert nodules are locally present in carbonate units. Konopka and Dott (1982) characterize at least 20% of the section to have been eolian sands deposited from a prevailing north to south wind pattern based on stratification, thickness of cross-bed sets, and an absence of bioturbation. Subaerial and marginal-marine deposition is mostly characterized by siliciclastic sand whereas carbonate deposition was restricted to open marine environments to the west and southwest. Konopka (1999) states that the Butterfield Peaks formation is recycled from older sedimentary formations of the cratonic interior. Butterfield Peaks is exposed throughout the basin.

Bingham Mine Formation

The Bingham Mine Formation is Upper Pennsylvanian (Missourian to Virgilian) and is approximately 825 m thick in the Cedar Mountains (Clark et al., 2016). The formation consists of light gray to tan, thinly color-banded and locally cross-bedded quartzite with interbedded thin, light- to medium-gray, calcareous, fine-grained sandstone, limestone, and siltstone.

Wallsburg Ridge Member

The Wallsburg Ridge Member is Upper Pennsylvanian (Missourian to Virgilian) and is approximately 1950 m thick in the Wasatch Range (Baker, 1976; Constenius et al., 2011). The formation consists of light gray to yellowish brown, thick-bedded quartzite with rare gray limestone interbeds. Wallsburg Ridge is used only in the Spanish Fork Peaks quadrangle and is time-equivalent to the Bingham Mine Formation.

Freeman Peak and Curry Peak Formations

The combined Freeman Peak and Curry Peak formations are lower Permian (Wolfcampian) and are approximately 1065 m thick in the Cedar Mountains (Clark et al., 2016). These units consist of medium- to dark-gray, calcareous, fine-grained sandstone and uncommon gray sandy limestone. “Worm trail” markings are common on bedding planes in the lower unit. Wolfcampian fusulinids are reported by Maurer (1970) and Clark et al. (2016). Freeman Peak and Curry Peak were deposited throughout the basin.

Kirkman Limestone

The Kirkman Limestone is lower Permian (Wolfcampian-Leonardian) and is approximately 100 m thick in the Wasatch Mountains (Constenius et al., 2011). The formation consists of moderate-gray to light brown limestone, calcareous sandstone, fossiliferous carbonate conglomerate, and oncolitic limestone. Limestone is locally bioclastic and cherty, and laminated with chert stringers and nodules. The Kirkman was deposited preferentially in the southeastern part of the basin (Baker, 1947; Clark, 2009) and is missing in outcrops to the northwest.

Diamond Creek Sandstone

The Diamond Creek Sandstone is lower Permian (Leonardian) and is approximately 386 m thick in the Wasatch Mountains. The formation consists of coarse-grained, cross-bedded sandstone that

conformably underlies the Park City Formation, and overlies the Kirkman Limestone (Baker and Williams, 1940; Allard, 1997). The Diamond Creek Sandstone has 85-92% quartz grains, displays evidence for being deposited in eolian and littoral environments, and is recorded in deeper water regions as clastic high-density grain flows (Allard, 1997). The source of Diamond Creek Sandstone sediment is consistent with cratonic interior based on petrographic analysis (Allard, 1997).

Methods

Tectonic Subsidence Analysis

Tectonic subsidence analysis is a graphical method used to track a location's subsidence and uplift history since deposition due to tectonic forces (van Hinte, 1978). Tectonic subsidence curve analysis (Angevine et al., 1990; Xie and Heller, 2009; Sturmer et al., 2018) was performed to better understand the spatiotemporal evolution of subsidence within the Oquirrh basin, ultimately guiding sampling locations. To perform subsidence analysis, the stratigraphic thickness, lithology, age constraint, and paleobathymetry of each unit are needed. Accounting for these factors generates a total subsidence curve influenced by tectonic, sediment, and water loading. To determine basin subsidence only as a response to tectonic loading, "backstripping" as described by Steckler and Watts (1978) is used. Backstripping removes subsidence due to mechanical compaction, sediment loading, and paleobathymetry (Angevine et al., 1990; Xie and Heller, 2009) to show an idealized tectonic subsidence pattern if water, not sediment filled the basin. Tectonic backstripping provides a way to normalize subsidence across basins with different sedimentation histories (Xie and Heller, 2009; Sturmer et al., 2018).

Initially, subsidence analysis was performed on 10 published stratigraphic sections (Erskine, 1997) throughout the basin to constrain the subsidence history of the basin. Decompacted thicknesses were calculated following lithology-dependent porosity values (Bond and Kominz, 1984) and formation midpoints were used to estimate burial depth. Bathymetry estimates were not considered due to a lack of bathymetric control for the published sections. Finally, the curves were backstripped and allowed to rebound isostatically as younger units are removed (Angevine et al., 1990). The resultant subsidence curve represents subsidence due to tectonics.

Stratigraphic thickness and lithology are found in published data (Young, 1955; Rigby, 1958; Johnson, 1959; Baker, 1964b; Maurer, 1970; Tooker and Roberts, 1971; Hintze, 1973; Morris et al., 1977; Erskine, 1997). Age control is from stage bounding-defining taxa documented in the literature including fusulinids (Welsh and James, 1961; Maurer, 1970; Rich, 1971; Jordan and Douglass, 1980; Konopka and Dott, 1982) and conodonts (Chamberlain and Clark, 1973; Larson, 1977; Davis et al., 1994). The calculated tectonic subsidence curves from the Oquirrh basin were compared to one another in an east-west transect across the basin. These curves illuminate the tectonic evolution of the basin and add to our understanding of the overall tectonic context of late Paleozoic deformation in southwestern Laurentia.

Sandstone Petrographic Analysis

I collected 28 samples for thin-section analysis from Atokan to Leonardian clastic units in eight mountain ranges across the Oquirrh basin. All 28 samples were made into standard (30 μm) thin-sections for petrographic analysis using the Gazzi-Dickinson point counting method as described in Ingersoll et al. (1984). This method is used as a more sophisticated way to measure total provenance of sands and the advantage of this method is that it makes parent-rock associations regardless of grain size. The primary control on sandstone composition is the tectonic setting of the provenance region; however, relief,

climate, transport, depositional environment, and diagenetic change are also factors that can affect composition (Dickinson, 1985). The major continental provenance categories from which sandstones are derived are stable cratons, basement uplifts, magmatic arcs, and recycled orogens. In general, stable cratons produce quartzose sands, basement uplifts and plutons produce quartzofeldspathic sands, magmatic arcs produce feldspatholithic sands, and recycled orogens produce quartzolithic sands (Dickinson, 1985). Contributions from the different provenance categories can be estimated in thin-section and plotted or constrained on triangular quartz-feldspar-lithic (QFL) diagrams.

Thin-sections were made at the University of Cincinnati and 300 points per sample were identified using a microscope fitted with a mechanical stage, capable making of set, incremental adjustments for a random, yet statistically significant survey of each petrographic slide. Each grain was identified and tallied for a later average of the sample's makeup. The average sample makeup fell into three broad categories (quartz, feldspar, and lithics).

U-Pb Detrital Zircon Analysis

U-Pb analyses of zircon grains from six late Paleozoic Oquirrh basin samples were obtained by LA-ICP-MS. Three locations were selected for detrital zircon U-Pb geochronology and two samples were taken at each location, from Atokan and Leonardian strata; except at the Hobble Creek location, where samples were taken from Missourian and Leonardian strata due to private property and topographic restrictions affecting outcrop access (Table 1). Zircon grains were separated from crushed samples using standard heavy-mineral separation techniques including use of a disk mill, GEMINI[®] table, Frantz[™] isodynamic magnetic separator, and heavy liquids (methylene iodide). The grains were handpicked under a binocular microscope after representative sample splits were obtained using a microsplitter, then mounted on double-sided tape on top of resin discs.

I analyzed six samples (HCDCDZ, HCWRDZ, STMPDKDZ, STMPBPDZ, LMBWDZ, and GMPUDZ) at the University of Kansas, Department of Geology, using a Thermo Scientific Element2 ICP-MS, attached to a Photon Machines Analyte.G2 193 nm ArF excimer laser ablation system. Circular, 20 μm spots were ablated with the laser at 1.6 J cm^{-2} fluency and 10 Hz repetition rate, resulting in pits of ca. 15 μm depth. The ablated material was carried to the ICP in He gas with a flow rate of 1.1 l/min, tied in with Ar gas of 1.1 L/min flow rate ca. 25 cm before entry into the plasma torch. Laser-induced fractionation, including elemental fractionation and downhole fractionation, and calibration drift were corrected by bracketing measurements of unknowns with GJ1 zircon reference material (Jackson et al., 2004) and data reduction was accomplished using the VizualAge data reduction scheme (Petrus and Kamber, 2011) for the IOLITE software package (Paton et al., 2010; 2011). During the course of the analyses, the secondary zircon reference material Plešovice (Sláma et al., 2008) yielded a weighted mean $^{206}\text{Pb}/^{238}\text{U}$ date of 336.7 ± 1.3 (2 σ) (n=56; MSWD=1.3), within 1% of the 337.13 ± 0.37 Ma age determined by chemical abrasion thermal ionization mass spectrometry (Sláma et al., 2008). The interlaboratory comparison of Kosler et al. (2013) for LA-ICP-MS and SIMS data by the six laboratories with the most reliable results on other standards gave an average $^{206}\text{Pb}/^{238}\text{U}$ age of 340.94 ± 0.53 Ma, with an MSWD = 1.09, p = 0.21 on 148 analyses for Plešovice zircon. Data for the four LA-ICP-MS laboratories gave an average $^{206}\text{Pb}/^{238}\text{U}$ age of 340.0 ± 0.7 Ma, MSWD 0.82, p = 0.90 on 100 analyses. These values are in agreement with the long-term average results on Plešovice zircon produced in the University of Kansas, Isotope Geochemistry Laboratory.

Concordia plots, concordia ages, and weighted mean U-Pb ages for all data were derived using the ISOPLOT software (Ludwig, 2003). Intercepts were calculated using model 1 fitting and are quoted at 95% confidence level. The results of the U-Pb analyses are shown in Appendix A.

Results were not corrected for common lead. Discordance percentage was determined from the following formulas. For $^{206}\text{Pb}/^{238}\text{U}$ dates younger than 850 Ma, discordance % = $(100 - 100 \times [(^{206}\text{Pb}/^{238}\text{U} \text{ date}) / (^{207}\text{Pb}/^{235}\text{U} \text{ date})])$. For $^{206}\text{Pb}/^{238}\text{U}$ dates older than 1100 Ma discordance % = $(100 - 100 \times [(^{206}\text{Pb}/^{238}\text{U}$

date)/($^{207}\text{Pb}/^{206}\text{Pb}$ date)]). For spots with $^{206}\text{Pb}/^{238}\text{U}$ dates older than 850 Ma, the $^{207}\text{Pb}/^{206}\text{Pb}$ date was used as an estimate of the geological age (Wotzlaw et al., 2013).

Table 1				
Sample	Stratigraphic Units	Location	Coordinates	
			Easting	Northing
HCPDC (AJ2)	Diamond Creek SS	Hobble Creek, Utah County	W111°25.961'	N40°11.510'
HCPPWR (AJ4)	Wallsburg Ridge Mbr	Hobble Creek, Utah County	W111°32.178'	N40°09.358'
LMPPBP (AJ5)	Butterfield Peaks Fm	Lakeside Mountains, Tooele County	W111°25.961'	N40°11.510'
GMPU (AJ6)	Permian Unconformity (Doelling, 1964)	Grassy Mountains, Tooele County	W113°05.939'	N41°01.736'
STMPDC (AJ7)	Diamond Creek SS	Stansbury Range, Tooele County	W112°32.403'	N40°28.689'
STMPPBP (AJ8)	Butterfield Peaks Fm	Stansbury Range, Tooele County	W112°33.784'	N40°25.275'

Table 1. Sample locations for detrital zircon age dating. Coordinates reported in reference to 1984 World Geodetic System (WGS84).

Results

Subsidence Analysis

Subsidence analysis of 10 published stratigraphic sections shows two phases of subsidence affecting eastern and western parts of the basin differently (Figure 5). Tectonic subsidence rates are reflected by the slope of the tectonic subsidence curve, therefore steeper slopes indicate increasing subsidence. The easternmost stratigraphic sections of Mt. Nebo, Spanish Fork, and Provo experienced the highest subsidence rates in the basin from Atokan to Missourian time (315-305 Ma). This event is represented in the center of the basin as seen in the Oquirrh Mountains, Stansbury Range, and E. Tintic Mountain sections but to a lesser extent than in the east. The western sections of the Cedar and Lakeside Mountains do not show subsidence rates as high as the central and eastern sections in the Pennsylvanian. Tectonic subsidence in the central and eastern sections ranged from a total of 1114 to 1639 m during Atokan to Missourian time versus 185 to 246 m in the west. The Lakeside and Cedar Mountain sections subsided more rapidly in Leonardian time (281-272.9 Ma) than did the rest of the sections. This period of increased subsidence and steepening of subsidence curves in the westernmost stratigraphic sections was not seen in the sections to the east. Leonardian tectonic subsidence in the western sections ranged from 302 to 386 m compared to 19 to 96 m in the central and eastern sections. Tectonic subsidence rates are included in Table 2.

Figure 5. Oquirrh basin within Utah and its areas of differential tectonic subsidence. (a) Subsidence curves from the western part of the basin. (b) Subsidence curves from the central part of the basin. (c) Subsidence curves from the eastern part of the basin. (d) Google Earth image showing sections with higher Pennsylvanian subsidence in red and higher Permian subsidence in green circles. Locations of subsidence curves for the Oquirrh basin are marked by numbers as follows: 1, Bovine Mountains (Rigby, 1958); 2, Cedar Mountains (Clark et al., 2016); 3, Cedar Mountains (Maurer, 1970); 4, Lakeside Mountains (Young, 1955); 5, Stansbury Range (Rigby, 1958); 6, Oquirrh Mountains (Tooker and Roberts, 1971); 7, E. Tintic Mountain (Morris et al., 1977); 8, Mt. Nebo (Johnson, 1959); 9, Spanish Fork (Hintze, 1973); 10, Provo (Baker, 1964b). Basin shape from Erskine (1997). Red circle is area of most rapid Pennsylvanian subsidence, green is area of higher Permian subsidence.

Table 2. Subsidence rates from Oquirrh basin sections calculated for middle Pennsylvanian and early Permian intervals										
Subsidence rates given in m/Myr										
	Bovine (1)	Cedar (2)	Cedar (3)	Lakeside (4)	Stansbury (5)	Oquirrh (6)	E.Tintic (7)	Nebo (8)	Sp.Fork (9)	Provo (10)
313- 304 Ma	27	36	48	22	108	184	141	162	128	107
281- 273 Ma	-	14	33	55	-	-	2	9	12	-

Sandstone Petrography

In general, sandstone composition is consistent throughout the lower Pennsylvanian to the lower Permian. Samples are dominantly quartz arenite or quartz sublitharenite (i.e. Folk, 1974) and were likely sourced from the cratonic interior or from a recycled orogenic provenance (i.e. Dickinson, 1984). However, sandstone texture does show variability in time equivalent samples across the basin and moving up section, even in the same location (Figure 6 and Table 3).

Figure 6. Sandstone point counts from Atokan to Leonardian sediments found in Table 3. Outline of Oquirrh basin in green adapted from Lawton et al. (2015). SLC = Salt Lake City, Utah.

The Atokan to Desmoinesian Butterfield Peaks Formation (Figure 7) is sourced from the cratonic interior or a recycled orogenic provenance and is compositionally more mature in the east and west parts of the basin. Samples include very fine-grained sand (0.062-0.125mm) and coarse silt (0.031-0.62mm), the grains are well sorted, and contain less than 1% feldspar or 10% lithics. Samples have 10-30% secondary calcite cement except for at South Mountain, which has almost no calcite cement. The Stansbury Range sample is moderately sorted, with grains up to 0.8 mm in a matrix of average grain sizes being between 0.062-0.25 mm. Grains are sub-angular to sub-rounded. The westernmost locations (Cedar and Lakeside Mountains) are sublitharenites whereas the other locations are quartz arenites.

Figure 7. (Left) Butterfield Peaks Formation in the Lakeside Mountains. (Right) Sample under crossed polarizers at 5x magnification. Field of view is 4 mm.

The Missourian to Virgilian Bingham Mine Formation (Figure 8) is sourced from the cratonic interior and becomes compositionally more mature to the east. Samples include very fine-grained sand (0.062-0.125 mm) and coarse silt (0.031-0.62 mm), grains are moderately well sorted, and contain less than 1% feldspar or 1% lithics. Samples can show significant differences in amount of secondary calcite cementation between locations within the basin (<10% at South Mountain versus <30% in Stansbury Range). Texturally, quartz grains are angular to sub-angular; compositionally, all are quartz arenites.

Figure 8. (Left) Bingham Mine Formation in the Stansbury Range. (Right) Sample under crossed polarizers at 5x magnification. Field of view is 4 mm.

The Wolfcampian Curry Peak and Freeman Peak formations (Figure 9) were sourced from the cratonic interior and become compositionally more mature to the west. Samples include very fine-grained sand (0.62-0.125 mm) and coarse silt (0.031-0.62 mm), grains are well sorted, and contain less than 1% feldspar or 4% lithics. Samples have 10-20% secondary calcite cement composition uniformly throughout the basin. Texturally, quartz grains are sub-angular to round; compositionally, all samples are quartz arenites.

Figure 9. (Left) Curry Peak and Freeman Peak (Undivided) Formation in the Lakeside Mountains. (Right) Sample under crossed polarizers at 5x magnification. Field of view is 4 mm.

The Leonardian Diamond Creek Sandstone (Figure 10) is sourced from the cratonic interior or a recycled orogenic provenance and is compositionally more mature to the west. Samples include secondary calcite cement ranges from <10% to 30%. Hobble Creek and Nephi samples (eastern sections) are poorly sorted; angular to rounded; and include coarse sand sized (0.5-1.0 mm) grains, very fine-grained sand (0.62-0.125 mm), and coarse silt (0.031-0.62 mm) grains. The Stansbury Range and Grassy Mountains (central and western sections, respectively) samples are well sorted; grains are sub-angular to sub-round; and include very fine-grained sand (0.62-0.125 mm) and coarse silt (0.031-0.62 mm) grains. All samples are arenites except for the Grassy Mountains (westernmost) sample, which is a sublitharenite.

Figure 10. (Left) Diamond Creek Sandstone in Hobble Creek Canyon of the Wasatch Mountains. (Right) Sample under crossed polarizers at 5x magnification. Field of view is 4 mm.

Table 3						
			QFL (%)			
Location	Sample	Age	Quartz	Feldspar	Lithics	Provenance
Grassy						
	GMPo2-1	Mid-Upper Penn	99	0	1	Craton Interior
	GMPo3-1	Mid-Upper Penn	96	0	4	Craton Interior
	GMPo4-1	Mid Penn	100	0	0	Craton Interior
	GMPo5-1	Lower-Mid Penn	99	1	0	Craton Interior
	GMPU-1	Leonardian	89	0	11	Recycled Orogenic
Lakeside						
	LMPBW-1	Atokan	90	0	10	Recycled Orogenic
	LMPBM-1	Missourian-Virgil	100	0	0	Craton Interior
	LMPFC-1	Wolfcampian	97	0	3	Craton Interior

Cedar						
	CMPPBP-1	Atokan	92	0	8	Recycled Orogenic
	CMPFC-1	Wolfcampian	100	0	0	Craton Interior
Stansbury						
	STMPDK-1	Leonardian	98	1	1	Craton Interior
	STMCP-1	Wolfcampian	99	0	1	Craton Interior
	STMPFC-1	Wolfcampian	100	0	0	Craton Interior
	STMPBM-1	Missourian-Virgil	99	0	1	Craton Interior
	STMPBP-1	Atokan	97	0	3	Craton Interior
	STMPBP-2	Atokan	98	1	1	Craton Interior
South						
	SMPFP-1	Wolfcampian	96	0	4	Craton Interior
	SMPBM-1	Missourian-Virgil	100	0	0	Craton Interior
	SMPBP-1	Atokan	98	0	2	Craton Interior
	SMPBP-2	Atokan	100	0	0	Craton Interior
	SMPBP-3	Atokan	85	0	15	Recycled Orogenic
West						
	WMPK-1	Wolfcamp-Leonard	94	0	6	Recycled Orogenic
	WMPBP-1	Atokan	88	0	12	Recycled Orogenic
Hobble Creek						
	HCPDC-1	Leonardian	98	0	2	Recycled Orogenic
	HCPK-1	Wolfcamp-Leonard	26	0	74	n/a – limestone
Nephi						
	NPDC-1	Leonardian	99	0	1	Craton Interior

Table 3. Sandstone point counting results.

U-Pb Detrital Zircon Analysis

Detrital zircon U-Pb age results for the six sandstone samples collected from the Oquirrh basin are presented in Figure 11. The results of the individual LA-ICP-MS spot analyses for sandstone are available in Appendix A. Of the six grains analyzed, a total of 783 concordant ages were identified within discordance limits. Ages range from 273 to 3229 Ma and prominent age distributions peaks are seen for all samples at 330-490 Ma (88 grains, 11%), 900-1200 Ma (165 grains, 21%), 1300-1500 Ma (108 grains, 14%), 1600-1800 Ma (172 grains, 22%), and 2500-3500 Ma (54 grains, 7%). The youngest grains recorded (270-280 Ma) in these analyses are from the Leonardian Diamond Creek Sandstone, but only include one grain from each sample (3 grains).

Figure 11. Probability density plots (red line) of Oquirrh Group sandstones. Detrital zircon age provinces are highlighted by vertical color bars. All histogram bins are 50 My (blue rectangles).

Hobble Creek Permian Diamond Creek Sandstone

Sample yielded 141 concordant grains. Ages range from 273 to 3048 Ma and prominent age distributions peaks are seen at 330-490 Ma (20 grains, 14%), 900-1200 Ma (37 grains, 26%), 1300-1500 Ma (14 grains, 10%), 1600-1800 Ma (26 grains, 18%), and 2500-3500 Ma (5 grains, 4%).

Hobble Creek Pennsylvanian Wallsburg Ridge Member

Sample yielded 141 concordant grains. Ages range from 293 to 2949 Ma and prominent age distributions peaks are seen at 330-490 Ma (9 grains, 6%), 900-1200 Ma (28 grains, 20%), 1300-1500 Ma (18 grains, 13%), 1600-1800 Ma (37 grains, 26%), and 2500-3500 Ma (11 grains, 8%).

Lakeside Mountains Pennsylvanian Butterfield Peaks Formation

Sample yielded 142 concordant grains. Ages range from 353 to 2706 Ma and prominent age distributions peaks are seen at 330-490 Ma (18 grains, 13%), 900-1200 Ma (31 grains, 22%), 1300-1500 Ma (19 grains, 13%), 1600-1800 Ma (18 grains, 13%), and 2500-3500 Ma (6 grains, 4%).

Grassy Mountains Permian Unconformity

Sample yielded 135 concordant grains. Ages range from 376 to 2934 Ma and prominent age distributions peaks are seen at 330-490 Ma (15 grains, 11%), 900-1200 Ma (20 grains, 15%), 1300-1500 Ma (18 grains, 13%), 1600-1800 Ma (41 grains, 30%), and 2500-3500 Ma (10 grains, 7%).

Stansbury Range Permian Diamond Creek Sandstone

Sample yielded 81 concordant grains. Ages range from 291 to 2880 Ma and prominent age distributions peaks are seen at 330-490 Ma (14 grains, 17%), 900-1200 Ma (12 grains, 15%), 1300-1500 Ma (8 grains, 10%), 1600-1800 Ma (8 grains, 10%), and 2500-3500 Ma (9 grains, 11%).

Stansbury Range Pennsylvanian Butterfield Peaks Formation (AJ8)

Sample yielded 145 concordant grains. Ages range from 335 to 3120 Ma and prominent age distributions peaks are seen at 330-490 Ma (11 grains, 8%), 900-1200 Ma (31 grains, 23%), 1300-1500 Ma (21 grains, 16%), 1600-1800 Ma (35 grains, 24%), and 2500-3500 Ma (8 grains, 6%).

Discussion

Subsidence Analysis

Subsidence analysis across the Oquirrh basin indicates that tectonic subsidence was 2.5 times that of the Eagle and Paradox Basins (Sturmer et al., 2018). The high magnitude of subsidence farthest from hypothesized tectonic drivers of ARM subsidence exists as a complex expression of southwest Laurentian intraplate deformation. The Oquirrh basin's intermediate location between two large transpressive margins, transitional crust beneath, or proximity to the Las Vegas-Wasatch tectonic hinge may explain the high magnitude of subsidence. Even within the Oquirrh basin, subsidence rates vary greatly from east to west (Table 2). Middle Pennsylvanian subsidence in the eastern and central Oquirrh basin is interpreted as flexural response to a fixed load on the eastern side of the basin, based on decreasing subsidence rates toward the west. Early Permian subsidence rate increasing in the western Oquirrh basin is interpreted as flexural loading from the west (Figure 3). Pennsylvanian subsidence of the Oquirrh basin may be related to the "classic" ARM orogeny (Kluth, 1986), while Permian subsidence may be related to the Humboldt uplift and unconformity sequence documented in Antler Overlap basins of northeastern Nevada (Trexler et al., 2004) or may be related to the questionable northeastern Nevada Pequop Uplift (Jordan and

Douglass, 1980). Whatever the source of Permian subsidence, the change in subsidence driver did little to alter long-standing sedimentation patterns of southwest Laurentia as seen in the relatively unchanging petrography and detrital zircon ages of Oquirrh Group sediments.

Sandstone Petrography

Petrographic analysis of 28 Oquirrh Group samples led to identification of five sublitharenites, 22 quartz arenites, and one calcarenite. Petrographic analysis suggests late Paleozoic sandstone grains were sourced from a quartz-rich source terrane(s). Sandstone samples consist of fine-grained, sub-angular to angular quartz grains. Atokan to Desmoinesian sandstones making up the Butterfield Peaks Formation are sublitharenitic to arenitic whereas Missourian to Leonardian sandstones are quartz arenites. Allard (1997) found Wolfcampian and Leonardian sandstones in the easternmost part of the basin to be sublitharenitic. Jordan and Douglass (1980) report Oquirrh Group samples to be subarkosic to quartz arenite. In comparison, the Lower Pennsylvanian Fountain and Lyons Formations from the Front Range Uplift (Hubert, 1960) and the lower Permian White Rim and Castle Valley Formations from the Uncompahgre Uplift (Lawton et al., 2015) are more arkosic than Oquirrh Group formations. This difference should be expected as central Colorado and southeast Utah both have ARM uplifts capable of generating arkosic detritus (Figure 2) whereas Idaho and central to northwest Utah do not. Geslin (1998) determined Oquirrh Group units in the Wood River Basin in Idaho were subarkosic to arenitic and most likely sourced from the craton's interior. Odom et al. (1976) analyzed the Middle Pennsylvanian Weber Sandstone from the Wyoming Shelf and classified it as subarkosic to arenitic, citing the craton as the ultimate source of the multi-cycled sand.

Crustal Provinces

The North American craton contains several age provinces ranging from the Archean to the Paleozoic that provided sediment to the western Laurentian margin (Figure 12; Gehrels et al., 2011). The Greater Appalachian Province (330 - 490 Ma) forms the eastern portion of Laurentia, and formed as a result of multiple mountain building events associated with the Appalachian orogen. Greater Appalachian zircon grains have been found as far west as the Grand Canyon and throughout western margin basins (Gehrels et al., 2011; May et al., 2013; Gehrels and Pecha, 2014). The Grenville Province (900-1200 Ma) lies west of, and parallels the Greater Appalachian Province along southern and eastern Laurentia. The Grenville Province served as the dominant sediment source for western Laurentia throughout the Neoproterozoic (Rainbird et al., 1997; 2012). The Granite-Rhyolite Province (1300-1500 Ma) is found in the southern portion of Laurentia and records activity associated with continental rifting. The Granite-Rhyolite Province is bound on the east by the Grenville Province, to the north and west by the Yavapai-Mazatzal Province (1600-1800 Ma), and to the south by the southern Laurentian margin. The Yavapai-Mazatzal Province is located in the Laurentian mid-continent and acts as a significant source of western margin grains after the Cambrian uplift of the Trans-continental arch (Lawton et al., 2010; Linde, 2016). Wyoming and Superior Archean Provinces (2500-3500 Ma) located farther north on the Laurentian craton act as sources for the oldest zircon grains found in the Cordilleran passive margin.

Greater Appalachian Terrane (330-490 Ma) – Population A

Population A contains Upper Paleozoic grains. Grains 500 Ma and younger originated in the Taconic (440-490 Ma), Acadian (350-420 Ma), and Alleghenian (270-330 Ma) orogens of eastern Laurentia (Dickinson and Gehrels, 2003, 2009; Thomas, 2011). All samples show strong signals up to 500 Ma except the Missourian Wallsburg Ridge Member in the east, which has a subdued signal. The Permian Diamond

Creek Sandstone sample from Hobble Creek recorded the most Population A grains ($n = 20$) and the Pennsylvanian Wallsburg Ridge Member sample from Hobble Creek recorded the least ($n = 9$).

Grenville Terrane (900-1200 Ma) – Population B

Population B consists of Mesoproterozoic grains most likely derived from the eastern and southeastern Laurentian margins (Dickinson and Gehrels, 2009). These ages correspond to a major period of felsic magmatism that accompanied collisional deformation as supercontinent Rodinia formed (Hoffman, 1989; Rainbird et al., 1997). The Grenville Province is the only Mesoproterozoic region large enough to have sourced so many grains (Rainbird et al., 1997). The central samples have strong signals <1000 Ma while the others do not, but generally population B grains have more distinct age peaks in the east and central parts of the basin while the west has a more equal distribution of grains in this age range. The Permian Diamond Creek Sandstone sample from Hobble Creek record the most Population B grains ($n = 37$) and the Permian Diamond Creek Sandstone sample from the Stansbury Range recorded the least ($n = 12$).

Granite-Rhyolite Terrane (1300-1500 Ma) – Population C

Population C consists of Mesoproterozoic grains derived from the granite-rhyolite terrane (Anderson, 1989; Dickinson and Gehrels, 2009) or grains from the 1350-1440 Ma plutons in the Uncompahgre uplift or San Juan dome (Bickford and Cudzilo, 1975; Jessup et al., 2006; Gonzales and Van Schmus, 2007). Population C grains have more distinct age peaks in the east and central parts of the basin whereas the west has a more equal distribution of grains in this age range. Population C signals were present in all six samples, but Permian samples were subdued compared to Pennsylvanian samples. The Pennsylvanian Butterfield Peaks Formation sample from the Stansbury Range record the most Population C grains ($n = 21$) and the Diamond Creek Sandstone sample from Hobble Creek recorded the least ($n = 14$).

Yavapai-Mazatzal Terrane (1600-1800 Ma) – Population D

Population D consists of Paleoproterozoic and Mesoproterozoic grains derived from the Yavapai-Mazatzal and Central Plains basements (Dickinson and Gehrels, 2009) or metamorphosed rocks of the Uncompahgre uplift or San Juan dome (Bickford et al., 1989; Jessup et al., 2006; Gonzales and Van Schmus, 2007; Jones et al., 2009). All six samples have grains of this age and the three Permian samples have a strong signal at 1600 Ma. Population D grains have more distinct age peaks in the east and central parts of the basin while the west has a more equal distribution of grains in this age range. The Permian Unconformity sample from the Grassy Mountains record the most Population D grains (n = 41) and the Pennsylvanian Butterfield Peaks Formation sample from the Lakeside Mountains recorded the least (n = 18)

Archean Terrane (2500-3500 Ma) – Population E

Population E consists of Archean grains derived from the Wyoming and Superior Provinces, as well as the cratonic nucleus of Laurentia. Population E grains are less common in the western samples as they are in the central and eastern samples. The Permian Diamond Creek Sandstone sample from the Stansbury Range record the most Population E grains (n = 11) and the Permian Diamond Creek Sandstone from Hobble Creek recorded the least (n = 5).

