In accordance with Washington City Zoning Ordinance 29-2-103(8), the Cultural Resource Study, Paleontological, and Threatened and Endangered Species are included in this section. Upon request, color photos will be made available by the State of Utah School and Institutional Trust Lands Administration.

REDCLIFFS
DESERT RESERVE
A WASHINGTON COUNTY INITIATIVE

Mr. Curt Gordon
School and Institutional Trust Lands Administration
2303 N. Coral Canyon Blvd., Suite 100-A
Washington City, Utah 84780

Aug. 30, 04

Dear Curt:

I thought it might be useful to provide a summary of where we are with tortoise coordination in the vicinity of Milepost 13. The area near mile post 13 and north of I-15 is a designated take area. The Washington County HCP Administration cleared and released 8 acres of property around your development pad site in the spring of 2004. A map of the area released was included with your release documentation since it was somewhat larger than what you had requested. Development within this 8 acres can continue to proceed without further coordination. As development prepares to expand outside this cleared area, you will need to submit another clearance request; as you know, removal of tortoises from take areas is easy to coordinate during the spring and fall clearance windows. The area south of I-15 is not a designated take area for tortoises although we are aware of some tortoises in the general area, especially as one moves east toward the base of the Washington Black Ridge. My staff, assisted by JBR Environmental, removed tortoises located within the borrow sites and the associated "Zone of Influence" prior to development. It is Washington County's understanding that Federal Highways, through SITLA, has completed Endangered Species Act section 7 consultation on the Milepost 13 project including the borrow sites and the Washington City trail since federal funding was involved. Future development outside of the graded areas should also be coordinated with this office so that we may remove tortoises prior to surface disturbance.

If new evidence indicates tortoises might be in harms way in or adjacent to previously cleared areas, please call us so we can remove the animals. If in the future you develop new areas (north or south of I-15) please call us so we can arrange to move tortoises.

WASHINGTON COUNTY HCP ADMINISTRATION / 197 EAST TABERNACLE / ST. GEORGE, UTAH 84770 / (435) 634-5756 / FAX (435) 634-5758

The USFWS issued the incidental take permit for tortoises to Washington County and, as outlined in the HCP, we are the party which oversees the removal of tortoises from private property outside the reserve unless there is a federal nexus. (In the case of a federal nexus, the USFWS must be consulted by the appropriate federal agency.) Washington City signed an inter-local agreement with Washington County and regularly forwards impact fees to the county, therefore property within the city limits is covered by our incidental take permit. As you know, the process is simple and SITLA has always made certain, in the agency's typical, professional manner, to be in compliance with the provisions of the Washington County HCP.

Yours sincerely,

Bill Mader
Administrator

cc: Elise Boeke, USFWS

Utah Code Annotated §9-8-404 requires state agencies to "take into account the effect" of their "undertakings" on important historic and archaeological sites, buildings and structures prior to expending funds or otherwise approving the undertaking (or project) in questions, and to "allow the state historic preservation officer (or SHPO) a reasonable opportunity to comment with regard to the undertaking or expenditure." In compliance with this statute, the Trust Lands Administration has conducted – or caused to be conducted – a number of archaeological investigations in the Milepost 13 project area, and consultation with the SHPO has been ongoing as each phase of the development in the project area occurs. The Utah Department of Transportation (or UDOT), as part of their compliance with the same act (often referred to as the "Utah Antiquities Act") and the federal counterpart statute (Section 106 of the National Historic Preservation Act), have also caused archaeological investigations to be conducted and SHPO consultation completed for their RP 13-Washington Parkway project.

These archaeological investigations have resulted in the identification, investigation and protection of numerous historic archaeological sites in the Milepost 13 project area. Additional investigations will continue as appropriate, as will include additional rounds of SHPO consultation regarding the effect (if any) of additional phases of development in the greater project area.

DINOSAUR TRACKSITES

ON

SCHOOL AND INSTITUTIONAL

TRUST LANDS

NEAR I-15 EXIT 13

WASHINGTON COUNTY, UTAH

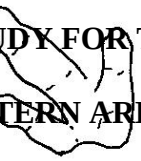
A STUDY FOR THE

SOUTHWESTERN AREA OFFICE

OF

UTAH SCHOOL AND INSTITUTIONAL

TRUST LANDS ADMINISTRATION



By

Alden H. Hamblin
A.H. Hamblin Paleontological Consulting
3793 N. Minersville Hwy
Cedar City, Utah 84720

October 7, 2004

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INTRODUCTION

A number of dinosaur tracksites have been discovered over the years in southwestern Utah, particularly the St. George/Washington City area of Washington County. Most of these occur in rocks of lower Jurassic age, (approximately 200 million years old) in the Navajo, Kayenta, and Moenave Formations. Local residents are familiar with some of these dinosaur tracksites and some have been studied or mentioned in the literature. With the recent discovery of the Johnson Farm tracksite, interest in other sites has increased (Kirkland, Lockley, and Milner, 2002).

Two paleontological surveys were performed by the author in connection with the Interstate-15, Exit 13 Project northeast of Washington City (Hamblin, 2002 and 2003). One survey was for the areas affected by construction of Exit 13 by Utah Department of Transportation (UDOT). The other was on the proposed Grading Areas for barrow material for Exit 13 owned and managed by School and Institutional Trust Lands Administration (SITLA). Several minor tracksites were identified in the Kayenta Formation during these surveys. There are three other known tracksites in the Kayenta Formation with in a mile of the Exit 13 project, all on SITLA property.

Because of the potential for tracks in this area it was recommended that excavation work on Exit 13 and the SITLA Grading Areas be monitored for tracks. The author monitored work on the SITLA Grading Areas. No tracks were found during monitoring of this work. Another paleontologist, Rose Difley, was hired by the construction company to monitor their excavation work. Ms. Difley did not find tracks during her monitoring, but did fine indicators suggesting conditions were favorable for track preservation (personal communication, 2004). Excavation work by caterpillars and scrapers is not conducive to finding tracks, although the author has found tracks under similar circumstances in the past.

The author was asked by the Southwestern Area Office of SITLA to document and write a report on the tracksites on SITLA property known in the area around Exit 13. Five sites, including the two minor discoveries made during the Exit 13 surveys (localities 42Ws207T and 42Ws320T), two sites near the Washington City Water tanks (42Ws152T and 42Ws143T), and the largest site known as Grapevine Pass Wash Site (42Ws201T), will be covered in this report in reverse order as listed here. (Figure 1.)

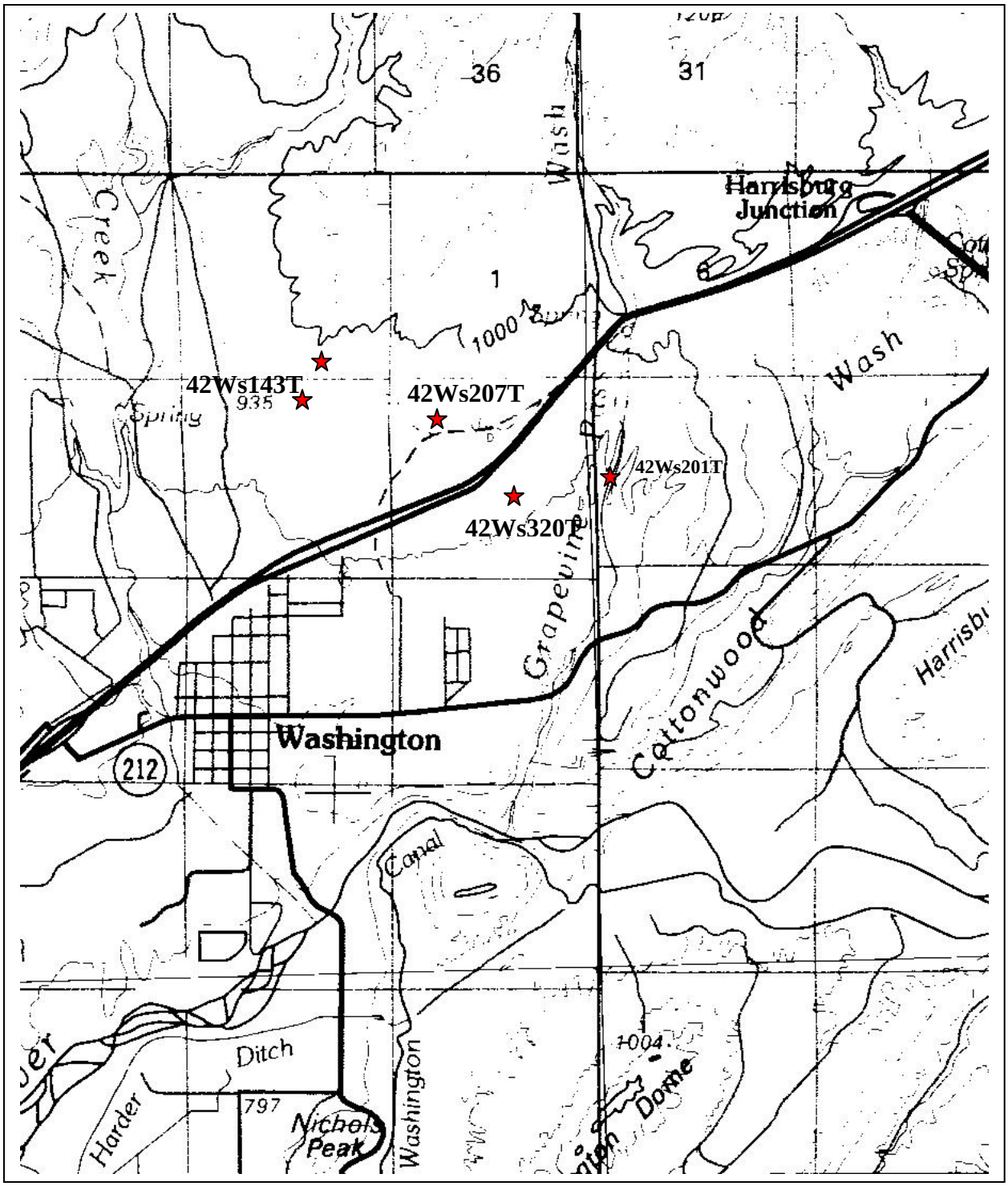


Figure 1. Locations of five tracksites on SITLA lands.

★ = Tracksites [----------] Scale = 1 mile

GRAPEVINE PASS WASH TRACKSITE (42Ws201T)

The Grapevine Pass Wash Site has been known locally for some time and visited often by the public. Study of the Grapevine Pass Wash tracksite was requested and funded by the Southwestern Area Office of Utah School and Institutional Trust Lands Administration (SITLA). Future development of property west of this site will likely result in increased interest and visitation to this track site. The purpose of this study is to map and describe the Grapevine Pass Wash Tracksite and to provide information that can be used for public interpretation at the site.

LOCATION

The Grapevine Pass Wash tracksite is located in the east branch of Grapevine Pass Wash, 1 ½ miles northwest of Washington City, ¾ mile south of Grapevine Pass and Interstate 15, in SW1/4, NW1/4, Section 7, T 42 S, R 14 W. It has been assigned state locality number 42Ws201T by the Paleontology Office of the Utah Geological Survey.

METHODS

The tracksite was mapped using a metric grid 44 meters long and 12 meters wide. The long distance runs south 60 degrees west (azimuth 240 degrees southwest), the short distance being perpendicular to it. For mapping and reference purposes, meter lengths running southwest were assigned numbers while meter lengths running southeast were given letters designations.

Each square meter where tracks were observed was mapped using a 1 X 1 meter frame divided into 20 X 20 centimeter squares. Tracks were drawn on graph paper on a scale equal to 1 inch per meter. Photo and tracings were also made of several well-formed tracks.

