

**BEFORE THE STATE CORPORATION COMMISSION  
OF THE STATE OF KANSAS**

|                                                   |   |                              |
|---------------------------------------------------|---|------------------------------|
| In the Matter of the Application of Shakespeare   | ) | Docket No. 25-CONS-3411-CUIC |
| Oil Company, Inc. for a permit to authorize       | ) |                              |
| injection into the Whitehorse and Cedar Hills     | ) | CONSERVATION DIVISION        |
| formations at the Wells #2-27 well in Section 27, | ) |                              |
| Township 16 South, Range 35 West, Cowley          | ) | License No. 7311             |
| County, Kansas                                    | ) |                              |
| _____                                             | ) |                              |

**PREFILED REBUTTAL TESTIMONY**

**OF**

**ANDREW T. ECK**

**ON BEHALF OF APPLICANT,**

**SHAKESPEARE OIL COMPANY, INC.**

\_\_\_\_\_

1 Q. Please state your name.

2 A. My name is Andrew T. Eck.

3 Q. Are you the same Andrew T. Eck who is employed by Shakespeare Oil Company, Inc.  
4 (“Shakespeare”) as a Geologist and who submitted pre-filed testimony in this docket on  
5 September 26, 2025?

6 A. Yes, I am.

7 Q. Have you read and reviewed the pre-filed testimony of Todd Bryant and of Kenny Sullivan  
8 that was filed on behalf of KCC Staff in this docket?

9 A. Yes, I have read and reviewed their pre-filed testimony, including the exhibits submitted  
10 with it.

11 Q. In his pre-filed testimony Mr. Bryant states that he believes that your cross-section, which  
12 is Eck Exhibit No. 3, is not persuasive and that he believes that your formation depths  
13 have been misidentified or are inconsistent. What reasons does Mr. Bryant give to support  
14 that belief?

15 A. The first reason he cites, at page 9, line 19 through page 10, line 3, is that my cross-section  
16 correlates logs on a line that zigzags back and forth and crosses over itself. He also states  
17 “[g]enerally, cross sections are in straight lines across a certain area and are used to show  
18 trends in the subsurface” and that he has “never seen a cross section depicted in such a  
19 manner.” I don’t understand the basis for his position. The use of stratigraphic cross-  
20 sections for the purpose of correlating formation tops is standard practice in our profession  
21 because it’s the best way to maintain consistency and accuracy in formation picks, which  
22 are then used as the basis for creating subsurface maps. This is why we spend the extra  
23 money to run electric logs on dry holes. The index line for my cross-section simply shows  
24 a map view of the wells that were used in the cross-section and the order in which those

1 wells are displayed. As I stated in my direct testimony (page 3, lines 16-23), 8 of the 9  
2 logs displayed in my cross-section were chosen because they are part of the KGS Type  
3 Log Project, which were used as the “seed picks” for my correlations. I didn’t choose  
4 which wells were used in the KGS Type Log Project. My cross-section is run in a general  
5 north to south trajectory with the Wells #2-27 in the middle. In the one case where my  
6 index line “crosses over itself”, that is where I switched the position of two of the wells  
7 so that I could present the modern log suite of the Wells #2-27 with the modern log suite  
8 of the Witham & Sons Type Log well for easier pattern recognition for non-geologists.  
9 That switch didn’t change any formation picks; it only changed the order of display.  
10 Again, that methodology is standard practice and has no impact on the validity of my cross  
11 section or its usefulness.

12 Q. What is the second reason that Mr. Bryant gives for doubting the credibility of your cross-  
13 section (Eck Exhibit No. 3)?

14 A. He states that it is because the formation depths that I have picked on my cross-section  
15 have been misidentified or are inconsistent. The formation depths that I picked, using my  
16 cross-section, are shown on Eck Exhibit No. 3. While Mr. Bryant may disagree with my  
17 formation picks for the Wells #2-27 in my cross-section, he has not created his own cross-  
18 section to refute mine. Mr. Bryant does not provide any independent analysis performed  
19 by him that contradicts the formation depths in my cross-section. Moreover, neither Mr.  
20 Bryant nor Mr. Sullivan have shown any log correlations of their own to support their  
21 testimony, and do not provide any basis for their seed picks beyond a generalized set of  
22 maps, which I will discuss in more detail later. As for Mr. Bryant’s claim that the  
23 formation depths shown in my cross-section are inconsistent, that claim is based on the  
24 differences between the formation depths in the Form U-1 filed by Shakespeare and the

1 formation depths shown in my cross-section. The formation depths in the U-1 were done  
2 prior to and without the benefit of my cross-section work. I am confident that our top two  
3 sets of perforations are labeled accurately in Eck Exhibit 4 from my original testimony.  
4 In addition, because Staff has requested it, Shakespeare has filed an amended U-1 with  
5 formation depths and designations that are consistent with my cross-section.