EM	East Mexico Magmatic Arc 0.29 - 0.23 Ga	PM	Passive Margin (reworked archean) 1.9 - 1.8 Ga
GA	Greater Appalachian 0.5 - 0.27 Ga	TH	Trans - Hudson Province 2.0 - 1.8 Ga
	Ouachita-Marathon ?	W	Wopmay 2.45 - 2.0 Ga
PA	Pan - African Province 0.72 - 0.40 Ga	PL	Peri - Laurentian Province >2.5 Ga & 2.0 - 0.40 Ga
GO	Grenville Orogen 1.2 - 1.0 Ga	M	Mojavia Province >2.5 & 1.72 - 1.68 Ga
GR	Granite - Rhyolite 1.48 - 1.34 Ga	WP/A	Wyoming Province/Archean 3.6 - 2.5 Ga
YM	Yavapai - Mazatzal Province 1.8 - 1.7 Ga		

Figure 12. Location of the main North American age provinces that may have provided sediment for the Late Paleozoic Oquirrh basin. Figure is adapted from Gehrels et al. (2011) and Linde (2016). ARM uplifts from Gehrels et al. (2011). Oquirrh basin highlighted in red within modern-day Utah.

Local and Distant Sediment Sources

Five population groupings of zircon ages can be identified in each sample, most of which are significantly older than the time of deposition. The spread of ages through five major crust-building events (Populations A-E) show the effects of having a large hinterland with a variety of source ages following episodic age distributions (Hawkesworth et al., 2009). Minor zircon grain contributions could have been sourced from local plutonism in pre-ARM strata of the Uncompahgre Uplift (Populations C and D). Zircon age spectra for the Oquirrh basin is generally similar to other Pennsylvanian sandstones in western Laurentia (May et al., 2013; Gehrels and Pecha, 2014). Pennsylvanian sedimentation blanketed Laurentia with Archean grains 2800-2500 Ma, Paleoproterozoic grains 1800-1600 Ma, Grenville-age grains 1200-900 Ma, and Ordovician and Silurian grains 445-425 Ma that show up in western Laurentian margin basins from Mexico to Canada (Gehrels et al., 1995; Link et al. 2014; Beranek et al., 2016). The Paradox Basin has a probability age plot (Lawton et al., 2015) very similar to the Oquirrh's in that it captures grains from terranes found close to the southern margin as well as grains from the eastern margin.

Potential for Zircon Recycling

Widespread dispersal across Laurentia of Mesoproterozoic to Late Paleozoic zircon grains originating from the Appalachian, Grenville, Granite-Rhyolite, Yavapai-Mazatzal, and Archean terranes make zircon recycling a possibility. Detrital zircon ages in this study show similar zircon terranes present in late Paleozoic rocks as those deposited along the north-south early Paleozoic passive margin. Initial deposition of zircon grains followed by subsequent uplift, erosion, and transport may not be captured alone by U-Pb age dating and therefore should not be ruled out. One potential example of zircon recycling would be Mesoproterozoic Grenvillian grains deposited in early Paleozoic sediments that become exposed

to erosion by Appalachian uplifting, resulting in a reintroduction to the sediment system, transport westward, and deposition into the Oquirrh basin in the late Paleozoic. Another example might include Grenville grains deposited in late Proterozoic or early Paleozoic units in Wyoming or Utah that were reintroduced into the system following ARM uplift and erosion.

Regional Correlation

Gehrels and Pecha (2014) identify similar zircon populations as in this study from the Grenville, Granite-Rhyolite, Yavapai-Mazatzal, and Archean provinces in early Paleozoic Cordilleran passive margin strata from northern Mexico to eastern Alaska. Linde (2016) found Neoproterozoic rocks in central Utah to have Grenville and Granite-Rhyolite zircon affinities whereas Cambrian rocks in the same location were shed more from the Granite-Rhyolite and Yavapai-Mazatzal mid-continent terranes. Coeval Permian units in the Paradox Basin record similar age distributions as the Oquirrh basin but with a sharp peak at 1441 Ma, sourced from Uncompahgre Uplift plutons (Lawton et al., 2015). We found six individual grains (one from each sample) within 10 My of 1441 Ma. The east and central samples have peaks around 1100 Ma which may coincide with activity associated with the Pikes Peak Batholith (Guitreau et al., 2016). We found nine grains to fall within 10 My of 1100 Ma. Lawton et al. (2015) identify zircon age peaks at 1750 Ma in the Paradox Basin representative of older Uncompahgre plutonism. We found 18 zircon grains to be within 10 My of 1750 Ma. Blum and Pecha (2014) identify Greater Appalachian, Grenville, Granite-Rhyolite, Yavapai-Mazatzal, and Archean zircon grains in northern Alberta with similar abundances as this study.

Basin Development and Sediment Provenance an Indicator of Transcontinental Transport System

Subsidence analysis of the Oquirrh basin identified two phases of tectonism that drove basin subsidence. Rapid basin subsidence enhanced the accommodation necessary to accumulate, on average, 7.5 km of sediment across the basin (Bissell, 1970; Geslin, 1998). The Cordilleran margin provided an enormous amount of sediment that eventually was deposited in the rapidly subsiding Oquirrh basin.

Petrographic analysis suggests sandstone grains from the Middle and Upper Pennsylvanian and lowest and lower Permian were sourced from the craton interior or were recycled. Samples are compositionally mature, and generally sub-angular quartz arenite or sublitharenite with varying levels of secondary calcite cement. Petrographic studies from western sediment sources are more chert- and lithic-rich than the Oquirrh basin suggesting the Roberts Mountain Allochthon was not a significant source of sediment.

The presence of zircon age groups consistent with timing of the Greater Appalachian orogen, initial Gondwanan collision with Laurentia, Grenville orogen, magmatism across south-central Laurentia, Yavapai-Mazatzal accretion, and Wyoming-Superior basement would suggest the presence of a transcontinental drainage system that moved sediment from the east to the west across Laurentia (Dickinson and Gehrels, 2003, 2009; Bhattacharya et al., 2016). Blum and Pecha (2014) identify a waning of Granite-Rhyolite and Yavapai-Mazatzal signatures in modern-day Tennessee, Mississippi, and Arkansas basins indicating Proterozoic and early Paleozoic sediment flow from the mid-continent was not to the east or southeast. Highlands are interpreted to have occupied the northern, eastern, and southern margins of Laurentia in the late Paleozoic leaving the majority of cratonic sediment nowhere to go but west and into the Cordilleran margin (Johansen, 1988). The abundance of Grenville zircons in Neoproterozoic strata along the passive margin of western Laurentia suggests that Precambrian transcontinental rivers must

have also transported sediment from Grenvillian highlands in eastern Laurentia (Rainbird et al., 1992, 1997; Stewart et al., 2001). The large number of Laurentian-derived sediments from geographically isolated source areas within Laurentia hint at the presence of presumably multiple transcontinental river systems through the Proterozoic and Paleozoic (Riggs et al., 1996; Rainbird et al., 1997; Stewart et al., 2001; Dickinson and Gehrels, 2009). Other detrital zircon age studies along the North American Cordillera show similar age populations (Dickinson and Gehrels, 2003; Hawkesworth et al., 2009; Blum and Pecha, 2014; Lawton et al., 2015). Each of the grain populations can be related to potential sources within age belts of Precambrian or Phanerozoic bedrock lying within the interior of Laurentia or along its tectonic margins. Paleogeographic reconstructions severely hinder arguments that zircon grains could have been derived from other continental blocks farther south and further support an east to west system (Johansen, 1988; Dickinson and Gehrels, 2003, 2009; Gehrels et al., 2011; Blakey, 2013).

Paleogeographic reconstructions suggest a marine trough existed between the Roberts Mountain Allochthon and the western edge of Laurentia (the Las Vegas-Wasatch tectonic hinge; Blakey, 2013). With the prevailing wind and ocean currents moving south and southwest (Allard, 1997; Dickinson and Gehrels, 2003; Lawton et al., 2015), sediment transported in western Laurentian fluvial systems would have reached the oceanic trough and been carried southward as part of longshore drift (Johansen, 1988; Gehrels et al., 1995). Ultimately grains would be funneled into the Oquirrh basin. The majority of Oquirrh basin sediment was sourced from a transcontinental sediment transport system that required southerly flow off of the craton, but local sources like the Uncompahgre and Piute Uplifts would have contributed sediment as well (Figure 13; Bissell, 1974; Lawton et al., 2015; Leary et al., 2017).

Figure 13. Late Pennsylvanian paleogeographic reconstruction showing proposed trans-continental fluvial system required to explain the abundant grains sourced in eastern Laurentia. Paleogeographic reconstruction by Blakey (2013), trade winds (large black arrows) from Gehrels and Pecha (2013), paleo-equator (white dashed line) from Gehrels and Pecha (2013), transcontinental arch (TCA; gold dashed line) from Linde (2016), longshore drift direction (small black arrows) from Dickinson and Gehrels (2003), Wasatch tectonic hinge (WH; purple dashed line) from Stokes (1976). Oquirrh basin highlighted in red.

Conclusions

The Oquirrh basin experienced differential tectonic subsidence that was active in the east and center part of the basin in the Pennsylvanian (Atokan), and in the west in the Permian (Leonardian). This interpretation guided sampling for sandstone petrography and U-Pb detrital zircon geochronology to discover if the differential subsidence rates were reflected in the provenance of the basin's sediment. Sandstone point counting showed that Oquirrh Group sandstones are compositionally mature, texturally immature, and contain sparse feldspar or lithic grains, leading to the interpretation that sample sediments were derived from the cratonic interior or from a recycled orogenic source – both are feasible with derivation from the tectonically-active Laurentian craton.

U-Pb detrital zircon age dating of three Pennsylvanian and three Permian Oquirrh Group samples suggest source terranes inboard on the Laurentian craton to the north, south, and east of the Oquirrh basin. Paleogeographic barriers along with wind and ocean currents, make it likely grains were sourced from Laurentia and not a western or southern source (Allard, 1997; Rainbird et al., 1997; Lawton et al., 2015). Age groups common in North American Cordilleran basins are seen in these samples including grains interpreted from the Appalachian orogen (330-490 Ma), Grenville orogen (900-1200 Ma), granite-rhyolite suite (1300-1500 Ma), Yavapai-Mazatzal terrane (1600-1800 Ma), and Archean basement (2500-3500 Ma).

This study tests the sedimentation response to differential subsidence in the Oquirrh basin and found that diachronous subsidence on the east and west of the basin was not significantly expressed in petrographic or geochronologic analyses. The potential westerly sediment source, the Roberts Mountain Allochthon, had no mechanism of delivering sediment beyond northeast Nevada thanks in part to the

western Utah highland and paleocurrents limiting eastward transport. Instead, sediment was overwhelmingly transported across multiple basement provinces, off the Laurentian craton, and delivered to the western Laurentian margin through time. Burial and recycling of Proterozoic sediment already deposited in western Laurentia is likely to have occurred as Paleozoic uplifts and basins would have trapped mid-continent sediment; however, a transport system coeval with the formation of the Oquirrh basin is needed to allow for Greater Appalachian grains to get from the Appalachian collision zone to the western margin of Laurentia.

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Appendix A

RAW U/PB ZIRCON DATA

Hobble Creek Permian Diamond Creek (AJ2) – Leonardian (291-272.95 Ma)

Grai n #	Bes t Ag e (M a)	U		Th		Th/ U	Equiv alent U	207/235		206/238		Error Correl -ation 6/38 vs 7/35	207/206		Age 207/235		Age 206/238		Age 207/206		Disc orda nce % (206 - 238/ 207- 235 date ere nce)	Un cer tai nty wei ght ed age diff ere nce
		ppm	2SE	ppm	2SE			Ratio	Prop 2SE	Ratio	Prop 2SE		Ratio	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE		
AJ2- 117	211	4110.0	140.0	4000.0	120.0	0.90	4245.0	0.4780	0.0220	0.0323	0.0016	0.2563	0.1054	0.0056	394	15	211	14	1678	100	46.5	12.2
AJ2- 126	273	277.0	20.0	60.8	3.9	0.22	291.3	0.3690	0.0130	0.0432	0.0012	0.4210	0.0621	0.0030	318	10	273	7	613	95	14.4	4.6
AJ2- 67	316	382.0	34.0	220.0	31.0	0.58	433.7	0.3850	0.0140	0.0503	0.0015	0.7133	0.0559	0.0012	329	10	316	9	440	46	3.9	1.3
AJ2- 103	328	548.0	37.0	206.0	13.0	0.38	596.4	0.3960	0.0100	0.0523	0.0009	0.2031	0.0545	0.0013	338	8	328	5	387	53	3.0	1.3
AJ2- 87	335	4525.0	74.0	446.0	6.3	0.10	4559.3	0.7900	0.0270	0.0534	0.0022	0.9454	0.1086	0.0016	589	15	335	14	1774	27	43.1	16.9
AJ2- 147	346	322.0	21.0	94.4	2.1	0.29	344.2	0.4108	0.0120	0.0552	0.0009	0.2069	0.0539	0.0013	349	8	346	6	350	56	0.8	0.3
AJ2- 175	352	521.0	33.0	265.0	16.0	0.51	583.3	0.5190	0.0230	0.0563	0.0032	0.7188	0.0689	0.0028	425	16	352	20	876	85	17.2	4.6
AJ2- 87	366	397.0	54.0	31.5	2.9	0.08	404.4	0.6260	0.0240	0.0584	0.0013	0.5298	0.0701	0.0023	494	15	366	8	1175	55	25.9	8.5
AJ2- 17	380	201.0	17.0	80.8	6.5	0.40	220.0	0.4270	0.0140	0.0608	0.0010	0.2547	0.0517	0.0016	361	10	380	6	260	68	5.3	1.9
AJ2- 147	388	547.0	30.0	186.0	8.4	0.34	590.7	0.5500	0.0200	0.0621	0.0015	0.0740	0.0665	0.0027	443	13	388	9	805	88	12.4	4.2
AJ2- 35	399	562.0	40.0	327.0	27.0	0.58	638.8	0.6480	0.0220	0.0638	0.0020	0.8218	0.0723	0.0014	506	14	399	12	1026	39	21.1	7.6
AJ2- 127	401	202.0	20.0	107.0	9.9	0.53	227.1	0.5020	0.0140	0.0641	0.0010	0.1533	0.0564	0.0014	413	10	401	6	455	58	3.1	1.3
AJ2- 51	401	243.0	27.0	79.2	4.9	0.33	261.6	0.4810	0.0140	0.0642	0.0010	0.1520	0.0541	0.0014	398	10	401	6	364	57	-0.7	-0.3
AJ2- 137	408	223.0	11.0	98.3	5.0	0.44	246.1	0.4960	0.0150	0.0653	0.0012	0.1441	0.0554	0.0016	410	10	408	7	410	64	0.6	0.2
AJ2- 56	413	302.0	18.0	8.2	0.6	0.03	303.9	0.5510	0.0180	0.0662	0.0014	0.4396	0.0602	0.0015	447	12	413	8	597	53	7.6	2.8
AJ2- 107	417	695.0	40.0	301.0	22.0	0.43	765.7	0.5070	0.0140	0.0668	0.0016	0.7446	0.0551	0.0009	416	9	417	10	416	36	-0.3	-0.1
AJ2- 72	420	177.0	21.0	4.5	0.2	0.03	178.1	0.5078	0.0130	0.0674	0.0011	0.2237	0.0541	0.0012	417	9	420	6	368	50	-0.9	-0.4
AJ2- 143	423	38.4	0.9	49.9	1.4	1.30	50.1	0.5440	0.0380	0.0679	0.0020	0.2397	0.0583	0.0038	442	25	423	12	510	140	4.3	0.8
AJ2- 143	427	423.0	63.0	40.2	0.9	0.10	432.4	0.5320	0.0180	0.0685	0.0016	0.6280	0.0577	0.0016	432	12	427	10	494	62	1.1	0.4

AI2_78	436	179.0	16.0	26.4	1.8	0.15	185.2	0.5470	0.0180	0.0699	0.0013	0.1039	0.0571	0.0017	443	12	436	8	499	67	1.7	0.6
AI2_136	436	103.7	9.3	68.9	4.9	0.66	119.9	0.5590	0.0210	0.0699	0.0014	0.0744	0.0586	0.0019	452	13	436	8	539	73	3.6	1.3
AI2_30	445	70.2	5.8	69.0	6.2	0.98	86.4	0.5500	0.0230	0.0715	0.0017	0.2422	0.0552	0.0022	445	15	445	10	428	91	0.0	0.0
AI2_64	455	401.0	33.0	206.0	17.0	0.51	449.4	0.6100	0.0240	0.0731	0.0017	0.5983	0.0598	0.0016	483	15	455	10	607	59	5.8	1.9
AI2_108	459	286.0	56.0	86.0	12.0	0.30	306.2	0.6720	0.0300	0.0739	0.0020	0.3376	0.0656	0.0022	519	18	459	12	771	69	11.6	3.3
AI2_37	461	265.0	25.0	99.3	2.3	0.37	288.3	0.6030	0.0150	0.0741	0.0011	0.1557	0.0591	0.0013	478	10	461	7	560	48	3.7	1.8
AI2_113	468	394.0	45.0	46.1	2.3	0.12	404.8	0.6750	0.0220	0.0754	0.0020	0.0929	0.0633	0.0021	522	13	468	12	714	72	10.3	4.2
AI2_92	474	105.0	17.0	31.7	4.3	0.30	112.4	0.6670	0.0330	0.0764	0.0025	0.4845	0.0636	0.0023	517	20	474	15	707	80	8.3	2.2
AI2_120	478	115.0	13.0	102.0	12.0	0.89	139.0	0.5730	0.0240	0.0770	0.0014	0.1757	0.0538	0.0021	458	16	478	9	341	85	-4.4	-1.3
AI2_139	494	899.0	60.0	79.9	7.6	0.09	911.8	1.0590	0.0410	0.0797	0.0035	0.9277	0.0963	0.0016	721	20	494	21	1550	21	32.4	11.9
AI2_21	497	170.0	15.0	122.1	9.4	0.72	198.7	0.6300	0.0210	0.0802	0.0015	0.5151	0.0578	0.0016	498	13	497	9	532	60	0.2	0.1
AI2_79	503	361.0	18.0	186.2	8.1	0.52	404.8	0.6560	0.0170	0.0811	0.0015	0.5619	0.0591	0.0011	512	10	503	9	570	42	1.8	0.9
AI2_63	541	213.0	25.0	18.4	1.3	0.09	217.3	0.7890	0.0280	0.0876	0.0021	0.6280	0.0659	0.0014	592	16	541	13	806	45	8.6	3.2
AI2_84	543	654.0	85.0	216.0	25.0	0.33	704.8	0.7270	0.0170	0.0879	0.0015	0.2096	0.0601	0.0015	554	10	543	9	589	51	2.0	1.1
AI2_105	565	1099.0	71.0	49.0	11.0	0.04	1110.5	2.3300	0.1700	0.0921	0.0075	0.9922	0.1870	0.0026	1219	51	565	44	2720	23	53.7	12.8
AI2_48	577	151.2	7.3	54.2	2.0	0.36	163.9	0.7900	0.0220	0.0937	0.0017	0.2315	0.0611	0.0017	591	13	577	10	625	58	2.3	1.0
AI2_11	591	172.9	5.8	87.9	3.3	0.51	193.6	0.8120	0.0210	0.0960	0.0016	0.2434	0.0607	0.0013	604	12	591	9	626	46	2.2	1.1
AI2_101	616	185.0	38.0	64.0	16.0	0.35	200.0	1.1490	0.0980	0.1009	0.0080	0.9514	0.0840	0.0019	754	44	616	46	1297	44	18.3	3.1
AI2_96	639	129.0	11.0	72.3	5.9	0.56	146.0	0.8510	0.0260	0.1043	0.0018	0.2607	0.0598	0.0017	623	14	639	11	586	61	-2.6	-1.2
AI2_54	642	69.1	2.4	26.0	0.8	0.38	75.2	0.8520	0.0310	0.1047	0.0027	0.3210	0.0593	0.0021	623	17	642	16	553	78	-3.0	-1.1
AI2_32	648	184.0	15.0	152.7	7.8	0.83	219.9	0.8930	0.0280	0.1057	0.0018	0.3713	0.0611	0.0015	646	15	648	11	639	52	-0.3	-0.1
AI2_106	654	6.4	1.5	1.8	0.6	0.28	6.8	1.2000	0.2000	0.1080	0.0110	0.4666	0.0799	0.0099	778	91	654	62	1010	240	15.9	1.4
AI2_68	671	388.0	27.0	42.0	2.7	0.11	397.9	0.9300	0.0190	0.1098	0.0016	0.2302	0.0615	0.0010	667	10	671	9	651	34	-0.6	-0.4
AI2_122	759	649.0	83.0	94.0	15.0	0.14	671.1	1.4230	0.0520	0.1246	0.0049	0.9224	0.0846	0.0016	901	22	759	28	1304	37	15.8	6.5
AI2_29	763	55.5	5.3	30.3	2.2	0.55	62.6	1.2940	0.0640	0.1260	0.0053	0.6422	0.0726	0.0025	841	28	763	30	1005	71	9.3	2.8
AI2_31	809	290.0	30.0	91.6	7.6	0.32	311.5	1.3250	0.0980	0.1343	0.0077	0.9651	0.0695	0.0018	834	46	809	44	922	52	3.0	0.5

AI2-134	826	664.0	97.0	244.0	23.0	0.37	718.3	2.1880	0.0540	0.1368	0.0041	0.8957	0.1175	0.0021	1170	17	926	23	1915	32	29.9	20.8
AI2-34	859	106.0	11.0	40.0	1.9	0.38	115.4	1.3210	0.0400	0.1425	0.0023	0.0942	0.0670	0.0018	854	18	859	13	822	58	-0.6	-0.3
AI2-53	873	401.9	6.8	21.9	3.5	0.05	407.0	1.9300	0.2500	0.1470	0.0140	0.9944	0.0861	0.0042	998	89	873	78	1307	99	12.5	1.4
AI2-44	885	133.0	15.0	38.2	3.7	0.29	142.0	1.4480	0.0420	0.1472	0.0025	0.2505	0.0710	0.0018	909	17	885	14	968	49	2.6	1.4
AI2-47	888	35.2	1.7	12.3	0.6	0.35	38.1	1.4900	0.0500	0.1477	0.0036	0.1260	0.0708	0.0023	925	20	888	20	981	70	4.0	1.9
AI2-138	888	557.0	32.0	401.0	23.0	0.72	651.2	2.4660	0.0660	0.1478	0.0037	0.8913	0.1211	0.0015	1161	20	888	21	1972	21	29.6	18.7
AI2-6	906	136.0	13.0	112.6	8.4	0.83	162.5	1.5200	0.0660	0.1513	0.0063	0.8537	0.0732	0.0016	931	27	906	36	1016	44	2.7	0.9
AI2-14	923	111.4	5.3	27.7	1.5	0.25	117.9	1.6650	0.0450	0.1540	0.0031	0.5723	0.0797	0.0017	999	17	923	17	1177	42	7.6	4.5
AI2-17	926	115.0	12.0	40.4	3.9	0.35	124.5	1.5210	0.0370	0.1544	0.0023	0.2710	0.0712	0.0015	940	15	926	13	959	44	1.5	0.9
AI2-115	929	364.0	16.0	125.0	5.4	0.34	393.4	1.5460	0.0320	0.1550	0.0024	0.5511	0.0722	0.0010	949	13	929	13	991	28	2.1	1.6
AI2-100	940	193.2	9.5	81.7	2.9	0.42	212.4	1.5090	0.0330	0.1570	0.0022	0.1264	0.0701	0.0012	934	14	940	12	926	36	-0.6	-0.4
AI2-114	956	136.0	21.0	54.0	8.9	0.40	148.7	1.5430	0.0420	0.1598	0.0027	0.4564	0.0701	0.0015	947	17	956	15	945	40	-1.0	-0.5
AI2-27	960	475.0	44.0	50.5	8.4	0.11	486.9	2.1400	0.3300	0.1650	0.0200	0.9949	0.0815	0.0047	1020	110	960	110	1120	120	5.9	0.5
AI2-46	966	37.9	2.4	14.2	1.5	0.37	41.2	1.5630	0.0590	0.1617	0.0034	0.1172	0.0703	0.0026	955	24	966	19	951	74	-1.2	-0.5
AI2-52	966	225.0	22.0	33.5	2.6	0.15	232.9	1.5820	0.0370	0.1617	0.0028	0.8147	0.0706	0.0012	962	15	966	16	940	34	-0.4	-0.3
AI2-98	969	829.0	85.0	190.0	14.0	0.23	873.7	1.8970	0.0550	0.1625	0.0060	0.9404	0.0857	0.0019	1077	20	969	34	1340	45	10.0	5.4
AI2-135	985	415.0	63.0	101.6	6.3	0.24	438.9	1.8080	0.0410	0.1651	0.0029	0.6330	0.0795	0.0012	1048	15	985	16	1179	30	6.0	4.2
AI2-24	990	137.8	4.3	83.3	3.8	0.60	157.4	1.6590	0.0370	0.1658	0.0028	0.3266	0.0731	0.0014	994	14	990	16	1012	39	0.4	0.3
AI2-26	101	126.0	12.0	50.7	4.9	0.40	137.9	1.7280	0.0370	0.1704	0.0026	0.2271	0.0730	0.0013	1018	14	1014	14	1012	37	0.4	0.3
AI2-116	101	120.0	14.0	28.8	2.7	0.24	126.8	1.7630	0.0500	0.1746	0.0029	0.3394	0.0728	0.0017	1033	18	1037	16	1013	47	-0.4	-0.2
AI2-99	103	186.0	20.0	58.1	6.2	0.31	199.7	1.7290	0.0410	0.1692	0.0030	0.3450	0.0737	0.0014	1022	15	1007	16	1035	39	1.5	1.0
AI2-12	104	170.7	6.0	108.5	2.8	0.64	196.2	1.7750	0.0360	0.1732	0.0024	0.3700	0.0742	0.0011	1036	13	1030	13	1041	31	0.6	0.5
AI2-8	104	114.0	15.0	70.4	8.7	0.62	130.5	1.8260	0.0410	0.1784	0.0030	0.3647	0.0741	0.0014	1055	15	1058	17	1045	37	-0.3	-0.2
AI2-41	104	269.0	10.0	63.5	2.2	0.24	283.9	1.8160	0.0370	0.1779	0.0025	0.2783	0.0742	0.0011	1050	13	1055	14	1046	29	-0.5	-0.4
AI2-76	104	56.8	5.9	29.4	2.9	0.52	63.7	1.7540	0.0520	0.1733	0.0030	0.3434	0.0740	0.0020	1034	19	1030	16	1046	53	0.4	0.2
AI2-104	105	235.0	15.0	39.2	1.8	0.17	244.2	1.8570	0.0410	0.1806	0.0027	0.4844	0.0743	0.0011	1065	14	1070	15	1050	30	-0.5	-0.4

AI2_124	105	319.0	12.0	364.1	8.9	1.14	404.6	1.7860	0.0360	0.1733	0.0026	0.5832	0.0746	0.0010	1040	13	1030	14	1059	27	0.9	0.7
AI2_10	106	72.6	6.4	26.7	2.0	0.37	78.9	1.7880	0.0460	0.1733	0.0031	0.2346	0.0746	0.0017	1045	17	1030	17	1067	48	1.4	0.9
AI2_25	108	152.0	15.0	35.1	2.6	0.23	160.2	1.8000	0.0410	0.1738	0.0028	0.3569	0.0754	0.0014	1046	16	1033	15	1083	36	1.2	0.8
AI2_128	108	188.0	12.0	140.7	5.8	0.75	221.1	1.7850	0.0480	0.1712	0.0036	0.6457	0.0757	0.0014	1039	18	1018	20	1086	37	2.0	1.2
AI2_18	110	172.1	6.7	140.7	4.0	0.82	205.2	1.9690	0.0430	0.1868	0.0026	0.0713	0.0765	0.0014	1106	14	1105	14	1103	35	0.1	0.1
AI2_70	110	31.7	2.0	18.6	0.9	0.59	36.1	2.1390	0.0780	0.2025	0.0041	0.1923	0.0769	0.0026	1163	25	1190	22	1106	67	-2.3	-1.1
AI2_130	111	62.9	5.1	25.2	2.1	0.40	68.8	1.7600	0.0590	0.1694	0.0039	0.5011	0.0760	0.0020	1026	22	1008	21	1119	53	1.8	0.8
AI2_140	112	234.0	14.0	79.0	5.1	0.34	252.6	1.8960	0.0400	0.1780	0.0029	0.5040	0.0772	0.0011	1080	14	1056	16	1122	28	2.2	1.7
AI2_95	114	99.8	7.9	27.9	3.6	0.28	106.4	2.0530	0.0480	0.1925	0.0031	0.3186	0.0779	0.0016	1137	16	1135	17	1148	39	0.2	0.1
AI2_39	115	236.0	15.0	138.2	7.0	0.59	268.5	2.1550	0.0450	0.1998	0.0028	0.4085	0.0783	0.0011	1166	14	1174	15	1157	28	-0.7	-0.6
AI2_42	116	75.8	3.9	22.5	1.0	0.30	81.1	2.1070	0.0540	0.1975	0.0033	0.4529	0.0788	0.0016	1152	18	1161	18	1160	40	-0.8	-0.5
AI2_49	116	115.0	12.0	57.1	6.1	0.50	128.4	2.0610	0.0650	0.1887	0.0043	0.5861	0.0787	0.0017	1132	22	1114	24	1162	42	1.6	0.8
AI2_74	117	44.3	2.8	30.4	1.9	0.69	51.4	2.1500	0.0660	0.1974	0.0038	0.1723	0.0787	0.0023	1168	21	1161	21	1170	60	0.6	0.3
AI2_129	117	262.0	11.0	42.8	3.4	0.16	272.1	1.9880	0.0440	0.1812	0.0029	0.4057	0.0792	0.0013	1110	15	1073	16	1174	33	3.3	2.5
AI2_91	117	45.6	4.1	74.8	6.5	1.64	63.2	2.0250	0.0700	0.1873	0.0036	0.2945	0.0780	0.0023	1119	23	1106	20	1176	63	1.2	0.6
AI2_132	118	211.0	25.0	113.0	13.0	0.54	237.6	2.2980	0.0560	0.2107	0.0038	0.6082	0.0792	0.0013	1210	17	1232	21	1182	33	-1.8	-1.3
AI2_83	119	198.0	26.0	88.0	13.0	0.44	218.7	2.0560	0.0480	0.1874	0.0038	0.6008	0.0797	0.0013	1133	16	1107	21	1191	33	2.3	1.6
AI2_58	120	52.8	2.7	26.7	1.4	0.51	59.1	2.1470	0.0580	0.1950	0.0039	0.4260	0.0801	0.0018	1161	19	1150	21	1202	46	0.9	0.6
AI2_121	120	46.2	2.8	16.8	1.0	0.36	50.1	2.2730	0.0680	0.2094	0.0039	0.2699	0.0796	0.0021	1202	21	1225	21	1206	50	-1.9	-1.1
AI2_148	123	146.0	20.0	86.0	8.9	0.59	166.2	2.4200	0.0530	0.2148	0.0033	0.3133	0.0818	0.0014	1250	16	1254	18	1238	34	-0.3	-0.3
AI2_149	123	47.0	4.6	30.0	1.4	0.64	54.1	2.2610	0.0770	0.1991	0.0041	0.2007	0.0817	0.0026	1197	24	1172	22	1239	64	2.1	1.0
AI2_50	128	138.9	6.8	49.1	2.1	0.35	150.4	2.4360	0.0540	0.2110	0.0033	0.4524	0.0836	0.0014	1254	16	1234	18	1287	31	1.6	1.3
AI2_71	130	329.0	28.0	110.0	16.0	0.33	354.9	2.0120	0.0990	0.1719	0.0087	0.9566	0.0843	0.0012	1107	35	1018	48	1305	27	8.0	2.5
AI2_9	131	18.0	0.7	16.6	0.6	0.92	21.9	2.2540	0.0930	0.1913	0.0051	0.3715	0.0856	0.0032	1189	29	1127	27	1316	75	5.2	2.1
AI2_23	132	70.8	3.7	37.7	2.5	0.53	79.7	2.5100	0.1200	0.2112	0.0040	0.6367	0.0863	0.0033	1268	34	1235	21	1322	73	2.6	1.0
AI2_73	134	95.0	13.0	27.5	2.3	0.29	101.5	2.6470	0.0660	0.2222	0.0035	0.1102	0.0866	0.0018	1315	18	1295	18	1346	41	1.5	1.1