SITE DESCRIPTION

The sandstone exposure containing the tracks occurs in the lower part of the Kayenta Formation (Figure 2). The track layer dips 13 degrees north, with a dip direction of north 35 degrees west. According to Beik (2003), the Kayenta is early Jurassic in age (from Imlay, 1980) and 925 feet (282 m) to 935 feet (285 m) thick northwest of the study area. Kayenta exposures are seen as “a thick, monotonous sequence of interbedded, thin-to medium-bedded, moderate-reddish-brown siltstone, fine-grained sandstone, and mudstone”. Beik further states that “Kayenta strata generally weather to poorly exposed slopes, except in the upper part of the formation where ledges and small cliffs are common” (Beik, 2003).

The Kayenta layer containing the tracks is about ½ meter (18 to20 inches) thick. It is 5 meters (15 feet) above the Kayenta base and is “a very pale-orange, medium-bedded, very fine-to fine-grained sandstone that is overlain by thin-bedded, reddish-brown mudstone and siltstone” (Beik, 2003). The tracks on the track layer were exposed as the mudstone and siltstone above was removed by erosion. Erosion also wears away the tracks on the track layer, but this process has been slowed by a dam ¼ mile north of the

Figure 2. Grapevine Pass Wash Tracksite. Paleontology locality 42Ws201T. View is looking south. Track surface is 5 meters (15 feet) above the base of the Kayenta Formation (Lower Jurassic) and dips 13 degrees north, with a direction of north 35 degrees west.

site. Currently, slopewash from the mudstone and siltstone slope above the site covers 1.80 to 3.10 meters (6 to 10 feet) of the bed that was at one time exposed. Prior to the dam this material would have been washed away; so much of this slopewash has accumulated since the dam was installed upstream. Approximately 20 additional square meters were cleared from the track layer next to the slope. This exposed additional tracks, but all had been weathered to some extent.

The exposed track layer covers over 500 square meters and measures approximately 44 meters (144 ft.) by 12 meters (39 ft.). Not all of this rock exposure contains tracks, many tracks likely having been eroded away years ago. Most tracks occur down slope near the contact with the overlying layer. Some of the deepest and best tracks also occur in the area. Some of the tracks are quite shallow and hard to distinguish. Others are distorted by erosion of the dipping sandstone bed.

Meter by meter mapping produced a long narrow map of the track site. This map has been reproduced in 6 separate page sized maps, Maps 1 through 6. A somewhat one directional trend can be seen when standing on the site and this is readily apparent on the map. Ninety six percent of the tracks are going roughly south-southwest. There are, however, a few tracks (4%) going in the exact opposite direct.

TRACKS

In his report on the Geologic Map of the Harrisburg Junction Quadrangle, Beik (2003) describes the tracks at Grapevine Pass Wash as “about seven sets of parallel tracks” and that “the tracks are up to 16 inches 40cm long, 12 inches (30cm) wide, and 2 inches deep.”

A casual inspection of the track-bearing surface shows 50 or so tracks. However, detailed mapping of the site revealed approximately 200 tracks. Detail of the tracks varies with some showing good form and up to 5cm (2 inches) deep. Others are quite shallow with little detail and only visible under certain light conditions. In some cases, only toe points were map able. All tracks appear to have been made by the same species of animal, a tridactyl (three-toed), bipedal (moved on two legs) theropod (meat-eating) dinosaur. They are very similar in shape and size. Most fit in the size range of 30 to 46cm (12 to 18 inches) in length and 25 to 37cm (10 to 15 inches) wide. The smallest track observed measured 25cm (10 inches) long and 18cm (7 inches) wide. No small tracks of *Gallator* size and type (as are also common in the Kayenta Formation) were observed at this site. These small track makers may have been absent at the time the other tracks were made and preserved or being much smaller, eroded away from the surface more quickly. Perhaps smaller tracks would be found if new material were to be exposed by removing the overlying siltstone and mudstone beds where no erosion has occurred.

The tracks are most likely referable to the ichnogenus *Eubrontes*, the most common large track in the Kayenta Formation. Although many tracks are distorted by erosion, those that do show good form compare well with *Eubrontes* type tracks (Lull, 1953). (Figures 3 and 4.)

TRACKWAYS

Trackways (a set of three or more tracks demonstrating steps by one individual) at the site are sometimes hard to distinguish because of eroded and missing tracks, or mixing with other tracks. Although trackways are difficult to distinguish, there may be as many as 8 or 9 trackways at the site. Four examples are noted on the track site Maps, numbers 1, 3, and 4. These vary in direction of motion from South 10 degrees east to south 17 degrees west with. Measured steps (measured toe tip to toe tip) of these trackways are as follows (see Maps 1, 3, and 4):

a - Tracks 1 to 2 = 1.70 m, tracks 2 to 3 = 1.45 m in a south 6 degrees west direction.

b – Tracks1 to 2 = 2.10 m, tracks 2 to 3 = 2.10 m, 3tracks 3 to 4 = 2.10 m, tracks 4 to 5 = 2.05 m in a south 17 degrees west direction.

c – Tracks 1 to 2 = 1.75 m, tracks 2 to 3 = 1.50 m, tracks 3 to 4 = 1.40 m, and tracks 4 to 5= 1.45 m in a south 2 degrees west direction.

d – Tracks 1 to 2 = 1.30 m, and tracks 2 to 3 = 1.30 m.

ENVIRONMENT, POSSIBLE TRACKMAKER, AND BEHAVIOR

Referencing Sansom (1992), Blakey (1994), and Peterson (1994), Beik (2003) describes the depositional environment of the Kayenta as fluvial, distal fluvial/playa, and minor lacustrine. The sandstone track-bearing layer may represent the shoreline of a small lake.

Over the years several types of dinosaurs have been proposed as track-makers for *Eubrontes* tracks. Miller, Britt and Stadtman (1989) suggested a prosauropod for the track-makers at the Warner Valley tracksite. However, others consider *Eubrontes* tracks to be those of theropod (meat-eating) dinosaurs (Olsen, 1980; Thulborn, 1989; and Lockley and Hunt, 1995; and Hamblin and Bilbey, 1999). Kirkland, Lockley and Milner (2002), in discussing the new tracksite at Johnson Farm, suggest the *Eubrontes* tracks were made by the crested, meat eating dinosaur *Dilophosaurus* or some similar animal known from the Kayenta Formation following the interpretation of others (Lockley and Hunt, 1995.

With a few exceptions, tracks at the Grapevine Pass Wash site show large (for early Jurassic times) theropod dinosaurs moving in a south-southwest direction. Numerous parallel tracks and trackways are often interpreted as indicating animal movement next to a lake shore, stream, or seaway (Lockley, 1987). It may also indicate gregarious behavior (Lockley, 1986). Trackway “b” is of particular interest because of the length of the step, over two meters. If this is a correctly measured trackway without missing tracks, this possibly represents a dinosaur moving faster than a walking gait.

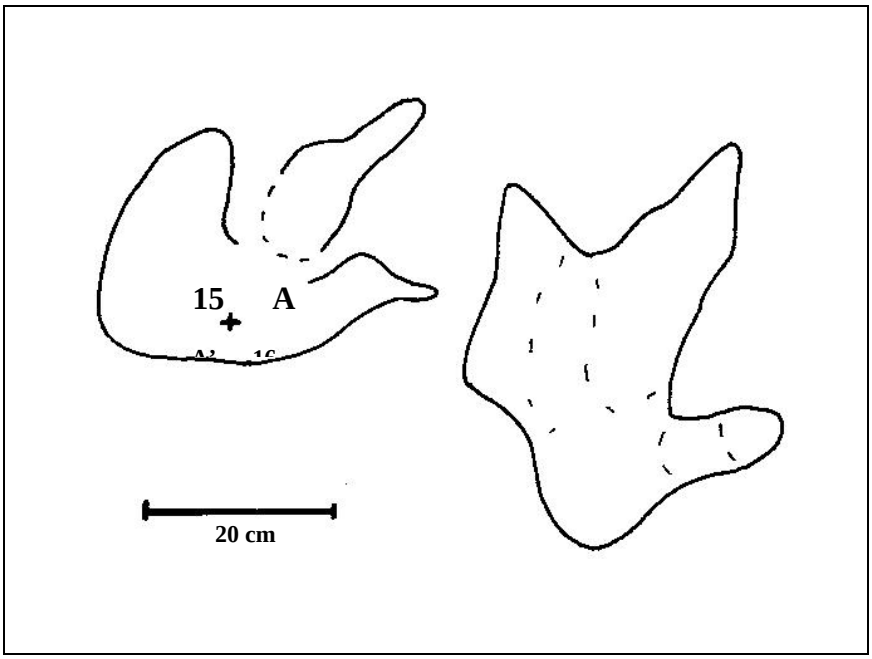
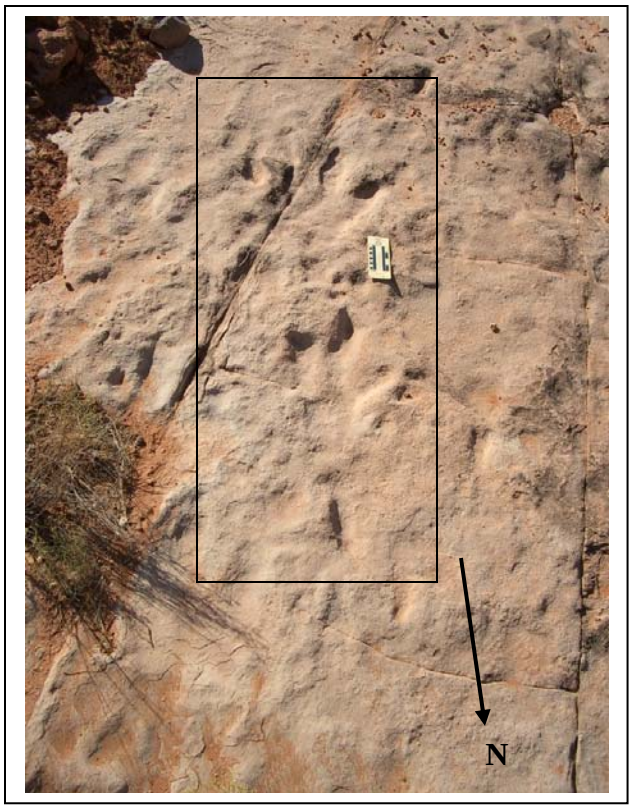


Figure 3.Track photo and tracing of two tracks at junction of 15 and 16, A and A' on the map. Grapevine Pass Wash Tracksite (42Ws201T). Photo orientation and angle is slightly different from the tracing taken directly off the surface.



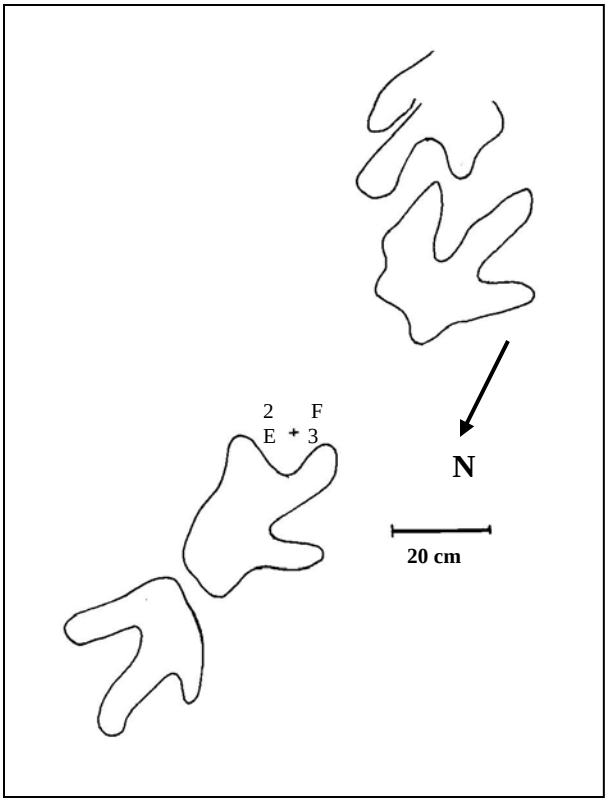


Figure 4. Photo and tracing taken at the junction of 2 and 3, E and F, Grapevine Pass Wash tracksite (42Ws201T). Orientation and scale are not the same.