6 Q. Do you have high confidence that your cross-section is accurate?

7 A. Yes I do. My cross-section was created using seed picks (which are formation picks that  
8 are used as the basis for further correlation) from the KGS Type Log Project which I  
9 correlated consistently to the Wells #2-27. 8 of the 9 wells in the cross-section were  
10 correlated by scientists with the KGS Type Log Project. One of the main purposes of the  
11 KGS Type Log Project was to provide a foundation of seed picks for geologists to  
12 correlate with. Using those consistent and high-quality picks to start with, we can then  
13 consistently create control points with which to create precise and accurate maps, without  
14 the inconsistencies associated with multiple different geologists from different  
15 backgrounds attempting to correlate formations. So, in my opinion, using the formation  
16 picks from the experts in the KGS Type Log Project as seed picks gives me a very high  
17 level of confidence that my cross-section is accurate and reliable.

18 Q. At page 12, lines 1 – 7 of his direct testimony, Mr. Sullivan states that he does not believe  
19 that the Wells #2-27 is perforated in the Day Creek, but that the upper perforations in that  
20 well are in the Morrison formation. Did Mr. Sullivan present any of his own log analysis  
21 to support that conclusion?

22 A. No, he did not. Mr. Sullivan's formation picks are based on his interpretation of a set of  
23 KGS maps. There are multiple reasons why using those maps is not an accurate or a  
24 precise way to pick formations. The maps that Mr. Sullivan references are very

1 generalized regional maps covering a very large area, and some of those maps have not  
2 been updated this century. Although there are many thousands of available wells and logs  
3 with which to create control points, only a small fraction of those control points were used  
4 to create the maps that Mr. Sullivan relied upon. Those maps generally used only one  
5 control point per township, which is much lower than 10%, and in some areas only about  
6 1% of the available wells. Perhaps more importantly is that there is not a single control  
7 point on those maps within the 36 square-mile township in which the Wells #2-27 is  
8 located. Further, those maps are contoured on a large (50 foot) interval. Mr. Sullivan  
9 appears to 'back into' his formation picks by choosing the location of the Wells #2-27  
10 between contours and then using the maps to calculate where the formation tops should  
11 be. I can't overstate that this is a 'backward' methodology and is not standard practice in  
12 our profession. Best practice begins with correlating and picking formation tops from logs  
13 using high-quality seed picks and using each well with its own correlated formation top  
14 as a control point. Only after all of the available logs have been used to create every  
15 available control point can you then create precise and accurate maps. My method of using  
16 the seed picks from the KGS Type Log Project to correlate consistently between wells is  
17 a far more accurate and consistent way to pick formation tops.

18 Q. At page 12, lines 1 – 7, Mr. Sullivan testifies that he does not believe that the Wells #2-  
19 27 is perforated in the Cedar Hills, but that the lower perforations are in the Blaine  
20 formation. Did Mr. Sullivan present his own log analysis to support that conclusion?

21 A. No, he did not perform any log analysis to support that conclusion. In addition, I would  
22 point out that identity of the formation associated with the lower perforations in the Wells  
23 #2-27 is not relevant to this docket since Staff does not oppose injection into that  
24 formation, and because those perforations have no permeability and are ineffective for

1 injection. Whether those lower perforations are in the Blaine or the Cedar Hills, that  
2 designation does not impact my analysis and conclusions regarding the upper two sets of  
3 perforations in the Day Creek and Whitehorse.

4 Q. Mr. Bryant and Mr. Sullivan have both testified that the upper perforations in the Wells  
5 #2-27 do not comply with Table II because of the presence of white sands in the formation  
6 samples. Do you agree that the presence of white sand from the upper perforations  
7 necessarily leads to the conclusion that those perforations are above the top of the Red  
8 Beds?