AI2_136	67.2	1.5	23.0	0.5	0.34	72.6	2.6660	0.0650	0.2208	0.0034	0.0150	0.0877	0.0020	1319	18	1286	18	1368	43	2.5	1.8
AI2_20	386.0	40.0	100.3	6.2	0.26	409.6	2.3700	0.1700	0.1950	0.0100	0.9767	0.0878	0.0024	1208	58	1141	56	1374	54	5.5	1.2
AI2_94	63.3	3.4	15.5	0.8	0.25	67.0	2.7220	0.0740	0.2265	0.0038	0.1619	0.0875	0.0022	1337	20	1315	20	1376	48	1.6	1.1
AI2_111	227.0	15.0	73.1	2.0	0.32	244.2	2.9170	0.0560	0.2359	0.0032	0.1859	0.0897	0.0012	1386	15	1365	17	1418	27	1.5	1.4
AI2_81	96.0	14.0	19.5	1.7	0.20	100.6	3.0160	0.0770	0.2383	0.0044	0.2332	0.0917	0.0019	1411	19	1377	23	1451	40	2.4	1.8
AI2_118	132.5	8.5	46.3	2.9	0.35	143.4	3.4090	0.0760	0.2671	0.0041	0.5385	0.0927	0.0014	1505	18	1527	21	1478	28	-1.5	-1.2
AI2_112	191.0	16.0	63.5	3.9	0.33	205.9	3.0250	0.0650	0.2361	0.0040	0.5749	0.0928	0.0013	1412	16	1366	21	1480	27	3.3	2.9
AI2_148	182.0	16.0	35.9	3.3	0.20	190.4	2.9100	0.1800	0.2203	0.0085	0.9438	0.0936	0.0030	1356	51	1280	45	1491	61	5.6	1.5
AI2_149	243.0	32.0	57.6	5.4	0.24	256.5	2.4230	0.0970	0.1898	0.0067	0.9154	0.0933	0.0015	1246	28	1118	36	1495	29	10.3	4.6
AI2_90	404.0	30.0	82.6	5.8	0.20	423.4	2.5530	0.0670	0.1994	0.0045	0.8870	0.0937	0.0011	1289	20	1171	24	1499	22	9.2	5.9
AI2_85	189.0	14.0	98.8	5.6	0.52	212.2	3.4790	0.0660	0.2703	0.0038	0.3799	0.0937	0.0012	1522	15	1542	19	1501	24	-1.3	-1.4
AI2_57	168.2	6.6	68.4	2.3	0.41	184.3	3.3840	0.0670	0.2612	0.0037	0.4120	0.0942	0.0013	1500	15	1496	19	1508	25	0.2	0.2
AI2_110	99.3	5.0	42.7	4.4	0.43	109.3	3.6100	0.1800	0.2747	0.0073	0.8591	0.0955	0.0030	1546	43	1563	38	1539	61	-1.1	-0.4
AI2_156	174.0	12.0	59.3	2.0	0.34	187.9	3.4140	0.0820	0.2542	0.0043	0.7617	0.0969	0.0014	1505	19	1463	23	1564	27	2.8	2.2
AI2_22	11.3	1.1	12.8	1.1	1.13	14.3	3.9900	0.1800	0.2914	0.0078	0.4910	0.0980	0.0039	1617	38	1646	39	1577	75	-1.8	-0.8
AI2_45	287.0	15.0	199.3	8.6	0.69	333.8	4.0150	0.0720	0.2901	0.0040	0.4961	0.1000	0.0011	1637	15	1642	20	1623	21	-0.3	-0.4
AI2_28	46.5	6.8	12.8	1.6	0.28	49.5	3.8150	0.1100	0.2781	0.0055	0.5653	0.1002	0.0022	1594	24	1581	28	1626	42	0.8	0.5
AI2_82	27.1	3.3	9.7	1.1	0.36	29.4	3.8800	0.1300	0.2775	0.0061	0.5090	0.1006	0.0031	1605	28	1578	31	1627	56	1.7	1.0
AI2_61	165.0	13.0	49.3	2.7	0.30	176.6	3.9520	0.0880	0.2841	0.0048	0.7848	0.1002	0.0013	1622	18	1614	25	1628	24	0.5	0.4
AI2_150	101.0	6.5	65.0	3.5	0.64	116.3	3.9020	0.0810	0.2810	0.0045	0.3085	0.1005	0.0016	1614	17	1596	23	1635	30	1.1	1.1
AI2_60	239.0	27.0	143.0	14.0	0.60	272.6	3.8740	0.0760	0.2771	0.0043	0.5101	0.1008	0.0014	1607	16	1576	22	1638	25	1.9	2.0
AI2_109	75.4	2.9	57.1	2.1	0.76	88.8	4.0820	0.0830	0.2903	0.0040	0.1519	0.1016	0.0016	1651	17	1643	20	1648	30	0.5	0.5
AI2_102	277.0	15.0	61.0	17.0	0.22	291.3	3.9610	0.0790	0.2830	0.0044	0.6699	0.1016	0.0012	1625	16	1608	21	1651	22	1.0	1.1
AI2_13	199.0	24.0	73.7	3.7	0.37	216.3	4.0900	0.0780	0.2905	0.0042	0.4126	0.1017	0.0013	1652	15	1644	21	1657	24	0.5	0.5
AI2_144	133.2	5.6	150.1	2.5	1.13	168.5	3.9870	0.0800	0.2817	0.0044	0.4575	0.1019	0.0015	1632	17	1599	22	1663	27	2.0	1.9
AI2_4	236.0	17.0	102.1	6.9	0.43	260.0	4.1960	0.0770	0.2987	0.0041	0.4891	0.1022	0.0012	1673	15	1685	20	1665	22	-0.7	-0.8

AI2_166	166	160.0	15.0	80.9	7.3	0.51	179.0	3.8800	0.0790	0.2741	0.0046	0.3609	0.1025	0.0016	1610	16	1561	23	1667	28	3.0	3.1
AI2_145	7	193.0	12.0	85.9	4.4	0.45	213.2	3.9400	0.1300	0.2807	0.0077	0.9251	0.1027	0.0013	1618	27	1593	40	1672	23	1.5	0.9
AI2_62	2	473.0	43.0	177.0	8.7	0.37	514.6	3.4430	0.1100	0.2435	0.0058	0.9016	0.1026	0.0015	1514	25	1403	30	1672	26	7.3	4.4
AI2_80	2	143.5	8.2	37.6	1.5	0.26	152.3	3.7970	0.0950	0.2620	0.0049	0.7202	0.1034	0.0016	1595	20	1500	25	1681	28	6.0	4.8
AI2_5	1	568.0	49.0	221.0	14.0	0.39	619.9	3.5200	0.2200	0.2370	0.0160	0.9919	0.1035	0.0016	1498	63	1400	77	1682	30	6.5	1.6
AI2_15	2	224.0	36.0	34.1	5.5	0.15	232.0	4.2440	0.0990	0.2906	0.0061	0.6340	0.1056	0.0017	1682	19	1643	30	1725	30	2.3	2.1
AI2_89	5	110.0	14.0	39.7	2.5	0.36	119.3	4.5830	0.0920	0.3114	0.0045	0.1413	0.1068	0.0016	1747	16	1747	22	1740	28	0.0	0.0
AI2_36	0	289.0	31.0	158.0	11.0	0.55	326.1	2.8460	0.0810	0.1913	0.0053	0.8151	0.1069	0.0018	1368	22	1127	29	1742	31	17.6	11.0
AI2_88	2	270.0	19.0	99.8	7.4	0.37	293.5	4.5980	0.0890	0.3101	0.0046	0.5662	0.1072	0.0013	1748	16	1742	23	1752	23	0.3	0.4
AI2_125	2	98.8	5.0	34.0	1.2	0.34	106.8	4.4230	0.1000	0.2993	0.0049	0.3635	0.1073	0.0019	1716	19	1687	24	1753	32	1.7	1.5
AI2_142	3	127.8	9.1	54.6	4.4	0.43	140.6	4.6760	0.0980	0.3141	0.0048	0.7104	0.1081	0.0014	1761	17	1760	24	1769	25	0.1	0.1
AI2_59	9	371.0	19.0	135.8	6.5	0.37	402.9	4.6870	0.0810	0.3139	0.0042	0.6278	0.1085	0.0011	1765	15	1759	21	1774	19	0.4	0.4
AI2_93	4	232.0	22.0	31.0	1.7	0.13	239.3	4.8200	0.0950	0.3209	0.0055	0.6938	0.1086	0.0012	1790	16	1796	26	1776	20	-0.3	-0.4
AI2_123	6	64.8	2.0	18.3	1.1	0.28	69.1	5.0690	0.1200	0.3353	0.0055	0.3322	0.1097	0.0021	1832	20	1863	27	1790	34	-1.7	-1.6
AI2_77	0	542.0	27.0	250.0	13.0	0.46	600.8	4.9140	0.0870	0.3251	0.0045	0.8952	0.1095	0.0011	1805	15	1814	22	1793	17	-0.5	-0.6
AI2_66	3	326.0	18.0	142.8	7.3	0.44	359.6	5.0740	0.1000	0.3188	0.0050	0.7437	0.1163	0.0013	1833	17	1784	24	1898	20	2.7	2.9
AI2_38	8	35.2	2.8	27.3	1.7	0.78	41.6	5.8800	0.1600	0.3535	0.0072	0.7172	0.1209	0.0026	1957	24	1950	34	1968	38	0.4	0.3
AI2_97	8	561.0	32.0	21.1	1.0	0.04	566.0	5.1320	0.1200	0.3055	0.0070	0.8920	0.1217	0.0013	1841	19	1717	34	1979	19	6.7	6.5
AI2_86	9	67.0	15.0	66.0	5.7	0.99	82.5	6.2200	0.1800	0.3675	0.0081	0.8915	0.1235	0.0021	2002	27	2016	39	2002	30	-0.7	-0.5
AI2_200	2	163.0	12.0	52.6	0.8	0.32	175.4	6.0200	0.2400	0.3485	0.0100	0.9770	0.1248	0.0019	1966	39	1924	51	2021	28	2.1	1.1
AI2_43	1	244.0	11.0	181.2	8.1	0.74	286.6	6.6800	0.1200	0.3825	0.0052	0.4143	0.1263	0.0014	2069	16	2089	24	2055	19	-1.0	-1.2
AI2_16	5	140.0	13.0	65.5	4.8	0.47	155.4	6.6140	0.1400	0.3770	0.0063	0.6358	0.1273	0.0015	2062	19	2061	29	2061	21	0.0	0.1
AI2_55	1	254.0	14.0	210.0	14.0	0.83	303.4	12.4470	0.2100	0.4992	0.0068	0.6243	0.1814	0.0017	2638	16	2612	29	2665	16	1.0	1.6
AI2_141	5	16.8	1.5	19.3	0.9	1.15	21.3	13.9800	0.4100	0.5430	0.0140	0.7881	0.1851	0.0041	2740	32	2790	57	2702	36	-1.8	-1.6
AI2_270	2	365.0	81.0	25.8	3.0	0.07	371.1	14.0900	0.3400	0.5202	0.0083	0.7339	0.1930	0.0025	2752	23	2699	35	2766	21	1.9	2.3
AI2_65	2	72.5	3.7	24.2	1.3	0.33	78.2	15.5000	0.3600	0.5436	0.0087	0.7121	0.2064	0.0028	2847	22	2797	36	2874	22	1.8	2.3
AI2_19	6																					
AI2_287	4																					

A12_3	3048	286.0	26.0	36.7	1.9	0.13	294.6	15.8000	0.6100	0.4870	0.0140	0.9702	0.2320	0.0048	2837	52	2553	64	3048	42	10.0	5.5
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Hobble Creek Wallsburg Ridge Member (AJ4) – Missourian-Virgilian (306.5-298.9 Ma)

Grain #	Best Age (Ma)	U		Th		Th/U	Equiv alent U	207/235		206/238		Error Correl -ation 6/38 vs 7/35	207/206		Age 207/235		Age 206/238		Age 207/206		Discor dance % (206-238/207-age difference date)	Unc ertai nty weig hted age diffe renc e
		pp m	2SE	ppm	2SE		ppm	Ratio	Prop 2SE	Ratio	Prop 2SE		Ratio	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE		
AJ4_100	264	1180.0	220.0	253.0	50.0	0.30	1263.0	0.4470	0.0330	0.0419	0.0031	0.9776	0.0776	0.0011	368	24	264	19	1138	29	28.3	4.3
AJ4_9	293	413.0	20.0	140.6	6.8	0.34	446.0	0.3590	0.0120	0.0466	0.0015	0.5846	0.0560	0.0011	312	10	293	9	457	43	6.0	2.0
AJ4_63	334	475.0	33.0	80.0	11.0	0.17	493.8	0.4100	0.0210	0.0531	0.0019	0.2698	0.0558	0.0013	348	14	334	12	430	52	4.2	1.0
AJ4_36	346	2000.0	210.0	579.0	45.0	0.29	21136.1	0.6080	0.0370	0.0553	0.0036	0.9847	0.0799	0.0010	476	24	346	22	1190	26	27.3	5.4
AJ4_56	349	640.0	150.0	63.0	22.0	0.10	654.8	0.4670	0.2300	0.0556	0.0130	0.5144	0.0613	0.0027	388	45	349	63	690	50	10.1	0.9
AJ4_98	393	337.0	13.0	369.0	15.0	1.09	423.7	0.4714	0.0120	0.0629	0.0011	0.3709	0.0541	0.0012	392	8	393	7	368	48	-0.3	-0.2
AJ4_158	397	180.1	8.8	135.5	4.3	0.75	211.9	0.4880	0.0140	0.0635	0.0013	0.1347	0.0559	0.0015	403	10	397	8	442	62	1.4	0.6
AJ4_10	434	246.0	18.0	78.8	5.4	0.32	264.5	0.5230	0.0150	0.0696	0.0013	0.2227	0.0545	0.0013	427	10	434	8	381	54	-1.7	-0.7
AJ4_50	438	356.0	32.0	21.8	1.3	0.06	361.1	0.5380	0.0450	0.0703	0.0028	0.2242	0.0552	0.0020	438	27	438	16	429	69	0.0	0.0
AJ4_133	438	208.0	16.0	232.0	30.0	1.12	262.5	0.5820	0.0240	0.0704	0.0029	0.8603	0.0602	0.0014	466	15	438	17	623	56	6.0	1.9
AJ4_23	449	912.0	73.0	45.0	20.0	0.05	922.6	0.5720	0.1200	0.0722	0.0075	0.1803	0.0585	0.0025	459	51	449	43	530	61	2.1	0.2
AJ4_65	482	123.0	8.8	77.9	6.0	0.63	141.3	0.6230	0.0190	0.0777	0.0013	0.0268	0.0576	0.0018	492	12	482	8	492	69	2.1	0.8
AJ4_79	536	415.0	57.0	146.0	17.0	0.35	449.3	0.8380	0.0210	0.0867	0.0014	0.4223	0.0700	0.0013	619	11	536	8	938	38	13.4	7.6
AJ4_42	563	685.0	97.0	46.7	7.5	0.07	696.0	0.7500	0.6600	0.0912	0.0270	0.7218	0.0601	0.0083	568	150	563	140	614	160	0.9	0.0
AJ4_11	580	268.0	14.0	61.3	2.1	0.23	282.4	0.7600	0.0200	0.0941	0.0017	0.2600	0.0592	0.0013	573	11	580	10	577	47	-1.2	-0.6
AJ4_77	584	1660.0	200.0	700.0	120.0	0.42	1824.5	1.3700	0.1400	0.0957	0.0094	0.9922	0.1026	0.0013	847	58	584	55	1669	23	31.1	4.5
AJ4_49	593	116.5	5.8	89.7	5.6	0.77	137.6	0.7890	0.0860	0.0964	0.0026	0.3747	0.0597	0.0053	589	29	593	15	563	100	-0.7	-0.1
AJ4_3	613	201.5	3.3	5.0	1.0	0.03	202.7	0.8400	0.1400	0.0998	0.0096	0.3588	0.0635	0.0021	618	51	613	53	710	52	0.8	0.1
AJ4_99	618	495.0	57.0	398.0	51.0	0.80	588.5	0.8360	0.0180	0.1006	0.0017	0.5519	0.0604	0.0009	617	10	618	10	618	32	-0.1	0.0
AJ4_21	639	159.6	2.1	99.2	5.2	0.62	182.9	0.8660	0.0260	0.1042	0.0018	0.4848	0.0603	0.0013	634	14	639	10	619	45	-0.8	-0.4
AJ4_142	651	864.0	61.0	277.0	17.0	0.32	929.1	1.3880	0.0340	0.1063	0.0027	0.8930	0.0872	0.0011	842	15	651	15	1364	24	22.7	12.7

A14_47	675	856.0	64.0	8.4	1.5	0.01	858.0	0.9530	0.2200	0.1105	0.0130	0.6283	0.0634	0.0032	679	75	675	73	718	79	0.6	0.1
A14_27	757	4075.0	95.0	384.0	43.0	0.36	1165.2	1.7450	0.1100	0.1247	0.0073	0.9040	0.1009	0.0012	4024	53	757	43	4639	23	26.1	5.0
A14_88	773	1380.0	120.0	44.7	2.9	0.03	1390.5	1.2810	0.0550	0.1276	0.0053	0.9766	0.0723	0.0008	831	25	773	31	993	22	7.0	2.3
A14_22	807	767.0	26.0	108.7	8.2	0.14	792.5	1.4710	0.0670	0.1336	0.0066	0.9587	0.0797	0.0013	919	32	807	38	1190	31	12.2	3.5
A14_75	864	990.0	100.0	269.0	25.0	0.27	1093.2	2.2520	0.0980	0.1435	0.0037	0.9553	0.1645	0.0017	1469	24	864	21	2502	48	41.2	25.2
A14_83	873	831.0	67.0	26.5	3.0	0.03	837.2	1.4450	0.0330	0.1452	0.0032	0.8719	0.0719	0.0009	909	14	873	18	985	24	4.0	2.6
A14_134	896	220.0	18.0	44.6	4.2	0.20	230.5	1.5400	0.1400	0.1500	0.0110	0.9833	0.0713	0.0021	905	61	896	61	943	66	1.0	0.1
A14_71	897	1190.0	110.0	230.0	20.0	0.19	1244.1	2.0600	0.1400	0.1472	0.0099	0.9922	0.0999	0.0011	1116	45	897	57	1622	20	19.6	4.9
A14_96	906	347.0	10.0	50.8	6.5	0.15	358.9	1.5140	0.0720	0.1512	0.0058	0.9713	0.0726	0.0011	927	30	906	33	997	31	2.3	0.7
A14_93	928	255.0	25.0	122.0	10.0	0.48	283.7	1.5670	0.0380	0.1549	0.0031	0.7125	0.0734	0.0010	957	15	928	18	1020	28	3.0	1.9
A14_92	933	20.7	1.6	11.1	0.7	0.54	23.3	1.6150	0.0810	0.1552	0.0050	0.4881	0.0789	0.0034	984	32	933	29	1167	88	5.2	1.6
A14_101	942	412.0	35.0	132.0	7.2	0.32	443.0	1.6430	0.0480	0.1575	0.0041	0.8722	0.0752	0.0010	986	18	942	23	1072	27	4.5	2.4
A14_18	948	1017.0	63.0	147.8	7.6	0.15	1051.7	1.6300	0.0600	0.1585	0.0058	0.8638	0.0753	0.0008	981	27	948	33	1075	21	3.4	1.2
A14_117	982	850.0	130.0	204.0	27.0	0.24	897.9	1.9250	0.0820	0.1649	0.0064	0.9648	0.0837	0.0010	1081	29	982	35	1287	24	9.2	3.4
A14_68	995	37.9	4.7	25.1	2.9	0.66	43.8	1.7100	0.0630	0.1670	0.0042	0.3534	0.0736	0.0024	1007	23	995	23	1031	68	1.2	0.5
A14_34	999	115.2	2.5	4.4	0.3	0.04	116.2	1.6420	0.2000	0.1677	0.0110	0.5033	0.0720	0.0026	992	54	999	55	978	57	-0.7	-0.1
A14_106	1020	853.0	93.0	218.0	21.0	0.26	904.2	1.7430	0.0330	0.1715	0.0025	0.7656	0.0731	0.0008	1024	12	1021	13	1020	21	0.3	0.2
A14_151	1035	247.0	31.0	63.1	6.9	0.26	261.8	1.7390	0.0360	0.1739	0.0024	0.0053	0.0722	0.0012	1023	13	1035	13	989	33	-1.1	-0.9
A14_51	1049	147.0	13.0	63.0	6.8	0.43	161.8	1.8010	0.0570	0.1736	0.0043	0.5569	0.0740	0.0012	1046	23	1032	24	1049	35	1.3	0.6
A14_114	1056	212.5	7.8	26.4	0.6	0.12	218.7	1.8250	0.0360	0.1779	0.0026	0.2305	0.0745	0.0010	1054	13	1056	14	1056	27	-0.2	-0.1
A14_16	1057	52.1	3.0	22.9	1.3	0.44	57.5	1.7640	0.0660	0.1731	0.0044	0.1314	0.0743	0.0021	1029	25	1031	25	1057	56	-0.2	-0.1
A14_132	1068	82.5	7.2	22.7	1.7	0.28	87.8	1.8170	0.0460	0.1759	0.0026	0.0840	0.0750	0.0018	1051	17	1044	14	1068	50	0.6	0.4
A14_33	1069	286.0	15.0	98.4	4.1	0.34	309.1	1.9100	0.0360	0.1838	0.0025	0.3572	0.0749	0.0010	1084	13	1087	14	1069	25	-0.3	-0.3
A14_19	1094	363.0	19.0	90.8	5.9	0.25	384.3	1.7940	0.0430	0.1720	0.0028	0.7996	0.0759	0.0010	1043	16	1024	16	1094	26	1.8	1.2
A14_145	1106	402.0	21.0	166.5	7.2	0.41	441.1	1.9890	0.0360	0.1884	0.0028	0.5397	0.0764	0.0009	1112	13	1114	15	1106	24	-0.2	-0.1
A14_104	1125	517.0	68.0	68.6	1.5	0.13	533.1	1.8290	0.0410	0.1714	0.0030	0.6545	0.0773	0.0010	1055	14	1020	17	1125	25	3.3	2.5
A14_20	1128	147.8	9.4	41.7	2.7	0.28	157.6	2.0390	0.0550	0.1913	0.0038	0.3484	0.0772	0.0012	1129	19	1128	22	1128	30	0.1	0.1
A14_135	1129	91.0	5.6	31.9	1.8	0.35	98.5	2.0870	0.0530	0.1936	0.0031	0.1769	0.0774	0.0016	1144	17	1141	17	1129	41	0.3	0.2

AI4_28	1132	377.0	58.0	22.7	2.0	0.06	382.3	2.0030	0.0540	0.1868	0.0042	0.7823	0.0775	0.0012	1116	18	1106	23	1132	30	0.9	0.6
AI4_105	1137	405.0	18.0	167.7	8.2	0.41	444.4	2.0620	0.0420	0.1927	0.0031	0.9453	0.0776	0.0009	1135	14	1136	17	1137	24	-0.1	0.0
AI4_125	1144	304.7	8.6	147.7	4.0	0.48	339.4	2.1080	0.0400	0.1968	0.0026	0.4230	0.0778	0.0010	1151	13	1158	14	1144	26	-0.6	-0.5
AI4_130	1145	239.7	5.5	83.0	3.7	0.35	259.2	1.9270	0.0410	0.1798	0.0028	0.6108	0.0779	0.0012	1089	14	1068	15	1145	29	1.9	1.5
AI4_150	1154	48.9	3.3	22.3	1.3	0.46	54.1	2.0320	0.0620	0.1886	0.0035	0.3196	0.0783	0.0021	1127	21	1113	19	1154	54	1.2	0.7
AI4_152	1161	571.0	37.0	148.3	7.5	0.26	605.9	2.0280	0.0400	0.1875	0.0030	0.9055	0.0785	0.0008	1124	13	1108	16	1161	21	1.4	1.2
AI4_143	1167	351.0	21.0	59.3	3.4	0.17	364.9	2.2600	0.0470	0.2087	0.0035	0.6299	0.0789	0.0010	1200	14	1222	19	1167	25	-1.8	-1.6
AI4_40	1186	59.4	8.1	12.8	1.2	0.22	62.4	2.0820	0.0780	0.1899	0.0042	0.5602	0.0801	0.0022	1148	26	1120	23	1186	55	2.4	1.1
AI4_91	1210	65.3	3.9	39.3	2.4	0.60	74.5	2.3670	0.0540	0.2105	0.0036	0.3844	0.0808	0.0013	1231	17	1231	19	1210	33	0.0	0.0
AI4_73	1255	139.2	8.1	48.7	2.8	0.35	150.6	2.3930	0.0610	0.2114	0.0035	0.7883	0.0826	0.0013	1238	18	1236	19	1255	30	0.2	0.1
AI4_115	1262	689.0	89.0	11.7	0.7	0.02	691.8	2.3500	0.2100	0.2059	0.0100	0.8507	0.0830	0.0022	1235	47	1207	52	1262	41	2.3	0.6
AI4_85	1300	233.0	21.0	80.5	5.1	0.35	251.9	2.5490	0.0920	0.2190	0.0072	0.8181	0.0844	0.0012	1287	31	1276	39	1300	30	0.9	0.4
AI4_86	1305	111.2	6.6	37.4	3.1	0.34	120.0	1.9470	0.0720	0.1679	0.0047	0.7617	0.0846	0.0018	1099	24	1002	27	1305	41	8.8	4.0
AI4_94	1310	44.2	0.5	26.2	0.9	0.59	50.3	2.6160	0.0950	0.2243	0.0060	0.2175	0.0854	0.0021	1303	29	1304	32	1310	49	-0.1	0.0
AI4_41	1332	300.0	7.8	61.2	4.5	0.20	314.4	2.6570	0.0510	0.2250	0.0035	0.4821	0.0858	0.0011	1316	15	1308	18	1332	25	0.6	0.5
AI4_45	1337	292.5	6.4	127.9	2.2	0.44	322.6	2.7420	0.0520	0.2312	0.0034	0.6158	0.0859	0.0009	1339	14	1342	18	1337	21	-0.2	-0.2
AI4_90	1382	346.0	16.0	95.0	13.0	0.27	368.3	2.7400	0.1300	0.2228	0.0080	0.9724	0.0884	0.0016	1330	37	1299	41	1382	35	2.3	0.8
AI4_127	1406	845.0	37.0	225.6	8.2	0.27	898.0	2.6370	0.0950	0.2125	0.0064	0.9786	0.0893	0.0012	1304	29	1240	34	1406	27	4.9	2.2
AI4_67	1423	93.6	8.0	24.6	1.9	0.26	99.4	2.8200	0.1100	0.2239	0.0070	0.8978	0.0898	0.0019	1351	32	1300	37	1423	41	3.8	1.6
AI4_122	1449	78.7	3.7	65.1	2.4	0.83	94.0	3.1920	0.0730	0.2526	0.0043	0.2363	0.0910	0.0016	1455	19	1451	22	1449	34	0.3	0.2
AI4_131	1466	307.0	21.0	79.5	4.5	0.26	325.7	3.2860	0.0600	0.2597	0.0038	0.2766	0.0917	0.0013	1477	14	1488	20	1466	25	-0.7	-0.8
AI4_7	1472	112.0	6.0	47.3	2.2	0.42	123.1	3.2540	0.0660	0.2557	0.0035	0.2395	0.0922	0.0015	1470	16	1468	18	1472	29	0.1	0.1
AI4_123	1475	123.0	4.9	25.1	0.9	0.20	128.9	3.1990	0.0790	0.2502	0.0050	0.3197	0.0926	0.0014	1456	20	1439	26	1475	29	1.2	0.9
AI4_121	1477	177.6	9.4	46.4	2.1	0.26	188.5	3.3260	0.0620	0.2608	0.0037	0.3220	0.0927	0.0012	1486	15	1494	19	1477	26	-0.5	-0.5
AI4_60	1480	99.5	9.5	26.9	3.2	0.27	105.8	3.3290	0.0720	0.2590	0.0038	0.2450	0.0927	0.0015	1486	17	1489	20	1480	32	-0.2	-0.2
AI4_58	1481	365.0	40.0	63.0	6.7	0.17	379.8	3.3250	0.0680	0.2604	0.0045	0.6435	0.0927	0.0012	1486	16	1492	23	1481	23	-0.4	-0.4
AI4_153	1486	95.4	5.2	51.0	2.2	0.53	107.4	3.3040	0.0700	0.2571	0.0043	0.3333	0.0927	0.0016	1481	16	1475	22	1486	32	0.4	0.4
AI4_154	1490	918.0	42.0	670.0	23.0	0.73	1075.5	3.4200	0.0580	0.2664	0.0035	0.6756	0.0931	0.0008	1509	14	1524	18	1490	17	-0.9	-1.0