WASHINGTON CITY WATER TANK TRACKSITE 1 (42Ws143T)

This tracksite was exposed when the water tank 300 meters northwest of the site was flushed washing away alluvium which covering the site. The site was reported by Ralph McClure and Neal Stephens and recorded in 1989 by David Gillette and Martha Hayden of the State Paleontologist's Office (records at the State Paleontologist's Office). It is in a well-visited area and several hiking and biking trails pass close by.

LOCATION

This tracksite is located in the bottom of a ravine, about 300 meters (975 feet) southeast of the upper Washington City water tank, in the SE ¼, SW ¼, SE ¼ of section 2, T 42 S, R 15 W. It has been assigned state locality number 42Ws143T by the Paleontology Office of the Utah Geological Survey.

SITE DESCRIPTION

The tracksite is an area of approximately 30 square meters in the upper part of the Kayenta Formation (Lower Jurassic age,) approximately 18.5 meters (60 feet) below an orange sandstone above the last major red mudstone layer thought to be the top of the Kayenta. The track layer is a 10 cm (4 inch) thick white calcareous fine-grained sandstone.

A hiking/biking trail passes a few feet south of this tracksite. One track at the site has been damaged by an attempt to make a plaster cast of the track.

METHODS

The tracksite was mapped using the same methods as those at the Grapevine Pass Wash site. A grid of 5 by 8 meters was measured out and a 1 X 1 meter frame divided into 20 X 20 cm squares was used to map the tracks onto graph paper at a scale of 1 inch to a meter. The long distance of this grid runs east 75 degrees north (azimuth 75 degrees east), the short distance being perpendicular to it (Map 7). Photos and tracings were made of several tracks.

TRACKS

Approximately 50 tridactyl (three-toed), bipedal tracks and partial tracks were mapped (Map 7). Gillette and Hayden considered the tracks referable to the ichnogenus *Grallator* (records at the Office of the State Paleontologist). Most tracks at this site are smaller than *Eubrontes* seen at Grapevine Pass Wash, but are somewhat larger than *Grallator* type tracks known from other sites in the Kayenta Formation. These tracks compare well with *Eubrontes* Tracks (Lull, 1953), except possibly for size. The track ichnogenus *Anchisauripus* has been suggested as an intermediate form in a growth series between *Grallator* and *Eubrontes* (Olsen, 1980). These tracks are intermediate, but some researchers feel that *Anchisauripus* is not a distinct type since the only difference between *Anchisauripus and Grallator* and *Eubrontes* is its intermediate size (Lockley and Hunt, 1995). The author will refer these to the *Eubrontes* ichnogenus.

The common size at this site ranges from 26 to 30 cm (10 to 12 inches) in length and 20 to 27 cm (8 to 10.5 inches) wide. Two tracks, apparently of the same animal, are the size of usual large *Eubrontes* tracks. These two tracks are eroded and distorted, but are approximately 40 cm (16 inches) long and 40 cm (16 inches) wide. (Figure 5.)

TRACKWAYS

Because of the limited number of tracks and size of the site, identifiable trackways are limited and only one possible three-track trackway was recorded. Two other sequences of 2 tracks each were noted including the two large tracks mentioned above. The two large tracks are 130 cm (51 inches) apart. In the 3-step trackway, steps measure 90 cm (35 inches) and 86 cm (33 inches) each. The other two-step sequence measures 92 cm (36 inches). (Figure 6.)

ENVIRONMENT, POSSIBLE TRACKMAKER, AND BEHAVIOR

Again, referencing Sansom (1992), Blakey (1994), and Peterson (1994), Beik (2003) describes the depositional environment of the Kayenta as fluvial, distal fluvial/playa, and minor lacustrine.

Over the years several types of dinosaurs have been proposed as track-makers for *Eubrontes* tracks. Miller, Britt and Stadtman (1989) suggested a prosauropod for the track-makers at the Warner Valley tracksite. However, others consider *Eubrontes* tracks to those of theropod (meat-eating) dinosaurs (Olsen, 1980; Thulborn, 1989; and Lockley and Hunt, 1995; and Hamblin and Bilbey, 1999). Kirkland, Lockley and Milner (2002), in discussing the new tracksite at Johnson Farm, consider the *Eubrontes* tracks were made by the crested, meat eating dinosaur *Dilophosaurus* or some similar animal known from the Kayenta Formation following the interpretation of others (Lockley and Hunt, 1995.

As discussed above, the tracks appear to be of the *Eubrontes* ichnogenus.
This is a small window of what is most likely a much larger track surface. Track directions are random with no dominant direction. Behavior is hard to establish based on this small sample, and random orientation of tracks.

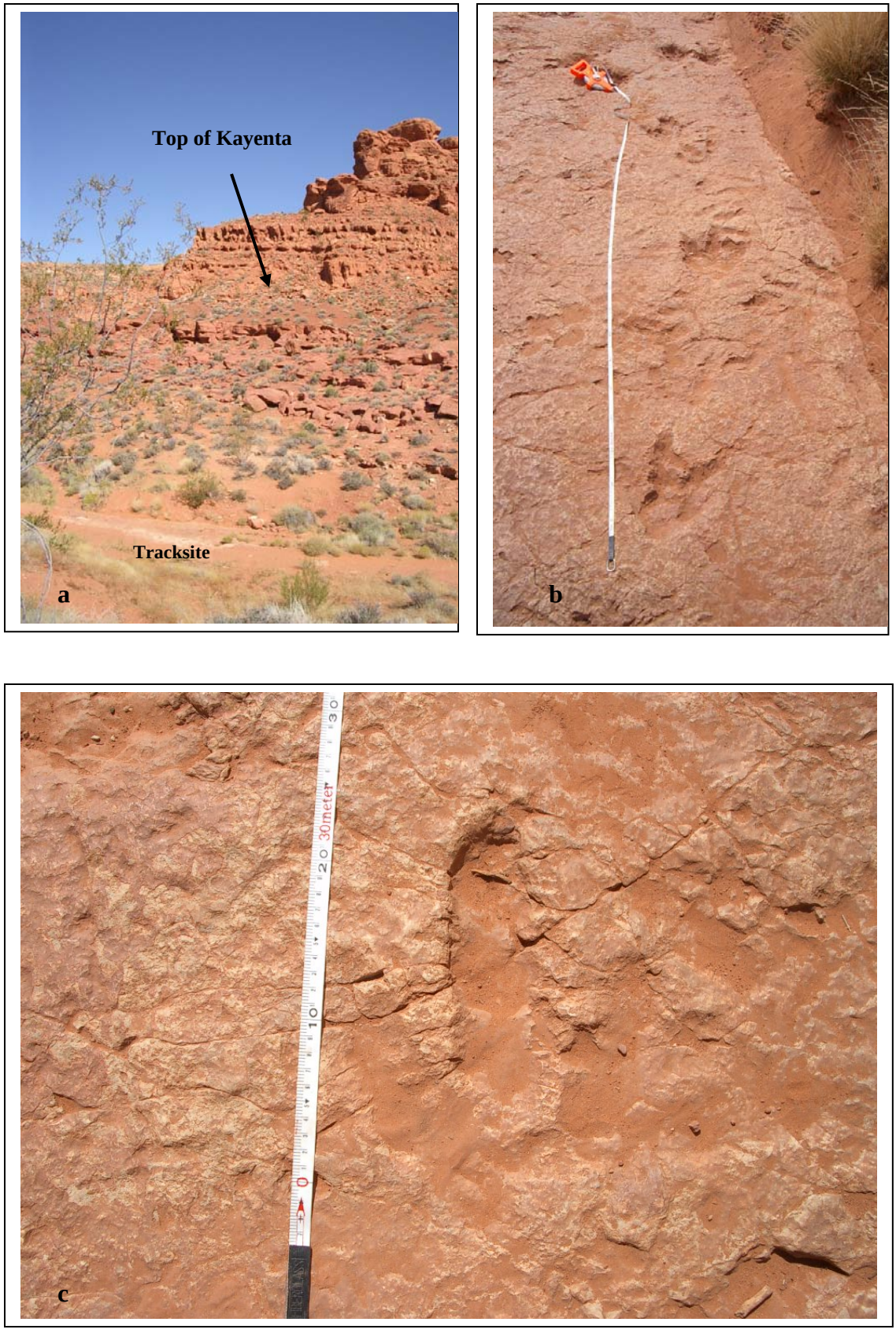


Figure 5. Washington City Water Tank Tracksite 1 (42Ws143T). a = View of site, Kayenta and Navajo Formations. b = Possible Trackway. c = Example of *Eubrontes* type track.

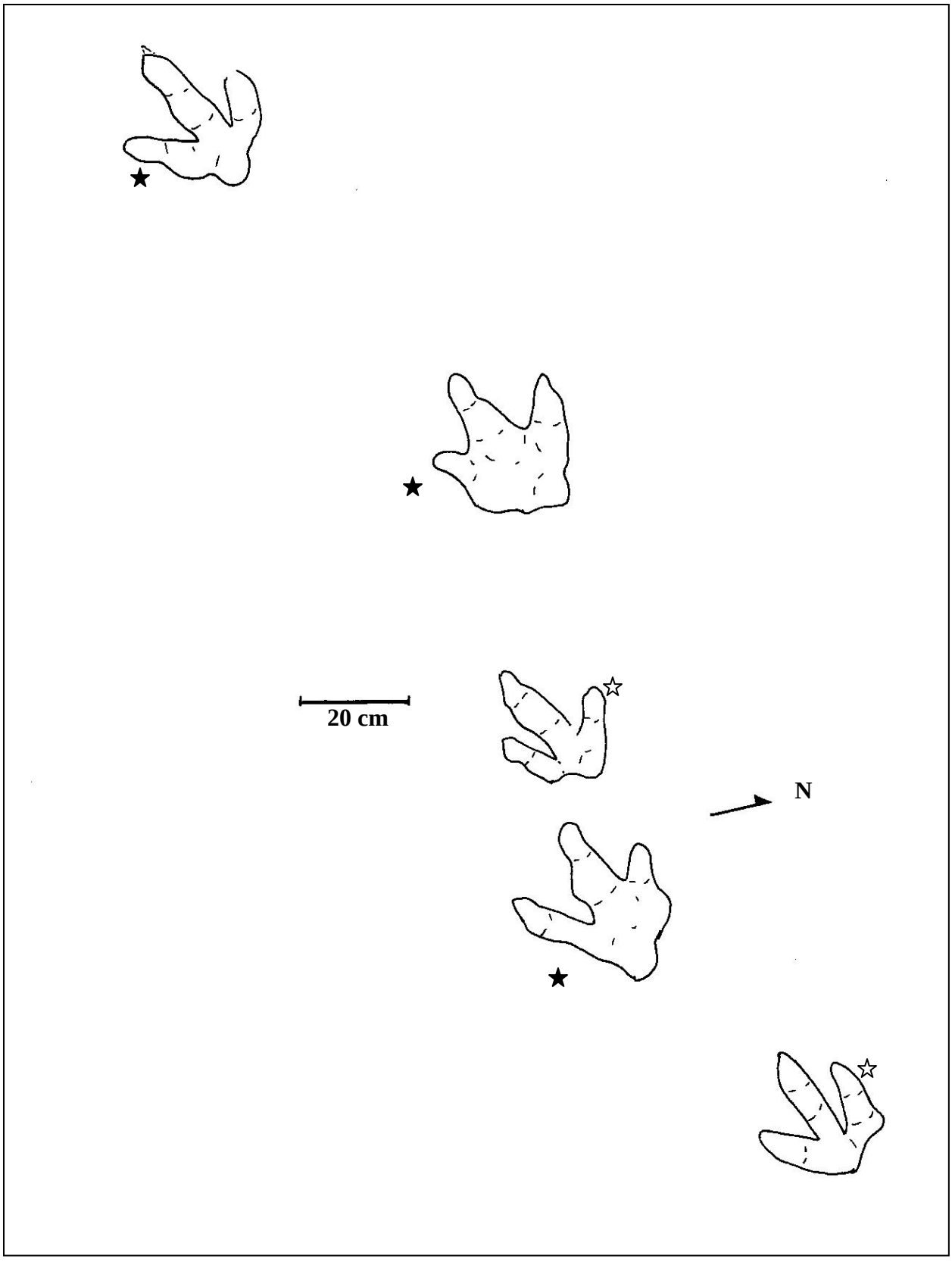


Figure 6. Tracing of tracks at Washington City Water Tank Tracksite 1 (42Ws143T), ★ = Tracks in possible 3 track trackway. ☆ = Tracks in possible 2 track sequence.