9 A. No, I do not. As I stated in my initial pre-filed testimony, not all of the rocks in the Red  
10 Beds are red. The presence of white sands in the upper Permian is documented in multiple  
11 publications. Eck Exhibit No. 5 is one example of a publication from the Kansas  
12 Geological Survey which shows the presence of white sands in the Whitehorse. Eck  
13 Exhibit No. 6 is a satellite view of the outcrop that was pictured in the KGS publication  
14 showing laterally extensive white sands at the top of the Whitehorse formation in Section  
15 12-T33S-17W. Next, in Eck Exhibits Nos. 7 through 11, I conclusively show the presence  
16 of non-red sands in the Permian red beds at the outcrop of that formation. On November  
17 4, 2025, I travelled to Clark County, KS where the boundary between the Big Basin and  
18 the Whitehorse formations is visible at the surface in a highway road cut. That location is  
19 shown on Eck Exhibit No. 7 as a yellow star on the Kansas surface geologic map. That  
20 location, and where I took photographs and sand samples is shown as yellow stars and red  
21 stars on Eck Exhibit No. 8, which is a satellite photo of that location. Eck Exhibit No. 9  
22 are the photographs that I took at that location of the outcrop and the location where I took  
23 sand samples. Lastly, Eck Exhibit No. 10 is a picture of the sand that I collected from the  
24 outcrop. You will notice that this sand looks like the sand that was swabbed from the top

1 set of perforations in the Wells #2-27, and is obviously not red. Perhaps just as  
2 significantly, this sample comes from near the boundary of the Big Basin and Whitehorse  
3 formations (both within the Permian red beds) which is where our top set of perforations  
4 is located in the Wells #2-27. Lastly, I would like to add that the best time to study  
5 outcrops is in the winter when vegetation cover is less dense. For that reason, I intend to  
6 take additional pictures and samples at that outcrop site in December 2025 when there is  
7 less vegetation obstructing the view of the outcrop and will supplement my testimony with  
8 those additional photographs and samples.

9 Q. At page 13, lines 3–22, Mr. Sullivan refers to a test well in Wichita County (the AEC Test  
10 Hole #5) with red bed cuttings and a Day Creek dolomite pick at 1,282' to 1,285' in that  
11 well. Is his testimony regarding that well significant?

12 A. Yes, I believe it is very significant. I first want to clarify that I concur with Mr. Sullivan's  
13 overall analysis of that well – first, that the Day Creek dolomite is located at 1,282'-1,285';  
14 and, second, that the samples from just above and below the Day Creek Dolomite in that  
15 well are indeed red beds. I also agree with him that the sand sample from above 1,200'  
16 depth is from the Jurassic, that is above the red beds. However, I also took his observations  
17 from the AEC Test Hole #5 and did some additional analysis. Specifically, I created Eck  
18 Exhibit No. 11 which is a stratigraphic electric log cross-section showing how the AEC  
19 Test Hole #5 correlates with the Wells #2-27 and with nearest well from the KGS Type  
20 Log Project (to ensure consistency). As shown in Eck Exhibit No. 11, clearly there are red  
21 beds in the samples above the zone that correlates to the perforations in the Wells #2-27  
22 and to my Day Creek pick in the Wells #2-27. Thus, the physical evidence of red bed  
23 samples in the AEC Test Hole #5 validates the work of the KGS Type Log Project as well  
24

1 as my own work. This is obviously significant and shows that all of the perforations in the  
2 Wells #2-27 are below the top of the red beds and Table II compliant.

3 Q. Mr. Bryant and Mr. Sullivan both testified that they disagree with your testimony that  
4 there are sufficient confining layers between the upper perforations in the Wells #2-27 and  
5 Cheyenne formation. Do you believe that their testimony is supported by any evidence  
6 similar to the log analysis that you performed and explained in your pre-filed testimony?

7 A. No, I do not. To support his conclusion, Mr. Bryant relies on alleged elevated formation  
8 pressures in the Permian interval and supposed evidence of natural and unpredictable  
9 fracturing in that interval. Mr. Scarbrough has presented evidence in his rebuttal  
10 testimony that the Day Creek and Whitehorse formations, which are in the Permian  
11 interval, are not over-pressured. In fact, based on his calculations, they are slightly under-  
12 pressured. As for any evidence of “natural and unpredictable fracturing” in the Permian  
13 interval, Mr. Bryant has presented no evidence to support that conclusion. Also, neither  
14 Mr. Bryant nor Mr. Sullivan explain what an adequate confining layer would be. If we  
15 look to the precedent set by other Whitehorse and Day Creek injection wells in Wichita  
16 County and counties adjacent thereto (as shown in Scarbrough Exhibit No. 4) which  
17 presumably have adequate confining layers above the injection zones, we have more than  
18 enough impermeable shale in the Wells #2-27 to create an adequate confining layer.

