

PIPER SURVEYING COMPANY

August 4, 1988

Garry Mauro, Land Commissioner
General Land Office
Stephen F. Austin Bldg., 1700 Congress Ave.
Austin, Texas 78701

Attention: Herman Forbes, Director of Surveying

Re: Report of the Survey of State of Texas Mineral Lease "M-92068" issued in favor of Cyprus Beryllium Corp. covering Sections 43 and 44, Block 71, Twp. 6; Sections 5, 6, 7, 8, 17, and 18, Block 71, Twp. 7; and Sections 1, 12, and 13, Block 72, Twp. 7, all being within the Texas and Pacific Railway Survey, Hudspeth County, Texas.

Dear Mr. Forbes:

INTRODUCTION

The general location of this project is in South Central Hudspeth County between the towns of Sierra Blanca and Fort Hancock. The survey covers the following geographical land marks: Sierra Blanca Mountains, Little Sierra Blanca Mountain, Round Top Mountain, Little Round Top Mountain, Malone Mountains, Gunsight Hills, and the North tip of Quitman Mountains. The area is drained by Arroyo Balluco, Arroyo Diablo, Madden Arroyo and Arroyo Macho into the Rio Grande River.

The agricultural value of this land is limited, since surface and underground water is very scarce and the vegetation is confined to a variety of sparse grasses, scrub mesquite, creosote and multiple varieties of cactus. These circumstances have contributed to limited amounts of development and surveying, with the quality and completeness of the surveys suffering. The discovery of a valuable mineral or oil always points out the importance of good surveying no matter what the apparent value of the property. Therefore, the argument that the land is not valuable enough to warrant a complete and accurate survey is not valid, since no one can really establish the future value of property.

I have been contracted by Cyprus Beryllium Corp. to survey and locate the lands described in the caption above. Their continued exploration and proposed mining require the location of the boundary lines in this area for payment of surface damages and/or royalties.

RECORD RESEARCH

The records researched included the General Land Office, especially the sketch files, roll sketch files and the correspondence files. The records of several private surveyors' files, who had previously worked in the area, were researched. A working sketch found in private records covering Blocks 71 through 74, Township 7, was made available to me. The book

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prepared by J. J. Bowden titled "Surveying The Texas and Pacific Land Grant West of the Pecos River" was referred to for a general history of the original surveys.

Correspondence files contained communications between the original surveyor, the agent of the Texas and Pacific Railroad, the Commissioner of the General Land Office, Special Surveyor McCombs, and various interested parties between 1878 and 1943. Their correspondence includes several letters, reports, and instructions for the original surveyor, report of original surveyor, protest by other parties on original survey, instructions for Special Surveyor of Land Board, report of Special Surveyor, instructions by Commissioner, reports by various other surveyors, protest by other parties on the resurvey by Special Surveyor.

HISTORY OF THE ORIGINAL SURVEY

The reservation was created by act of February 4, 1856, being 16 miles in width in favor of the Memphis, El Paso & Pacific Railroad Company, the predecessors of the Texas and Pacific Railroad, to construct a railroad across Texas. The State of Texas, under the act of May 2, 1873, enlarged the land reservation for the Texas and Pacific Railroad extending Westerly from the 100th Meridian, to the Rio Grande River at El Paso and extending Southerly from the 32nd parallel of latitude for 80 miles. Jacob Kuechler was hired by the T&P Railroad to survey and locate their land certificates in the area West of the Pecos River on August 31, 1878. Mr. Kuechler was working against a deadline because the reservation was about to expire, (January 1, 1880) thus opening the area to others for location of land certificates.

Mr. Kuechler was in the field from October 3, 1878, to April 3, 1879, with one field party. His survey was primarily a reconnaissance survey with monuments set usually each mile on scattered lines. His principle role was to locate the T&P land certificates on the lands which had the best mineral and agricultural possibilities. Kuechler was on the ground in Blocks 71, Twp. 6 & 7; Blocks 72, 73, & 74, Twp. 7, for one day on February 7th, 1879, in which he only ran 4 1/2 miles of line in the South part of Blocks 73 and 74, Twp. 7. His recorded field notes call for only three monuments being earth or rock mounds with limited witnesses. In the last 109 years, none of these mounds have been reported found by other surveyors.

MCCOMBS RESURVEY PRIOR TO PATENTS ISSUED

In October of 1880, questions of accuracy, based on a survey by A. Q. Wingo, were raised concerning the location of the South line of the reserve as surveyed by Kuechler and the amount of excess in Kuechler's distances and acreages. This question was supported by other interested parties for several years which kept the Texas and Pacific Railroad from patenting their lands.

On September 17, 1883 Commissioner Walsh instructed Paul

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McCombs, State Land Board appointed Special State Surveyor, to retrace Kuechler's footsteps and determine the amount of excess and how much he had exceeded the 80 mile reserve along the South line. The T&P Railroad accepted and paid for McCombs survey and applied multiple land certificates to some sections for patents.