WASHINGTON CITY WATER TANK TRACKSITE 2 (42Ws152T)

This tracksite was recorded by Wade Miller of Brigham Young University (records at the Office of State Paleontologist). Most of the site has been covered over with sand and rock, apparently to protect it. The author visited the site in December 2000 to survey an area for installation of a new water tank (Hamblin, 2000).

SITE DESCRIPTION

In December 2000 exposures of the track-bearing layer outcropped northeast of the water tank location in four or five places with about 12 tracks or partial tracks exposed. The track layer is 10 to 5 cm (4 to 6 inch) thick white calcareous fine-grained sandstone. The covered area may contain a number of other tracks, perhaps in better condition. At present very few tracks are visible at this site and most of these are not clear and well formed. The author attempted to follow the track-bearing layer northeast to Water Tank site 1 (42Ws143T), but a sand dune covers part of the area. It does seem to be close, putting it in the upper part of the Kayenta Formation (Lower Jurassic).

LOCATION

This site is located on a small ridge or spur on a south facing slope 540 meters (1,750 feet) south of the upper Washington City Water Tank and immediately northeast of the lower Washington Water Tank in the NW ¼, NW ¼, NE ¼ of section 11, T 42 S, R 15 W. It has been assigned state locality number 42Ws152T by the Paleontology Office of the Utah Geological Survey. (Figure 7.)

METHODS

Only photographs and one tracing were taken at the site due to the limited exposures of the track layer.

TRACKS

There is a very small representation of visible tracks at this site. The best track observed measures 26 X 26 cm (10 X 10 inches). The track is similar in size to those at 42Ws143T. (Figure 5.) The author believes this to another example of *Eubrontes*. This track compare well with *Eubrontes* Tracks (Lull, 1953), except possibly for size. The track ichnogenus *Anchisauripus* has been suggested as an intermediate form in a growth series between *Grallator* and *Eubrontes* (Olsen, 1980). This track is intermediate, but some researchers feel that *Anchisauripus* is not a distinct type since the only difference between *Anchisauripus and Grallator* and *Eubrontes* is its intermediate size (Lockley and Hunt, 1995). The author will refer this track to the *Eubrontes* ichnogenus. This track is oriented in a south 45 degrees west direction. (Figure 7 b & c.)

TRACKSWAYS

There are no visible trackways as the site is presently exhibited.

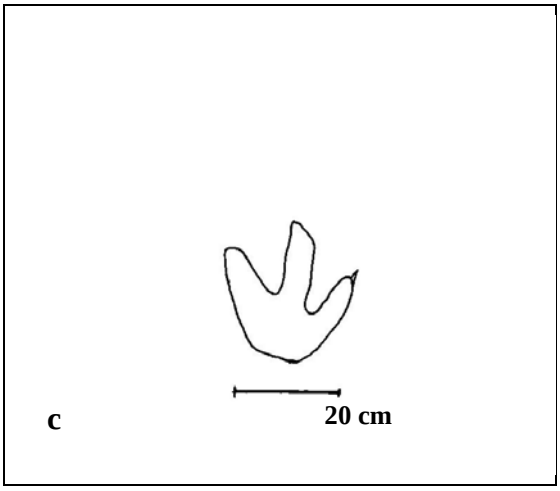


Figure 7. Washington Water Tank Tracksite 2 (42Ws152T).
a = Tracksite and water tank. b = Track. c = Track tracing

ENVIRONMENT, POSSIBLE TRACKMAKER, AND BEHAVIOR

Again, referencing Sansom (1992), Blakey (1994), and Peterson (1994), Beik (2003) describes the depositional environment of the Kayenta as fluvial, distal fluvial/playa, and minor lacustrine.

The one track examined closely appears to be of the *Eubrontes* ichnogenus. Over the years several types of dinosaurs have been proposed as track-makers for *Eubrontes* tracks. Miller, Britt and Stadtman (1989) suggested a prosauropod for the track-makers at the Warner Valley tracksite. However, others consider *Eubrontes* tracks to those of theropod (meat-eating) dinosaurs (Olsen, 1980; Thulborn, 1989; and Lockley and Hunt, 1995; and Hamblin and Bilbey, 1999). Kirkland, Lockley and Milner (2002), in discussing the new tracksite at Johnson Farm, consider the *Eubrontes* tracks were made by the crested, meat eating dinosaur *Dilophosaurus* or some similar animal known from the Kayenta Formation following the interpretation of others (Lockley and Hunt, 1995.

Available information at this site is too small a site to be able to suggest behavior accept as it may replicate other known sites in this area.

EXIT 13 NORTH NORTHSITE (42Ws207T)

This is a small tracksite discovered during the paleontological survey for the I-15, Exit 13 project. It occurs in the upper part of the Kayenta Formation (Lower Jurassic Age).

LOCATION

This site is located northeast of the new Exit 13 off I-15 in NE ¼, SW ¼, SW ¼ section 12, T 42 S, R 15 W. It has been assigned state locality number 42Ws207T by the Paleontology Office of the Utah Geological Survey.

SITE DESCRIPTION

This site consists of 5 or 6 small tridactyl (three-toed), bipedal (moved on two legs) tracks on the top surface of a 3 foot ledge of orange-red sandstone. This layer is roughly 25 meters (80 feet) below the bottom of the Navajo Sandstone (map measurement). A new road passes immediately south of the outcrop containing these tracks.

METHODS

Only photographs and tracings were taken of the tracks at this locality. No surface material was removed at the site. Future work at the site could clear more of the surface and might reveal more tracks and possible trackways.

TRACKS

Five or 6 small tridactyl (three-toed) tracks made by a bipedal (moved on two legs) dinosaur were recorded at this site. The tracks are longer than they are wide and range from 12 to 14 cm (4.5 to 5.5 inches) long and 9 to 11 cm (3.5 to 4.5 inches) wide. Though not a lot of detail is seen in these tracks, based on size and general shape the tracks compare quite well with other known *Grallator* type tracks (Lull, 1953). The tracks all point in a south-southwest direct. (Figure 8.)

TRACKWAYS

None of the tracks observed are in sequence.

ENVIRONMENT, POSSIBLE TRACKMAKER, AND BEHAVIOR

Referencing Sansom (1992), Blakey (1994), and Peterson (1994), Beik (2003) describes the depositional environment of the Kayenta as fluvial, distal fluvial/playa, and minor lacustrine.

Grallator tracks have been attributed to small theropod (meat-eating) dinosaurs (Olsen, 1980; Lockley and Hunt, 1995, and Hamblin and Bilbey, 1999). According to Kirkland, Lockley, Milner (2002), the slender meat-eating dinosaur *Megapnosaurus* is thought responsible for *Grallator* type tracks.

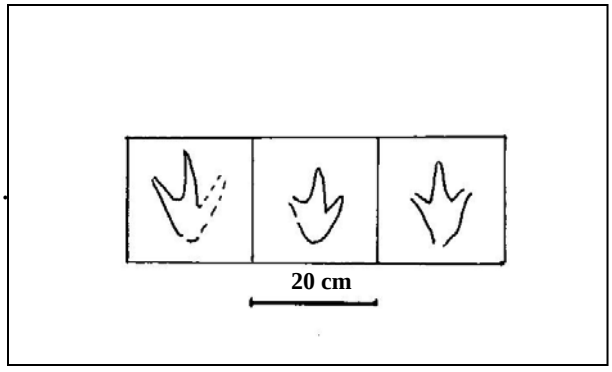


Figure 8. Exit 13 North Tracksite (42Ws207T). Photos of three *Grallator* Tracks and tracings of these three tracks.

There is not enough information from the site to suggest behavior by the track maker accept as it may replicate other known sites in this area.

EXIT 13 SOUTH TRACKSITE (42Ws320T)

This is a very small tracksite. It was recorded during the paleontological survey of the SITLA owned areas graded during construction of I-15, Exit 13.

LOCATION

This site is south of the new Exit 13 on I-15. It is located in the NW ¼, NW ¼, SE ¼ of section 12, T 42 S, R 15 W. It has been assigned state locality number 42Ws320 T by the Paleontology Office of the Utah Geological Survey.

SITE DESCRIPTION

This site occurs on a very small ridge with an east-west rock outcrop of mostly orange-red and some white mottled sandstone. It occurs between the new Washington Boulevard and Grading area to the east, on the east side of a small drainage.

METHODS

Only photographs and tracings were taken of the tracks at this locality.

TRACKS

One small track cast and several possible toe marks were discovered at this site. The track cast does not show much detail and is composed of and came from an orange-red mottled sandstone. The possible toe marks are in a, white fine-grained sandstone. The one track found measures 11 cm (4.5 inches) long and 9 cm (3.75 inches) wide. Based mainly on size and general shape, it is probably of the *Grallator* track type (Figure 9). Rocks east of the site were monitored during the grading process, but no tracks were found.

TRACKWAYS

This tracksite is too small and not conducive to exhibiting trackways.

ENVIRONMENT, POSSIBLE TRACKMAKER, AND BEHAVIOR

Referencing Sansom (1992), Blakey (1994), and Peterson (1994), Beik (2003) describes the depositional environment of the Kayenta as fluvial, distal fluvial/playa, and minor lacustrine.

The one track discovered, based mainly on size and general shape, is probably of the *Grallator* track type. According to Kirkland, Lockely, Milner (2002), the slender meat-eating dinosaur *Megapnosaurus* is thought responsible for *Grallator* type tracks.

There is not enough information from the site to suggest behavior by the track maker accept as it may replicate other known sites in this area.