AI4_8	1499	107.0	6.2	38.7	2.7	0.36	116.1	3.3260	0.0730	0.2570	0.0044	0.4257	0.0938	0.0015	1486	17	1474	23	1499	29	0.8	0.7
AI4_109	1505	219.0	34.0	118.0	15.0	0.54	246.7	3.4530	0.0690	0.2670	0.0039	0.5415	0.0940	0.0012	1517	15	1525	20	1505	25	-0.6	-0.6
AI4_97	1506	330.0	44.0	71.3	3.7	0.22	346.8	2.5090	0.0590	0.1965	0.0038	0.8573	0.0936	0.0011	1274	17	1156	20	1506	22	9.3	6.9
AI4_110	1509	108.0	18.0	19.4	2.9	0.18	112.6	3.4200	0.1300	0.2585	0.0057	0.7901	0.0945	0.0024	1514	32	1481	30	1509	50	2.2	1.0
AI4_38	1510	372.0	28.0	187.0	14.0	0.50	415.9	3.3560	0.0580	0.2590	0.0036	0.4450	0.0938	0.0010	1494	13	1484	18	1510	20	0.7	0.8
AI4_118	1539	956.0	96.0	224.0	11.0	0.23	1008.6	2.6400	0.1200	0.2014	0.0091	0.9879	0.0956	0.0010	1308	36	1179	49	1539	19	9.9	3.6
AI4_107	1567	395.0	21.0	54.6	2.2	0.14	407.8	3.7700	0.0660	0.2799	0.0037	0.5394	0.0970	0.0010	1586	14	1591	19	1567	19	-0.3	-0.3
AI4_29	1567	54.7	2.9	24.2	0.9	0.44	60.4	3.6100	0.1400	0.2647	0.0069	0.8656	0.0970	0.0025	1543	33	1512	35	1567	47	2.0	0.9
AI4_14	1570	98.0	14.0	44.8	4.8	0.46	108.5	3.4290	0.0900	0.2524	0.0044	0.9043	0.0977	0.0020	1503	25	1445	27	1570	38	3.9	2.3
AI4_37	1575	192.0	7.4	110.4	4.7	0.58	217.9	3.7750	0.0680	0.2802	0.0037	0.4073	0.0973	0.0011	1587	15	1592	19	1575	22	-0.3	-0.4
AI4_155	1578	20.7	1.7	19.1	1.6	0.92	25.2	3.8100	0.1500	0.2862	0.0070	0.3403	0.0983	0.0029	1592	33	1621	35	1578	54	-1.8	-0.9
AI4_119	1590	1049.0	93.0	264.0	22.0	0.25	1111.0	2.5370	0.0700	0.1874	0.0048	0.9402	0.0982	0.0010	1279	20	1106	26	1590	20	13.5	8.7
AI4_30	1602	171.0	17.0	155.0	14.0	0.91	207.4	3.8080	0.0750	0.2787	0.0039	0.4912	0.0986	0.0013	1596	16	1585	20	1602	24	0.7	0.7
AI4_84	1607	51.8	4.6	43.2	4.5	0.83	62.0	3.9010	0.1200	0.2839	0.0052	0.7586	0.0988	0.0023	1609	25	1615	28	1607	44	-0.4	-0.2
AI4_55	1616	69.5	3.4	47.5	1.6	0.68	80.7	3.8880	0.0950	0.2837	0.0052	0.2094	0.0993	0.0016	1612	20	1610	27	1616	30	0.1	0.1
AI4_32	1619	202.0	16.0	155.4	9.7	0.77	238.5	3.3820	0.0800	0.2449	0.0045	0.9131	0.0998	0.0013	1498	19	1411	23	1619	24	5.8	4.6
AI4_1	1623	203.0	30.0	115.5	7.1	0.57	230.1	3.6070	0.0860	0.2620	0.0048	0.8020	0.0998	0.0013	1550	19	1501	25	1623	25	3.2	2.6
AI4_59	1627	177.0	25.0	73.5	4.2	0.42	194.3	3.9350	0.0760	0.2842	0.0041	0.4484	0.1002	0.0013	1620	16	1612	20	1627	25	0.5	0.5
AI4_128	1629	473.0	35.0	326.0	23.0	0.69	549.6	3.8510	0.0680	0.2788	0.0038	0.5753	0.1003	0.0011	1605	14	1585	19	1629	20	1.2	1.4
AI4_15	1630	201.0	14.0	76.9	3.8	0.38	219.1	3.9240	0.0720	0.2835	0.0039	0.3927	0.1003	0.0012	1618	15	1609	19	1630	23	0.6	0.6
AI4_136	1638	222.0	29.0	54.2	3.7	0.24	234.7	4.0640	0.0800	0.2928	0.0047	0.6242	0.1008	0.0012	1646	16	1655	24	1638	23	-0.5	-0.6
AI4_113	1641	232.0	22.0	84.1	8.0	0.36	251.8	4.0250	0.0750	0.2891	0.0041	0.4427	0.1008	0.0012	1640	15	1637	21	1641	23	0.2	0.2
AI4_138	1646	43.0	3.7	11.8	0.7	0.27	45.8	4.0250	0.1100	0.2889	0.0054	0.4312	0.1015	0.0020	1641	22	1635	27	1646	38	0.4	0.3
AI4_116	1652	481.0	33.0	222.0	13.0	0.46	533.2	2.9400	0.1300	0.2100	0.0087	0.9745	0.1016	0.0011	1383	34	1225	46	1652	20	11.4	4.6
AI4_82	1653	840.0	39.0	233.0	13.0	0.28	894.8	2.3580	0.0760	0.1709	0.0044	0.9153	0.1016	0.0012	1230	23	1016	24	1653	22	17.4	9.3
AI4_156	1655	623.0	39.0	117.8	6.0	0.19	650.7	3.6800	0.2100	0.2610	0.0120	0.9912	0.1017	0.0015	1567	48	1494	64	1655	27	4.7	1.5
AI4_111	1657	373.0	31.0	128.8	6.8	0.35	403.3	4.0430	0.0890	0.2881	0.0052	0.8755	0.1018	0.0011	1643	18	1631	26	1657	21	0.7	0.7
AI4_146	1659	428.0	24.0	106.6	5.7	0.25	453.1	3.6100	0.1200	0.2558	0.0074	0.9452	0.1020	0.0012	1546	27	1466	38	1659	21	5.2	3.0

AI4_102	1662	129.5	5.2	43.9	4.3	0.34	139.8	3.8310	0.0790	0.2739	0.0046	0.3941	0.1022	0.0016	1598	17	1560	23	1662	30	2.4	2.2
AI4_129	1663	77.1	4.8	45.4	2.8	0.59	87.8	3.9510	0.0910	0.2815	0.0042	0.2912	0.1021	0.0018	1625	19	1599	21	1663	32	1.6	1.4
AI4_61	1663	105.6	4.0	46.9	0.9	0.44	116.6	3.2390	0.0740	0.2313	0.0048	0.7334	0.1024	0.0015	1466	17	1345	25	1663	26	8.3	7.1
AI4_112	1668	370.0	120.0	112.0	30.0	0.30	396.3	2.8100	0.1400	0.2020	0.0096	0.9518	0.1023	0.0015	1351	40	1182	52	1668	26	12.5	4.2
AI4_62	1669	239.0	11.0	39.8	1.9	0.17	248.4	3.6820	0.1100	0.2599	0.0065	0.7776	0.1025	0.0013	1566	28	1489	34	1669	23	4.9	2.8
AI4_54	1673	392.0	91.0	154.0	26.0	0.39	428.2	3.7930	0.1100	0.2668	0.0065	0.8209	0.1028	0.0015	1589	23	1523	33	1673	27	4.2	2.9
AI4_159	1692	213.0	37.0	82.4	8.9	0.39	232.4	4.3040	0.0890	0.2979	0.0044	0.5355	0.1039	0.0014	1694	17	1684	22	1692	25	0.6	0.6
AI4_53	1709	117.8	8.1	38.3	2.7	0.33	126.8	4.4960	0.1100	0.3084	0.0066	0.9197	0.1047	0.0014	1727	21	1731	33	1709	25	-0.2	-0.2
AI4_137	1719	707.0	92.0	185.0	27.0	0.26	750.5	3.5200	0.2100	0.2430	0.0130	0.9903	0.1054	0.0013	1522	48	1394	67	1719	23	8.4	2.7
AI4_149	1722	427.0	28.0	74.3	3.1	0.17	444.5	4.4720	0.1000	0.3054	0.0053	0.9579	0.1056	0.0011	1724	19	1717	26	1722	20	0.4	0.4
AI4_87	1730	354.4	9.2	170.6	9.5	0.48	394.5	4.5270	0.0830	0.3104	0.0049	0.6979	0.1060	0.0012	1735	15	1742	24	1730	20	-0.4	-0.5
AI4_72	1732	98.3	6.0	27.0	2.1	0.27	104.6	4.6700	0.1500	0.3171	0.0085	0.8971	0.1062	0.0014	1765	28	1773	41	1732	25	-0.5	-0.3
AI4_124	1732	785.0	24.0	301.0	13.0	0.38	855.7	4.3810	0.0890	0.2974	0.0050	0.9641	0.1059	0.0010	1702	21	1678	25	1732	17	1.4	1.1
AI4_5	1733	370.0	18.0	134.6	6.5	0.36	401.6	4.4100	0.2100	0.3001	0.0140	0.9299	0.1062	0.0011	1714	47	1700	73	1733	19	0.8	0.3
AI4_140	1738	467.0	33.0	105.9	7.0	0.23	491.9	4.3780	0.0810	0.2979	0.0041	0.6067	0.1065	0.0012	1709	15	1681	20	1738	20	1.6	1.9
AI4_144	1767	113.1	8.2	37.5	2.3	0.33	121.9	4.6590	0.1100	0.3128	0.0061	0.8331	0.1080	0.0015	1757	21	1753	30	1767	27	0.2	0.2
AI4_139	1774	579.0	29.0	52.8	2.2	0.09	591.4	3.5150	0.0670	0.2343	0.0035	0.7543	0.1085	0.0011	1532	15	1357	19	1774	19	11.4	11.7
AI4_39	1785	409.0	28.0	153.2	8.4	0.37	445.0	4.8830	0.0880	0.3242	0.0046	0.7386	0.1092	0.0010	1799	15	1811	22	1785	18	-0.7	-0.8
AI4_103	1786	579.0	29.0	189.5	9.5	0.33	623.5	4.3240	0.0890	0.2866	0.0048	0.8948	0.1093	0.0011	1697	17	1624	24	1786	18	4.3	4.3
AI4_81	1789	107.9	8.9	28.0	2.1	0.26	114.5	4.9170	0.0960	0.3264	0.0047	0.4272	0.1094	0.0014	1807	17	1821	23	1789	24	-0.8	-0.8
AI4_70	1794	290.0	30.0	49.5	7.3	0.17	301.6	3.6700	0.2300	0.2390	0.0110	0.9662	0.1099	0.0021	1549	48	1374	57	1794	34	11.3	3.6
AI4_147	1803	199.0	12.0	72.2	1.7	0.36	216.0	4.8970	0.0910	0.3208	0.0045	0.5963	0.1102	0.0012	1802	16	1793	22	1803	20	0.5	0.6
AI4_95	1822	327.0	54.0	33.2	3.5	0.40	334.8	2.6500	0.2200	0.4120	0.0410	0.9621	0.1108	0.0033	1302	63	4023	61	1822	59	21.4	4.4
AI4_120	1825	270.0	12.0	181.9	5.9	0.67	312.7	5.1210	0.0890	0.3304	0.0046	0.3620	0.1114	0.0012	1839	15	1840	22	1825	19	0.0	-0.1
AI4_17	1900	413.0	22.0	115.9	4.6	0.28	440.2	5.1910	0.0900	0.3229	0.0043	0.6119	0.1161	0.0011	1851	15	1805	21	1900	18	2.5	3.0
AI4_157	1901	48.2	3.9	17.1	1.0	0.35	52.2	5.1200	0.1100	0.3171	0.0054	0.3427	0.1168	0.0021	1839	18	1775	26	1901	33	3.5	3.6
AI4_44	1913	565.0	27.0	131.9	7.3	0.23	596.0	3.2600	0.1200	0.2031	0.0071	0.9659	0.1173	0.0012	1467	28	1190	38	1913	18	18.9	9.9
AI4_80	1956	151.9	8.8	41.5	2.8	0.27	161.7	5.9100	0.1500	0.3560	0.0078	0.9115	0.1198	0.0013	1961	22	1961	36	1956	19	0.0	0.0

AI4_69	1968	547.0	27.0	446.0	22.0	0.82	651.8	4.8900	0.2400	0.2920	0.0140	0.8789	0.1209	0.0012	1802	54	1651	74	1968	19	8.4	2.8
AI4_78	2187	28.8	6.4	5.2	0.9	0.18	30.0	6.7600	0.2600	0.3553	0.0087	0.7840	0.1372	0.0037	2086	35	1957	41	2187	49	6.2	3.7
AI4_66	2307	640.0	80.0	26.8	3.5	0.04	646.3	5.3100	0.2900	0.2590	0.0120	0.9782	0.1464	0.0021	1846	47	1481	59	2307	24	19.8	7.8
AI4_126	2433	105.7	7.4	38.8	3.0	0.37	114.8	9.2700	0.1900	0.4259	0.0064	0.4628	0.1581	0.0023	2366	20	2287	29	2433	25	3.3	4.0
AI4_52	2559	103.2	9.7	41.8	4.2	0.41	113.0	10.7400	0.2500	0.4562	0.0080	0.5304	0.1698	0.0023	2501	21	2422	34	2559	21	3.2	3.8
AI4_25	2598	114.0	17.0	70.2	7.7	0.62	130.5	10.2900	0.4300	0.4250	0.0170	0.9747	0.1744	0.0021	2443	47	2274	81	2598	20	6.9	3.6
AI4_6	2656	153.0	10.0	72.5	4.4	0.47	170.0	9.7000	0.4300	0.3881	0.0170	0.7839	0.1805	0.0018	2407	52	2113	82	2656	17	12.2	5.7
AI4_76	2665	109.4	8.7	31.3	2.2	0.29	116.8	10.3800	0.5000	0.4125	0.0190	0.7741	0.1815	0.0019	2468	62	2234	94	2665	18	9.5	3.8
AI4_13	2667	267.0	22.0	207.0	16.0	0.78	315.6	10.1800	0.4100	0.4029	0.0130	0.8957	0.1817	0.0027	2449	50	2181	63	2667	27	10.9	5.4
AI4_148	2667	375.0	28.0	176.7	9.6	0.47	416.5	11.1500	0.2700	0.4442	0.0086	0.9346	0.1815	0.0017	2538	22	2368	38	2667	15	6.7	7.7
AI4_2	2680	93.2	9.7	54.5	4.5	0.58	106.0	12.0800	0.6700	0.4800	0.0240	0.9790	0.1832	0.0022	2591	55	2520	110	2680	20	2.7	1.3
AI4_74	2704	115.4	5.0	84.0	4.7	0.73	135.1	13.1400	0.4200	0.5170	0.0160	0.8147	0.1858	0.0020	2694	39	2684	72	2704	18	0.4	0.3
AI4_89	2794	563.0	44.0	119.0	17.0	0.21	591.0	13.0900	0.6100	0.4790	0.0220	0.9874	0.1960	0.0020	2677	43	2529	96	2794	18	5.5	3.4
AI4_141	2798	605.0	64.0	111.0	17.0	0.18	631.1	9.9200	0.7100	0.3760	0.0260	0.9659	0.1973	0.0036	2458	65	2060	120	2798	30	16.2	6.1
AI4_31	2949	362.0	21.0	29.9	1.6	0.08	369.0	13.3500	0.9100	0.4500	0.0300	0.9419	0.2154	0.0024	2710	99	2393	140	2949	19	11.7	3.2

Lakeside Mountains Pennsylvanian Butterfield Peaks Formation (AJ5) – Atokan-Desmoinesian (318.8-306.5 Ma)

Grain #	Best Age (Ma)	U		Th		Th/U	Equivalent U	207/235		206/238		Error Correlation 6/38 vs 7/35	207/206		Age 207/235		Age 206/238		Age 207/206		Discordance % (206-238/207-235 difference)	Uncertainty weight assigned age difference
		ppm	2SE	ppm	2SE	Ratio		Prop 2SE	Ratio	Prop 2SE	Ratio		Prop 2SE	Ratio	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE			
AJ5_111	296	1043.0	31.0	137.7	4.7	0.13	1075.4	1.0060	0.0380	0.0471	0.0017	0.8852	0.1543	0.0040	704	19	296	23	1360	52	57.9	21.5
AJ5_16	353	100.4	9.3	37.9	2.6	0.38	109.3	0.4520	0.0200	0.0562	0.0017	0.4026	0.0594	0.0026	379	15	353	110	1452	89	7.0	1.8
AJ5_104	362	110.0	15.0	22.5	0.6	0.20	115.3	0.6240	0.0300	0.0578	0.0028	0.3493	0.0813	0.0060	491	19	362	24	1311	58	26.3	6.8
AJ5_48	372	193.0	64.0	110.0	38.0	0.57	218.9	0.4570	0.0250	0.0595	0.0024	0.5543	0.0581	0.0028	383	17	372	27	1673	42	2.9	0.6
AJ5_118	379	275.0	19.0	100.0	8.7	0.36	298.5	0.4612	0.0140	0.0606	0.0012	0.4646	0.0554	0.0016	386	10	379	26	1321	55	1.6	0.6
AJ5_109	392	148.0	18.0	117.0	12.0	0.79	175.5	0.4900	0.0190	0.0628	0.0016	0.3581	0.0569	0.0023	403	13	392	25	1506	49	2.7	0.8
AJ5_43	404	455.0	20.0	199.3	6.4	0.44	501.8	0.4829	0.0140	0.0646	0.0013	0.4225	0.0547	0.0014	400	10	404	23	1198	62	-1.2	-0.5
AJ5_73	425	251.0	11.0	10.0	0.4	0.04	253.4	0.5170	0.0170	0.0682	0.0013	0.1351	0.0552	0.0018	424	12	425	37	1573	48	-0.2	-0.1
AJ5_93	433	400.0	32.0	86.3	6.0	0.22	420.3	0.6530	0.0300	0.0695	0.0018	0.5833	0.0685	0.0025	513	19	433	20	993	61	15.6	4.2
AJ5_39	434	324.0	30.0	294.0	25.0	0.91	393.1	0.5360	0.0170	0.0697	0.0014	0.1549	0.0560	0.0018	436	11	434	22	967	56	0.3	0.1
AJ5_121	435	154.0	15.0	82.6	6.2	0.54	173.4	0.5520	0.0200	0.0698	0.0014	0.1330	0.0574	0.0021	445	13	435	64	2733	38	2.3	0.8
AJ5_146	437	59.7	5.4	23.8	2.5	0.40	65.3	0.5240	0.0280	0.0701	0.0016	0.0575	0.0552	0.0032	431	18	437	32	1602	51	-1.3	-0.3
AJ5_119	439	71.2	6.1	24.9	2.2	0.35	77.1	0.5470	0.0230	0.0705	0.0020	0.0223	0.0578	0.0028	445	16	439	28	1619	44	1.3	0.4
AJ5_141	444	84.4	9.5	46.0	4.8	0.55	95.2	0.5810	0.0300	0.0713	0.0016	0.1030	0.0602	0.0032	468	20	444	30	1310	53	5.1	1.2
AJ5_20	449	452.0	28.0	284.4	9.5	0.63	518.8	0.5522	0.0160	0.0721	0.0013	0.2758	0.0560	0.0015	447	10	449	38	1755	40	-0.4	-0.2
AJ5_54	449	234.0	20.0	162.0	11.0	0.69	272.1	0.5620	0.0170	0.0721	0.0014	0.2448	0.0569	0.0018	452	11	449	10	553	96	0.8	0.3
AJ5_56	458	385.0	26.0	56.8	3.1	0.15	398.3	0.6210	0.0260	0.0736	0.0016	0.1624	0.0616	0.0025	489	16	458	17	1027	53	6.4	2.0
AJ5_149	462	441.0	45.0	218.0	10.0	0.49	492.2	0.5850	0.0180	0.0744	0.0014	0.0124	0.0577	0.0018	467	11	462	26	1489	46	0.9	0.4
AJ5_92	468	168.0	15.0	129.0	8.1	0.77	198.3	0.5770	0.0210	0.0753	0.0018	0.3186	0.0563	0.0020	463	14	468	31	1635	44	-1.1	-0.4
AJ5_52	469	607.0	84.0	259.0	35.0	0.43	667.9	0.5930	0.0170	0.0754	0.0014	0.4248	0.0569	0.0015	473	11	469	8	447	62	0.9	0.4

AJ5_96	498	195.5	7.4	27.0	2.6	0.14	201.8	0.6590	0.0270	0.0804	0.0027	0.7427	0.0596	0.0018	514	16	498	32	1265	52	3.1	1.0
AJ5_23	545	694.0	97.0	35.5	2.6	0.05	692.3	1.2520	0.0630	0.0933	0.0044	0.9351	0.1104	0.0031	820	28	545	46	1586	49	37.2	10.9
AJ5_57	529	258.0	10.0	23.0	0.6	0.09	263.4	1.0690	0.0450	0.0857	0.0028	0.4939	0.0923	0.0039	734	22	529	26	1802	51	27.9	9.3
AJ5_71	565	256.0	17.0	221.0	13.0	0.86	307.9	0.7390	0.0210	0.0916	0.0017	0.2810	0.0589	0.0017	563	12	565	31	1492	50	-0.3	-0.1
AJ5_81	598	112.2	5.5	60.0	4.2	0.53	126.3	0.7990	0.0670	0.0968	0.0064	0.9282	0.0621	0.0024	588	37	598	31	1389	56	-1.7	-0.3
AJ5_42	616	335.0	49.0	23.6	1.0	0.07	340.5	1.1200	0.0690	0.1004	0.0038	0.8002	0.0809	0.0031	753	32	616	24	1492	45	18.2	4.3
AJ5_106	695	131.0	16.0	31.3	1.4	0.24	138.4	0.9610	0.0330	0.1138	0.0025	0.4207	0.0616	0.0020	684	17	695	25	1318	53	-1.6	-0.6
AJ5_10	755	591.0	73.0	244.0	14.0	0.41	648.3	1.2380	0.0440	0.1244	0.0038	0.8529	0.0716	0.0019	815	20	755	34	1661	49	7.4	3.0
AJ5_7	811	132.0	11.0	47.8	3.1	0.36	143.2	1.4490	0.0520	0.1342	0.0040	0.6731	0.0795	0.0024	911	22	811	34	1387	49	11.0	4.5
AJ5_53	848	320.0	28.0	63.8	3.8	0.20	335.0	1.7790	0.0820	0.1356	0.0072	0.9439	0.0965	0.0036	1039	30	848	39	1512	47	21.3	7.4
AJ5_49	834	163.0	36.0	41.1	1.6	0.25	172.7	1.3400	0.1200	0.1390	0.0098	0.9187	0.0675	0.0025	835	53	834	23	1098	51	0.1	0.0
AJ5_21	867	660.0	30.0	92.7	5.9	0.14	681.8	1.6760	0.0650	0.1436	0.0055	0.9008	0.0830	0.0022	995	25	867	22	1072	50	12.9	5.1
AJ5_3	895	187.4	9.1	35.3	1.4	0.19	195.7	1.7380	0.0560	0.1490	0.0042	0.6532	0.0847	0.0025	1022	21	895	33	1638	48	12.4	6.0
AJ5_88	897	368.0	50.0	41.5	3.4	0.11	377.8	2.5000	0.1500	0.1500	0.0093	0.8725	0.1198	0.0037	1256	42	897	20	907	51	28.6	8.5
AJ5_34	927	578.0	84.0	38.7	2.8	0.07	587.1	1.4600	0.0420	0.1547	0.0037	0.9032	0.0693	0.0017	915	18	927	18	991	63	-1.3	-0.7
AJ5_90	971	255.0	30.0	20.7	1.5	0.08	259.9	1.6810	0.0490	0.1627	0.0037	0.6407	0.0759	0.0020	1000	19	971	21	963	70	2.9	1.5
AJ5_35	975	79.7	2.7	31.6	1.3	0.40	87.1	1.5890	0.0490	0.1633	0.0033	0.0926	0.0722	0.0021	964	19	975	25	1237	50	-1.1	-0.6
AJ5_85	975	130.0	13.0	136.8	8.1	1.05	162.1	1.6660	0.0550	0.1635	0.0046	0.7442	0.0754	0.0022	993	21	975	31	1543	48	1.8	0.9
AJ5_95	981	254.0	36.0	61.2	7.7	0.24	288.4	1.6620	0.0780	0.1647	0.0069	0.9150	0.0732	0.0019	986	31	981	8	464	71	0.5	0.2
AJ5_36	982	68.6	7.7	38.6	3.5	0.56	77.7	1.5860	0.0540	0.1643	0.0037	0.2938	0.0710	0.0024	964	22	982	23	1231	67	-1.9	-0.8
AJ5_134	993	64.5	4.0	17.9	0.9	0.28	68.7	1.6360	0.0580	0.1665	0.0037	0.1983	0.0721	0.0026	981	23	993	23	1201	74	-1.2	-0.5
AJ5_77	993	44.7	3.3	10.3	0.4	0.23	47.1	1.7900	0.0860	0.1661	0.0056	0.6844	0.0796	0.0029	1037	31	993	32	1612	44	4.2	1.4
AJ5_74	1000	351.0	29.0	115.1	6.9	0.33	378.0	2.9360	0.0850	0.2448	0.0052	0.8166	0.0883	0.0021	1391	22	1411	22	1000	67	-1.4	-0.9
AJ5_9	1008	86.0	10.0	28.6	2.6	0.33	92.7	1.6560	0.0540	0.1693	0.0037	0.5085	0.0724	0.0022	991	21	1008	8	396	58	-1.7	-0.8
AJ5_129	1013	291.0	15.0	80.1	3.3	0.28	309.8	3.2550	0.0920	0.2529	0.0057	0.9246	0.0940	0.0022	1469	23	1453	38	1013	54	1.1	0.7
AJ5_138	1021	140.0	11.0	50.3	3.6	0.36	151.8	1.7940	0.0520	0.1777	0.0036	0.2654	0.0784	0.0018	1076	21	1040	19	1021	55	3.3	1.7
AJ5_17	1041	228.0	12.0	59.7	2.8	0.26	242.0	1.7050	0.0460	0.1701	0.0030	0.3005	0.0738	0.0019	1009	17	1013	22	1041	66	-0.3	-0.2
AJ5_51	1045	191.0	33.0	18.9	2.2	0.10	195.4	9.9500	0.3600	0.4261	0.0100	0.9014	0.1684	0.0044	2426	34	2290	20	1045	59	5.6	4.0

AJ5_31	1050	389.0	36.0	94.0	12.0	0.24	411.1	1.8760	0.0510	0.1809	0.0042	0.6892	0.0760	0.0020	1058	19	1050	15	514	100	0.8	0.4
AJ5_40	1054	55.7	2.4	33.1	0.8	0.59	63.5	2.2310	0.0760	0.2008	0.0044	0.1741	0.0742	0.0021	1046	18	1054	56	850	74	-0.8	-0.4
AJ5_120	1073	353.0	58.0	42.3	6.2	0.12	362.9	2.8900	0.2100	0.2410	0.0130	0.9843	0.0857	0.0029	1344	60	1385	26	1073	58	-3.1	-0.7
AJ5_131	1073	286.0	19.0	102.7	6.7	0.36	310.1	2.1170	0.0530	0.2008	0.0038	0.5365	0.0763	0.0019	1071	18	1073	9	493	58	-0.2	-0.1
AJ5_8	1079	334.0	20.0	50.4	1.5	0.15	345.8	2.8260	0.1100	0.2127	0.0070	0.9315	0.0820	0.0028	1187	24	1179	35	1079	64	0.7	0.3
AJ5_64	1088	254.0	41.0	76.2	3.9	0.30	271.9	2.7810	0.0920	0.2208	0.0065	0.9304	0.0890	0.0023	1347	25	1337	20	1088	54	0.7	0.4
AJ5_124	1090	688.0	44.0	28.0	3.9	0.04	694.6	2.1520	0.0550	0.1950	0.0037	0.7074	0.0779	0.0026	1094	23	1090	9	470	68	0.4	0.2
AJ5_25	1093	50.0	4.5	28.8	2.3	0.58	56.8	2.9550	0.0910	0.2458	0.0060	0.5385	0.0886	0.0026	1396	23	1416	21	1093	52	-1.4	-0.9
AJ5_44	1103	257.0	32.0	61.8	3.1	0.24	271.5	4.3300	0.1100	0.3071	0.0059	0.7331	0.1036	0.0024	1699	21	1726	25	1103	65	-1.6	-1.3
AJ5_72	1110	59.6	5.1	25.3	2.1	0.42	65.5	12.3600	0.3200	0.5099	0.0099	0.6374	0.1784	0.0043	2633	24	2658	24	1110	86	-0.9	-1.0
AJ5_145	1115	24.8	1.3	28.9	1.6	1.17	31.6	1.9590	0.0870	0.1892	0.0044	0.3513	0.0763	0.0025	1100	24	1115	10	630	77	-1.4	-0.6
AJ5_69	1123	282.0	34.0	69.0	7.2	0.24	298.2	4.4500	0.1400	0.2891	0.0074	0.9301	0.1123	0.0026	1723	27	1636	23	1123	69	5.0	3.2
AJ5_38	1127	101.8	5.1	66.8	2.7	0.66	117.5	3.3810	0.0920	0.2599	0.0058	0.6452	0.0961	0.0025	1498	21	1494	21	1127	47	0.3	0.2
AJ5_66	1140	120.0	4.3	23.2	0.6	0.19	125.5	4.5750	0.1200	0.3185	0.0063	0.6329	0.1057	0.0027	1743	23	1782	21	1140	48	-2.2	-1.7
AJ5_80	1155	269.0	38.0	156.0	17.0	0.58	305.7	2.5640	0.0830	0.2270	0.0056	0.7617	0.0851	0.0022	1322	23	1321	25	1155	45	0.1	0.0
AJ5_148	1175	70.0	3.5	51.5	2.0	0.74	82.1	2.3090	0.0670	0.2086	0.0043	0.2876	0.0778	0.0019	1154	17	1179	21	1175	72	-2.2	-1.5
AJ5_123	1177	262.0	28.0	44.8	1.2	0.17	272.5	3.5800	0.2900	0.2280	0.0150	0.9896	0.1153	0.0032	1548	62	1311	32	1177	71	15.3	3.8
AJ5_128	1219	156.0	14.0	19.6	0.9	0.13	160.6	14.2400	0.5400	0.5390	0.0180	0.9899	0.1938	0.0045	2756	42	2773	23	1219	57	-0.6	-0.4
AJ5_15	1223	322.2	7.3	104.0	11.0	0.32	346.6	4.4440	0.1300	0.3016	0.0076	0.9351	0.1074	0.0024	1718	24	1698	20	1223	46	1.2	0.8
AJ5_26	1230	253.0	13.0	116.9	6.9	0.46	280.5	3.4060	0.0840	0.2678	0.0048	0.4334	0.0933	0.0023	1505	19	1530	17	1230	140	-1.7	-1.3
AJ5_84	1236	226.0	28.0	69.4	4.8	0.31	242.3	4.6300	0.1800	0.2886	0.0090	0.9206	0.1187	0.0030	1746	34	1632	23	1236	48	6.5	3.4
AJ5_137	1265	148.9	7.1	36.1	1.3	0.24	157.4	2.7470	0.0800	0.2328	0.0045	0.4763	0.0871	0.0024	1339	22	1349	60	1265	70	-0.7	-0.5
AJ5_58	1278	285.0	31.0	33.3	4.9	0.12	292.8	2.4100	0.2600	0.2000	0.0160	0.9831	0.0900	0.0028	1329	51	1278	10	557	62	3.8	1.0
AJ5_132	1282	250.0	19.0	14.3	0.9	0.06	253.3	3.6050	0.0960	0.2760	0.0058	0.7424	0.0948	0.0023	1549	21	1571	30	1282	58	-1.4	-1.0
AJ5_27	1286	186.2	9.1	59.3	1.6	0.32	200.1	2.5550	0.0810	0.2208	0.0047	0.7643	0.0851	0.0022	1287	23	1286	8	422	74	0.1	0.0
AJ5_41	1289	790.0	120.0	137.8	8.1	0.17	822.4	2.9410	0.0940	0.2158	0.0061	0.9209	0.0812	0.0019	1166	17	1148	84	1289	81	1.6	1.1
AJ5_19	1309	206.9	3.9	93.8	3.0	0.45	228.9	4.0180	0.1100	0.2924	0.0063	0.7644	0.1008	0.0024	1637	23	1652	67	1309	69	-0.9	-0.7
AJ5_1	1316	68.9	3.2	19.9	0.7	0.29	73.6	2.7370	0.0780	0.2314	0.0045	0.4109	0.0872	0.0024	1338	21	1341	29	1316	49	-0.2	-0.1