Commissioner Walsh, in his second letter of instructions to McCombs dated March 12, 1884, instructed McCombs to carefully measure between the old corners, report the exact length where they could be found, set those corners not originally monumented and include a full description in the new field notes. In Mr. Walsh's third letter of instructions to McCombs covering the Western portion of El Paso County, (included present day Hudspeth County) he instructed him to "in that portion lying South of Township Four and West of Block 70, you will erect all of your corners so as to make each section of uniform size of 640 acres".

McCombs did not file any corrected field notes, he only interlined or changed Kuechler's field notes. He failed to include the descriptions of the monuments that he set in most cases on his survey. Therefore, in our area of interest, the field notes have not been amended by McCombs since he conformed to Walsh instructions for 640 acres. The patents for all of the original railroad sections (odd numbered sections) are based on these field notes. Mr. McCombs did file a map showing the monuments that he found and set on his survey in the General Land Office and a report of his survey. He also wrote a later report to W. H. Abrams, General Agent for Texas and Pacific Railroad, detailing his construction and monumentation of the corners in more detail and included a statement of his perpetuation of said corners in 1905.

STATE VS. CANDA et al.

On July 20th, 1891, the State of Texas brought suit against Charles J. Canda, Simon J. Drake, and William Strauss, the then present owners of the Texas and Pacific lands, in District Court of Jeff Davis County, Texas. The case was finally heard in Travis District Court in 1893. The State recovered some 184,712 acres of land because the railroad had received certificates for tracks laid on spurs and sidings, which under the law were not allowed. All odd numbered sections in Block 71, Twp. 6 and the North 5 tiers of sections of Blocks 71, 72, and 73, Twp. 7, were forfeited, along with others, in different areas. The court ordered and adjudged that the plaintiffs, the State of Texas take nothing except those lands specified, and the defendant was quieted in their title to all other lands as listed in Exhibit "A". The map, which shows the corners that were set by McCombs, was entered into evidence at the trial.

ACCEPTANCE OF McCOMBS CORNERS AS LOCATIVE

I believe that the Paul McCombs' corners will be the locative corners in our area of interest, even though they are not original corners set by Kuechler, the original surveyor, because of the following list of facts:

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(1) McCombs was a duly authorized surveyor performing his duties as instructed by the Commissioner of the General Land Office.

(2) The corners were set prior to the issuance of patents for benefit of the parties involved, being the State of Texas and the Texas and Pacific Railroad.

(3) In the trespass to try title suit of State vs. Charles J. Canda et al., a map showing the corners set by McCombs was entered into evidence. The court ordered and adjudged that the defendants were the legal and equitable owners of all the lands described in Exhibit "A" (includes several sections in the South part of Blocks 71, 72, and 73, Twp. 7, T&P. RR.).

(4) The adjacent Public School Land Blocks, as originally surveyed by A. H. Parker, attempted to observe the location of the Texas and Pacific Railroad Surveys relative to the McCombs corners.

(5) The few corrected field notes, which have been filed in the subject blocks and townships, appear to have largely observed the McCombs' corners.

RETRACEMENT AND CONSTRUCTION BY W. J. POWELL

In 1930, Kloh, Rumsey and Abrams, the present owners of the Texas and Pacific Railroad Lands, decided to resurvey them because of the lack of any very definite knowledge of the actual location of these lands to resurvey them. They hired Mr. W. J. Powell to supervise the project and make the construction. Mr. H. L. George was hired as principal surveyor in charge of field work. In 1938, Mr. R.W. Baker was employed to retrace some of McCombs' lines. In conference with Powell, McCombs, and J. H. Walker, Commissioner of General Land Office, they agreed to construct that portion West of Block 57. Jacob Kuechler's lines would be retraced and construction conformed to wherever they can be found and identified. Where two or more such corners are found and identified they would establish that line between them. Where only one corner was originally set that line would be established by passing it through a true meridian. This work was to be consummated by surrendering of patents and issuance of corrected patents. The work was never completed because of a lack of money and corrected field notes or patents were never filed.

They did retrace all of Kuechler's lines and most of McCombs' lines. They prepared strip maps of each traverse line showing each monument recovered and tying it to cultural features and USC&GS triangulation stations. This is important because McCombs was in the field with this crew most of 1930 and 1931 pointing out his and Kuechler's monuments. In 1938, Mr. Powell prepared a strip map showing the results of traverse line no. 46 as surveyed by H. L. George in 1931, and traverse line no. 75 as surveyed by R. W. Baker in 1938.

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Mr. George's traverse included those McCombs' corners, in Block 71, and the East part of Block 72, Township 7. Mr. Baker's traverse included all of McCombs' corner monuments in the West part of Block 72, and all of Blocks 73 and 74, Township 7. At the end of this strip map, Mr. Powell prepared a construction map of Blocks 71, 72, 73 and 74, Township 7 based on McCombs' corners with meridians of longitude and parallels of latitude passing through each corner. This construction map was filed by W. F. Sowell in the General Land Office in 1953, and is known as Roll Sketch 38. This construction is the basis of six patents prepared from corrected field notes by Sowell and E. W. Estill.