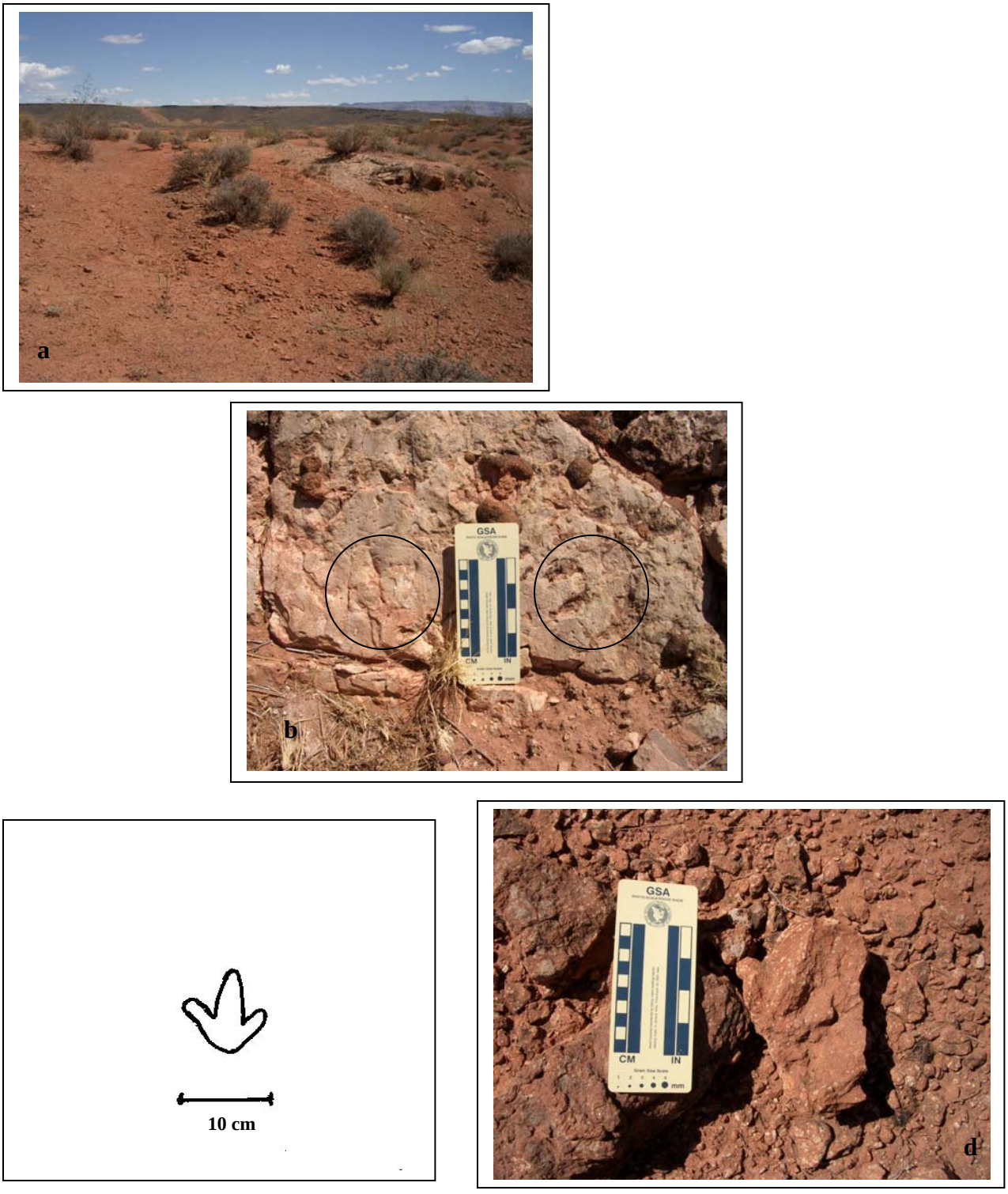


Figure 9. Exit 13 South Tracksite (42Ws320T). a = photo of site looking east. b = rock surface with possible toe prints. c = Tracing of track cast. d = Track cast.

CONCLUSIONS

The five tracksites discussed give samples of tracks through the Kayenta Formation. Not all known Kayenta tracks are represented, but there is a range in sizes from large *Eubrontes* tracks at Grapevine Pass Wash to the small *Grallator* tracks seen at the two Exit 13 sites. Intermediate *Eubrontes* tracks are seen at the two Water Tank sites. The Grapevine Pass Wash and Water Tank 1 sites are the best opportunities for public interpretation. There is a possibility that the Exit 13 North site could be expanded and more tracks uncovered for study and interpretation. This site is now very close to a new road and if the site was expanded could be an opportunity to interpret small *Grallator* tracks.

There is definitely a growing interest in track fossils in this area. With more land development near these sites, concern for their protection as well as opportunities for public interpretation should be considered. Future developments may also reveal additional track localities in this area.

Finally, monitoring excavation work at Exit 13 and the Grading areas did not prove successful in finding additional tracks. Discovering fossil tracks in rock being removed by heavy equipment such as scrapers and caterpillars with rippers is not easy, although it has been done on other projects.

ACKNOWLEDGEMENTS

Funding for this study was provided through the Southwestern Area Office of Utah School and Institutional Lands Administration who manages the property on which these track sites occur.

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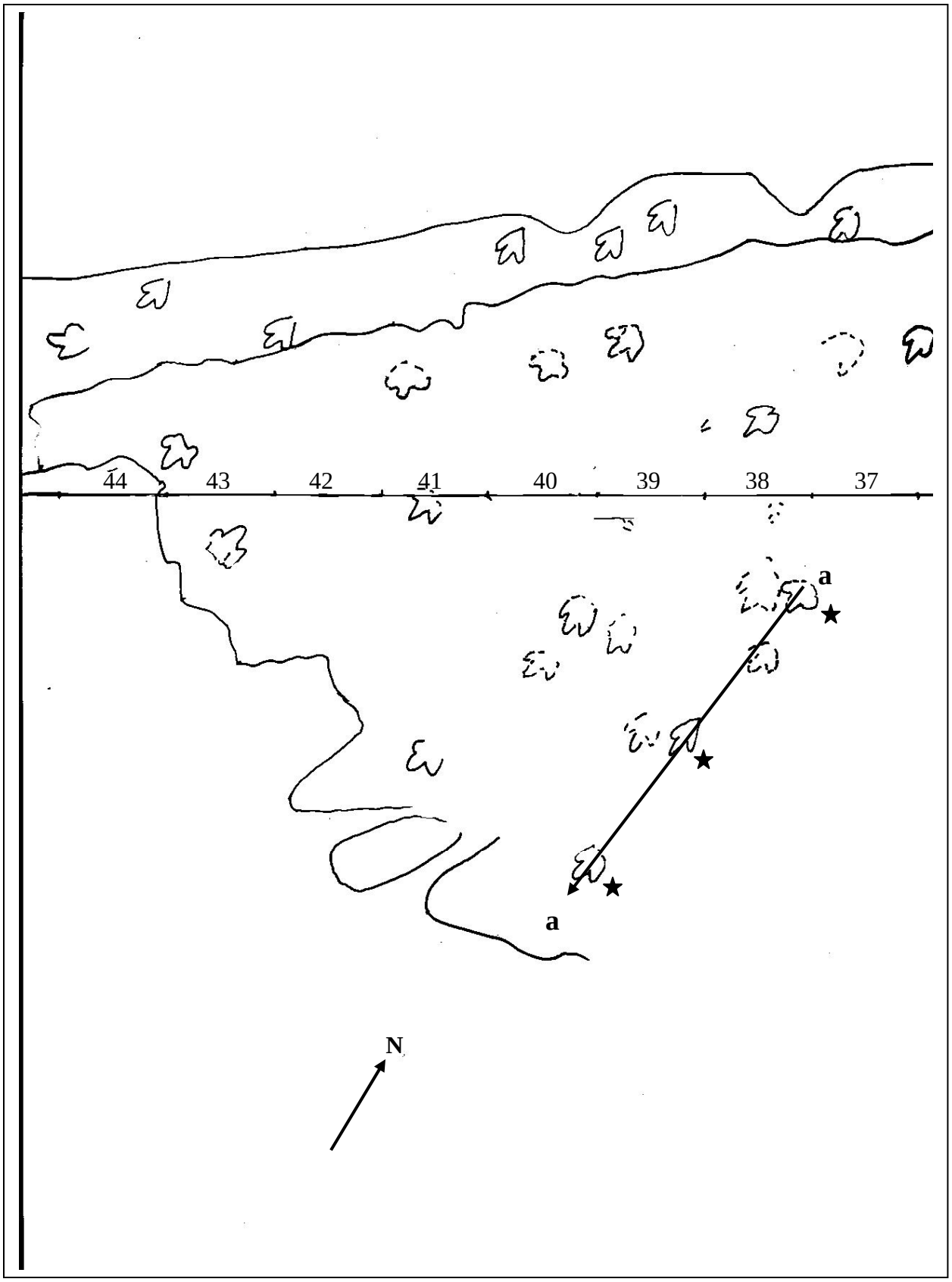
MAPS

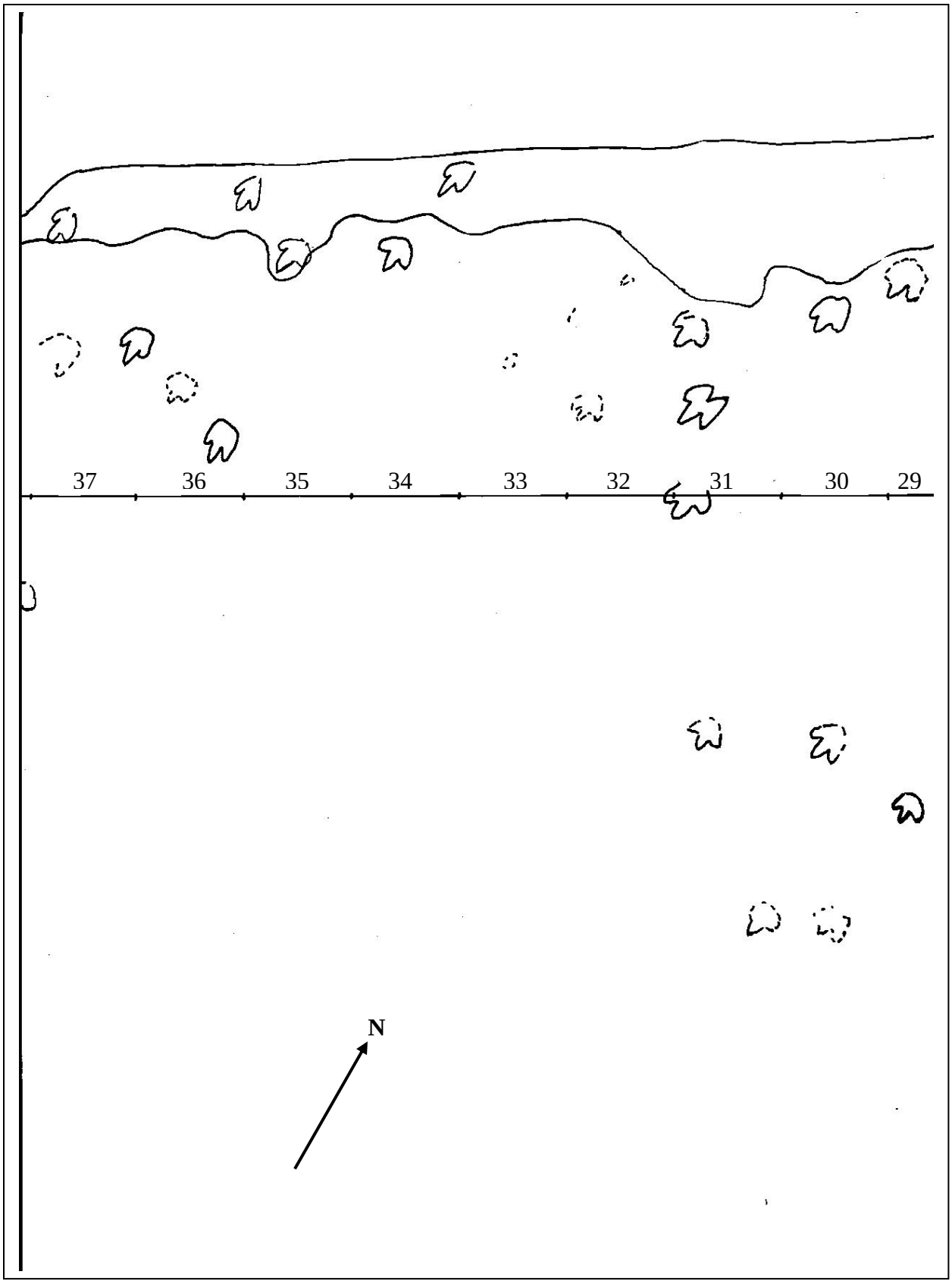
MAPS 1 – 6 Grapevine Pass Wash Tracksite (42Ws201T)

MAP 7 Washington City Water Tank Tracksite 1 (42Ws143T)