19 Q. Do you have any other reasons to believe that water injected into the Wells #2-27 will not  
20 migrate upward?

21 A. Yes, Shakespeare is not asking for approval to inject water under pressure, and the top  
22 two proposed injection intervals in question are high-permeability rocks, as evidenced by  
23 swab rates. I have no reason to believe that the injection intervals will be compromised  
24 considering that they are under-pressured and highly permeable and are located below a



1 thick, impermeable shale as shown by the log for Wells #2-27.

2 Q. Mr. Bryant and Mr. Sullivan disagree with your direct testimony based on their  
3 assumption that you testified that the Day Creek Dolomite in the Wells #2-27 is 40'+  
4 thick. Do you agree that is an accurate description of your direct testimony?

5 A. No, I do not. In my direct testimony I never called or specified the bottom of the Day  
6 Creek Dolomite (which is typically 3 - 4' thick, as is the case in the Wells #2-27), but I  
7 simply referred to all of the rocks below the dolomite and above the Whitehorse as Day  
8 Creek. Perhaps this was imprecise stratigraphic nomenclature on my part, but the KCC  
9 doesn't require it. To be fair, I understand being held to a higher standard of precision for  
10 the sake of clarification on a contested issue. However, there are existing active Day Creek  
11 disposal wells in District #1 with more than 50' of 'Day Creek' perforations on the permits  
12 and the KCC apparently has no issue with those wells. The most significant point that my  
13 pre-filed testimony makes is that the Wells #2-27 is perforated below the top of the red  
14 beds with 57' to spare, and is therefore compliant with Table II requirements.

15 Q. At page 14, lines 13-23 of his pre-filed testimony Mr. Sullivan refers to a KGS Study of  
16 the Dakota Aquifer and states that it supports the absence of confining layers and the  
17 potential for communication between the Permian formation and usable water in the  
18 Dakota Aquifer. To support that statement, he attaches an abstract of that KGS study  
19 which is Exhibit KS-11. Does the abstract of that study support Mr. Sullivan's testimony?

20 A. No, it does not. The abstract of that KGS study actually refers to saltwater intrusion from  
21 the Permian into the Dakota "in parts of central to north-central Kansas where the Dakota  
22 directly overlies the Cedar Hills Sandstone." The abstract does not refer to any examples  
23 of such intrusion in southwest Kansas. Moreover, in Wichita County the Dakota aquifer  
24 does not directly overlie the Cedar Hills. That example of saltwater intrusion from the

1 Permian into the Dakota comes from a very different geologic setting, and from a different  
2 region, and is therefore irrelevant to the issue at hand.

3 Q. Does this conclude your rebuttal testimony?

4 A. Yes, but I reserve the right to supplement my testimony as I previously indicated and to  
5 submit additional rebuttal testimony if Staff introduces any additional or revised  
6 testimony.

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OF THE STATE OF KANSAS**

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| Oil Company, Inc. for a permit to authorize       | ) |                              |
| injection into the Whitehorse and Cedar Hills     | ) | CONSERVATION DIVISION        |
| formations at the Wells #2-27 well in Section 27, | ) |                              |
| Township 16 South, Range 35 West, Wichita         | ) | License No. 7311             |
| County, Kansas                                    | ) |                              |
| _____                                             | ) |                              |

**CERTIFICATE OF SERVICE**

The undersigned hereby certifies that on November 7, 2025, I caused a true and correct copy of the foregoing Pre-Filed Rebuttal Testimony of Andrew (Toby) Eck to be electronically filed with the Kansas Corporation Commission, and that I caused a copy to be served via electronic mail to the following parties:

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/s/ David E. Bengtson  
David E. Bengtson