AJ5_28	1336	96.0	10.0	39.7	5.9	0.41	105.3	3.9570	0.1200	0.2815	0.0069	0.7508	0.1020	0.0027	1625	25	1601	53	1336	79	1.5	1.0
AJ5_86	1344	247.0	19.0	186.0	14.0	0.75	290.7	2.8120	0.0750	0.2319	0.0050	0.7047	0.0895	0.0022	1357	20	1344	38	662	82	1.0	0.7
AJ5_99	1354	281.0	17.0	25.9	1.8	0.09	287.1	8.1100	0.7800	0.3620	0.0280	0.9925	0.1618	0.0057	2210	100	2010	23	1354	52	9.0	2.0
AJ5_59	1358	126.4	9.1	48.2	3.2	0.38	137.7	23.2000	0.6300	0.6612	0.0140	0.6658	0.2577	0.0063	3237	26	3274	36	1358	51	-1.1	-1.4
AJ5_98	1365	57.3	1.5	14.5	1.0	0.25	60.7	13.1600	0.3400	0.5027	0.0095	0.6264	0.1915	0.0046	2689	25	2624	23	1365	46	2.4	2.6
AJ5_14	1391	259.0	31.0	72.3	3.6	0.28	276.0	2.5650	0.0950	0.2212	0.0056	0.8932	0.0849	0.0023	1288	28	1287	27	1391	48	0.1	0.0
AJ5_87	1397	166.0	14.0	59.3	2.7	0.36	179.9	3.4500	0.1400	0.2114	0.0078	0.8672	0.0836	0.0030	1208	58	1189	34	1397	48	1.6	0.3
AJ5_143	1414	356.0	29.0	137.0	11.0	0.38	388.2	2.8550	0.0700	0.2404	0.0044	0.6052	0.0873	0.0020	1370	18	1389	26	1414	48	-1.4	-1.0
AJ5_82	1415	184.0	52.0	34.7	4.6	0.19	192.2	5.4000	0.1600	0.3375	0.0076	0.8381	0.1177	0.0029	1885	26	1873	36	1415	58	0.6	0.5
AJ5_110	1418	34.0	2.0	43.7	2.2	1.29	44.3	13.3400	0.4000	0.5255	0.0130	0.9033	0.1846	0.0049	2695	33	2720	58	1418	64	-0.9	-0.8
AJ5_135	1435	134.0	12.0	56.6	7.8	0.42	147.3	3.1000	0.1300	0.2481	0.0073	0.8731	0.0897	0.0027	1432	32	1435	11	451	80	-0.2	-0.1
AJ5_55	1438	87.0	13.0	32.9	4.3	0.38	94.7	3.1860	0.1100	0.2502	0.0065	0.7204	0.0946	0.0027	1452	27	1438	11	861	75	1.0	0.5
AJ5_32	1452	541.0	17.0	130.5	5.6	0.24	571.7	2.0320	0.0550	0.1971	0.0041	0.7895	0.0760	0.0033	1100	31	1117	16	1452	81	-1.5	-0.5
AJ5_76	1472	709.0	65.0	111.5	9.2	0.16	735.2	4.9400	0.1300	0.3184	0.0065	0.6766	0.1130	0.0027	1808	22	1781	30	1472	52	1.5	1.2
AJ5_22	1472	241.0	16.0	78.7	2.2	0.33	259.5	3.4500	0.1500	0.2570	0.0089	0.9534	0.0979	0.0025	1508	36	1472	16	603	68	2.4	1.0
AJ5_61	1478	180.0	14.0	9.1	1.4	0.05	182.1	1.9100	0.1100	0.1836	0.0066	0.9425	0.0751	0.0018	1127	18	1159	31	1478	48	-2.8	-1.8
AJ5_50	1481	154.0	15.0	50.4	5.2	0.33	165.8	4.8980	0.1300	0.3291	0.0069	0.7537	0.1095	0.0027	1805	21	1833	27	1481	50	-1.6	-1.3
AJ5_46	1502	306.0	17.0	149.4	5.0	0.49	341.1	12.1300	0.3800	0.4460	0.0120	0.9438	0.1994	0.0045	2612	29	2373	31	1502	51	9.2	8.2
AJ5_116	1505	201.7	5.9	55.8	1.9	0.28	214.8	2.0110	0.0600	0.1789	0.0042	0.7677	0.0994	0.0023	1389	24	1259	26	1505	45	9.4	5.4
AJ5_105	1507	149.0	15.0	30.4	2.5	0.20	156.1	4.6270	0.1100	0.3159	0.0057	0.4398	0.1071	0.0026	1755	21	1769	29	1507	44	-0.8	-0.7
AJ5_70	1521	174.0	17.0	95.0	12.0	0.55	196.3	9.7300	0.2500	0.4598	0.0092	0.7690	0.1561	0.0036	2410	24	2438	30	1521	48	-1.2	-1.2
AJ5_122	1526	265.0	11.0	71.9	4.0	0.27	281.9	4.6300	0.1200	0.3191	0.0059	0.8813	0.1056	0.0026	1753	22	1785	29	1526	46	-1.8	-1.5
AJ5_83	1532	543.0	60.0	50.3	6.5	0.09	554.8	2.4000	0.1900	0.2040	0.0110	0.9807	0.0741	0.0023	1076	23	1101	33	1532	56	-2.3	-1.1
AJ5_147	1557	160.0	17.0	21.0	2.0	0.13	164.9	2.7700	0.1600	0.2200	0.0110	0.9685	0.0756	0.0024	1074	35	1085	40	1557	49	-1.0	-0.3
AJ5_6	1566	110.3	3.5	101.7	4.2	0.92	134.2	3.5430	0.0950	0.2750	0.0050	0.3823	0.0942	0.0024	1537	21	1566	15	659	70	-1.9	-1.4
AJ5_4	1588	301.0	18.0	66.1	4.7	0.22	316.5	3.9200	0.0980	0.2794	0.0054	0.7266	0.1025	0.0024	1618	20	1588	10	469	84	1.9	1.5
AJ5_144	1592	27.8	5.1	20.1	1.8	0.72	32.5	11.7700	0.8700	0.4390	0.0290	0.9241	0.1946	0.0060	2552	80	2330	40	1592	48	8.7	2.8
AJ5_65	1617	102.1	7.8	62.1	3.4	0.61	116.7	4.2400	0.1200	0.3073	0.0073	0.8130	0.1018	0.0026	1681	25	1726	43	1617	49	-2.7	-1.8

AJ5_127	1639	137.0	13.0	83.4	4.5	0.61	156.6	3.9700	0.1400	0.2900	0.0086	0.9449	0.0996	0.0025	1627	30	1639	8	422	62	-0.7	-0.4
AJ5_130	1646	89.3	3.9	35.0	0.7	0.39	97.5	3.3380	0.0980	0.2649	0.0058	0.7718	0.0924	0.0025	1490	23	1514	33	1646	46	-1.6	-1.0
AJ5_103	1649	105.1	9.0	35.7	2.5	0.34	113.5	4.0450	0.1100	0.2917	0.0066	0.6747	0.1013	0.0025	1645	22	1649	12	503	110	-0.2	-0.2
AJ5_37	1655	139.0	10.0	50.9	1.9	0.37	151.0	2.4140	0.0680	0.2175	0.0046	0.6670	0.0974	0.0024	1363	30	1242	26	1655	45	8.9	4.0
AJ5_33	1656	218.0	21.0	167.0	13.0	0.77	257.2	4.0580	0.1200	0.2930	0.0066	0.9209	0.1010	0.0026	1643	24	1656	9	494	83	-0.8	-0.5
AJ5_47	1661	151.0	14.0	24.2	1.6	0.16	156.7	1.8010	0.0560	0.1785	0.0034	0.5042	0.0810	0.0024	1220	20	1221	36	1661	48	-0.1	-0.1
AJ5_150	1667	118.8	9.4	65.6	6.4	0.55	134.2	2.6320	0.0870	0.2234	0.0066	0.8279	0.0869	0.0024	1306	25	1298	33	1667	46	0.6	0.3
AJ5_139	1670	167.0	15.0	182.0	12.0	1.09	209.8	3.8520	0.1300	0.2848	0.0079	0.9555	0.0984	0.0026	1594	32	1614	26	1670	57	-1.3	-0.6
AJ5_78	1686	940.0	120.0	370.0	41.0	0.39	1027.0	1.8930	0.0590	0.1753	0.0045	0.9055	0.0728	0.0024	998	21	1011	29	1686	44	-1.3	-0.6
AJ5_102	1706	553.0	34.0	228.7	9.8	0.41	606.7	3.9770	0.1200	0.2609	0.0084	0.9037	0.1127	0.0029	1630	25	1492	33	1706	45	8.5	5.5
AJ5_91	1720	558.0	38.0	133.5	5.4	0.24	589.4	4.3000	0.1600	0.3002	0.0094	0.9680	0.1055	0.0024	1691	30	1689	29	1720	45	0.1	0.1
AJ5_113	1720	69.1	4.4	49.0	3.9	0.71	80.6	3.4390	0.1100	0.2475	0.0050	0.8127	0.1022	0.0031	1510	26	1425	47	1720	42	5.6	3.3
AJ5_2	1722	244.0	21.0	59.7	6.9	0.24	258.0	2.8700	0.3000	0.2200	0.0190	0.9928	0.1182	0.0033	1513	32	1234	31	1722	47	18.4	8.7
AJ5_108	1725	255.0	21.0	32.8	2.0	0.13	262.7	5.6100	0.1800	0.3470	0.0088	0.9103	0.1179	0.0028	1914	28	1918	31	1725	45	-0.2	-0.1
AJ5_30	1739	185.0	12.0	65.8	2.5	0.36	200.5	3.3230	0.1100	0.2578	0.0076	0.8691	0.0941	0.0024	1485	26	1477	38	1739	46	0.5	0.3
AJ5_60	1752	242.0	25.0	164.0	18.0	0.68	280.5	3.4670	0.0980	0.2743	0.0061	0.9170	0.0926	0.0023	1518	23	1562	28	1752	45	-2.9	-1.9
AJ5_117	1790	46.8	3.0	29.4	1.4	0.63	53.7	1.9350	0.0630	0.1843	0.0042	0.2100	0.0733	0.0020	1045	20	1059	34	1790	44	-1.3	-0.7
AJ5_114	1835	489.0	46.0	18.1	2.7	0.04	403.3	7.1900	0.2400	0.3025	0.0079	0.9049	0.1730	0.0044	2129	31	1702	41	1835	46	20.1	13.8
AJ5_133	1838	115.8	8.6	58.3	3.3	0.50	129.5	3.3540	0.0900	0.2645	0.0052	0.6029	0.0925	0.0025	1492	21	1512	43	1838	46	-1.3	-1.0
AJ5_112	1838	52.7	7.5	13.7	2.3	0.26	55.9	2.6200	0.1800	0.2207	0.0100	0.9025	0.0916	0.0039	1280	100	1260	37	1838	43	1.6	0.2
AJ5_125	1841	126.6	8.8	81.2	1.5	0.64	145.7	5.0400	0.1600	0.3309	0.0083	0.9237	0.1123	0.0028	1822	29	1841	20	979	74	-1.0	-0.7
AJ5_29	1846	302.0	14.0	106.2	3.7	0.35	327.0	2.7170	0.0930	0.2247	0.0064	0.9397	0.0883	0.0022	1329	27	1306	32	1846	43	1.7	0.9
AJ5_97	1875	415.0	43.0	88.3	5.2	0.21	435.8	4.4000	0.1400	0.3006	0.0076	0.9791	0.1067	0.0026	1702	33	1693	80	1875	53	0.5	0.3
AJ5_107	1924	77.5	6.7	26.2	1.7	0.34	83.7	2.6410	0.0790	0.2325	0.0057	0.5493	0.0834	0.0023	1314	22	1347	37	1924	44	-2.5	-1.5
AJ5_12	1926	208.0	22.0	160.0	20.0	0.77	245.6	3.7150	0.1000	0.2780	0.0063	0.5311	0.0988	0.0027	1575	22	1580	42	1926	41	-0.3	-0.2
AJ5_140	1932	236.0	14.0	92.6	4.1	0.39	257.8	3.0840	0.0760	0.2422	0.0060	0.7173	0.0936	0.0024	1428	19	1397	41	1932	51	2.2	1.6
AJ5_142	1935	201.0	27.0	107.0	11.0	0.53	226.1	2.9980	0.0940	0.2357	0.0057	0.8261	0.0947	0.0023	1404	24	1363	45	1935	46	2.9	1.7
AJ5_5	1941	63.8	8.4	19.3	1.6	0.30	68.3	2.8410	0.0880	0.2428	0.0051	0.4847	0.0857	0.0024	1364	23	1401	52	1941	54	-2.7	-1.6

AJ5_100	2395	464.0	72.0	265.0	39.0	0.57	526.3	3.9960	0.1100	0.2805	0.0065	0.9302	0.1048	0.0026	1628	25	1593	10	2395	43	2.1	1.4
AJ5_101	2415	606.0	42.0	110.3	6.1	0.18	631.9	1.8650	0.0520	0.1747	0.0039	0.8226	0.0817	0.0020	1247	20	1268	41	2415	40	-1.7	-1.1
AJ5_94	2423	167.0	10.0	97.6	4.5	0.58	189.9	10.4500	0.3400	0.4569	0.0110	0.9010	0.1659	0.0041	2471	31	2423	10	560	110	1.9	1.5
AJ5_18	2455	150.5	7.1	128.8	4.1	0.86	180.8	3.2960	0.0860	0.2602	0.0051	0.6231	0.0931	0.0022	1480	21	1491	130	2455	66	-0.7	-0.5
AJ5_13	2513	478.0	24.0	312.0	15.0	0.65	551.3	3.4240	0.0930	0.2506	0.0055	0.8172	0.0999	0.0024	1508	21	1441	51	2513	42	4.4	3.2
AJ5_126	2548	48.3	6.7	20.2	0.8	0.42	53.0	1.9660	0.0710	0.1890	0.0045	0.5072	0.0817	0.0020	1120	21	1061	47	2548	47	5.3	2.8
AJ5_24	2586	140.0	13.0	60.8	4.6	0.43	154.3	3.6010	0.1000	0.2855	0.0062	0.6222	0.0932	0.0024	1549	22	1618	39	2586	41	-4.5	-3.1
AJ5_62	2637	61.8	4.1	37.8	2.4	0.61	70.7	2.1450	0.0730	0.1960	0.0038	0.0030	0.0862	0.0033	1284	56	1281	43	2637	39	0.2	0.1
AJ5_136	2692	228.0	20.0	71.7	2.2	0.31	244.8	4.0190	0.1100	0.2800	0.0061	0.7590	0.1055	0.0025	1638	22	1591	53	2692	43	2.9	2.1
AJ5_11	2706	123.5	3.8	78.8	6.1	0.64	142.0	13.5100	0.4300	0.5230	0.0150	0.9503	0.1892	0.0043	2713	32	2706	10	420	120	0.3	0.2
AJ5_68	2752	470.0	30.0	164.1	8.8	0.35	508.6	3.3390	0.0840	0.2597	0.0051	0.6439	0.0939	0.0022	1489	20	1488	41	2752	39	0.1	0.1
AJ5_75	2772	281.0	36.0	223.0	26.0	0.79	333.4	4.3620	0.1100	0.3122	0.0067	0.8104	0.1023	0.0024	1706	22	1751	79	2772	39	-2.6	-2.0
AJ5_115	2780	0.7	0.2	0.1	0.0	0.20	0.7	39.3000	6.8000	0.5010	0.0860	0.7655	0.6260	0.0840	3760	190	2650	140	2780	50	29.5	5.8
AJ5_79	2821	136.8	8.9	54.2	3.0	0.40	149.5	1.8340	0.0510	0.1770	0.0036	0.4647	0.0774	0.0019	1069	19	1037	55	2821	36	3.0	1.7
AJ5_63	3000	193.0	36.0	16.7	1.3	0.09	196.9	21.8000	2.1000	0.5990	0.0310	0.9536	0.2550	0.0150	3074	100	3000	8	509	65	2.4	0.7
AJ5_89	3156	75.7	9.0	78.6	4.7	1.04	94.2	1.6680	0.0520	0.1699	0.0039	0.3242	0.0838	0.0035	1199	76	1184	120	3156	95	1.3	0.2
AJ5_45	3229	58.5	2.8	36.8	1.0	0.63	67.1	1.8830	0.0620	0.1863	0.0040	0.3524	0.0789	0.0028	1164	24	1153	53	3229	38	0.9	0.5
AJ5_67	4530	279.0	44.0	21.6	0.8	0.08	284.1	3.9780	0.1000	0.2875	0.0053	0.4101	0.1012	0.0026	1630	20	1631	350	4530	210	-0.1	-0.1

Grassy Mountains Permian Unconformity (A16) – Leonardian (281-272.95)

Grain #	Best Age (Ma)	U		Th		Th/U	Equivalent U	207/235		206/238		Error Correlation 6/38 vs 7/35	207/206		Age 207/235		Age 206/238		Age 207/206		Discordance % (206-238/235 date difference)	Uncertainty weight assigned difference
		ppm	2SE	ppm	2SE		ppm	Ratio	Prop 2SE	Ratio	Prop 2SE		Ratio	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE		
A16_100	278	432.0	84.0	490.0	120.0	1.13	547.2	0.6590	0.0290	0.0441	0.0019	0.0758	0.1145	0.0075	513	17	278	1790	120	1790	45.8	13.8
A16_71	301.5	828.0	60.0	1189.0	62.0	1.44	1107.4	1.5700	0.1100	0.0479	0.0016	0.2060	0.2470	0.0190	947	46	302	3140	130	3140	66.2	14.0
A16_69	346	758.0	39.0	332.0	15.0	0.44	836.0	1.0450	0.0540	0.0551	0.0014	0.4953	0.1416	0.0068	720	26	346	2211	83	2211	51.9	14.4
A16_106	376	15.5	0.9	13.3	0.7	0.86	18.6	0.4410	0.0430	0.0601	0.0023	0.1621	0.0536	0.0052	362	30	376	340	190	340	-3.9	-0.5
A16_55	395	176.7	3.4	69.2	3.5	0.39	193.0	0.4920	0.0170	0.0632	0.0013	0.3087	0.0569	0.0021	406	12	395	484	79	484	2.6	0.9
A16_22	407.4	837.0	95.0	238.0	19.0	0.28	892.9	0.5850	0.0220	0.0653	0.0016	0.2698	0.0635	0.0022	468	15	407	719	72	719	12.9	4.0
A16_30	420.7	334.0	27.0	254.0	17.0	0.76	393.7	0.5080	0.0160	0.0674	0.0014	0.4672	0.0550	0.0016	416	11	421	406	63	406	-1.1	-0.4
A16_73	421.3	133.5	9.2	64.3	3.0	0.48	148.6	0.5240	0.0190	0.0675	0.0014	0.0247	0.0568	0.0021	430	12	421	470	84	470	1.9	0.7
A16_39	425	160.4	6.2	95.7	5.8	0.60	182.9	0.5170	0.0180	0.0682	0.0014	0.3061	0.0552	0.0018	422	12	425	412	77	412	-0.6	-0.2
A16_57	425.9	163.0	16.0	87.3	9.0	0.54	183.5	0.5210	0.0200	0.0683	0.0014	0.3048	0.0558	0.0021	425	13	426	436	83	436	-0.2	-0.1
A16_43	429.2	276.0	20.0	96.7	7.7	0.33	297.3	0.7800	0.0770	0.0687	0.0017	0.5313	0.0804	0.0070	571	42	429	1050	170	1050	24.8	3.4
A16_21	431.9	445.0	21.0	255.0	12.0	0.57	504.9	0.5630	0.0170	0.0693	0.0016	0.6451	0.0593	0.0016	453	11	432	571	61	571	4.7	1.9
A16_18	433.4	226.0	22.0	86.9	4.4	0.38	246.4	0.5280	0.0160	0.0696	0.0014	0.3004	0.0552	0.0016	430	11	433	405	65	405	-0.8	-0.3
A16_116	433.9	197.0	10.0	61.2	2.7	0.31	211.4	0.5700	0.0190	0.0696	0.0018	0.1724	0.0593	0.0022	458	12	434	564	81	564	5.3	2.0
A16_62	437.7	79.4	4.5	39.1	1.5	0.49	88.6	0.5230	0.0240	0.0703	0.0016	0.1359	0.0549	0.0024	425	16	438	377	98	377	-3.0	-0.8
A16_16	440.4	359.0	44.0	85.8	7.0	0.24	379.2	0.5510	0.0180	0.0707	0.0015	0.3403	0.0574	0.0018	445	12	440	496	66	496	1.0	0.4
A16_1	444.9	294.0	17.0	48.1	2.8	0.16	305.3	0.5437	0.0150	0.0715	0.0014	0.2438	0.0555	0.0015	441	10	445	431	65	431	-1.0	-0.4
A16_90	453.5	169.2	8.7	76.0	4.1	0.45	187.1	0.5490	0.0190	0.0729	0.0016	0.2549	0.0549	0.0018	443	12	454	386	73	386	-2.3	-0.8
A16_89	462	1890.0	130.0	1220.0	82.0	0.65	2176.7	1.1730	0.0370	0.0743	0.0019	0.6868	0.1154	0.0030	787	17	462	1881	45	1881	41.3	19.1
A16_12	468	65.9	6.8	25.3	2.5	0.38	71.8	0.6140	0.0290	0.0751	0.0026	0.3519	0.0614	0.0030	485	18	468	604	110	604	3.5	0.9

AI6_49	634	292.0	42.0	28.4	4.4	0.10	298.7	1.2800	0.1500	0.1032	0.0092	0.9683	0.0879	0.0040	793	72	634	55	1362	100	20.1	2.2
AI6_76	637	97.0	25.0	74.0	18.0	0.76	114.4	1.2440	0.0600	0.1048	0.0093	0.7545	0.0997	0.0083	812	31	637	55	1490	140	21.6	5.6
AI6_130	670	408.0	43.0	138.9	7.5	0.34	440.6	1.4330	0.0630	0.1098	0.0044	0.9273	0.0958	0.0024	902	27	670	26	1540	46	25.7	8.6
AI6_52	751	533.0	79.0	16.2	1.7	0.03	536.8	1.1600	0.0420	0.1237	0.0028	0.7062	0.0677	0.0019	781	20	751	16	858	59	3.8	1.5
AI6_47	811	363.0	67.0	13.2	1.5	0.04	366.1	1.5700	0.0890	0.1343	0.0055	0.8902	0.0830	0.0031	951	36	811	31	1257	75	14.7	3.9
AI6_19	835	1467.0	84.0	560.0	38.0	0.38	1598.6	2.2050	0.0810	0.1380	0.0049	0.9390	0.1168	0.0028	1178	25	835	28	1907	42	29.1	13.7
AI6_91	839	22.9	3.7	5.5	0.8	0.24	24.2	8.8000	1.2000	0.1390	0.0160	0.9175	0.4470	0.0240	2230	130	839	91	4068	87	62.4	10.7
AI6_26	842	96.5	9.9	12.8	1.9	0.13	99.5	2.0000	0.2900	0.1420	0.0170	0.9900	0.0923	0.0053	1000	110	842	94	1440	120	15.8	1.4
AI6_75	861	138.0	27.0	16.1	2.1	0.12	141.8	3.7900	0.3800	0.1450	0.0150	0.9770	0.1919	0.0050	1518	84	861	83	2759	44	43.3	7.8
AI6_150	890	0.4	0.1	0.3	0.1	0.68	0.5	11.1000	1.7000	0.1480	0.0200	0.1526	0.5500	0.1000	2550	130	890	110	4410	260	65.1	12.8
AI6_70	908	25.2	2.3	11.0	0.7	0.43	27.8	1.5620	0.0940	0.1517	0.0078	0.5937	0.0769	0.0036	950	37	908	44	1106	92	4.4	1.1
AI6_104	940.4	307.0	20.0	48.5	2.6	0.16	318.4	1.5480	0.0380	0.1571	0.0028	0.4806	0.0723	0.0017	951	16	940	15	996	47	1.1	0.7
AI6_109	940.7	252.0	23.0	82.4	6.7	0.33	271.4	1.4920	0.0380	0.1571	0.0028	0.2647	0.0703	0.0018	926	15	941	15	929	52	-1.6	-1.0
AI6_88	975	305.0	27.0	150.0	12.0	0.49	340.3	1.7440	0.0510	0.1634	0.0044	0.7501	0.0782	0.0020	1025	19	975	25	1152	51	4.9	2.6
AI6_81	977	32.8	1.5	41.7	1.5	1.27	42.6	1.6860	0.0730	0.1638	0.0041	0.6014	0.0764	0.0029	1001	27	977	22	1092	80	2.4	0.9
AI6_20	979	46.8	2.6	13.8	0.4	0.29	50.0	1.7360	0.0780	0.1641	0.0039	0.5743	0.0769	0.0031	1018	29	979	21	1113	80	3.8	1.3
AI6_112	979	569.0	46.0	58.1	4.7	0.10	582.7	1.7570	0.0710	0.1637	0.0061	0.9213	0.0782	0.0019	1029	25	979	34	1149	48	4.9	2.0
AI6_121	1033	151.0	13.0	108.0	11.0	0.72	176.4	1.7080	0.0490	0.1738	0.0034	0.4154	0.0723	0.0020	1010	18	1033	19	995	57	-2.3	-1.3
AI6_61	1096	223.0	26.0	80.5	8.1	0.36	241.9	1.7530	0.0560	0.1707	0.0052	0.7433	0.0762	0.0021	1030	21	1015	29	1096	54	1.5	0.7
AI6_148	1112	74.9	6.2	56.7	4.0	0.76	88.2	1.7840	0.0580	0.1719	0.0038	0.2778	0.0759	0.0025	1037	21	1022	21	1112	66	1.4	0.7
AI6_87	1116	68.0	6.1	27.4	1.6	0.40	74.4	1.8740	0.0600	0.1754	0.0037	0.2542	0.0770	0.0026	1071	22	1042	20	1116	68	2.7	1.3
AI6_11	1127	49.6	2.1	18.3	0.8	0.37	53.9	2.0040	0.0690	0.1900	0.0044	0.3952	0.0775	0.0025	1118	23	1121	24	1127	67	-0.3	-0.1
AI6_64	1134	61.4	2.3	36.7	1.8	0.60	70.0	1.8730	0.0640	0.1763	0.0038	0.2438	0.0773	0.0026	1070	23	1046	21	1134	70	2.2	1.0
AI6_32	1135	411.0	29.0	302.0	19.0	0.73	482.0	2.0100	0.0500	0.1884	0.0035	0.5765	0.0777	0.0018	1118	17	1113	19	1135	47	0.5	0.3
AI6_139	1148	65.7	3.6	41.4	2.1	0.63	75.4	2.0870	0.0710	0.1972	0.0040	0.4997	0.0783	0.0025	1141	24	1160	21	1148	64	-1.7	-0.8
AI6_82	1163	124.4	8.5	40.3	2.4	0.32	133.9	2.1680	0.0610	0.2022	0.0043	0.3605	0.0784	0.0021	1169	20	1187	23	1163	51	-1.5	-0.9
AI6_107	1175	258.0	12.0	59.8	2.0	0.23	272.1	2.0210	0.0540	0.1861	0.0038	0.7229	0.0792	0.0020	1122	18	1100	20	1175	48	2.0	1.2
AI6_17	1176	67.5	1.7	1.0	0.1	0.02	67.7	2.1200	0.1200	0.1912	0.0078	0.8948	0.0794	0.0025	1144	38	1130	43	1176	65	1.2	0.4

AI6_4	1182	639.0	64.0	430.0	49.0	0.67	740.1	2.2790	0.0570	0.2094	0.0038	0.6748	0.0795	0.0018	1205	18	1225	20	1182	46	-1.6	-1.1
AI6_98	1194	181.0	31.0	38.9	2.4	0.21	190.1	1.9300	0.0620	0.1758	0.0042	0.7354	0.0801	0.0022	1091	22	1043	23	1194	54	4.4	2.2
AI6_15	1294	60.8	4.2	29.3	1.9	0.48	67.7	2.5100	0.0690	0.2212	0.0045	0.3291	0.0841	0.0023	1273	20	1288	24	1294	55	-1.2	-0.8
AI6_56	1301	67.7	8.9	16.6	0.6	0.24	71.6	2.6490	0.0870	0.2311	0.0046	0.5321	0.0840	0.0024	1313	24	1340	24	1301	56	-2.1	-1.1
AI6_108	1303	63.6	4.4	20.6	1.4	0.32	68.4	2.4100	0.0690	0.2068	0.0039	0.1293	0.0850	0.0025	1245	20	1211	21	1303	58	2.7	1.7
AI6_60	1314	305.0	64.0	15.3	1.9	0.05	308.6	2.2500	0.0900	0.1923	0.0046	0.7858	0.0853	0.0026	1199	28	1133	25	1314	58	5.5	2.4
AI6_94	1319	229.0	12.0	89.5	3.3	0.39	250.0	2.3220	0.0720	0.1968	0.0044	0.7950	0.0853	0.0021	1217	22	1158	24	1319	49	4.8	2.7
AI6_8	1324	358.0	38.0	62.8	4.4	0.18	372.8	2.6760	0.0690	0.2296	0.0045	0.5406	0.0855	0.0021	1321	19	1332	24	1324	47	-0.8	-0.6
AI6_36	1357	434.0	58.0	148.0	14.0	0.34	468.8	2.6450	0.0770	0.2230	0.0050	0.8217	0.0869	0.0021	1313	21	1297	26	1357	46	1.2	0.8
AI6_14	1365	270.0	26.0	75.9	3.1	0.28	287.8	2.7100	0.1300	0.2266	0.0090	0.9567	0.0873	0.0022	1327	36	1313	47	1365	48	1.1	0.4
AI6_147	1389	501.0	34.0	14.5	1.4	0.03	504.4	2.5100	0.1500	0.2055	0.0095	0.9654	0.0889	0.0026	1260	47	1201	51	1389	58	4.7	1.3
AI6_48	1404	108.9	4.7	44.1	1.8	0.40	119.3	2.9330	0.0850	0.2399	0.0051	0.6748	0.0890	0.0023	1390	22	1386	27	1404	50	0.3	0.2
AI6_133	1419	196.0	14.0	71.2	3.6	0.36	212.7	2.7700	0.1200	0.2238	0.0072	0.9344	0.0895	0.0023	1340	33	1308	38	1419	51	2.4	1.0
AI6_124	1424	348.0	37.0	61.8	5.1	0.18	362.5	2.2500	0.0700	0.1864	0.0048	0.7997	0.0900	0.0023	1200	22	1101	26	1424	48	8.3	4.5
AI6_125	1437	132.9	4.0	109.4	3.2	0.82	158.6	3.0330	0.0820	0.2424	0.0046	0.4396	0.0906	0.0023	1417	21	1399	24	1437	48	1.3	0.9
AI6_136	1454	102.6	7.3	29.2	1.5	0.28	109.5	3.1200	0.0890	0.2508	0.0049	0.5040	0.0914	0.0025	1437	22	1442	25	1454	51	-0.3	-0.2
AI6_126	1461	179.0	23.0	45.3	2.9	0.25	189.6	3.3200	0.1500	0.2570	0.0110	0.9546	0.0918	0.0024	1476	39	1479	57	1461	51	-0.2	-0.1
AI6_68	1463	411.0	32.0	161.0	15.0	0.39	448.8	3.1100	0.0810	0.2497	0.0053	0.8256	0.0915	0.0021	1435	20	1437	27	1463	46	-0.1	-0.1
AI6_102	1480	188.0	13.0	67.7	4.9	0.36	203.9	2.4400	0.0750	0.1910	0.0050	0.8529	0.0926	0.0023	1254	22	1126	27	1480	47	10.2	5.8
AI6_117	1494	28.2	2.3	9.1	0.8	0.32	30.3	2.9870	0.1100	0.2336	0.0058	0.4649	0.0940	0.0032	1404	29	1352	30	1494	66	3.7	1.8
AI6_85	1498	109.4	6.3	43.0	2.1	0.39	119.5	3.1870	0.0890	0.2502	0.0049	0.5394	0.0935	0.0025	1454	21	1439	25	1498	49	1.0	0.7
AI6_127	1502	210.8	8.9	67.2	2.3	0.32	226.6	3.1770	0.0770	0.2465	0.0043	0.3025	0.0938	0.0023	1452	18	1420	22	1502	47	2.2	1.8
AI6_10	1511	336.0	14.0	208.1	7.5	0.62	384.9	3.4930	0.0860	0.2717	0.0049	0.6458	0.0942	0.0022	1527	20	1549	25	1511	43	-1.4	-1.1
AI6_41	1522	226.0	32.0	81.9	9.8	0.36	245.2	3.3430	0.0820	0.2577	0.0047	0.4927	0.0949	0.0023	1491	19	1478	24	1522	45	0.8	0.7
AI6_86	1533	98.7	2.8	57.6	1.7	0.58	112.2	3.3430	0.0890	0.2586	0.0054	0.4570	0.0952	0.0025	1490	21	1482	27	1533	50	0.5	0.4
AI6_110	1533	278.0	35.0	79.1	7.4	0.28	296.6	2.8940	0.0800	0.2226	0.0052	0.8076	0.0953	0.0023	1380	21	1295	27	1533	47	6.2	4.0
AI6_120	1554	33.3	1.9	95.2	3.7	2.86	55.7	3.3930	0.1100	0.2598	0.0054	0.0464	0.0954	0.0035	1501	27	1488	28	1554	73	0.9	0.5
AI6_2	1572	112.0	8.9	85.3	6.8	0.76	132.0	3.5880	0.1100	0.2658	0.0063	0.8070	0.0973	0.0024	1546	23	1519	32	1572	47	1.7	1.2