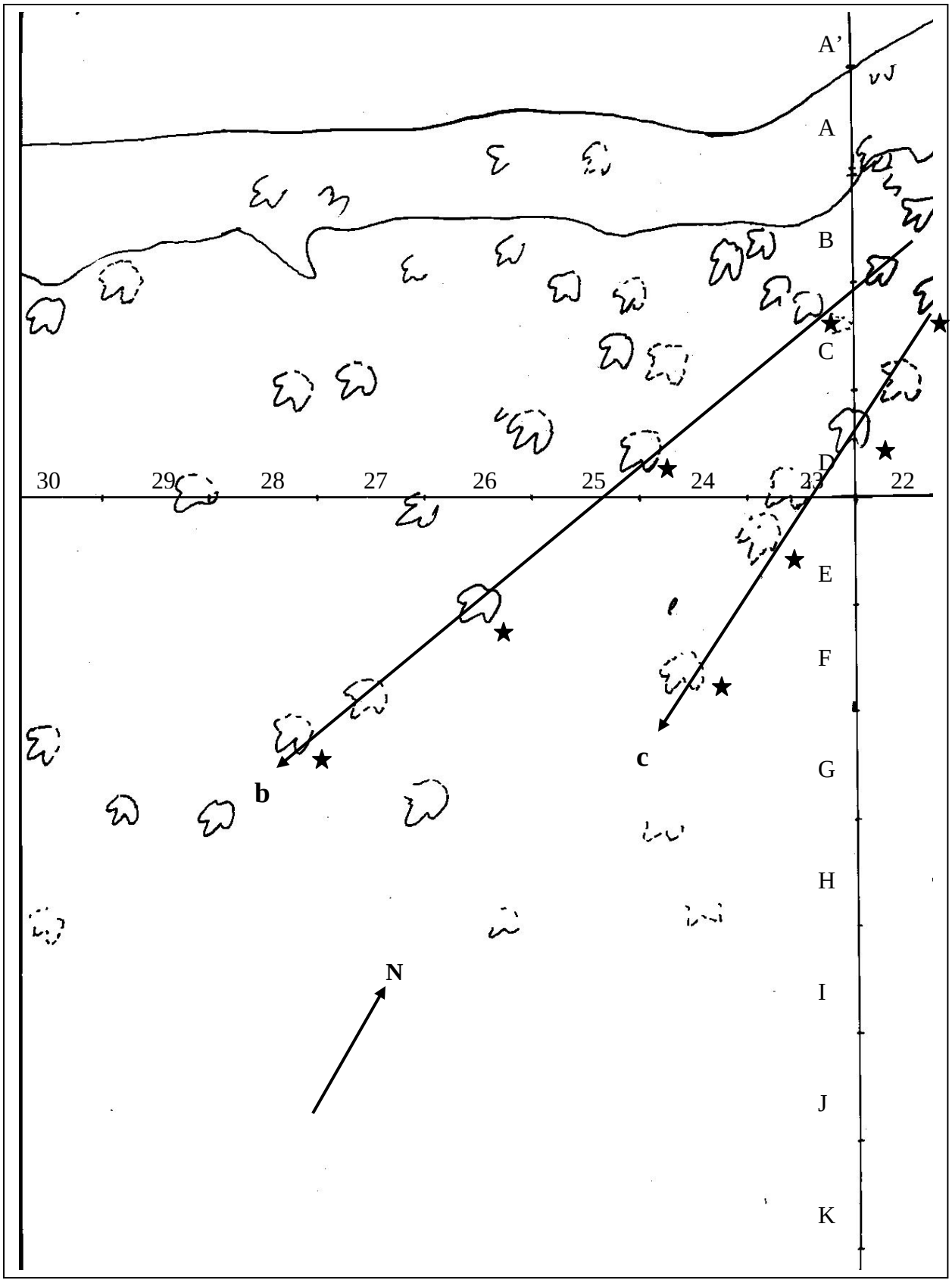


MAP 1. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
★⟶ **= Possible trackway** [----------] Scale = 1 meter

A.H. Hamblin Paleontological Consulting, 3793 North Minersville Highway, Cedar City, Utah 84720 (435) 867-8355

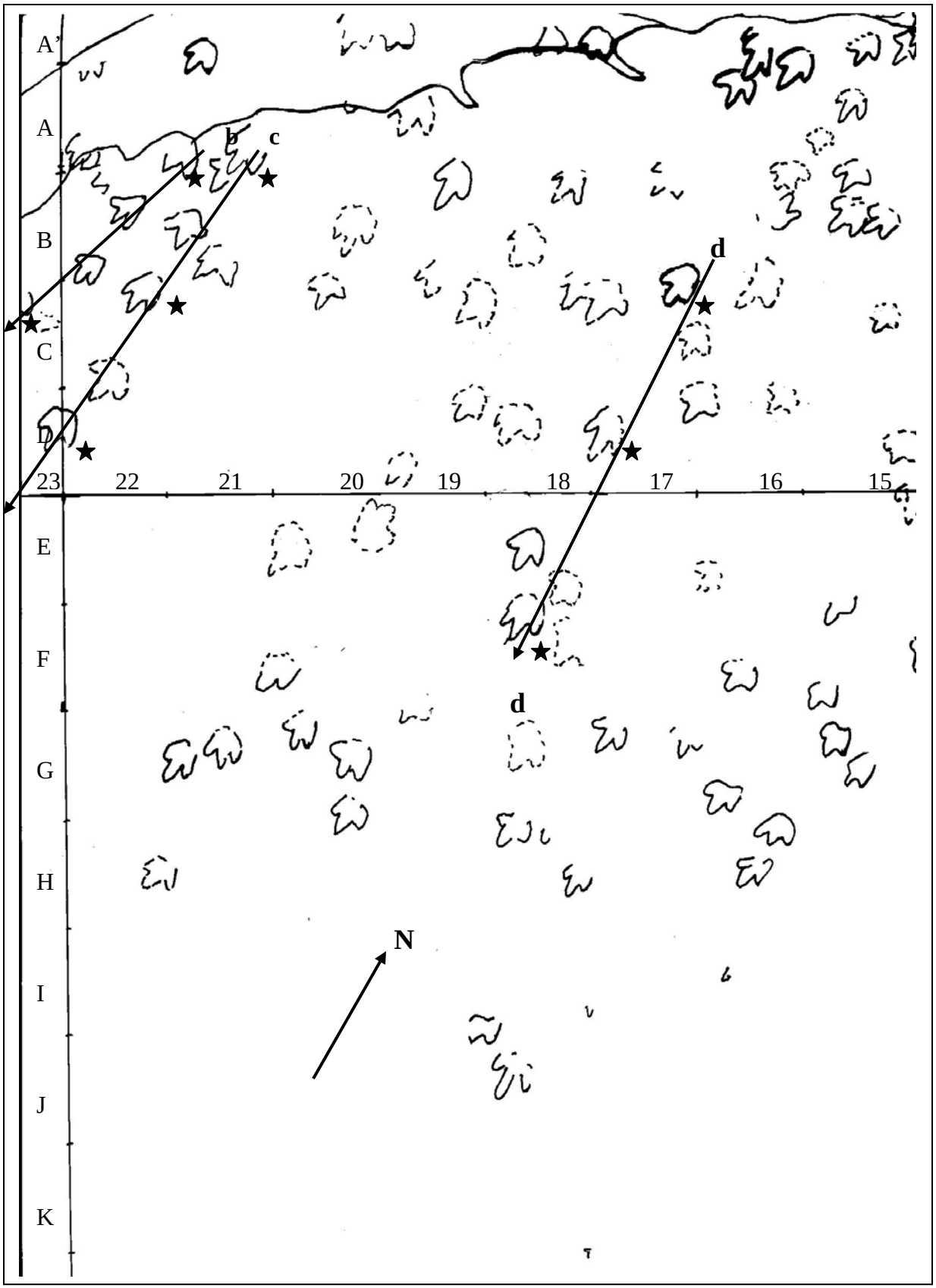


MAP 2. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
[----------] Scale = 1 meter

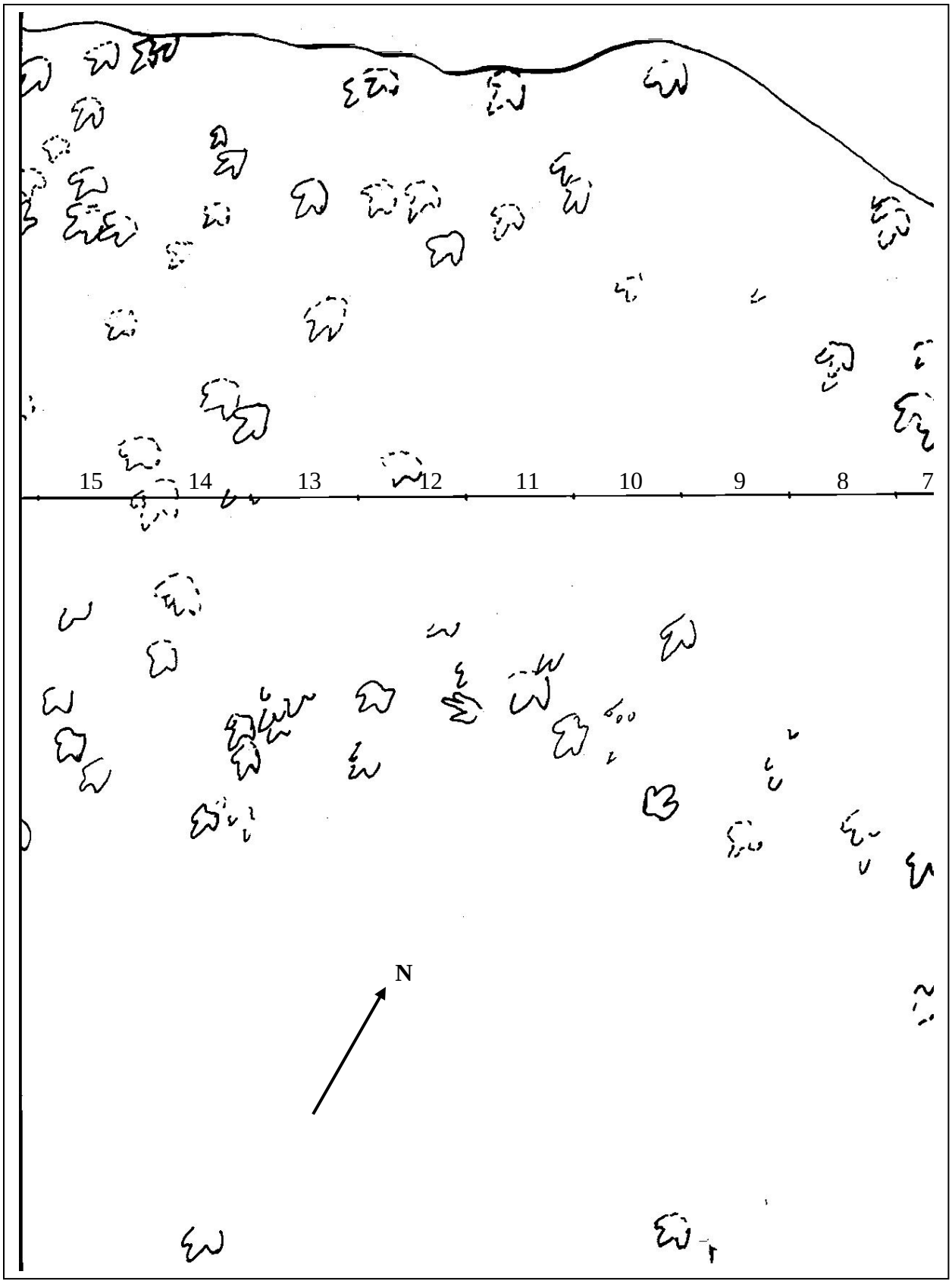


MAP 3. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
★⟶ **= Possible trackways, continued on MAP 4** [----------] Scale = 1 meter