# Petrography of Upper Permian Rocks in South-central Kansas

by Ada Swineford

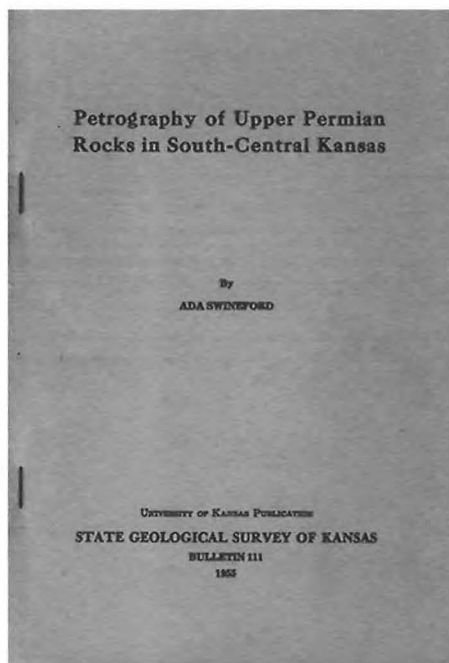
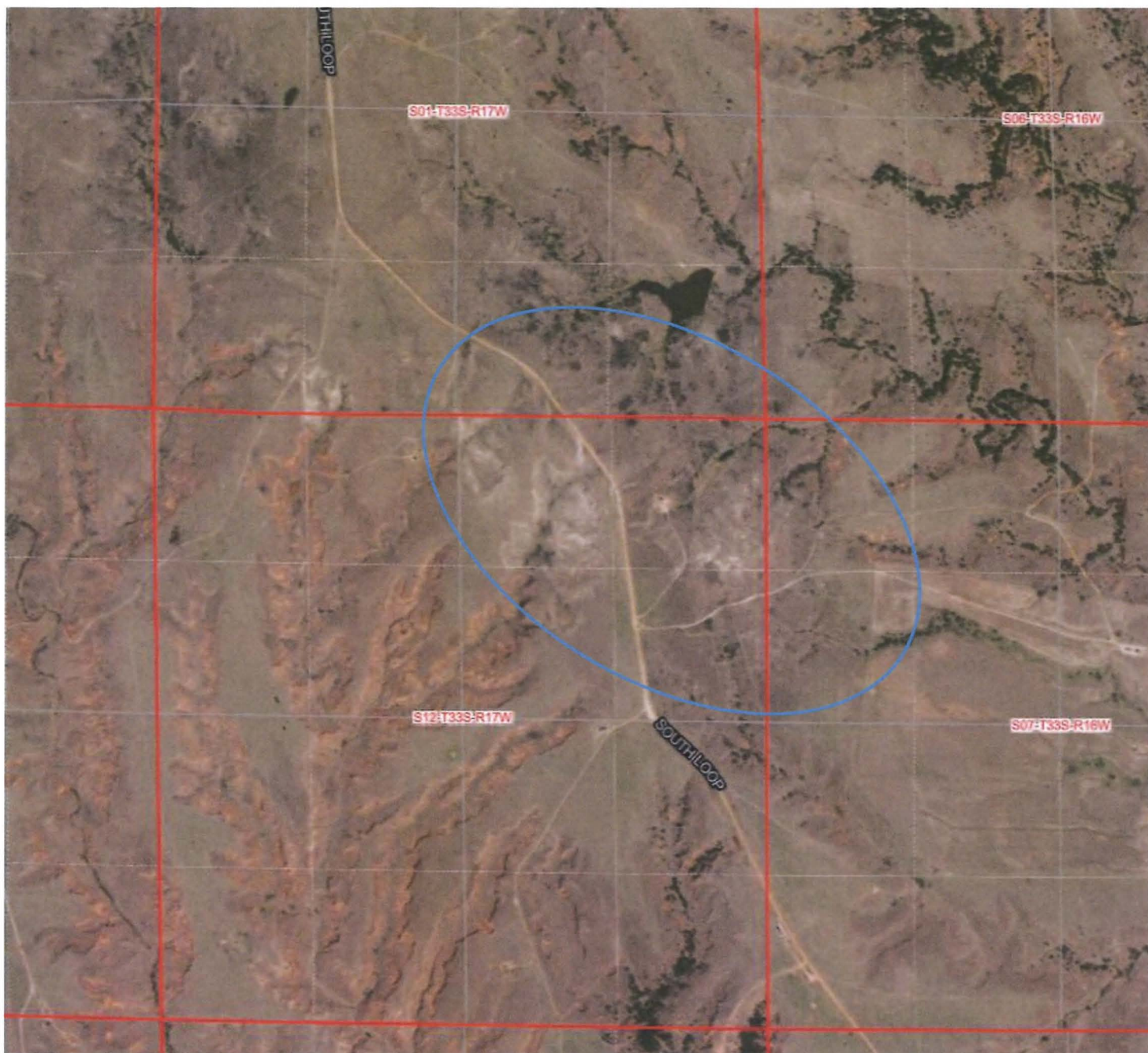