AI6_3	1574	87.5	6.3	55.7	4.7	0.64	100.6	3.6920	0.0970	0.2731	0.0050	0.3006	0.0978	0.0026	1570	21	1556	26	1574	51	0.9	0.7
AI6_44	1581	195.0	14.0	129.0	12.0	0.66	225.3	3.8420	0.0950	0.2863	0.0054	0.6434	0.0979	0.0023	1602	20	1622	27	1581	44	-1.3	-1.0
AI6_146	1588	73.8	9.7	30.4	3.2	0.41	80.9	3.2930	0.1200	0.2509	0.0084	0.7035	0.0982	0.0028	1479	28	1440	43	1588	56	2.6	1.4
AI6_76	1592	95.4	2.3	48.1	1.9	0.50	106.7	3.6000	0.1400	0.2678	0.0083	0.9508	0.0986	0.0025	1543	32	1528	43	1592	48	1.0	0.5
AI6_65	1594	244.0	13.0	159.0	14.0	0.65	281.4	3.5500	0.1700	0.2611	0.0100	0.9378	0.0984	0.0025	1526	37	1491	51	1594	48	2.3	0.9
AI6_29	1598	255.0	30.0	36.6	2.7	0.14	263.6	3.8300	0.1600	0.2802	0.0096	0.9132	0.0990	0.0026	1594	35	1594	48	1598	51	0.0	0.0
AI6_27	1604	163.0	24.0	58.0	4.9	0.36	176.6	3.6200	0.1600	0.2641	0.0086	0.9372	0.0988	0.0031	1549	38	1508	45	1604	56	2.6	1.1
AI6_93	1613	182.7	4.1	92.8	2.6	0.51	204.5	3.6220	0.1100	0.2671	0.0065	0.7983	0.0997	0.0024	1555	24	1525	33	1613	46	1.9	1.3
AI6_96	1616	184.0	15.0	95.8	5.3	0.52	206.5	3.8200	0.1200	0.2818	0.0069	0.8425	0.0995	0.0024	1596	25	1603	34	1616	45	-0.4	-0.3
AI6_123	1630	314.0	20.0	87.0	10.0	0.28	334.4	3.7420	0.1100	0.2721	0.0054	0.8250	0.1004	0.0025	1582	24	1551	27	1630	46	2.0	1.3
AI6_119	1632	357.0	8.5	100.0	10.0	0.28	380.5	3.6500	0.1600	0.2605	0.0081	0.9734	0.1010	0.0029	1549	40	1490	42	1632	58	3.8	1.5
AI6_40	1633	276.0	20.0	53.6	5.3	0.19	288.6	3.6790	0.1100	0.2675	0.0070	0.8473	0.1006	0.0024	1566	23	1526	36	1633	44	2.6	1.7
AI6_129	1637	354.0	45.0	305.0	37.0	0.86	425.7	4.0080	0.0960	0.2897	0.0050	0.5846	0.1007	0.0023	1636	19	1641	24	1637	43	-0.3	-0.3
AI6_51	1638	236.0	17.0	196.8	2.8	0.83	282.2	3.9560	0.1000	0.2886	0.0057	0.7062	0.1009	0.0024	1624	21	1634	28	1638	45	-0.6	-0.5
AI6_144	1641	289.0	29.0	189.0	16.0	0.65	333.4	4.2690	0.1100	0.3080	0.0067	0.7093	0.1012	0.0025	1687	22	1730	33	1641	45	-2.5	-2.0
AI6_135	1641	273.0	19.0	157.4	9.3	0.58	310.0	3.8980	0.0990	0.2821	0.0053	0.6755	0.1011	0.0024	1615	20	1601	27	1641	44	0.8	0.7
AI6_9	1643	59.1	4.1	50.5	3.2	0.85	71.0	3.8900	0.1200	0.2778	0.0055	0.3015	0.1014	0.0030	1613	23	1580	28	1643	55	2.0	1.4
AI6_143	1645	397.1	8.3	126.4	8.4	0.32	426.8	3.9120	0.0960	0.2821	0.0051	0.7687	0.1012	0.0023	1615	20	1601	26	1645	42	0.9	0.7
AI6_80	1646	232.8	9.7	124.0	5.7	0.53	261.9	3.9130	0.0950	0.2795	0.0051	0.6143	0.1013	0.0024	1616	20	1589	25	1646	42	1.6	1.3
AI6_46	1649	175.0	16.0	52.7	4.4	0.30	187.4	4.2120	0.1100	0.3039	0.0061	0.4548	0.1013	0.0027	1675	21	1710	30	1649	47	-2.1	-1.7
AI6_34	1650	201.0	22.0	35.5	3.4	0.18	209.3	3.9420	0.1000	0.2829	0.0051	0.4278	0.1017	0.0026	1621	21	1606	26	1650	47	0.9	0.7
AI6_145	1652	177.7	2.8	81.7	1.1	0.46	196.9	3.9330	0.1000	0.2842	0.0054	0.6122	0.1017	0.0024	1622	22	1612	27	1652	43	0.6	0.5
AI6_31	1657	576.0	46.0	164.6	6.1	0.29	614.7	4.0320	0.1100	0.2880	0.0059	0.9050	0.1018	0.0023	1639	22	1631	30	1657	42	0.5	0.4
AI6_24	1657	276.0	16.0	505.0	23.0	1.83	394.7	3.8060	0.1000	0.2741	0.0063	0.8212	0.1019	0.0024	1592	21	1564	32	1657	45	1.8	1.3
AI6_50	1659	184.0	31.0	59.0	11.0	0.32	197.9	4.0540	0.1000	0.2924	0.0056	0.4365	0.1020	0.0025	1644	20	1655	27	1659	46	-0.7	-0.6
AI6_67	1661	160.8	7.9	82.2	4.0	0.51	180.1	3.9690	0.1100	0.2819	0.0055	0.6369	0.1019	0.0026	1630	22	1601	28	1661	47	1.8	1.3
AI6_134	1667	254.0	35.0	71.2	6.7	0.28	270.7	4.1040	0.1100	0.2933	0.0057	0.6432	0.1020	0.0024	1654	21	1660	28	1667	45	-0.4	-0.3
AI6_72	1667	134.0	14.0	82.6	8.7	0.62	153.4	4.1550	0.1100	0.2948	0.0058	0.4788	0.1026	0.0025	1665	22	1665	29	1667	46	0.0	0.0

AI6_45	1675	8.2	0.5	3.0	0.4	0.37	8.9	3.6400	0.1800	0.2563	0.0095	0.3911	0.1039	0.0052	1562	40	1473	49	1675	92	5.7	2.2
AI6_122	1684	125.0	16.0	70.9	8.3	0.57	141.7	4.2690	0.1200	0.3023	0.0061	0.8958	0.1033	0.0026	1686	22	1702	30	1684	46	-0.9	-0.7
AI6_59	1703	290.0	29.0	59.5	3.7	0.21	304.0	4.5230	0.1200	0.3146	0.0065	0.7623	0.1044	0.0025	1735	22	1765	32	1703	44	-1.7	-1.4
AI6_28	1708	328.0	17.0	268.0	12.0	0.82	391.0	4.1950	0.1000	0.2907	0.0051	0.5999	0.1048	0.0024	1673	19	1646	26	1708	42	1.6	1.4
AI6_105	1714	55.8	2.9	18.3	1.2	0.33	60.1	4.1600	0.1200	0.2898	0.0060	0.5112	0.1050	0.0029	1665	24	1640	30	1714	50	1.5	1.0
AI6_53	1718	644.0	43.0	251.9	7.4	0.39	703.2	3.1150	0.0890	0.2134	0.0063	0.6742	0.1055	0.0030	1436	22	1253	34	1718	51	12.7	8.3
AI6_74	1722	114.3	6.4	27.5	1.1	0.24	120.8	3.8850	0.1100	0.2712	0.0056	0.6124	0.1056	0.0027	1610	23	1546	28	1722	47	4.0	2.8
AI6_118	1732	253.0	22.0	59.5	4.1	0.24	267.0	4.5450	0.1100	0.3191	0.0065	0.6174	0.1059	0.0025	1739	21	1785	32	1732	44	-2.6	-2.2
AI6_38	1738	29.4	2.7	15.2	1.3	0.52	33.0	3.3900	0.1500	0.2420	0.0092	0.5987	0.1065	0.0040	1514	37	1394	47	1738	72	7.9	3.2
AI6_37	1744	88.0	3.9	20.5	0.8	0.23	92.8	4.2800	0.1200	0.2931	0.0058	0.5376	0.1068	0.0028	1687	23	1656	29	1744	49	1.8	1.3
AI6_58	1748	177.0	10.0	117.0	5.2	0.66	204.5	4.4670	0.1300	0.3081	0.0064	0.7342	0.1071	0.0026	1724	24	1733	32	1748	45	-0.5	-0.4
AI6_84	1752	293.0	36.0	246.0	23.0	0.84	350.8	3.3900	0.1800	0.2340	0.0120	0.9731	0.1076	0.0030	1503	42	1360	65	1752	50	9.5	3.4
AI6_131	1753	429.0	85.0	53.7	5.6	0.13	441.6	4.4500	0.1700	0.3024	0.0088	0.9297	0.1074	0.0027	1720	33	1701	44	1753	47	1.1	0.6
AI6_128	1754	245.0	17.0	140.7	4.6	0.57	278.1	4.8180	0.1200	0.3270	0.0068	0.7460	0.1074	0.0025	1787	22	1823	33	1754	42	-2.0	-1.6
AI6_138	1755	71.0	13.0	35.7	7.6	0.50	79.4	2.8400	0.1900	0.2020	0.0140	0.8969	0.1088	0.0041	1369	52	1195	72	1755	70	12.7	3.3
AI6_113	1764	120.8	5.9	25.4	2.2	0.21	126.8	4.6570	0.1400	0.3120	0.0075	0.7835	0.1080	0.0027	1760	26	1749	37	1764	46	0.6	0.4
AI6_6	1766	106.1	8.4	40.2	3.6	0.38	115.5	4.1900	0.1400	0.2799	0.0052	0.3793	0.1084	0.0034	1668	26	1592	27	1766	56	4.6	2.9
AI6_42	1780	54.3	2.3	60.8	6.7	1.12	68.6	4.3400	0.2800	0.2830	0.0140	0.9530	0.1096	0.0038	1670	62	1596	74	1780	68	4.4	1.2
AI6_92	1794	221.0	17.0	38.8	2.0	0.18	230.1	4.9640	0.1200	0.3279	0.0058	0.5479	0.1099	0.0026	1813	21	1828	28	1794	43	-0.8	-0.7
AI6_54	1850	188.0	22.0	29.7	1.1	0.16	195.0	5.2380	0.1300	0.3396	0.0060	0.5019	0.1132	0.0027	1859	21	1884	29	1850	43	-1.4	-1.2
AI6_111	1857	331.0	29.0	34.8	2.8	0.11	339.2	5.2500	0.1400	0.3374	0.0071	0.8568	0.1135	0.0026	1859	22	1873	34	1857	41	-0.8	-0.6
AI6_140	1860	165.0	23.0	69.0	11.0	0.42	181.2	4.9500	0.2100	0.3130	0.0120	0.9796	0.1147	0.0030	1800	40	1753	58	1860	57	2.6	1.2
AI6_132	1863	126.2	8.0	34.3	1.9	0.27	134.3	5.4410	0.1400	0.3439	0.0069	0.5513	0.1139	0.0028	1891	22	1905	33	1863	47	-0.7	-0.6
AI6_33	1871	178.0	14.0	48.1	1.3	0.27	189.3	5.4540	0.1400	0.3498	0.0067	0.6399	0.1145	0.0027	1894	21	1933	32	1871	42	-2.1	-1.9
AI6_13	1871	112.7	6.9	40.2	3.2	0.36	122.1	5.0910	0.1500	0.3255	0.0068	0.4988	0.1147	0.0031	1834	24	1818	32	1871	49	0.9	0.7
AI6_79	1887	62.0	2.8	18.2	0.8	0.29	66.3	5.4370	0.1400	0.3449	0.0067	0.3929	0.1156	0.0029	1889	22	1909	32	1887	44	-1.1	-0.9
AI6_101	1942	427.0	30.0	3.0	0.3	0.01	427.7	5.5530	0.1400	0.3397	0.0068	0.8473	0.1192	0.0027	1907	22	1885	33	1942	40	1.2	1.0
AI6_142	1988	125.0	14.0	76.9	8.2	0.62	143.1	4.4400	0.1600	0.2632	0.0079	0.9215	0.1222	0.0029	1717	30	1518	41	1988	42	11.6	6.6

AI6_35	1989	205.0	14.0	70.8	4.0	0.35	221.6	5.7100	0.1600	0.3428	0.0070	0.6618	0.1225	0.0029	1931	24	1902	34	1989	42	1.5	1.2
AI6_66	1990	50.5	1.9	45.7	2.4	0.90	61.2	5.2520	0.1500	0.3148	0.0065	0.4523	0.1225	0.0034	1863	25	1764	32	1990	49	5.3	4.0
AI6_7	2014	210.0	35.0	91.1	7.3	0.43	231.4	6.3240	0.1600	0.3703	0.0066	0.7373	0.1239	0.0029	2022	22	2030	31	2014	43	-0.4	-0.4
AI6_103	2256	223.0	14.0	68.5	2.5	0.31	239.1	6.5400	0.3100	0.3340	0.0130	0.9681	0.1427	0.0035	2050	42	1851	65	2256	42	9.7	4.7
AI6_83	2483	204.0	23.0	89.0	11.0	0.44	224.9	9.8800	0.3000	0.4406	0.0110	0.9148	0.1628	0.0037	2419	29	2355	49	2483	39	2.6	2.2
AI6_25	2554	112.0	6.5	112.2	5.3	1.00	138.4	10.9600	0.2700	0.4715	0.0080	0.5287	0.1699	0.0040	2520	22	2490	35	2554	39	1.2	1.4
AI6_114	2621	232.8	7.6	217.0	13.0	0.93	283.8	7.8600	0.2700	0.3243	0.0094	0.9268	0.1767	0.0042	2211	32	1808	46	2621	39	18.2	12.6
AI6_137	2646	97.0	16.0	83.5	9.3	0.86	116.6	10.7500	0.4500	0.4430	0.0160	0.9328	0.1786	0.0045	2505	40	2364	72	2646	43	5.6	3.5
AI6_5	2665	409.0	36.0	33.3	1.8	0.08	416.8	12.2900	0.3400	0.4907	0.0120	0.9725	0.1816	0.0041	2619	31	2577	53	2665	38	1.6	1.4
AI6_23	2698	172.0	15.0	29.0	1.0	0.17	178.8	13.3700	0.3300	0.5284	0.0096	0.7396	0.1848	0.0042	2706	23	2734	40	2698	38	-1.0	-1.2
AI6_77	2706	140.9	6.0	143.5	3.4	1.02	174.6	13.0200	0.3200	0.5123	0.0095	0.6367	0.1858	0.0043	2682	22	2668	41	2706	38	0.5	0.6
AI6_63	2786	240.4	7.8	83.3	5.7	0.35	260.0	12.1500	0.3800	0.4521	0.0120	0.9110	0.1951	0.0045	2616	30	2407	53	2786	37	8.0	7.0
AI6_141	2797	20.2	1.2	35.3	1.4	1.75	28.5	12.0100	0.4600	0.4563	0.0120	0.8105	0.1972	0.0059	2600	37	2420	53	2797	50	6.9	4.9
AI6_115	2804	371.0	50.0	44.1	6.5	0.12	381.4	12.4800	0.6400	0.4550	0.0160	0.9143	0.1975	0.0058	2631	46	2418	72	2804	47	8.1	4.6
AI6_97	2934	52.5	6.4	23.8	3.1	0.45	58.1	13.5000	1.1000	0.4560	0.0310	0.9822	0.2147	0.0060	2689	83	2390	140	2934	46	11.1	3.6
AI6_99	4087	10.9	2.0	3.2	0.5	0.29	11.6	16.3000	2.0000	0.2430	0.0240	0.7760	0.4730	0.0330	2850	110	1380	120	4087	100	5±6	13±4

Stansbury Range Permian Diamond Creek Sandstone (AJ7) – Leonardian (281-272.95 Ma)

Grain #	Best Age (Ma)	U		Th		Th/U	Equivalent U	207/235		206/238		Error Correlation 6/38 vs 7/35	207/206		Age 206/238		Age 207/206		Discordance % (206-238/207-age difference)	Uncertainty weighted age difference	
		ppm	2SE	ppm	2SE			Ratio	Prop 2SE	Ratio	Prop 2SE		Ma	Prop 2SE	Ma	Prop 2SE					
AJ7_85	236	1100.0	200.0	628.0	92.0	0.57	1247.6	0.4170	0.0160	0.0374	0.0013	0.7608	0.0799	0.0022	354	11	236	8	1191	51	10.7
AJ7_3	340	83.6	3.5	18.4	0.7	0.22	87.9	0.8010	0.0380	0.0542	0.0019	0.4991	0.1062	0.0045	595	21	340	11	1735	74	12.1
AJ7_84	291	1120.0	180.0	559.0	75.0	0.50	1251.4	0.4060	0.0150	0.0461	0.0015	0.4959	0.0640	0.0018	345	11	291	9	733	61	4.9
AJ7_11	329	744.0	77.0	277.0	27.0	0.37	809.1	0.4850	0.0250	0.0524	0.0020	0.8338	0.0655	0.0015	402	17	329	12	791	52	4.3
AJ7_18	340	901.0	63.0	500.0	27.0	0.55	1018.5	0.5330	0.0160	0.0541	0.0016	0.5436	0.0708	0.0018	433	11	340	10	950	54	8.5
AJ7_34	396	126.0	10.0	0.4	0.1	0.00	126.1	0.4650	0.0200	0.0634	0.0013	0.2297	0.0538	0.0022	392	14	396	8	352	87	-1.1
AJ7_24	397	238.0	17.0	144.0	13.0	0.61	271.8	0.4720	0.0150	0.0636	0.0011	-0.0370	0.0538	0.0016	392	10	397	7	362	67	-1.4
AJ7_51	400	123.7	7.5	64.7	5.4	0.52	138.9	0.4700	0.0200	0.0640	0.0012	0.0615	0.0539	0.0024	391	14	400	7	335	92	-0.6
AJ7_2	417	497.0	26.0	177.2	8.4	0.36	538.6	0.5185	0.0120	0.0667	0.0010	0.2794	0.0565	0.0011	424	8	417	6	461	43	0.8
AJ7_42	426	578.0	38.0	210.0	16.0	0.36	627.4	0.5250	0.0160	0.0682	0.0016	0.1597	0.0568	0.0013	431	11	426	10	469	53	0.5
AJ7_17	433	416.0	46.0	92.1	8.7	0.22	437.6	0.5970	0.0180	0.0694	0.0015	0.4375	0.0633	0.0018	474	12	433	9	705	59	3.4
AJ7_75	434	134.0	16.0	58.7	2.6	0.44	147.8	0.5430	0.0200	0.0697	0.0015	0.2172	0.0559	0.0020	438	13	434	9	422	79	0.9
AJ7_63	436	165.0	24.0	133.0	17.0	0.81	196.3	0.5220	0.0170	0.0700	0.0013	0.2023	0.0537	0.0017	425	12	436	8	362	68	-2.6
AJ7_8	437	134.0	23.0	51.9	4.2	0.39	146.2	0.5310	0.0200	0.0701	0.0014	0.1047	0.0542	0.0019	431	13	437	8	373	76	-1.3
AJ7_81	438	472.0	36.0	280.0	20.0	0.59	537.8	0.5560	0.0160	0.0701	0.0017	0.6712	0.0567	0.0010	449	11	438	10	483	41	2.4
AJ7_45	455	307.6	5.7	423.0	14.0	1.38	407.0	0.5760	0.0160	0.0732	0.0011	0.2418	0.0574	0.0014	462	10	455	7	504	52	0.7
AJ7_73	461	190.0	12.0	106.7	6.9	0.56	215.1	0.5800	0.0170	0.0742	0.0012	-0.0518	0.0566	0.0016	465	11	461	8	490	61	0.3
AJ7_68	467	446.0	29.0	142.7	8.2	0.32	479.5	0.5990	0.0140	0.0751	0.0011	0.2576	0.0575	0.0011	478	9	467	7	517	41	2.3
AJ7_19	474	384.0	40.0	97.1	6.9	0.25	406.8	0.6020	0.0150	0.0763	0.0014	0.3160	0.0577	0.0012	479	10	474	8	520	46	1.0
AJ7_27	503	1231.0	56.0	226.7	4.7	0.18	1284.3	1.3050	0.0430	0.0964	0.0033	0.9573	0.0986	0.0012	847	19	503	19	1597	22	13.4
AJ7_14	594	637.0	38.0	4.0	0.9	0.01	637.9	0.8190	0.0170	0.0965	0.0016	0.3778	0.0618	0.0010	609	10	594	9	669	35	1.5

A17_40	700	59.0	10.0	21.9	1.0	0.37	64.1	1.2100	0.1100	0.1156	0.0095	0.8034	0.0783	0.0033	778	50	700	55	1157	84	10.0	1.6
A17_60	731	74.0	13.0	24.8	2.6	0.34	79.8	1.3350	0.1000	0.1207	0.0081	0.7856	0.0816	0.0033	858	45	731	47	1266	75	14.8	2.8
A17_23	778	911.0	47.0	304.5	8.9	0.33	982.6	1.8940	0.0590	0.1275	0.0042	0.9363	0.1074	0.0014	1075	21	778	23	1754	23	27.6	14.1
A17_16	793	527.0	49.0	243.0	22.0	0.46	584.1	1.3250	0.0370	0.1310	0.0036	0.8586	0.0742	0.0011	858	17	793	21	1048	29	7.6	3.8
A17_35	797	216.0	13.0	48.2	7.4	0.22	227.3	1.2430	0.0740	0.1321	0.0063	0.9319	0.0668	0.0016	810	35	797	36	848	46	1.6	0.4
A17_89	821	546.0	15.0	65.1	7.1	0.12	561.3	1.5400	0.1500	0.1370	0.0100	0.9882	0.0775	0.0025	900	65	821	59	1123	67	8.8	1.2
A17_79	851	410.0	86.0	68.0	10.0	0.17	426.0	2.1500	0.1400	0.1408	0.0090	0.9663	0.1104	0.0017	1159	45	851	51	1807	28	26.6	6.8
A17_7	854	90.1	5.7	90.7	5.5	1.01	111.4	1.4540	0.0520	0.1418	0.0047	0.7708	0.0764	0.0019	907	22	854	27	1099	49	5.8	2.4
A17_78	921	423.0	32.0	171.0	13.0	0.40	463.2	1.5540	0.0420	0.1538	0.0042	0.9312	0.0733	0.0011	947	18	921	23	1021	29	2.7	1.4
A17_5	955	256.4	6.3	66.0	5.7	0.26	271.9	1.6900	0.0430	0.1597	0.0030	0.8945	0.0761	0.0014	1005	17	955	17	1101	37	5.0	2.9
A17_10	964	259.0	33.0	88.5	4.1	0.34	279.8	1.6100	0.0330	0.1613	0.0023	0.2282	0.0725	0.0011	974	13	964	13	999	31	1.1	0.8
A17_74	986	282.0	39.0	126.0	15.0	0.45	311.6	1.7740	0.0440	0.1653	0.0036	0.6043	0.0785	0.0015	1036	16	986	20	1159	39	4.8	3.1
A17_22	1008	291.0	38.0	102.0	11.0	0.35	315.0	1.7710	0.0400	0.1767	0.0028	0.5948	0.0730	0.0011	1035	15	1049	16	1008	30	-1.4	-0.9
A17_82	1080	47.3	2.5	12.5	0.4	0.26	50.2	1.8190	0.0640	0.1732	0.0030	0.2615	0.0752	0.0025	1050	24	1031	17	1080	69	1.8	0.8
A17_88	1117	111.0	15.0	45.8	6.8	0.41	121.8	1.9280	0.0520	0.1829	0.0031	0.2894	0.0766	0.0019	1094	19	1083	17	1117	49	1.0	0.6
A17_86	1160	141.0	14.0	62.7	5.0	0.44	155.7	1.8270	0.0610	0.1687	0.0044	0.6235	0.0789	0.0018	1060	23	1004	24	1160	45	5.3	2.4
A17_43	1168	264.0	18.0	136.8	8.9	0.52	296.1	2.2660	0.0690	0.2071	0.0054	0.5975	0.0790	0.0012	1204	24	1213	30	1168	30	-0.7	-0.4
A17_28	1176	87.4	3.7	51.4	3.4	0.59	99.5	1.8860	0.0550	0.1742	0.0035	0.4775	0.0790	0.0020	1081	19	1035	19	1176	49	4.3	2.4
A17_31	1183	387.0	33.0	91.0	12.0	0.24	408.4	2.1700	0.1300	0.1974	0.0096	0.9772	0.0793	0.0014	1150	46	1157	52	1183	33	-0.6	-0.2
A17_57	1197	330.0	20.0	54.8	1.9	0.17	342.9	2.3170	0.0730	0.2101	0.0052	0.7937	0.0802	0.0012	1217	23	1229	28	1197	29	-1.0	-0.5
A17_83	1286	242.0	45.0	27.6	2.3	0.11	248.5	2.4200	0.1400	0.2043	0.0083	0.8887	0.0840	0.0021	1229	41	1195	45	1286	50	2.8	0.8
A17_47	1359	129.0	13.0	35.6	2.6	0.28	137.4	2.7800	0.0640	0.2336	0.0039	0.3940	0.0867	0.0015	1349	18	1355	20	1359	34	-0.4	-0.3
A17_36	1362	458.0	62.0	39.2	1.4	0.09	467.2	2.0700	0.0680	0.1690	0.0044	0.8941	0.0872	0.0015	1134	23	1006	24	1362	32	11.3	5.6
A17_20	1378	88.9	6.9	20.1	1.4	0.23	93.6	2.7050	0.0770	0.2252	0.0050	0.6879	0.0874	0.0017	1328	22	1308	26	1378	36	1.5	0.9
A17_37	1396	233.0	32.0	68.9	5.7	0.30	249.2	2.6300	0.1100	0.2164	0.0086	0.9385	0.0888	0.0015	1305	33	1259	47	1396	32	3.5	1.4
A17_71	1419	106.9	6.0	52.1	1.8	0.49	119.1	2.4530	0.0610	0.1990	0.0036	0.3106	0.0900	0.0018	1256	18	1170	20	1419	40	6.8	4.8
A17_6	1435	262.0	34.0	83.1	6.3	0.32	281.5	2.3530	0.0850	0.1909	0.0064	0.8936	0.0903	0.0015	1227	25	1124	35	1435	30	8.4	4.1
A17_13	1454	103.8	7.7	22.4	1.7	0.22	109.1	3.2670	0.0860	0.2567	0.0051	0.8163	0.0917	0.0016	1470	21	1472	26	1454	34	-0.1	-0.1

A17_50	1476	456.0	47.0	159.0	13.0	0.35	493.4	2.9260	0.0730	0.2287	0.0046	0.8687	0.0923	0.0010	1388	19	1327	24	1476	21	4.4	3.2
A17_49	1508	36.3	4.2	44.3	4.2	1.22	46.7	3.1820	0.1100	0.2458	0.0049	0.2852	0.0935	0.0026	1453	26	1416	25	1508	52	2.5	1.4
A17_29	1519	463.0	34.0	98.3	5.9	0.21	486.1	3.4850	0.0640	0.2676	0.0037	0.5844	0.0945	0.0010	1523	15	1528	19	1519	20	-0.3	-0.3
A17_70	1547	132.4	5.7	35.1	0.9	0.26	140.6	3.4040	0.0860	0.2534	0.0044	0.8359	0.0963	0.0016	1503	20	1455	23	1547	32	3.2	2.4
A17_77	1571	91.1	5.4	38.7	2.0	0.42	100.2	3.7310	0.0860	0.2761	0.0055	0.4129	0.0973	0.0019	1578	18	1571	28	1571	37	0.4	0.4
A17_44	1607	371.0	30.0	9.9	1.0	0.03	373.3	4.0110	0.0820	0.2941	0.0048	0.6853	0.0991	0.0012	1636	17	1663	23	1607	22	-1.7	-1.6
A17_33	1607	328.0	9.9	211.0	12.0	0.64	377.6	3.1790	0.0700	0.2316	0.0037	0.8723	0.0993	0.0014	1450	17	1343	19	1607	27	7.4	6.3
A17_87	1611	523.0	40.0	12.8	1.5	0.02	526.0	3.7870	0.0680	0.2763	0.0038	0.3485	0.0994	0.0011	1589	14	1573	19	1611	20	1.0	1.2
A17_72	1619	292.0	23.0	176.0	12.0	0.60	333.4	3.9150	0.0740	0.2850	0.0043	0.5570	0.0997	0.0012	1616	15	1616	22	1619	23	0.0	0.0
A17_46	1632	127.3	6.8	111.4	6.6	0.88	153.5	3.8290	0.0830	0.2763	0.0044	0.4503	0.1005	0.0015	1598	18	1572	22	1632	27	1.6	1.4
A17_64	1642	145.3	6.2	153.4	5.3	1.06	181.3	3.7430	0.0810	0.2682	0.0042	0.6424	0.1009	0.0015	1579	17	1533	22	1642	29	2.9	2.7
A17_30	1653	798.0	50.0	27.2	1.8	0.03	804.4	2.7800	0.1100	0.2016	0.0100	0.9618	0.1017	0.0016	1341	31	1179	54	1653	30	12.1	5.2
A17_12	1689	460.0	58.0	86.0	11.0	0.19	480.2	3.5200	0.1200	0.2531	0.0073	0.8783	0.1038	0.0017	1529	27	1452	38	1689	29	5.0	2.9
A17_59	1807	413.0	37.0	17.6	3.5	0.04	417.1	3.9800	0.1500	0.2611	0.0094	0.9493	0.1105	0.0013	1628	30	1501	48	1807	22	7.8	4.2
A17_9	1813	177.3	9.2	91.4	3.8	0.52	198.8	4.8750	0.0970	0.3165	0.0054	0.5726	0.1110	0.0015	1797	17	1774	27	1813	25	1.3	1.4
A17_41	1852	267.0	25.0	123.9	9.9	0.46	296.1	4.0430	0.0880	0.2596	0.0048	0.6317	0.1134	0.0015	1641	18	1487	25	1852	24	9.4	8.6
A17_58	1869	59.6	4.8	4.5	0.3	0.08	60.7	4.9900	0.1500	0.3198	0.0071	0.5951	0.1145	0.0026	1815	27	1787	34	1869	41	1.5	1.0
A17_38	1887	269.0	34.0	203.0	27.0	0.75	316.7	3.4100	0.1200	0.2168	0.0071	0.8953	0.1150	0.0017	1509	28	1267	38	1887	26	16.0	8.6
A17_53	1911	29.7	4.1	66.5	2.9	2.24	45.3	3.9500	0.3200	0.2450	0.0170	0.8130	0.1170	0.0046	1609	65	1405	87	1911	71	12.7	3.1
A17_52	1912	32.3	2.8	84.4	1.9	2.61	52.1	5.0800	0.1700	0.3109	0.0069	0.8389	0.1174	0.0028	1829	29	1744	34	1912	44	4.6	2.9
A17_65	1913	214.0	13.0	86.7	4.6	0.41	234.4	4.8840	0.1100	0.3039	0.0054	0.6744	0.1172	0.0015	1799	19	1710	27	1913	24	4.9	4.7
A17_15	1928	246.0	13.0	48.8	1.6	0.20	257.5	4.8450	0.1200	0.2952	0.0062	0.8874	0.1182	0.0016	1790	21	1666	31	1928	24	6.9	5.9
A17_1	1945	335.0	33.0	138.0	12.0	0.41	367.4	5.5900	0.1700	0.3356	0.0095	0.9246	0.1193	0.0014	1908	25	1863	45	1945	21	2.4	1.8
A17_61	1960	140.0	13.0	40.5	3.4	0.29	149.5	5.7120	0.1300	0.3404	0.0056	0.8407	0.1204	0.0020	1931	20	1888	27	1960	31	2.2	2.2
A17_25	1980	160.5	7.5	58.4	2.1	0.36	174.2	5.6230	0.1200	0.3341	0.0053	0.5455	0.1210	0.0017	1918	18	1858	25	1980	25	3.1	3.3
A17_55	2252	337.0	42.0	88.1	4.7	0.26	357.7	5.0500	0.3100	0.2550	0.0130	0.9756	0.1427	0.0029	1821	51	1462	66	2252	36	19.7	7.0
A17_32	2413	84.9	6.4	28.5	1.5	0.34	91.6	9.6400	0.3600	0.4419	0.0089	0.8203	0.1565	0.0039	2397	36	2357	40	2413	43	1.7	1.1
A17_76	2582	79.2	8.9	55.0	1.1	0.69	92.1	12.0500	0.4300	0.4940	0.0120	0.9301	0.1732	0.0033	2598	36	2584	53	2582	32	0.5	0.4