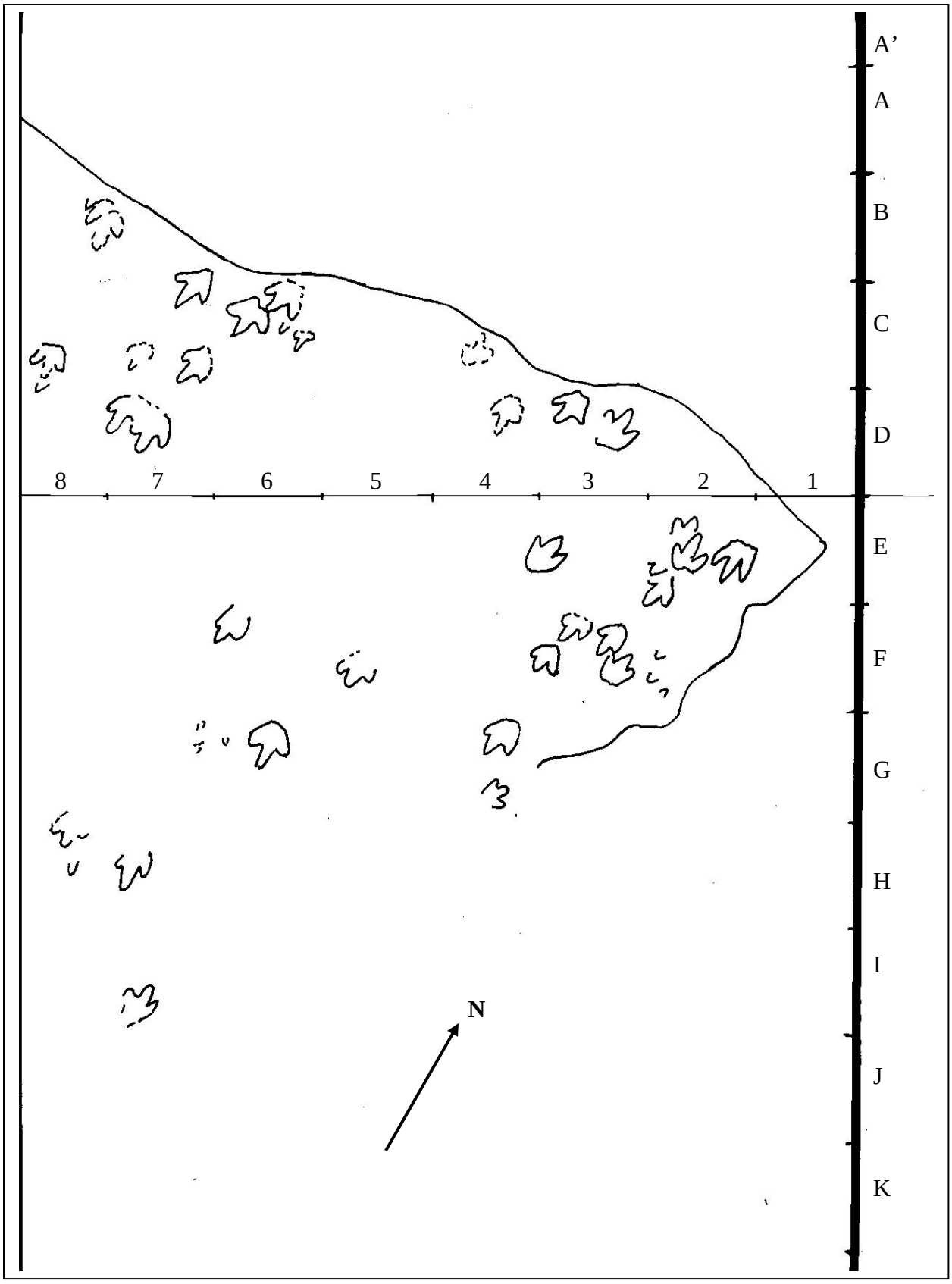
A.H. Hamblin Paleontological Consulting, 3793 North Minersville Highway, Cedar City, Utah 84720 (435) 867-8355



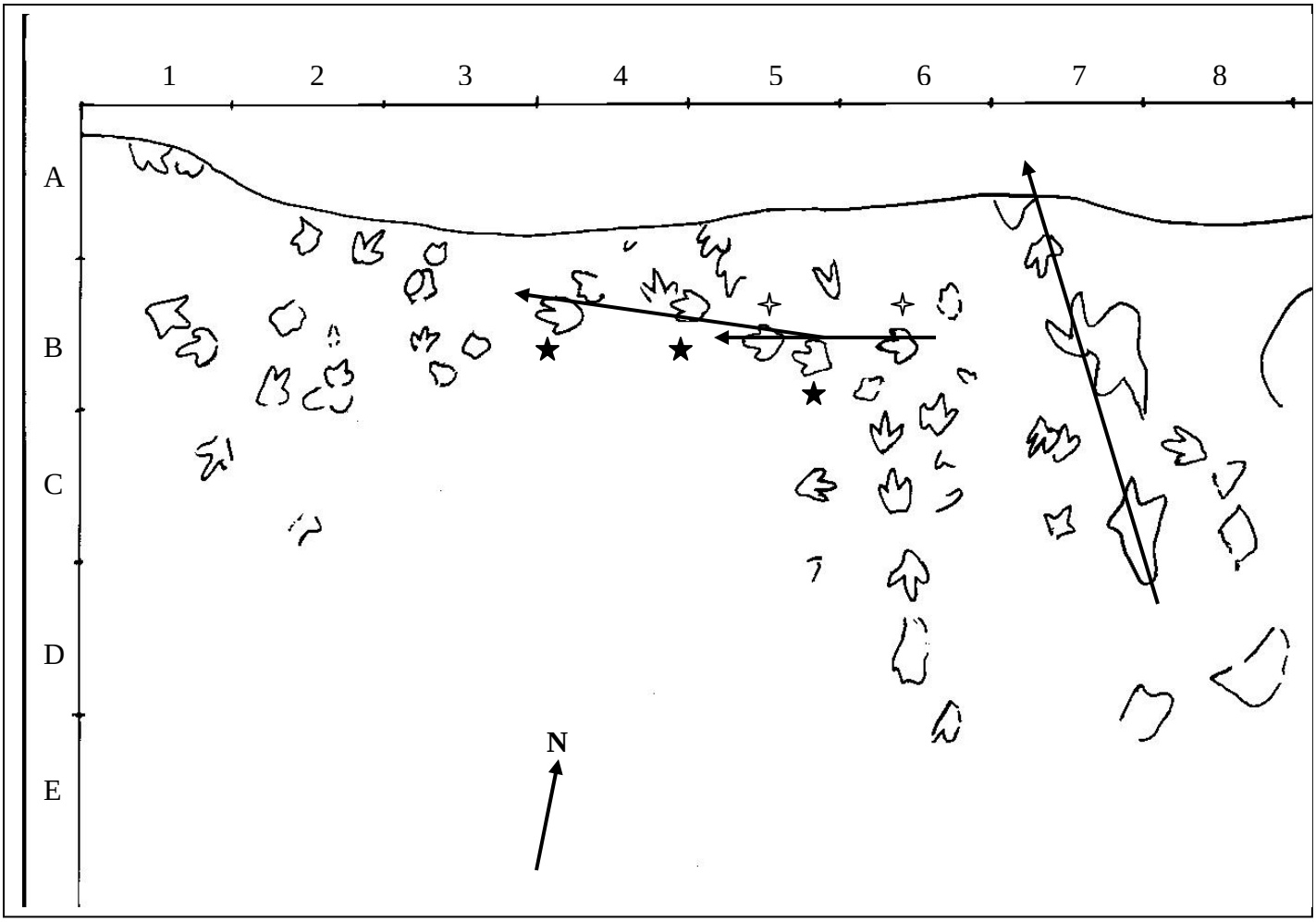
MAP 4. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
★⟶ **= Possible trackways, continued on MAP 3** [----------] Scale = 1 meter



MAP 5. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
[----------] Scale = 1 meter



MAP 6. GRAPEVINE PASS WASH TRACKSITE, Paleontology Locality 42Ws201T
[----------] Scale = 1 meter



Map 7. WASHINGTON CITY WATER TANK, TRACKSITE 1, Paleontology Locality 42Ws143T

★ **= Possible tracks in a Trackway** [----------] Scale = 1 meter.

MILE POST 13 LAND DEVELOPMENT PROJECT
Washington City, Washington County, Utah

Desert Tortoise Survey Report

Prepared by
JBR Environmental Consultants
8160 S. Highland Drive
Sandy Utah, 84128
801-943-4144

30 October 2003

During the period 10 October – 21 October 2003, JBR Environmental Consultants, Inc. (JBR) biologists conducted surveys for the presence of desert tortoises and tortoise sign within the Milepost 13 Land Development Project Area. Based on communications with Bill Mader (HCP Administrator, 7 October 2003), surveys were only required on that portion of the Project Area lying south of Interstate 15; Bill Mader was planning to conduct surveys on the north side. Based on communications with Curt Gordon [State Institutional Trust Lands Administration (SITLA) representative, 7 October 2003], and in order to simplify the survey effort, JBR combined the four areas of proposed disturbance indicated on Figure 1 (i.e., one staging area and three grading areas) into a single 100% survey area (outlined in purple on Figure 1). JBR biologists walked parallel transects, spaced 10-20 feet apart depending upon vegetation cover and visual opportunity, throughout the entire 100% survey area. In addition to surveying the proposed disturbance area, and based on communications with Elise Boeke (US Fish and Wildlife Service, 20 October 2003), a single JBR biologist also conducted Zone of Influence (ZOI) surveys at 100, 300, 600, and 1200 feet from the 100% survey area (indicated in green on Figure 1). All sign discovered, whether found within the Project Area, immediately on a ZOI line, or somewhere in between ZOI lines, were documented and mapped using a Trimble GPS.

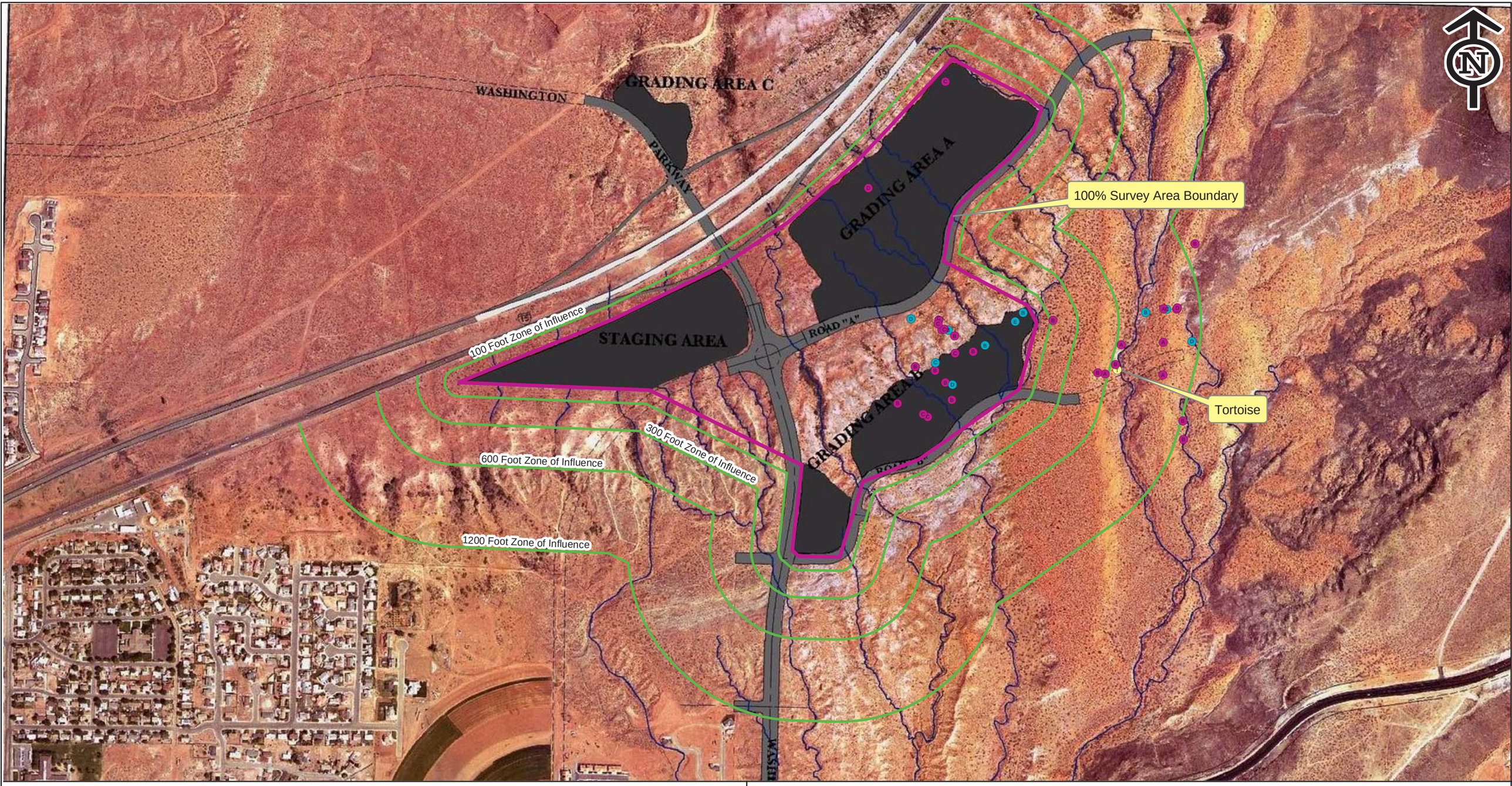
During the surveys, JBR discovered 1 tortoise, 29 tortoise burrows, and 10 pieces of tortoise scat not associated with a tortoise burrow (Figure 1, Table 1, and attached data sheets). Several tortoise burrows also contained scat; however, these scat were not recorded as scat since the site was already recorded as a burrow. All burrows within the 100% survey area were excavated and collapsed and all scat was broken up. No burrows along the ZOI lines were disturbed. Following instruction from Lori Rose (HCP Biologist, 14 October 2003), the single tortoise found along the 600 foot ZOI line was removed from its discovery location and delivered to the HCP office. In summary, based on the surveys it is evident that desert tortoises utilize the project area. It is also evident, however, that in at least recent years that this use has been more or less limited to the southeastern portion of the Project Area. Further, and based on the ZOI surveys, it also appears that the preferred habitat for tortoises in the greater area is found immediately east of the project area and likely sustains several other tortoises that were not removed from the ZOI area.