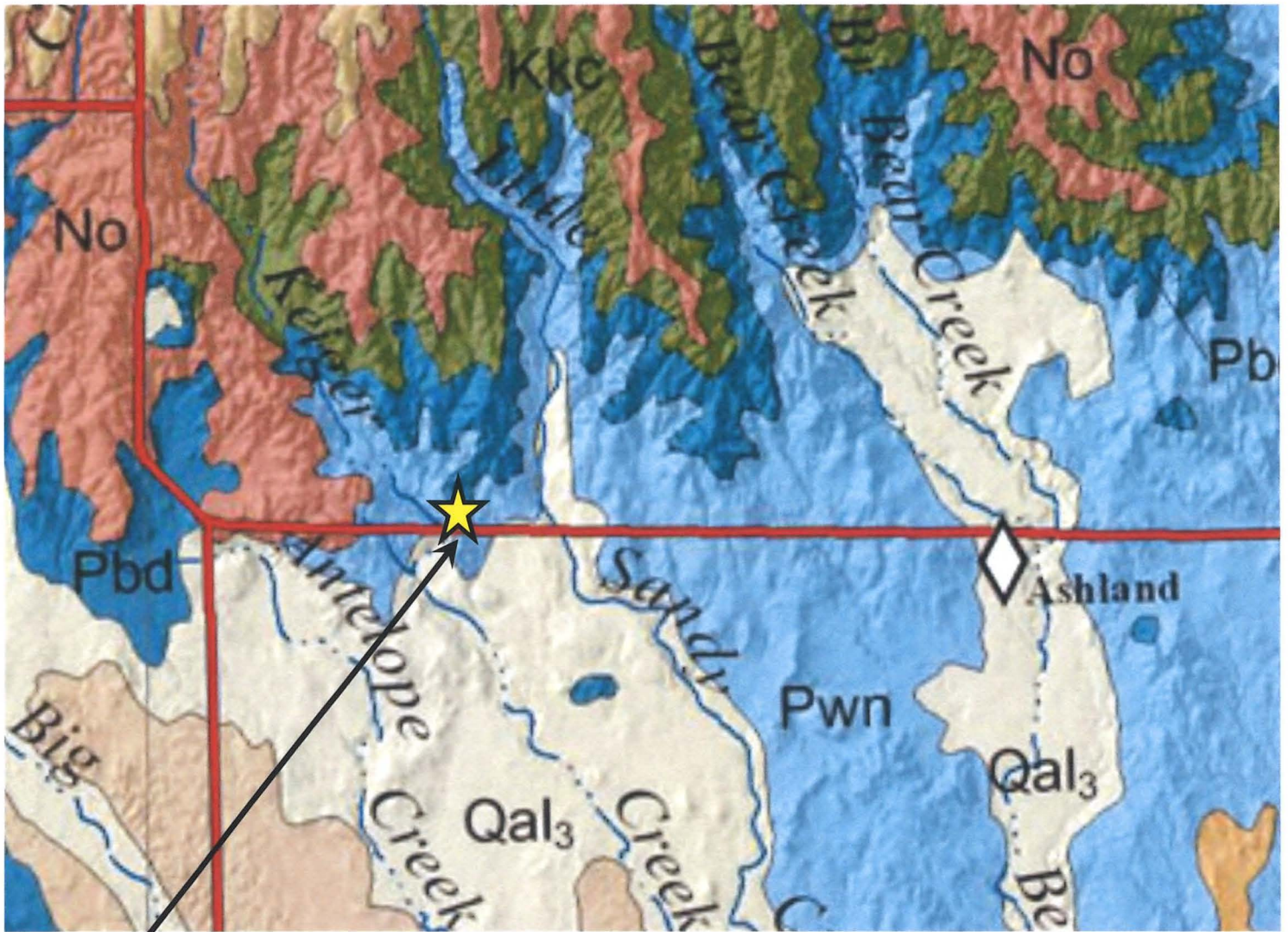
Plate 13--A, Thin dolomite and white sandstone at top of Relay Creek? member, Whitehorse formation; sec. 12, T. 33 S., R. 17 W., Comanche County.



**Satellite view of laterally extensive white sands at the top of the Whitehorse formation. 12-T33S-R17W (approximate location photographed and referenced in the 1955 paper above)**