A17_21	2587	622.0	34.0	91.0	3.1	0.15	643.4	4.6700	0.2700	0.1939	0.0100	0.9756	0.1729	0.0023	1737	47	1138	53	2587	22	34.5	12.7
A17_66	2685	674.0	34.0	257.0	14.0	0.38	734.4	5.7600	0.3100	0.2270	0.0110	0.9776	0.1833	0.0025	1924	49	1311	58	2685	22	31.9	12.5
A17_67	2699	149.0	36.0	140.0	15.0	0.94	181.9	10.5100	0.7300	0.4120	0.0270	0.9818	0.1855	0.0026	2476	72	2220	130	2699	23	10.3	3.6
A17_48	2708	98.0	10.0	39.9	3.7	0.41	107.4	13.6100	0.3000	0.5263	0.0110	0.7966	0.1863	0.0022	2721	21	2731	45	2708	19	-0.4	-0.5
A17_62	2726	67.6	6.0	51.1	3.7	0.76	79.6	13.3300	0.3000	0.5149	0.0100	0.8786	0.1883	0.0027	2701	22	2675	44	2726	23	1.0	1.2
A17_69	2727	107.0	5.8	129.5	1.6	1.21	137.4	12.6600	0.2700	0.4869	0.0083	0.8343	0.1885	0.0023	2652	21	2556	36	2727	20	3.6	4.6
A17_56	2752	509.0	53.0	110.0	12.0	0.22	534.9	12.0900	0.2500	0.4603	0.0084	0.8694	0.1909	0.0019	2610	19	2443	37	2752	16	6.4	8.8
A17_80	2844	104.4	5.5	51.9	1.5	0.50	116.6	13.4000	0.3100	0.4797	0.0110	0.7572	0.2024	0.0033	2707	23	2522	49	2844	27	6.8	8.0
A17_54	2879	98.9	2.8	53.8	0.8	0.54	111.5	14.2100	0.2700	0.5012	0.0080	0.6710	0.2067	0.0026	2764	19	2618	34	2879	20	5.3	7.7
A17_39	2880	124.0	6.9	52.3	2.0	0.42	136.3	16.0900	0.3100	0.5629	0.0091	0.9378	0.2068	0.0025	2877	24	2878	37	2880	20	0.0	0.0
A17_4	5152	0.9	0.2	0.2	0.0	0.24	1.0	670.0000	120.0000	5.5200	0.9100	0.9836	0.8840	0.0280	6490	190	1160	930	5152	64	-7.1	-7.1
A17_85	236	1100.0	200.0	638.0	92.0	0.57	1247.6	0.4120	0.0160	0.0374	0.0013	0.7608	0.0799	0.0022	954	11	236	8	1191	51	33.2	10.7
A17_3	340	83.6	3.5	18.4	0.7	0.22	87.9	0.8040	0.0380	0.0542	0.0019	0.4991	0.1062	0.0045	595	21	340	11	1735	74	42.9	12.1
A17_84	291	1120.0	180.0	559.0	75.0	0.50	1251.4	0.4060	0.0150	0.0461	0.0015	0.4959	0.0640	0.0018	345	11	291	9	733	61	15.7	4.9
A17_11	329	744.0	77.0	277.0	27.0	0.37	809.1	0.4850	0.0250	0.0524	0.0020	0.8338	0.0655	0.0015	402	17	329	12	791	52	18.2	4.3
A17_18	340	901.0	63.0	500.0	27.0	0.55	1018.5	0.5330	0.0160	0.0541	0.0016	0.5436	0.0708	0.0018	433	11	340	10	950	54	21.5	8.5
A17_34	396	126.0	10.0	0.4	0.1	0.00	126.1	0.4650	0.0200	0.0634	0.0013	0.2297	0.0538	0.0022	392	14	396	8	352	87	-1.1	-0.3
A17_24	397	238.0	17.0	144.0	13.0	0.61	271.8	0.4720	0.0150	0.0636	0.0011	-0.0370	0.0538	0.0016	392	10	397	7	362	67	-1.4	-0.5
A17_51	400	123.7	7.5	64.7	5.4	0.52	138.9	0.4700	0.0200	0.0640	0.0012	0.0615	0.0539	0.0024	391	14	400	7	335	92	-2.2	-0.6
A17_2	417	497.0	26.0	177.2	8.4	0.36	538.6	0.5185	0.0120	0.0667	0.0010	0.2794	0.0565	0.0011	424	8	417	6	461	43	1.6	0.8
A17_42	426	578.0	38.0	210.0	16.0	0.36	627.4	0.5250	0.0160	0.0682	0.0016	0.1597	0.0568	0.0013	431	11	426	10	469	53	1.3	0.5
A17_17	433	416.0	46.0	92.1	8.7	0.22	437.6	0.5970	0.0180	0.0694	0.0015	0.4375	0.0633	0.0018	474	12	433	9	705	59	8.7	3.4
A17_75	434	134.0	16.0	58.7	2.6	0.44	147.8	0.5430	0.0200	0.0697	0.0015	0.2172	0.0559	0.0020	438	13	434	9	422	79	0.9	0.3
A17_63	436	165.0	24.0	133.0	17.0	0.81	196.3	0.5220	0.0170	0.0700	0.0013	0.2023	0.0537	0.0017	425	12	436	8	362	68	-2.6	-0.9
A17_8	437	134.0	23.0	51.9	4.2	0.39	146.2	0.5310	0.0200	0.0701	0.0014	0.1047	0.0542	0.0019	431	13	437	8	373	76	-1.3	-0.4
A17_81	438	472.0	36.0	280.0	20.0	0.59	537.8	0.5560	0.0160	0.0701	0.0017	0.6712	0.0567	0.0010	449	11	438	10	483	41	2.4	1.0
A17_45	455	307.6	5.7	423.0	14.0	1.38	407.0	0.5760	0.0160	0.0732	0.0011	0.2418	0.0574	0.0014	462	10	455	7	504	52	1.4	0.7
A17_73	461	190.0	12.0	106.7	6.9	0.56	215.1	0.5800	0.0170	0.0742	0.0012	-0.0518	0.0566	0.0016	465	11	461	8	490	61	0.7	0.3

A17_68	467	446.0	29.0	142.7	8.2	0.32	479.5	0.5990	0.0140	0.0751	0.0011	0.2576	0.0575	0.0011	478	9	467	7	517	41	2.3	1.2
A17_19	474	384.0	40.0	97.1	6.9	0.25	406.8	0.6020	0.0150	0.0763	0.0014	0.3160	0.0577	0.0012	479	10	474	8	520	46	1.0	0.5
A17_27	593	4234.0	56.0	226.7	4.7	0.18	4284.3	1.3060	0.0430	0.0964	0.0033	0.9573	0.0986	0.0012	847	49	593	49	4597	22	30.0	13.4
A17_14	594	637.0	38.0	4.0	0.9	0.01	637.9	0.8190	0.0170	0.0965	0.0016	0.3778	0.0618	0.0010	609	10	594	9	669	35	2.4	1.5
A17_40	700	59.0	10.0	21.9	1.0	0.37	64.1	1.2100	0.1100	0.1156	0.0095	0.8034	0.0783	0.0033	778	50	700	55	1157	84	10.0	1.6
A17_60	731	74.0	13.0	24.8	2.6	0.34	79.8	1.3350	0.1000	0.1207	0.0081	0.7856	0.0816	0.0033	858	45	731	47	1266	75	14.8	2.8
A17_23	778	911.0	47.0	304.5	8.9	0.33	982.6	1.8940	0.0590	0.1275	0.0042	0.9463	0.1074	0.0014	1075	21	778	23	4754	23	27.6	14.1
A17_16	793	527.0	49.0	243.0	22.0	0.46	584.1	1.3250	0.0370	0.1310	0.0036	0.8586	0.0742	0.0011	858	17	793	21	1048	29	7.6	3.8
A17_35	797	216.0	13.0	48.2	7.4	0.22	227.3	1.2430	0.0740	0.1321	0.0063	0.9319	0.0668	0.0016	810	35	797	36	848	46	1.6	0.4
A17_89	821	546.0	15.0	65.1	7.1	0.12	561.3	1.5400	0.1500	0.1370	0.0100	0.9882	0.0775	0.0025	900	65	821	59	1123	67	8.8	1.2
A17_79	851	410.0	86.0	68.0	10.0	0.17	426.0	2.1500	0.1400	0.1408	0.0090	0.9663	0.1104	0.0017	1159	45	851	51	1807	28	26.6	6.8
A17_7	854	90.1	5.7	90.7	5.5	1.01	111.4	1.4540	0.0520	0.1418	0.0047	0.7708	0.0764	0.0019	907	22	854	27	1099	49	5.8	2.4
A17_78	921	423.0	32.0	171.0	13.0	0.40	463.2	1.5540	0.0420	0.1538	0.0042	0.9312	0.0733	0.0011	947	18	921	23	1021	29	2.7	1.4
A17_5	955	256.4	6.3	66.0	5.7	0.26	271.9	1.6900	0.0430	0.1597	0.0030	0.8945	0.0761	0.0014	1005	17	955	17	1101	37	5.0	2.9
A17_10	964	259.0	33.0	88.5	4.1	0.34	279.8	1.6100	0.0330	0.1613	0.0023	0.2282	0.0725	0.0011	974	13	964	13	999	31	1.1	0.8
A17_74	986	282.0	39.0	126.0	15.0	0.45	311.6	1.7740	0.0440	0.1653	0.0036	0.6043	0.0785	0.0015	1036	16	986	20	1159	39	4.8	3.1
A17_22	1008	291.0	38.0	102.0	11.0	0.35	315.0	1.7710	0.0400	0.1767	0.0028	0.5948	0.0730	0.0011	1035	15	1049	16	1008	30	-1.4	-0.9
A17_82	1080	47.3	2.5	12.5	0.4	0.26	50.2	1.8190	0.0640	0.1732	0.0030	0.2615	0.0752	0.0025	1050	24	1031	17	1080	69	1.8	0.8
A17_88	1117	111.0	15.0	45.8	6.8	0.41	121.8	1.9280	0.0520	0.1829	0.0031	0.2894	0.0766	0.0019	1094	19	1083	17	1117	49	1.0	0.6
A17_86	1160	141.0	14.0	62.7	5.0	0.44	155.7	1.8270	0.0610	0.1687	0.0044	0.6235	0.0789	0.0018	1060	23	1004	24	1160	45	5.3	2.4
A17_43	1168	264.0	18.0	136.8	8.9	0.52	296.1	2.2660	0.0690	0.2071	0.0054	0.5975	0.0790	0.0012	1204	24	1213	30	1168	30	-0.7	-0.4
A17_28	1176	87.4	3.7	51.4	3.4	0.59	99.5	1.8860	0.0550	0.1742	0.0035	0.4775	0.0790	0.0020	1081	19	1035	19	1176	49	4.3	2.4
A17_31	1183	387.0	33.0	91.0	12.0	0.24	408.4	2.1700	0.1300	0.1974	0.0096	0.9772	0.0793	0.0014	1150	46	1157	52	1183	33	-0.6	-0.2
A17_57	1197	330.0	20.0	54.8	1.9	0.17	342.9	2.3170	0.0730	0.2101	0.0052	0.7937	0.0802	0.0012	1217	23	1229	28	1197	29	-1.0	-0.5
A17_83	1286	242.0	45.0	27.6	2.3	0.11	248.5	2.4200	0.1400	0.2043	0.0083	0.8887	0.0840	0.0021	1229	41	1195	45	1286	50	2.8	0.8
A17_47	1359	129.0	13.0	35.6	2.6	0.28	137.4	2.7800	0.0640	0.2336	0.0039	0.3940	0.0867	0.0015	1349	18	1355	20	1359	34	-0.4	-0.3
A17_36	1362	458.0	62.0	39.2	1.4	0.09	467.2	2.0700	0.0680	0.1690	0.0044	0.8941	0.0872	0.0015	1134	23	1006	24	1362	32	11.3	5.6
A17_20	1378	88.9	6.9	20.1	1.4	0.23	93.6	2.7050	0.0770	0.2252	0.0050	0.6879	0.0874	0.0017	1328	22	1308	26	1378	36	1.5	0.9

A17_37	1396	233.0	32.0	68.9	5.7	0.30	249.2	2.6300	0.1100	0.2164	0.0086	0.9385	0.0888	0.0015	1305	33	1259	47	1396	32	3.5	1.4
A17_71	1419	106.9	6.0	52.1	1.8	0.49	119.1	2.4530	0.0610	0.1990	0.0036	0.3106	0.0900	0.0018	1256	18	1170	20	1419	40	6.8	4.8
A17_6	1435	262.0	34.0	83.1	6.3	0.32	281.5	2.3530	0.0850	0.1909	0.0064	0.8936	0.0903	0.0015	1227	25	1124	35	1435	30	8.4	4.1
A17_13	1454	103.8	7.7	22.4	1.7	0.22	109.1	3.2670	0.0860	0.2567	0.0051	0.8163	0.0917	0.0016	1470	21	1472	26	1454	34	-0.1	-0.1
A17_50	1476	456.0	47.0	159.0	13.0	0.35	493.4	2.9260	0.0730	0.2287	0.0046	0.8687	0.0923	0.0010	1388	19	1327	24	1476	21	4.4	3.2
A17_49	1508	36.3	4.2	44.3	4.2	1.22	46.7	3.1820	0.1100	0.2458	0.0049	0.2852	0.0935	0.0026	1453	26	1416	25	1508	52	2.5	1.4
A17_29	1519	463.0	34.0	98.3	5.9	0.21	486.1	3.4850	0.0640	0.2676	0.0037	0.5844	0.0945	0.0010	1523	15	1528	19	1519	20	-0.3	-0.3
A17_70	1547	132.4	5.7	35.1	0.9	0.26	140.6	3.4040	0.0860	0.2534	0.0044	0.8359	0.0963	0.0016	1503	20	1455	23	1547	32	3.2	2.4
A17_77	1571	91.1	5.4	38.7	2.0	0.42	100.2	3.7310	0.0860	0.2761	0.0055	0.4129	0.0973	0.0019	1578	18	1571	28	1571	37	0.4	0.4
A17_44	1607	371.0	30.0	9.9	1.0	0.03	373.3	4.0110	0.0820	0.2941	0.0048	0.6853	0.0991	0.0012	1636	17	1663	23	1607	22	-1.7	-1.6
A17_33	1607	328.0	9.9	211.0	12.0	0.64	377.6	3.1790	0.0700	0.2316	0.0037	0.8723	0.0993	0.0014	1450	17	1343	19	1607	27	7.4	6.3
A17_87	1611	523.0	40.0	12.8	1.5	0.02	526.0	3.7870	0.0680	0.2763	0.0038	0.3485	0.0994	0.0011	1589	14	1573	19	1611	20	1.0	1.2
A17_72	1619	292.0	23.0	176.0	12.0	0.60	333.4	3.9150	0.0740	0.2850	0.0043	0.5570	0.0997	0.0012	1616	15	1616	22	1619	23	0.0	0.0
A17_46	1632	127.3	6.8	111.4	6.6	0.88	153.5	3.8290	0.0830	0.2763	0.0044	0.4503	0.1005	0.0015	1598	18	1572	22	1632	27	1.6	1.4
A17_64	1642	145.3	6.2	153.4	5.3	1.06	181.3	3.7430	0.0810	0.2682	0.0042	0.6424	0.1009	0.0015	1579	17	1533	22	1642	29	2.9	2.7
A17_30	1653	798.0	50.0	27.2	1.8	0.03	804.4	2.7800	0.1100	0.2016	0.0100	0.9618	0.1017	0.0016	1341	31	1179	54	1653	30	12.1	5.2
A17_12	1689	460.0	58.0	86.0	11.0	0.19	480.2	3.5200	0.1200	0.2531	0.0073	0.8783	0.1038	0.0017	1529	27	1452	38	1689	29	5.0	2.9
A17_59	1807	413.0	37.0	17.6	3.5	0.04	417.1	3.9800	0.1500	0.2611	0.0094	0.9493	0.1105	0.0013	1628	30	1501	48	1807	22	7.8	4.2
A17_9	1813	177.3	9.2	91.4	3.8	0.52	198.8	4.8750	0.0970	0.3165	0.0054	0.5726	0.1110	0.0015	1797	17	1774	27	1813	25	1.3	1.4
A17_41	1852	267.0	25.0	123.9	9.9	0.46	296.1	4.0430	0.0880	0.2596	0.0048	0.6317	0.1134	0.0015	1641	18	1487	25	1852	24	9.4	8.6
A17_58	1869	59.6	4.8	4.5	0.3	0.08	60.7	4.9900	0.1500	0.3198	0.0071	0.5951	0.1145	0.0026	1815	27	1787	34	1869	41	1.5	1.0
A17_38	1887	269.0	34.0	203.0	27.0	0.75	316.7	3.4100	0.1200	0.2168	0.0071	0.8953	0.1150	0.0017	1509	28	1267	38	1887	26	16.0	8.6
A17_53	1911	29.7	4.1	66.5	2.9	2.24	45.3	3.9500	0.3200	0.2450	0.0170	0.8130	0.1170	0.0046	1609	65	1405	87	1911	71	12.7	3.1
A17_52	1912	32.3	2.8	84.4	1.9	2.61	52.1	5.0800	0.1700	0.3109	0.0069	0.8389	0.1174	0.0028	1829	29	1744	34	1912	44	4.6	2.9
A17_65	1913	214.0	13.0	86.7	4.6	0.41	234.4	4.8840	0.1100	0.3039	0.0054	0.6744	0.1172	0.0015	1799	19	1710	27	1913	24	4.9	4.7
A17_15	1928	246.0	13.0	48.8	1.6	0.20	257.5	4.8450	0.1200	0.2952	0.0062	0.8874	0.1182	0.0016	1790	21	1666	31	1928	24	6.9	5.9
A17_1	1945	335.0	33.0	138.0	12.0	0.41	367.4	5.5900	0.1700	0.3356	0.0095	0.9246	0.1193	0.0014	1908	25	1863	45	1945	21	2.4	1.8
A17_61	1960	140.0	13.0	40.5	3.4	0.29	149.5	5.7120	0.1300	0.3404	0.0056	0.8407	0.1204	0.0020	1931	20	1888	27	1960	31	2.2	2.2

A17_25	1980	160.5	7.5	58.4	2.1	0.36	174.2	5.6230	0.1200	0.3341	0.0053	0.5455	0.1210	0.0017	1918	18	1858	25	1980	25	3.1	3.3
A17_55	2252	337.0	42.0	88.1	4.7	0.26	357.7	5.0500	0.3100	0.2550	0.0130	0.9756	0.1427	0.0029	1821	51	1462	66	2252	36	19.7	7.0
A17_32	2413	84.9	6.4	28.5	1.5	0.34	91.6	9.6400	0.3600	0.4419	0.0089	0.8203	0.1565	0.0039	2397	36	2357	40	2413	43	1.7	1.1
A17_76	2582	79.2	8.9	55.0	1.1	0.69	92.1	12.0500	0.4300	0.4940	0.0120	0.9301	0.1732	0.0033	2598	36	2584	53	2582	32	0.5	0.4
A17_21	2587	622.0	34.0	91.0	3.1	0.15	643.4	4.6700	0.2700	0.1939	0.0100	0.9756	0.1729	0.0023	1727	47	1138	53	2587	22	34.5	12.7
A17_66	2685	674.0	34.0	257.0	14.0	0.38	734.4	5.7600	0.3100	0.2270	0.0110	0.9776	0.1833	0.0025	1924	49	1311	58	2685	22	31.9	12.5
A17_67	2699	149.0	36.0	140.0	15.0	0.94	181.9	10.5100	0.7300	0.4120	0.0270	0.9818	0.1855	0.0026	2476	72	2220	130	2699	23	10.3	3.6
A17_48	2708	98.0	10.0	39.9	3.7	0.41	107.4	13.6100	0.3000	0.5263	0.0110	0.7966	0.1863	0.0022	2721	21	2731	45	2708	19	-0.4	-0.5
A17_62	2726	67.6	6.0	51.1	3.7	0.76	79.6	13.3300	0.3000	0.5149	0.0100	0.8786	0.1883	0.0027	2701	22	2675	44	2726	23	1.0	1.2
A17_69	2727	107.0	5.8	129.5	1.6	1.21	137.4	12.6600	0.2700	0.4869	0.0083	0.8343	0.1885	0.0023	2652	21	2556	36	2727	20	3.6	4.6
A17_56	2752	509.0	53.0	110.0	12.0	0.22	534.9	12.0900	0.2500	0.4603	0.0084	0.8694	0.1909	0.0019	2610	19	2443	37	2752	16	6.4	8.8
A17_80	2844	104.4	5.5	51.9	1.5	0.50	116.6	13.4000	0.3100	0.4797	0.0110	0.7572	0.2024	0.0033	2707	23	2522	49	2844	27	6.8	8.0
A17_54	2879	98.9	2.8	53.8	0.8	0.54	111.5	14.2100	0.2700	0.5012	0.0080	0.6710	0.2067	0.0026	2764	19	2618	34	2879	20	5.3	7.7
A17_39	2880	124.0	6.9	52.3	2.0	0.42	136.3	16.0900	0.3100	0.5629	0.0091	0.9378	0.2068	0.0025	2877	24	2878	37	2880	20	0.0	0.0
A17_4	5152	0.9	0.2	0.2	0.0	0.24	1.0	670.0000	130.0000	5.5200	0.9100	0.9836	0.8840	0.0280	6490	190	11639	930	5152	64	-79.2	-27.1

Stansbury Range Pennsylvanian Butterfield Peaks Formation (AJ8) – Atokan-Desmoinesian (318.8-306.5 Ma)

Grain #	Best Age (Ma)	U		Th		Th/U	Equivalent U	207/235		206/238		Error Correlation 6/38 vs 7/35	207/206		Age 207/235		Age 206/238		Age 207/206		Discordance % (206-238/207-235 difference)	Uncertainty weighted age difference (Ma)
		ppm	2SE	ppm	2SE		ppm	Ratio	Prop 2SE	Ratio	Prop 2SE		Ratio	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE	Ma	Prop 2SE		
AJ8_52	335	2660.0	180.0	128.0	14.0	0.05	2690.1	0.4734	0.0130	0.0533	0.0012	0.5034	0.0660	0.0018	393	9	335	8	799	58	14.9	6.7
AJ8_8	390	94.6	6.0	43.9	2.2	0.46	104.9	0.4660	0.0210	0.0623	0.0016	0.1394	0.0556	0.0026	391	14	390	10	402	100	0.3	0.1
AJ8_37	401	324.0	34.0	60.2	2.6	0.19	338.1	0.4710	0.0150	0.0642	0.0015	0.3549	0.0551	0.0018	393	10	401	9	416	66	-2.2	-0.9
AJ8_7	414	135.8	9.1	46.0	2.4	0.34	146.6	0.5030	0.0180	0.0662	0.0014	0.2530	0.0550	0.0020	413	12	414	9	396	81	-0.1	0.0
AJ8_95	428	113.0	22.0	28.5	1.7	0.25	119.7	0.5290	0.0210	0.0687	0.0015	0.0661	0.0576	0.0023	431	15	428	9	499	90	0.7	0.2
AJ8_86	438	741.0	90.0	64.5	3.3	0.09	756.2	0.5400	0.0160	0.0703	0.0014	0.5565	0.0555	0.0015	438	10	438	9	428	60	0.0	0.0
AJ8_11	439	49.6	2.3	27.6	0.7	0.56	56.1	0.5810	0.0290	0.0704	0.0022	0.0927	0.0616	0.0034	464	18	439	13	640	120	5.4	1.4
AJ8_43	446	404.0	33.0	235.0	15.0	0.58	459.2	0.5380	0.0160	0.0716	0.0014	0.3558	0.0553	0.0016	437	10	446	8	420	62	-2.1	-0.9
AJ8_141	451	213.0	20.0	109.4	7.7	0.51	238.7	0.5450	0.0170	0.0724	0.0015	0.4510	0.0544	0.0016	441	11	451	9	404	66	-2.1	-0.8
AJ8_25	453	91.7	7.6	66.0	3.9	0.72	107.2	0.5600	0.0230	0.0728	0.0017	0.1499	0.0568	0.0024	452	15	453	10	475	93	-0.2	-0.1
AJ8_31	466	651.0	37.0	68.4	5.5	0.11	667.1	0.5790	0.0160	0.0749	0.0016	0.5964	0.0570	0.0015	464	11	466	9	494	59	-0.5	-0.2
AJ8_44	510	377.0	14.0	82.1	9.1	0.22	396.3	0.6550	0.0200	0.0823	0.0016	0.5145	0.0578	0.0016	513	12	510	10	533	62	0.6	0.2
AJ8_57	546	390.0	59.0	156.9	7.9	0.40	426.9	0.7210	0.0210	0.0884	0.0017	0.1739	0.0597	0.0017	551	12	546	10	594	62	0.9	0.4
AJ8_133	555	24.5	1.9	16.3	1.0	0.67	28.3	0.6970	0.0410	0.0900	0.0026	-0.0079	0.0577	0.0038	537	25	555	15	480	140	-3.4	-0.7
AJ8_102	578	31.6	0.8	0.1	0.0	0.00	31.6	0.7130	0.0440	0.0939	0.0028	0.1655	0.0549	0.0033	550	25	578	17	390	130	-5.1	-1.1
AJ8_38	645	120.9	9.1	64.3	2.4	0.53	136.0	0.8490	0.0320	0.1053	0.0024	0.4715	0.0590	0.0020	624	18	645	14	594	75	-3.4	-1.2
AJ8_73	849	211.0	13.0	64.5	3.8	0.31	226.2	1.5710	0.1000	0.1406	0.0092	0.9615	0.0818	0.0022	948	39	849	52	1245	49	10.4	2.5
AJ8_72	866	349.0	21.0	22.3	1.8	0.06	354.2	1.3860	0.0480	0.1438	0.0038	0.8959	0.0695	0.0019	881	21	866	21	922	57	1.7	0.7
AJ8_40	930	497.0	45.0	53.8	8.8	0.11	509.6	2.3000	0.4500	0.1590	0.0240	0.9961	0.0853	0.0065	1000	140	930	130	1170	150	7.0	0.5
AJ8_92	933	265.0	27.0	33.3	2.3	0.13	272.8	1.5320	0.0440	0.1558	0.0031	0.6485	0.0714	0.0019	942	18	933	17	967	53	1.0	0.5
AJ8_24	935	209.8	7.3	33.9	2.1	0.16	217.8	1.5190	0.0450	0.1559	0.0032	0.6620	0.0711	0.0019	938	18	935	17	953	53	0.3	0.2
AJ8_84	972	401.0	26.0	130.7	6.7	0.33	431.7	2.0600	0.0680	0.1628	0.0045	0.8185	0.0916	0.0023	1136	23	972	25	1461	50	14.4	7.1

AJ8_32	981	142.0	18.0	48.6	3.7	0.34	153.4	1.8260	0.0780	0.1644	0.0038	0.3310	0.0800	0.0030	1049	27	981	21	1174	70	6.5	2.5
AJ8_58	995	353.0	80.0	68.0	11.0	0.19	369.0	2.3000	0.2000	0.1670	0.0120	0.9592	0.0996	0.0032	1179	64	995	69	1613	59	15.6	2.9
AJ8_23	1004	165.0	11.0	51.4	3.3	0.31	177.1	1.6930	0.0450	0.1702	0.0031	0.3656	0.0728	0.0019	1005	17	1014	17	1004	54	-0.9	-0.6
AJ8_78	1025	128.2	9.0	3.3	0.3	0.03	129.0	1.7060	0.0510	0.1724	0.0034	0.5749	0.0718	0.0020	1010	20	1025	19	974	57	-1.5	-0.8
AJ8_41	1037	200.0	22.0	189.0	11.0	0.95	244.4	1.7320	0.0470	0.1746	0.0033	0.3709	0.0724	0.0019	1023	17	1037	18	990	53	-1.4	-0.8
AJ8_121	1041	731.0	78.0	93.2	1.9	0.13	752.9	1.8220	0.0480	0.1798	0.0035	0.6435	0.0741	0.0018	1052	17	1066	19	1041	48	-1.3	-0.8
AJ8_33	1043	233.0	11.0	66.7	2.5	0.29	248.7	1.7320	0.0490	0.1715	0.0038	0.6083	0.0742	0.0019	1021	19	1020	21	1043	51	0.1	0.1
AJ8_35	1043	524.0	36.0	146.3	9.2	0.28	558.4	1.7690	0.0450	0.1735	0.0034	0.6258	0.0743	0.0018	1034	17	1031	19	1043	49	0.2	0.1
AJ8_76	1054	310.0	35.0	184.0	23.0	0.59	353.2	1.8300	0.0500	0.1777	0.0036	0.7298	0.0745	0.0018	1056	18	1054	20	1054	50	0.2	0.1
AJ8_71	1057	289.0	13.0	57.1	1.5	0.20	302.4	1.9580	0.0530	0.1888	0.0039	0.8112	0.0747	0.0018	1102	19	1115	21	1057	50	-1.2	-0.7
AJ8_88	1062	97.1	4.8	62.7	3.0	0.65	111.8	1.8390	0.0570	0.1801	0.0035	0.3895	0.0748	0.0021	1061	20	1067	19	1062	60	-0.6	-0.3
AJ8_132	1071	165.0	11.0	53.0	3.1	0.32	177.5	1.9280	0.0530	0.1899	0.0041	0.6442	0.0748	0.0019	1094	18	1120	22	1071	50	-2.4	-1.4
AJ8_145	1073	29.9	2.1	36.5	2.2	1.22	38.5	1.9630	0.0810	0.1887	0.0046	0.3391	0.0752	0.0030	1097	28	1114	25	1073	81	-1.5	-0.6
AJ8_54	1078	215.0	15.0	123.3	7.3	0.57	244.0	1.8690	0.0490	0.1826	0.0037	0.4870	0.0755	0.0020	1071	18	1081	20	1078	51	-1.0	-0.6
AJ8_99	1083	259.0	12.0	62.6	2.1	0.24	273.7	1.9630	0.0500	0.1887	0.0034	0.4776	0.0757	0.0019	1103	18	1114	18	1083	50	-1.0	-0.6
AJ8_112	1090	282.0	33.0	77.9	4.9	0.28	300.3	1.9700	0.0520	0.1899	0.0034	0.4820	0.0756	0.0019	1104	18	1120	19	1090	50	-1.4	-0.9
AJ8_128	1100	233.0	45.0	63.7	8.5	0.27	248.0	2.0510	0.0930	0.1932	0.0069	0.8243	0.0760	0.0021	1128	31	1137	38	1100	54	-0.8	-0.3
AJ8_97	1104	47.7	3.7	9.0	0.6	0.19	49.8	1.8840	0.0700	0.1776	0.0041	0.0315	0.0767	0.0031	1071	25	1053	22	1104	84	1.7	0.7
AJ8_27	1108	402.0	44.0	6.4	0.3	0.02	403.5	1.9350	0.0670	0.1852	0.0052	0.8964	0.0766	0.0019	1090	24	1094	28	1108	47	-0.4	-0.2
AJ8_75	1111	340.0	32.0	2.9	0.6	0.01	340.7	1.8570	0.0470	0.1772	0.0034	0.6313	0.0767	0.0019	1065	17	1052	18	1111	47	1.2	0.8
AJ8_70	1111	63.0	3.7	43.3	1.0	0.69	73.2	1.7940	0.0660	0.1727	0.0051	0.5830	0.0761	0.0025	1044	25	1026	28	1111	68	1.7	0.7
AJ8_64	1122	489.0	28.0	9.5	0.4	0.02	491.2	2.0070	0.0490	0.1907	0.0034	0.5364	0.0770	0.0018	1118	17	1125	18	1122	46	-0.6	-0.4
AJ8_131	1159	155.0	18.0	67.1	7.1	0.43	170.8	2.0340	0.0520	0.1885	0.0035	0.1616	0.0786	0.0020	1126	18	1113	19	1159	53	1.2	0.7
AJ8_14	1160	10.1	0.4	7.9	0.2	0.77	12.0	1.9400	0.0950	0.1809	0.0068	0.1617	0.0788	0.0046	1094	33	1074	36	1160	120	1.8	0.6
AJ8_144	1166	606.0	65.0	172.0	22.0	0.28	646.4	2.2040	0.0660	0.2031	0.0053	0.8727	0.0789	0.0019	1180	20	1191	28	1166	46	-0.9	-0.6
AJ8_137	1166	45.6	2.6	18.6	1.0	0.41	50.0	2.1790	0.0770	0.2017	0.0043	0.2514	0.0786	0.0028	1178	23	1184	23	1166	69	-0.5	-0.3
AJ8_120	1175	361.0	15.0	141.0	3.4	0.39	394.1	2.2550	0.0600	0.2084	0.0044	0.7863	0.0793	0.0019	1197	19	1220	23	1175	49	-1.9	-1.2
AJ8_12	1201	122.9	6.0	43.8	1.8	0.36	133.2	2.2200	0.0720	0.2028	0.0052	0.5600	0.0801	0.0024	1188	22	1189	28	1201	57	-0.1	0.0