Table 1. Number and condition category of tortoise burrows and scat discovered within the Project Area and along the various ZOI lines.

	Tortoise Burrows					Tortoise Scat				
Condition*	Project Area	100’	300’	600’	1200’	Project Area	100’	300’	600’	1200’
A	-	-	-	2	3	-	-	-	-	-
B	7	1	-	2	3	3	-	-	-	1
C	8	-	-	-	1	1	-	-	-	1
D	1	-	-	-	1	2	-	-	-	1
E	-	-	-	-	-	1	-	-	-	-

*Condition descriptions are available on the attached data sheets. In general, condition ratings move sequentially from fresh/active (A) to older/deteriorated (E).

FIGURE



Base: Aerial provided by SITLA.

1:8,000

0 250 500 1,000 1,500 2,000 Feet

- Tortoise
- Scat
- Burrow

Condition values are also provided on the map.
Condition descriptions are provided on the data sheets.

Milepost 13 Land Development

Washington City, Washington County, Utah

Desert Tortoise Surveys

jbr environmental consultants

Salt Lake City Reno Elko Boise

Created: 22 October 2003
Version: 1
Printed: 22 October 2003

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DATA FORMS

SUMMARY FORM FOR ZONE OF INFLUENCE SURVEYS

Date: Oct. 10, 2003
Recorder: R. RASMUSSEN
Project Name: SITLA TORT 01
State: UTAH
County: WASHINGTON

Site UTM'S: NW 278560 X 4113550
NE 279680 X 4114260
SW 279430 X 4113160
SE 279830 X 4113540
NAD 27 UTM 1

Land form (e.g., mesa, bajada, wash): bajada / wash

Soils:

Vegetation: dominant perennials: creosotebush, Ephedra / salt cedar / ork
dominant annuals:

Weather: Air Temperature 80 °C Cloud Cover 5 % Wind Speed ____

Live Tortoises: Adult = 0 Juvenile = 0 Total Tortoises found: 0

Shelter Sites (Pallet/Burrow/Den):
a) currently active, with tortoise or recent tortoise sign ____
b) good condition, definitely tortoise; no evidence of recent use ____
c) deteriorated condition (please describe); definitely tortoise 1
d) deteriorated condition; possibly tortoise (please describe) 1
e) good condition; possibly tortoise (please describe) ____

Total shelter sites found: 2

Scat:
a) Wet (not from rain or dew) or freshly dried; obvious odor ____
b) Dried with glaze; some odor; dark brown ____
c) Dried; no glaze or odor, signs of bleaching ____
d) Dried; light brown to pale yellow; loose material ____
e) Bleached, or consisting only of plant fiber ____

Total scat found: 0

Shell Remains:
a) fresh or putrid ____
b) normal color; scutes adhere to bone ____
c) scutes peeling off bone ____
d) shell bone is falling apart; growth rings on scutes are peeling ____
e) disarticulated and scattered ____

Total shell remains: 0

Total eggshell remains: 0

Total *Neotoma* middens with tortoise sign: 0

Comments: 100% Survey w/in Project Boundary
Ross Rassmussen, Greg Brown, Eric Holt, Seth Tophum

SUMMARY FORM FOR ZONE OF INFLUENCE SURVEYS

Date: 10/12/2003
Recorder: Seth Topham
Project Name: Sitla Road -01
State:
County:

Site UTM'S: NW
NE
SW
SE

Land form (e.g., mesa, bajada, wash): See Page 1

Soils:

Vegetation: dominant perennials:
dominant annuals:

Weather: Air Temperature 68-75 °C Cloud Cover 0 % Wind Speed 0-5

Live Tortoises: Adult = 0 Juvenile = 0 Total Tortoises found: 0

Shelter Sites (Pallet/Burrow/Den):

a) currently active, with tortoise or recent tortoise sign
b) good condition, definitely tortoise; no evidence of recent use 1
c) deteriorated condition (please describe); definitely tortoise
d) deteriorated condition; possibly tortoise (please describe)
e) good condition; possibly tortoise (please describe)

Total shelter sites found: 1

Scat:

a) Wet (not from rain or dew) or freshly dried; obvious odor
b) Dried with glaze; some odor; dark brown
c) Dried; no glaze or odor, signs of bleaching
d) Dried; light brown to pale yellow; loose material
e) Bleached, or consisting only of plant fiber

Total scat found: 0

Shell Remains:

a) fresh or putrid
b) normal color; scutes adhere to bone
c) scutes peeling off bone
d) shell bone is falling apart; growth rings on scutes are peeling
e) disarticulated and scattered

Total shell remains: 0

Total eggshell remains: 0

Total *Neotoma* middens with tortoise sign: 0

Comments: Zone of Influence 100' and 300'

SUMMARY FORM FOR ZONE OF INFLUENCE SURVEYS

Date: 10/16/2003

Recorder: Eric A Holt

Project Name:

State: Utah

County: Washington

Site UTM'S: NW / NE / SW / SE: See page 1

Land form (e.g., mesa, bajada, wash): bajada, wash

Soils:

Vegetation: dominant perennials: Larrea, Coleogyne, Lycium

dominant annuals:

Weather: Air Temperature 85 °C Cloud Cover 0 % Wind Speed <3

Live Tortoises: Adult = 0 Juvenile = 0 Total Tortoises found: 0

Shelter Sites (Pallet/Burrow/Den):

a) currently active, with tortoise or recent tortoise sign ____

b) good condition, definitely tortoise; no evidence of recent use ____

c) deteriorated condition (please describe); definitely tortoise XX collapsed, partialy filled in

d) deteriorated condition; possibly tortoise (please describe) ____

e) good condition; possibly tortoise (please describe) ____

Total shelter sites found: 2

Scat:

a) Wet (not from rain or dew) or freshly dried; obvious odor ____

b) Dried with glaze; some odor; dark brown ____

c) Dried; no glaze or odor, signs of bleaching ____

d) Dried; light brown to pale yellow; loose material I

e) Bleached, or consisting only of plant fiber ____

Total scat found: 1

Shell Remains:

a) fresh or putrid ____

b) normal color; scutes adhere to bone ____

c) scutes peeling off bone ... ____

d) shell bone is falling apart; growth rings on scutes are peeling ____

e) disarticulated and scattered ____

Total shell remains: 0

Total eggshell remains: 0

Total *Neotoma* middens with tortoise sign: 0

Comments: 100% ~~Streory~~ Survey W/in Project Area

Eric Holt and Seth T Oldham

SUMMARY FORM FOR ZONE OF INFLUENCE SURVEYS

Date: 600 10/14/03 ROW 10/24/03
Recorder: SETH TOPHAM
Project Name: SITLA 01
State: UTAH
County: WASHINGTON

Site UTM'S: NW see page 1
NE
SW
SE

Land form (e.g., mesa, bajada, wash):

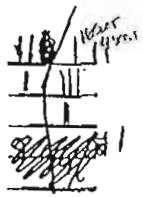
Soils:

Vegetation: dominant perennials: CREOSOTE, BURRAM TA BLACK BRUSH, DESERT ALMOND
dominant annuals: RED BROME, FILAREE

Weather: Air Temperature 67/65 °C Cloud Cover 0/2 % Wind Speed 0/0

Live Tortoises: Adult = 1/0 Juvenile = 0/0 Total Tortoises found: 1/0

Shelter Sites (Pallet/Burrow/Den):
a) currently active, with tortoise or recent tortoise sign
b) good condition, definitely tortoise; no evidence of recent use
c) deteriorated condition (please describe); definitely tortoise
d) deteriorated condition; possibly tortoise (please describe)
e) good condition; possibly tortoise (please describe)



Total shelter sites found: 3/0 (10)

Scat: a) Wet (not from rain or dew) or freshly dried; obvious odor
b) Dried with glaze; some odor; dark brown
c) Dried; no glaze or odor, signs of bleaching
d) Dried; light brown to pale yellow; loose material
e) Bleached, or consisting only of plant fiber

Total scat found: 0/2 (2)

Shell Remains:
a) fresh or putrid
b) normal color; scutes adhere to bone
c) scutes peeling off bone
d) shell bone is falling apart; growth rings on scutes are peeling
e) disarticulated and scattered

Total shell remains: 0/0
Total eggshell remains: 0/0
Total *Neotoma* middens with tortoise sign: 0/0

Comments: TORTOISE REMOVED. STILL MORE IN AREA.
600' (10/14/03) and 1200' (10/16/03) zone of influence surveys. Seth HCP called about tortoise discovered

SUMMARY FORM FOR ZONE OF INFLUENCE SURVEYS

Date: 10/20/2003
Recorder: Eric A Holt
Project Name: Sitla tort-01
State:
County:

Site UTM'S: NW
NE
SW
SE

See page 1

Land form (e.g., mesa, bajada, wash):

Soils:

Vegetation: dominant perennials:
dominant annuals:

Weather: Air Temperature ~90°C Cloud Cover 0 % Wind Speed 0

Live Tortoises: Adult = 0 Juvenile = 0 Total Tortoises found: 0

Shelter Sites (Pallet/Burrow/Den):

a) currently active, with tortoise or recent tortoise sign
b) good condition, definitely tortoise; no evidence of recent use — IIII
c) deteriorated condition (please describe); definitely tortoise — III
d) deteriorated condition; possibly tortoise (please describe)
e) good condition; possibly tortoise (please describe)

Total shelter sites found: 13

Scat:

a) Wet (not from rain or dew) or freshly dried; obvious odor
b) Dried with glaze; some odor; dark brown — I
c) Dried; no glaze or odor, signs of bleaching — I
d) Dried; light brown to pale yellow; loose material — II
e) Bleached, or consisting only of plant fiber — I

Total scat found: 6

Shell Remains:

a) fresh or putrid
b) normal color; scutes adhere to bone
c) scutes peeling off bone
d) shell bone is falling apart; growth rings on scutes are peeling
e) disarticulated and scattered

Total shell remains: 0

Total eggshell remains: 0

Total *Neotoma* middens with tortoise sign: 0

Comments: 100% Survey w/in Project Area
Seth, Eric, and Greg.
Finished up Surveys on 10/21/2003 → No Tort
Sign Found on 10/21/2003