**L = ½ mile**



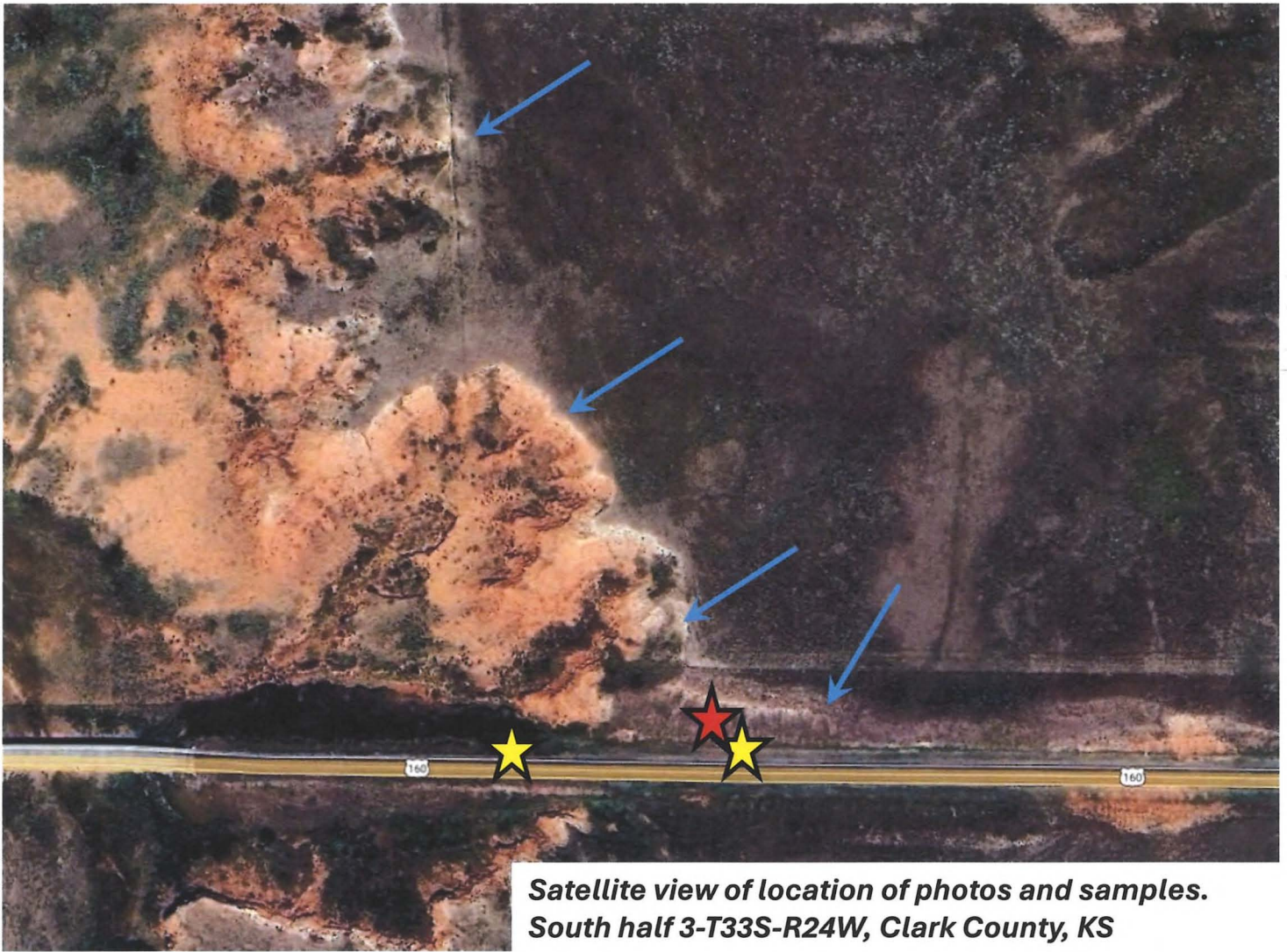


**Extract of the Kansas state geologic map, Clark County, KS**

**★ Location where white Permian Sand photos and samples were taken. Note that this is at the boundary between the Big Basin and Whitehorse formations.**

| Cenozoic Era                             |                                      | Paleozoic Era           |                      |
|------------------------------------------|--------------------------------------|-------------------------|----------------------|
| Quaternary System                        |                                      | Permian System          |                      |
| Qal3                                     | Alluvium (late Pleist. and Holocene) | Pbd                     | Big Basin Fm         |
| Qds                                      | Dune sand                            | Day Creek Dol           |                      |
| Ql                                       | Loess                                | Pwn                     | Whitehorse Fm        |
| Qal2                                     | Alluvium (early Pleistocene)         | Nippewalla Gp           |                      |
| Qgd                                      | Glacial drift                        | Ps                      | Sumner Gp            |
| Neogene System                           |                                      | Pc                      | Chase Gp             |
| Ntd                                      | Terrace deposits                     | Pcg                     | Council Grove Gp     |
| No                                       | Ogallala Fm                          | Carboniferous System    |                      |
| Mesozoic Era                             |                                      | Pennsylvanian Subsystem |                      |
| Cretaceous System                        |                                      | PCG                     | Council Grove Gp     |
| Kp                                       | Pierre Sh                            | IPa                     | Admire Gp            |
| Kn                                       | Niobrara Clk                         | IPw                     | Wabaunsee Gp         |
| Kc                                       | Carlile Sh                           | IPs                     | Shawnee Gp           |
| Kgg                                      | Greenhorn Ls                         | IPd                     | Douglas Gp           |
| Kd                                       | Dakota Fm                            | IPi                     | Lansing Gp           |
| Kkc                                      | Kiowa Fm                             | PKc                     | Kansas City Gp       |
|                                          | Cheyenne SS                          | IPp                     | Pleasanton Gp        |
| Igneous rocks emplaced during Cretaceous |                                      | IPm                     | Marmaton Gp          |
| K                                        | Kimberlite                           | IPC                     | Cherokee Gp          |
| L                                        | Lamproite                            | Mississippian Subsystem |                      |
| Jurassic System                          |                                      | M                       | Warsaw Ls            |
| JR                                       |                                      |                         | Burlington-Keokuk Ls |