AJ8_28	1206	140.6	8.5	47.0	2.3	0.33	151.6	2.2520	0.0580	0.2040	0.0042	0.4610	0.0805	0.0021	1198	18	1198	22	1206	50	0.0	0.0
AJ8_61	1219	407.0	34.0	50.6	7.2	0.12	418.9	2.2000	0.1500	0.1940	0.0085	0.9768	0.0814	0.0026	1166	45	1140	45	1219	64	2.2	0.6
AJ8_127	1226	119.6	7.0	33.4	1.2	0.28	127.4	2.4140	0.0690	0.2179	0.0046	0.5101	0.0814	0.0022	1248	21	1270	24	1226	53	-1.8	-1.0
AJ8_10	1254	195.0	10.0	45.7	1.0	0.23	205.7	2.4260	0.0640	0.2144	0.0040	0.6031	0.0825	0.0022	1249	19	1252	21	1254	51	-0.2	-0.2
AJ8_29	1260	273.0	21.0	10.2	1.7	0.04	275.4	2.4270	0.0710	0.2148	0.0049	0.7038	0.0824	0.0021	1249	21	1254	26	1260	46	-0.4	-0.2
AJ8_122	1271	175.0	13.0	65.6	2.7	0.37	190.4	2.5260	0.0670	0.2200	0.0040	0.2970	0.0830	0.0022	1278	19	1282	21	1271	51	-0.3	-0.2
AJ8_22	1280	460.0	100.0	75.0	10.0	0.16	477.6	2.6600	0.3100	0.2070	0.0190	0.9906	0.0863	0.0046	1210	110	1190	110	1280	120	1.7	0.2
AJ8_101	1289	146.0	11.0	54.2	1.8	0.37	158.7	2.4020	0.0950	0.2103	0.0063	0.8358	0.0839	0.0023	1243	28	1229	33	1289	53	1.1	0.5
AJ8_55	1302	128.6	6.3	64.7	2.1	0.50	143.8	2.5930	0.0710	0.2214	0.0041	0.4017	0.0847	0.0022	1297	20	1289	22	1302	51	0.6	0.4
AJ8_5	1323	174.0	10.0	77.9	3.1	0.45	192.3	2.7620	0.0720	0.2386	0.0048	0.4841	0.0854	0.0022	1346	19	1379	25	1323	49	-2.5	-1.7
AJ8_114	1340	196.0	15.0	134.4	9.4	0.69	227.6	2.6610	0.0680	0.2253	0.0040	0.4458	0.0862	0.0022	1318	19	1310	21	1340	50	0.6	0.4
AJ8_66	1345	273.0	30.0	39.9	5.6	0.15	282.4	2.6600	0.2800	0.2120	0.0170	0.9889	0.0875	0.0036	1244	86	1223	92	1345	81	1.7	0.2
AJ8_80	1347	213.3	7.3	58.8	1.2	0.28	227.1	2.6900	0.0710	0.2266	0.0048	0.6166	0.0862	0.0022	1326	20	1319	25	1347	49	0.5	0.4
AJ8_143	1350	33.3	2.7	8.1	0.9	0.24	35.2	2.2400	0.1300	0.1910	0.0096	0.7366	0.0865	0.0035	1186	42	1128	53	1350	81	4.9	1.4
AJ8_48	1359	262.0	18.0	117.2	5.6	0.45	289.5	2.9890	0.0780	0.2513	0.0051	0.7577	0.0870	0.0020	1406	20	1445	26	1359	46	-2.8	-2.0
AJ8_79	1365	772.0	65.0	79.4	6.1	0.10	790.7	2.1940	0.0710	0.1841	0.0053	0.9163	0.0874	0.0020	1176	22	1089	29	1365	45	7.4	4.0
AJ8_123	1373	1018.0	85.0	171.0	13.0	0.17	1058.2	2.4410	0.1100	0.2025	0.0081	0.9645	0.0878	0.0021	1247	33	1197	41	1373	47	4.0	1.5
AJ8_139	1380	352.0	26.0	21.7	4.0	0.06	357.1	2.9300	0.1900	0.2380	0.0110	0.9788	0.0885	0.0027	1368	55	1368	60	1380	61	0.0	0.0
AJ8_93	1386	50.7	5.7	28.4	2.7	0.56	57.4	2.6690	0.0880	0.2200	0.0058	0.4229	0.0881	0.0029	1319	25	1281	31	1386	64	2.9	1.5
AJ8_111	1400	50.8	7.0	5.6	2.5	0.11	52.1	3.1800	0.6500	0.2250	0.0230	0.9664	0.0929	0.0092	1330	140	1280	120	1400	180	3.8	0.4
AJ8_67	1417	91.5	8.7	38.6	7.2	0.42	100.6	2.9200	0.2100	0.2350	0.0120	0.9269	0.0904	0.0033	1357	57	1353	62	1417	74	0.3	0.1
AJ8_65	1424	297.0	42.0	43.2	5.9	0.15	307.2	2.7600	0.1100	0.2232	0.0067	0.8894	0.0902	0.0024	1342	28	1297	35	1424	51	3.4	1.6
AJ8_69	1436	288.0	33.0	51.2	5.1	0.18	300.0	3.3150	0.0990	0.2666	0.0064	0.7817	0.0906	0.0023	1484	24	1522	33	1436	48	-2.6	-1.6
AJ8_3	1459	171.0	16.0	33.2	2.9	0.19	178.8	3.3460	0.0960	0.2702	0.0057	0.5774	0.0914	0.0024	1492	23	1544	29	1459	50	-3.5	-2.3
AJ8_134	1459	131.9	9.1	45.8	3.2	0.35	142.7	3.1820	0.0850	0.2530	0.0047	0.3555	0.0918	0.0025	1451	21	1454	24	1459	52	-0.2	-0.1
AJ8_16	1466	432.0	18.0	220.1	7.0	0.51	483.7	3.4490	0.0890	0.2770	0.0060	0.7333	0.0921	0.0022	1515	20	1576	30	1466	45	-4.0	-3.1
AJ8_103	1479	247.0	15.0	80.8	3.4	0.33	266.0	3.3010	0.0880	0.2590	0.0049	0.6468	0.0927	0.0023	1480	21	1484	25	1479	47	-0.3	-0.2
AJ8_142	1486	162.5	5.7	72.8	3.6	0.45	179.6	3.2970	0.0960	0.2580	0.0055	0.8726	0.0930	0.0023	1478	23	1479	28	1486	45	-0.1	0.0

AJ8_60	1497	330.0	10.0	179.0	18.0	0.54	372.1	3.3260	0.0880	0.2595	0.0050	0.7388	0.0935	0.0023	1487	21	1489	26	1497	46	-0.1	-0.1
AJ8_106	1502	233.0	36.0	77.0	12.0	0.33	251.1	3.3640	0.0940	0.2625	0.0060	0.6342	0.0936	0.0023	1496	22	1502	31	1502	49	-0.4	-0.3
AJ8_18	1518	180.0	22.0	66.2	8.8	0.37	195.6	3.3330	0.1100	0.2535	0.0070	0.8293	0.0948	0.0024	1485	25	1462	36	1518	49	1.5	0.9
AJ8_34	1552	92.2	8.8	62.0	12.0	0.67	106.8	3.6700	0.2600	0.2760	0.0150	0.9417	0.0970	0.0035	1542	63	1563	75	1552	72	-1.4	-0.3
AJ8_74	1554	241.0	33.0	27.0	1.3	0.11	247.3	3.6060	0.1100	0.2739	0.0058	0.7975	0.0963	0.0024	1550	23	1562	30	1554	46	-0.8	-0.5
AJ8_110	1564	446.0	17.0	78.0	15.0	0.17	464.3	3.1120	0.1000	0.2356	0.0061	0.8656	0.0968	0.0024	1434	25	1363	32	1564	45	5.0	2.8
AJ8_59	1564	670.0	140.0	75.0	12.0	0.11	687.6	3.1040	0.0970	0.2336	0.0060	0.8244	0.0969	0.0024	1431	24	1352	31	1564	46	5.5	3.3
AJ8_81	1577	226.0	44.0	26.1	2.6	0.12	232.1	3.5900	0.3600	0.2570	0.0220	0.9839	0.0978	0.0037	1450	100	1450	120	1577	76	0.0	0.0
AJ8_100	1579	255.0	34.0	111.0	10.0	0.44	281.1	3.6770	0.1000	0.2720	0.0057	0.8178	0.0978	0.0023	1555	22	1550	29	1579	44	1.0	0.7
AJ8_96	1580	102.2	2.9	54.5	4.1	0.53	115.0	3.9160	0.1100	0.2890	0.0053	0.3976	0.0978	0.0025	1615	22	1636	27	1580	47	-1.3	-1.0
AJ8_130	1598	164.0	30.0	40.9	1.1	0.25	173.6	4.0650	0.1300	0.2972	0.0078	0.8318	0.0988	0.0025	1643	27	1676	39	1598	47	-2.0	-1.2
AJ8_21	1613	65.3	5.0	35.7	2.5	0.55	73.7	3.8840	0.1100	0.2836	0.0067	0.5553	0.0994	0.0028	1608	24	1608	33	1613	52	0.0	0.0
AJ8_53	1618	166.0	22.0	126.0	15.0	0.76	195.6	4.1090	0.1200	0.2984	0.0064	0.7228	0.0998	0.0025	1654	23	1686	33	1618	48	-1.9	-1.4
AJ8_1	1620	20.2	0.9	11.8	0.4	0.59	22.9	3.9600	0.1500	0.2939	0.0083	0.5363	0.0990	0.0034	1626	31	1663	41	1620	65	-2.3	-1.2
AJ8_26	1625	254.0	53.0	62.6	8.9	0.25	268.7	3.9950	0.1200	0.2876	0.0067	0.7781	0.1002	0.0026	1630	24	1635	32	1625	48	-0.3	-0.2
AJ8_63	1627	160.0	12.0	39.5	2.7	0.25	169.3	4.0360	0.1100	0.2951	0.0062	0.6597	0.0999	0.0025	1643	21	1666	31	1627	44	-1.4	-1.1
AJ8_62	1630	262.0	46.0	77.8	6.3	0.30	280.3	4.0940	0.1000	0.2985	0.0057	0.7648	0.1004	0.0024	1654	22	1684	28	1630	46	-1.8	-1.4
AJ8_49	1633	208.0	15.0	107.1	5.8	0.51	233.2	4.1610	0.1000	0.3012	0.0058	0.3253	0.1007	0.0025	1666	20	1697	29	1633	45	-1.9	-1.6
AJ8_82	1637	77.0	4.1	25.7	1.6	0.33	83.0	3.9690	0.1100	0.2854	0.0062	0.7637	0.1007	0.0027	1626	23	1618	31	1637	49	0.5	0.3
AJ8_46	1639	131.0	12.0	90.2	7.9	0.69	152.2	3.9290	0.1000	0.2865	0.0069	0.4952	0.1006	0.0027	1620	21	1626	34	1639	53	-0.4	-0.3
AJ8_129	1651	225.0	10.0	245.0	21.0	1.09	282.6	4.1030	0.1000	0.2933	0.0056	0.6667	0.1016	0.0025	1654	20	1658	28	1651	46	-0.3	-0.2
AJ8_45	1653	95.1	5.3	36.7	1.7	0.39	103.7	4.0340	0.1100	0.2899	0.0060	0.5006	0.1014	0.0026	1643	21	1643	29	1653	49	0.0	0.0
AJ8_150	1653	80.1	3.8	47.9	1.8	0.60	91.4	4.0740	0.1100	0.2900	0.0055	0.4466	0.1016	0.0027	1649	23	1641	27	1653	50	0.5	0.3
AJ8_125	1655	177.0	40.0	110.7	9.2	0.63	203.0	4.1280	0.1100	0.2950	0.0056	0.4647	0.1020	0.0027	1664	23	1671	28	1655	49	-0.4	-0.3
AJ8_77	1661	28.5	2.1	19.3	0.6	0.68	33.0	4.0100	0.1700	0.2853	0.0093	0.5092	0.1022	0.0039	1638	32	1615	47	1661	73	1.4	0.7
AJ8_124	1668	245.0	42.0	174.0	26.0	0.71	285.9	3.9900	0.1400	0.2783	0.0086	0.9325	0.1025	0.0025	1611	28	1580	44	1668	44	1.9	1.1
AJ8_2	1671	74.7	6.1	32.7	1.1	0.44	82.4	3.1040	0.1200	0.2256	0.0095	0.6456	0.1027	0.0038	1431	29	1313	51	1671	71	8.2	4.1
AJ8_107	1675	547.0	31.0	128.0	11.0	0.23	577.1	4.0100	0.1700	0.2815	0.0089	0.9548	0.1031	0.0026	1635	34	1601	44	1675	48	2.1	1.0

AJ8_138	1685	420.0	73.0	63.7	5.8	0.15	435.0	3.9700	0.4100	0.2610	0.0220	0.9914	0.1043	0.0050	1530	120	1470	120	1685	100	3.9	0.5
AJ8_117	1718	251.0	35.0	108.0	17.0	0.43	276.4	4.4050	0.1400	0.3019	0.0076	0.8973	0.1052	0.0025	1710	26	1703	38	1718	45	0.4	0.3
AJ8_4	1724	172.0	14.0	118.2	7.6	0.69	199.8	3.8700	0.1300	0.2686	0.0076	0.8133	0.1055	0.0027	1610	26	1535	38	1724	49	4.7	2.9
AJ8_113	1725	274.0	12.0	117.5	4.6	0.43	301.6	4.5740	0.1100	0.3145	0.0055	0.5375	0.1057	0.0025	1744	20	1764	28	1725	43	-1.2	-1.0
AJ8_98	1736	332.0	17.0	108.2	5.0	0.33	357.4	4.7180	0.1200	0.3238	0.0057	0.6239	0.1062	0.0025	1771	20	1808	28	1736	43	-2.1	-1.9
AJ8_91	1741	182.0	11.0	58.8	5.0	0.32	195.8	4.0730	0.1100	0.2787	0.0056	0.8370	0.1066	0.0025	1651	21	1587	29	1741	42	3.9	3.0
AJ8_118	1746	410.0	61.0	165.0	25.0	0.40	448.8	4.7160	0.1300	0.3202	0.0077	0.8732	0.1070	0.0025	1770	24	1793	37	1746	42	-1.3	-1.0
AJ8_140	1747	174.0	12.0	39.7	2.9	0.23	183.3	4.6320	0.1200	0.3152	0.0058	-0.0307	0.1071	0.0027	1754	21	1766	28	1747	45	-0.7	-0.6
AJ8_148	1747	65.1	7.3	26.6	1.9	0.41	71.4	4.5800	0.2200	0.3090	0.0130	0.9031	0.1069	0.0029	1731	41	1728	65	1747	52	0.2	0.1
AJ8_115	1755	317.0	29.0	84.0	5.3	0.26	336.7	4.2800	0.1400	0.2894	0.0070	0.9329	0.1074	0.0026	1686	28	1637	36	1755	43	2.9	1.8
AJ8_17	1756	418.0	61.0	71.5	4.2	0.17	434.8	4.5960	0.1100	0.3118	0.0055	0.6639	0.1075	0.0025	1748	20	1751	28	1756	43	-0.2	-0.2
AJ8_83	1759	409.0	53.0	104.2	8.2	0.25	433.5	4.3100	0.1600	0.2912	0.0092	0.9041	0.1076	0.0026	1692	31	1645	46	1759	44	2.8	1.5
AJ8_56	1759	46.7	1.1	34.3	1.7	0.73	54.8	4.1360	0.1300	0.2789	0.0074	0.7621	0.1079	0.0032	1661	27	1584	38	1759	54	4.6	2.9
AJ8_116	1784	252.0	54.0	96.0	26.0	0.38	274.6	4.8620	0.1300	0.3234	0.0073	0.8806	0.1092	0.0027	1794	23	1805	36	1784	44	-0.6	-0.5
AJ8_30	1792	462.0	63.0	109.0	5.4	0.24	487.6	3.6400	0.3300	0.2380	0.0180	0.9912	0.1104	0.0035	1518	82	1362	95	1792	63	10.3	1.9
AJ8_50	1793	105.1	7.8	35.0	2.4	0.33	113.3	5.1230	0.1400	0.3405	0.0070	0.4887	0.1101	0.0030	1843	23	1891	33	1793	50	-2.6	-2.1
AJ8_136	1793	799.0	57.0	218.0	13.0	0.27	850.2	4.9100	0.1300	0.3254	0.0073	0.9437	0.1096	0.0024	1804	24	1815	36	1793	42	-0.6	-0.5
AJ8_126	1797	157.0	13.0	39.5	2.5	0.25	166.3	5.1310	0.1300	0.3375	0.0061	0.4072	0.1096	0.0027	1842	22	1874	30	1797	43	-1.7	-1.5
AJ8_135	1812	100.0	11.0	30.4	3.4	0.30	107.1	4.6500	0.1500	0.3095	0.0088	0.7828	0.1111	0.0031	1759	28	1736	43	1812	51	1.3	0.8
AJ8_15	1818	120.7	2.8	27.4	1.5	0.23	127.1	4.9730	0.1300	0.3294	0.0064	0.6125	0.1112	0.0027	1816	22	1835	31	1818	45	-1.0	-0.9
AJ8_90	1821	677.0	44.0	69.0	10.0	0.10	693.2	3.7900	0.2100	0.2430	0.0110	0.9841	0.1112	0.0029	1587	44	1398	56	1821	45	11.9	4.3
AJ8_85	1842	292.0	22.0	21.2	0.9	0.07	297.0	5.0740	0.1200	0.3266	0.0060	0.4968	0.1127	0.0027	1832	21	1822	29	1842	43	0.5	0.5
AJ8_42	1842	146.0	28.0	48.6	9.1	0.33	157.4	4.0100	0.2300	0.2625	0.0067	0.6509	0.1150	0.0058	1631	45	1505	33	1842	86	7.7	2.8
AJ8_6	1856	340.0	24.0	130.6	4.4	0.38	370.7	4.6200	0.1200	0.2995	0.0069	0.6371	0.1133	0.0028	1751	22	1688	34	1856	47	3.6	2.9
AJ8_9	1917	62.0	14.0	21.5	5.6	0.35	67.1	4.8200	0.2000	0.3046	0.0100	0.7408	0.1172	0.0035	1783	34	1716	50	1917	55	3.8	2.0
AJ8_104	1935	158.8	4.3	33.8	1.1	0.21	166.7	5.1300	0.1600	0.3149	0.0079	0.8642	0.1186	0.0029	1839	27	1763	39	1935	42	4.1	2.8
AJ8_119	1954	196.0	10.0	81.0	5.5	0.41	215.0	5.8990	0.1500	0.3549	0.0063	0.5025	0.1199	0.0029	1960	21	1958	30	1954	42	0.1	0.1
AJ8_147	1956	138.0	15.0	33.2	1.3	0.24	145.8	5.5000	0.1700	0.3303	0.0078	0.8434	0.1201	0.0030	1902	25	1839	38	1956	45	3.3	2.5

A18_51	1962	269.0	13.0	104.3	2.1	0.39	293.5	5.5750	0.1500	0.3382	0.0076	0.7059	0.1207	0.0030	1910	23	1881	38	1962	44	1.5	1.3
A18_47	1979	94.0	14.0	15.1	1.0	0.16	97.5	5.5800	0.1800	0.3369	0.0082	0.7124	0.1215	0.0030	1913	26	1870	40	1979	46	2.2	1.7
A18_146	2027	143.8	6.7	60.4	2.1	0.42	158.0	6.2810	0.1600	0.3627	0.0073	0.5214	0.1249	0.0030	2015	22	1997	34	2027	44	0.9	0.8
A18_68	2131	498.0	59.0	9.7	0.8	0.02	500.3	6.0900	0.2000	0.3349	0.0074	0.2314	0.1333	0.0047	1998	31	1861	36	2131	59	6.9	4.4
A18_36	2200	1.4	0.3	0.1	0.0	0.04	1.4	4.9900	0.6500	0.2480	0.0240	0.4664	0.1470	0.0170	1780	120	1410	120	2200	220	20.8	3.1
A18_19	2300	187.0	10.0	102.7	3.2	0.55	211.1	7.2000	2.0000	0.2200	0.0180	0.9922	0.1880	0.0370	1720	190	1303	81	2300	290	24.7	2.2
A18_89	2349	636.0	36.0	42.8	2.8	0.07	646.1	4.8200	0.1700	0.2367	0.0063	0.8181	0.1506	0.0041	1784	30	1368	33	2349	47	23.3	13.9
A18_94	2605	206.0	17.0	54.7	2.0	0.27	218.9	11.2000	0.3500	0.4650	0.0100	0.9720	0.1757	0.0043	2528	37	2460	46	2605	45	2.7	1.8
A18_105	2620	128.3	6.4	66.8	4.3	0.52	144.0	9.4000	1.3000	0.3490	0.0180	0.8989	0.1870	0.0170	2290	130	1921	85	2620	160	16.1	2.8
A18_20	2680	367.0	41.0	93.0	32.0	0.25	388.9	12.7400	0.5200	0.5100	0.0200	0.9667	0.1832	0.0042	2657	40	2646	85	2680	38	0.4	0.3
A18_109	2720	117.0	15.0	129.8	7.3	1.11	147.5	13.0700	0.5400	0.5000	0.0200	0.9790	0.1875	0.0044	2673	41	2605	87	2720	38	2.5	1.7
A18_13	2728	137.0	4.2	46.7	2.1	0.34	148.0	13.0400	0.5400	0.5060	0.0190	0.9636	0.1882	0.0045	2670	41	2629	82	2728	41	1.5	1.0
A18_149	2736	9.4	0.8	18.4	1.8	1.96	13.7	13.5900	0.4900	0.5230	0.0150	0.3963	0.1890	0.0073	2714	34	2707	64	2736	63	0.3	0.2
A18_87	2821	303.0	14.0	25.9	1.0	0.09	309.1	14.9500	0.3600	0.5463	0.0100	0.7020	0.1993	0.0045	2811	23	2809	42	2821	38	0.1	0.1
A18_108	3120	125.2	7.9	39.1	2.3	0.31	134.4	21.4200	0.6000	0.6440	0.0140	0.9197	0.2401	0.0055	3155	27	3200	55	3120	37	-1.4	-1.7

APPENDIX B

Sandstone Petrography using Gazzi Dickinson Point Counting Method

Includes QFL Ternary Diagrams, Petrographic Thin-Sections Photos, and Sampling Locations

CMPBP-1, N40°41.121' W-112°51.752', 4757ft
Cedar Mountains, Butterfield Peaks, Middle Pennsylvanian (Atokan)

Thin-section under XPL

4 mm

Thin-section under PPL

CMPBP-1			
Quartz %	Feldspar %	Lithics %	
92.0	0.0	8.0

CMPPFC-1, N40°40.930' W-112°51.953'
 Cedar Mountains, Freeman/Curry Peak, Lowest Permian (Wolfcampian)

Thin-section under XPL

4 mm

CMPPFC-1			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0	

Thin-section under PPL

GMPO2-1, N40°59.169' W-112°59.368', 4526ft
Grassy Mountains, Middle Pennsylvanian

4 mm

Thin-section under XPL

GMPO2-1			
Quartz %	Feldspar %	Lithics %	
99.0	0.0	1.0	

Thin-section under PPL

GMPO3-1, N41°00.083' W-113°02.327', 4790ft
Grassy Mountains, Middle to Upper Pennsylvanian

Thin-section under XPL

4 mm

GMPO3-1			
Quartz %	Feldspar %	Lithics %	
96.0	0.0	4.0	

Thin-section under PPL

GMPo4-1, N41°00.663' W-113°02.691', 4678ft
Grassy Mountains, Middle Pennsylvanian

Thin-section under XPL

Thin-section under PPL

GMPo4-1			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0

GMPO5-1, N41°01.621' W-113°05.220', 4570ft
Grassy Mountains, Middle Pennsylvanian (Atokan)

4 mm

Thin-section under XPL

GMPO5-1			
Quartz %	Feldspar %	Lithics %	
99.0	1.0	0.0	

Thin-section under PPL

GMPU-1, N41°01.736' W-113°05.939', 4361ft
Grassy Mountains, Permian Unconformity, Lower Permian (Leonardian)

4 mm

Thin-section under XPL

GMPU-1			
Quartz %	Feldspar %	Lithics %	
89.0	0.0	11.0	

Thin-section under PPL

HCPDC-1, N40°11.510' W-111°25.961', 5608ft
Hobble Creek, Diamond Creek Sandstone – Lower Permian (Leonardian)

Thin-section under XPL

HCPDC-1			
Quartz %	Feldspar %	Lithics %	
81.5	0.0	18.5	

Thin-section under PPL

HCPK-1, N40°11.510' W-111°25.961', 5608ft
Hobble Creek, Kirkman Limestone, Lower Permian (Wolfcampian - Leonardian)

Thin-section under XPL

4 mm

HCPK-1			
Quartz %	Feldspar %	Lithics %	
26.5	0.0	73.5	

Thin-section under PPL

LMPBM-1, N40°49.452' W-112°47.807', 4997ft
Lakeside Mountains, Bingham Mine – Upper Penn. (Missourian - Virgilian)

Thin-section under XPL

4 mm

Thin-section under PPL

LMPBM-1			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0

LMPBW-1, N40°11.510' W-111°25.961', 5608ft
Lakeside Mountains, Butterfield Peaks – Middle Pennsylvanian (Atokan)

4 mm

Thin-section under XPL

LMPBW-1			
Quartz %	Feldspar %	Lithics %	
90.25	0.0	9.75	

Thin-section under PPL

LMPFC-1, N40°46.187' W-112°46.706'
 Lakeside Mountains, Freeman and Curry Peak, Lowest Permian (Wolfcampian)

4 mm

Thin-section under XPL

LMPFC-1			
Quartz %	Feldspar %	Lithics %	
97.0	0.0	3.0	

Thin-section under PPL

NPDC-1, N39°44.625' W-111°49.448', 5432ft
Nephi, Diamond Creek Sandstone – Lower Permian (Leonardian)

Thin-section under XPL

NPDC-1			
Quartz %	Feldspar %	Lithics %	
99.5	0.0	0.5	

Thin-section under PPL

SMPBM-1, N40°26.423' W-112°24.477' , 5192ft
South Mountain, Upper Pennsylvanian (Missourian - Virgilian)

Thin-section under XPL

4 mm

Thin-section under PPL

SMPBM-1			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0

SMPBP-1, N40°27.102' W-112°23.421', 5448ft
South Mountain, Butterfield Peaks – Middle Pennsylvanian (Atokan)

Thin-section under XPL

Thin-section under PPL

SMPBP-1			
Quartz %	Feldspar %	Lithics %	
98.5	0.0	1.5

SMPBP-3, N40°27.102' W-112°23.421', 5448ft
South Mountain, Butterfield Peaks, Middle Pennsylvanian (Atokan)

4 mm

Thin-section under XPL

SMPBP-2			
Quartz %	Feldspar %	Lithics %	
85.5	0.0	15.0	

Thin-section under PPL

SMPBP-2, N40°27.102' W-112°23.421', 5448ft
South Mountain, Butterfield Peaks – Middle Pennsylvanian (Atokan)

Thin-section under XPL

4 mm

SMPBP-2			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0	

Thin-section under PPL

SMPFP-1, N40°28.788' W-112°28.351', 5397ft
South Mountain, Freeman Peak, Lower Permian (Wolfcampian)

4 mm

Thin-section under XPL

SMPFP-1		
Quartz %	Feldspar %	Lithics %
96.5	0.0	3.5

Thin-section under PPL

STMCP-1, N40°25.986' W-112°31.904', 5552ft
Stansbury Range, Freeman Peak/Curry Peak, Lowest Permian (Wolfcampian)

4 mm

Thin-section under XPL

STMCP-1		
Quartz %	Feldspar %	Lithics %
99.0	0.0	1.0

Thin-section under PPL

STMPBM-1, N40°25.385' W-112°33.344' , 6544ft
Stansbury Range, Bingham Mine, Upper Pennsylvanian (Missourian -Virgilian)

4 mm

Thin-section under XPL

STMPBM-1			
Quartz %	Feldspar %	Lithics %	
99.5	0.0	0.5	

Thin-section under PPL

STMPBP-1, N40°25.275' W-112°33.784', 6475ft
Stansbury Range, Butterfield Peaks – Middle Pennsylvanian (Atokan)

Thin-section under XPL

Thin-section under PPL

STMPBP-1			
Quartz %	Feldspar %	Lithics %	
97.0	0.0	3.0

STMPBP-2, N40°25.275' W-112°33.784' , 6478ft
Stansbury Range, Butterfield Peaks – Middle Pennsylvanian (Atokan)

Thin-section under XPL

4 mm

Thin-section under PPL

STMPBP-2			
Quartz %	Feldspar %	Lithics %	
98.5	0.5	1.0

STMPDK-1, N40°28.689' W-112°32.403', 6599ft
Stansbury Range, Diamond Creek Sandstone – Lower Permian

4 mm

Thin-section under XPL

STMPDK-1			
Quartz %	Feldspar %	Lithics %	
98.0	1.0	1.0	

Thin-section under PPL

STMPFC-1, N40°25.986' W-112°31.904', 5552ft
Stansbury Range, Freeman & Curry Peak, Lowest Permian (Wolfcampian)

Thin-section under XPL

4 mm

Thin-section under PPL

STMPFC-1			
Quartz %	Feldspar %	Lithics %	
100.0	0.0	0.0

WMPBP-1, N40°07.737' W-111°48.647', 4757ft
West Mountain, Butterfield Peaks – Middle Pennsylvanian (Atokan)

4 mm

Thin-section under XPL

WMPBP-1			
Quartz %	Feldspar %	Lithics %	
88.0	0.0	12.0	

Thin-section under PPL

WMPK-1, N40°02.225' W-111°49.513', 5599ft
West Mountain, Kirkman Limestone – Lower Permian (Wolfcampian to Leonardian)

Thin-section under XPL

WMPK-1			
Quartz %	Feldspar %	Lithics %	
94.0	0.0	6.0	

Thin-section under PPL