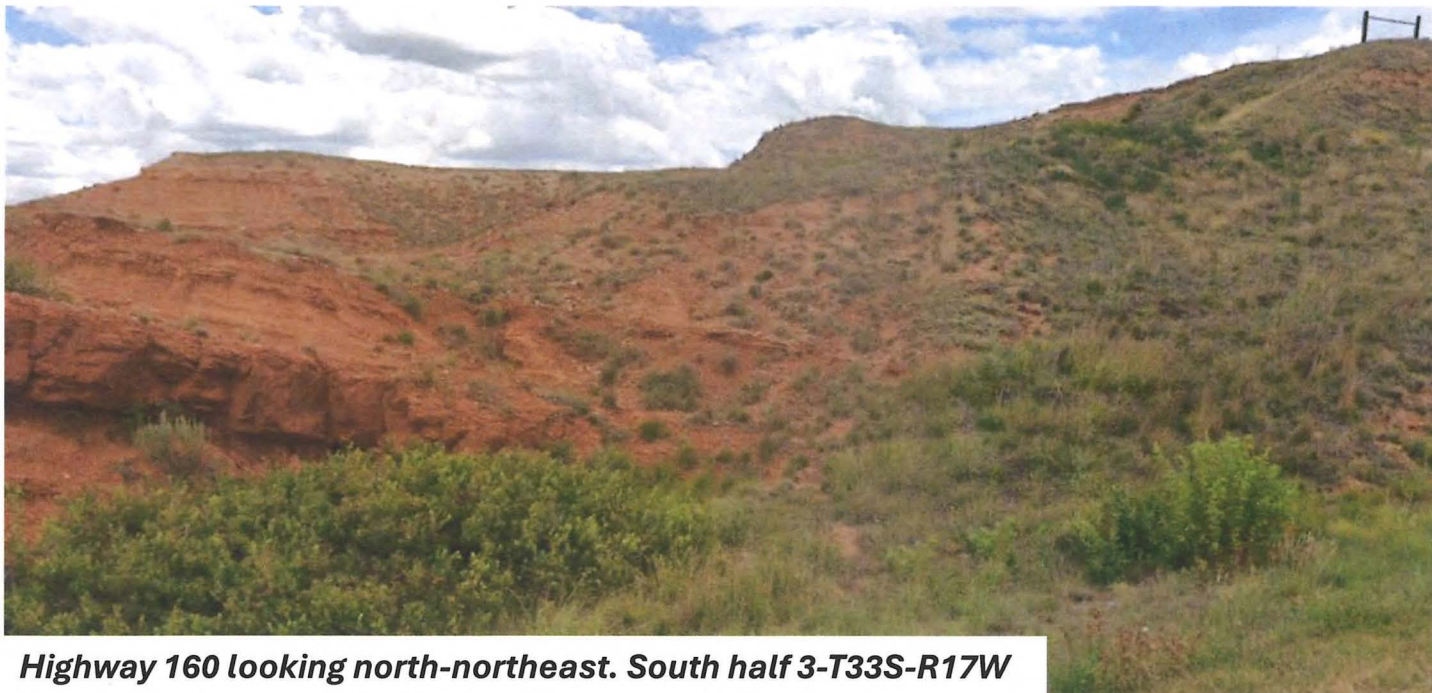
**Satellite view of location of photos and samples.  
South half 3-T33S-R24W, Clark County, KS**

 **Note the white rocks outcropping in a general NNW – SSE direction, including in the road cut where samples were taken.**

 **Locations photos were taken**

 **Location samples were taken**





**Highway 160 looking north-northeast. South half 3-T33S-R17W**



**Highway 160 looking north. South half 3-T33S-R17W.  
Standing ~200' east of photo above.**

**Location where sand sample was  
taken.**





***Sample of sandstone from near the Big Basin and Whitehorse formation contact.***