CONSTRUCTION OF SYSTEM OF SURVEYS

The retracement of McCombs corners was relatively easy with the use of the strip map prepared by W. J. Powell, and State Plane Coordinates on McCombs corners supplied by various other surveyors, especially Mr. W. C. Wilson. McCombs' maps show twenty-two monuments set in Blocks 71, 72, 73, and 74, Township 7, twenty of these monuments have been recovered and shown on this survey. The only monuments not found were the Northwest and Southeast corner of Section 47, Block 71, Twp. 7.

The most difficult task of this project was selecting a system of construction which would be legal, equitable, logical, follow in the footsteps of the locative surveyor, follow the commissioner's instructions, and the surveyors intent. The location of the twenty corners found complicated this selection, since they are along the North line of Blocks 73 and 74, Township 7, then diagonal Southeasterly to the Southeast corner of Block 74, Township 7. This string of corners do automatically give you a basis of protraction or to parallel.

Mr. McCombs speaks for the allowance of curvature and convergence in his report to the Commissioner of the General Land Office on February 16, 1884. It must also be remembered that the North and South boundary lines of the reserve were arcs of latitude.

The Kuechler field notes as amended by McCombs in 1884 called bearings of North, South, East, and West on each side with equal distances on North and South lines. This is also shown on the maps prepared by McCombs, which indicates that McCombs constructed the surveys using parallel lines. This shows a discrepancy in the policy of McCombs.

To my knowledge there have been no instructions to surveyors in Texas by the courts or the Commissioner of the General Land Office to establish lines on arcs of latitude or to consider convergency of the meridians in performing land boundary surveys. The simple fact that the earth is a geoid, best mathematically represented as an ellipsoid should not eliminate it from consideration.

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Therefore, the question that must be answered is did McCombs establish the corner monuments in a relationship in which consideration of the ellipsoid would produce the best construction in our area of interest. Also, the utmost question is how to relate to Kuechler/McCombs' North; was it based on a meridian or was it based on a sphere with convergency? Since the written documents are in discrepancy, we must look at the monuments as established on the ground. The following is a list of geodetic inverses of McCombs' corners on the ground compared to the intended bearings by the field note calls starting on the West side of our area.

<u>FROM PT.</u>	<u>TO PT.</u>	<u>GEODETIC INVERSE</u>	<u>INTENDED BRNG.</u>	<u>ERROR</u>
477	476	S89°58'15"E 1914.54	EAST	+0°01'45"
476	475	S89°52'44"E 1907.28	EAST	+0°07'16"
475	474	S89°58'14"E 1916.61	EAST	+0°01'46"
474	473	S89°56'23"E 1907.43	EAST	+0°03'37"
473	471	S89°55'32"E 1912.22	EAST	+0°04'28"
471	470	N89°57'24"E 1913.31	EAST	-0°02'36"
470	469	N89°58'21"E 1912.87	EAST	-0°01'39"
469	468	N89°08'49"E 1911.87	EAST	* -0°51'11"
468	467	N89°44'25"E 1900.98	EAST	-0°15'35"
467	466	N89°44'07"E 2117.44	EAST	-0°15'53"
466	464	N89°46'03"E 1913.09	EAST	-0°13'57"
464	108	N89°44'55"E 1906.52	EAST	-0°15'05"
108	107	S44°36'34"E 2688.68	S45°00'00"E	+0°23'26"
107	106	S44°51'37"E 2687.92	S45°00'00"E	+0°08'23"
106	105	S61°53'51"E 4352.70	S63°26'06"E	* +1°32'15"
105	104	S44°53'01"E 2707.54	S45°00'00"E	+0°06'59"
104	103	S44°53'04"E 2705.22	S45°00'00"E	+0°06'56"
103	102	S78°55'20"E 9816.08	S78°41'24"E	-0°13'56"
102	101	S56°04'04"E 6867.28	S56°18'36"E	+0°14'31"

* - omitted values in averages containing 90% of lines

The accuracy of bearings on each line related to geodetic North in which McCombs established is best expressed by the average absolute error which is equal to 0°15'04". When you eliminate the two line most erroneous (marked above *), then the average absolute error of 90% of the lines is 0°08'46". This shows that with the exception of two lines McCombs, is closely relative to geodetic North. Then the question raised is, is this error systematic or compensating. With the sign of error considered, then the average of the 18 lines (90%) is only 0°00'01.5" per line. This shows very strongly that McCombs' North in our area is related to geodetic North. The next question to be answered is, was McCombs deflecting his meridian to stay aligned with North. The convergence between the end points of the lines listed above is equal to 0°13'42", since the average error is only 0°08'46" and lines near the end are within a few minutes of the intended bearing, I believe that McCombs was making an attempt to correct his lines to true North at some interval, if not at each mile.

Therefore, the construction selected for this survey includes both convergence and parallel arc established on lines of meridians of longitude and parallels of latitude. I think it

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would be very hard to consider one without the other since they are so closely related. This construction is based on the same premise as that of W. J. Powell's construction of 1938. The only exception is that I did not honor the 2" iron pipe at the Northeast corner of Section 18, Block 72, Twp. 7. This monument is not a McCombs' monument as shown on McCombs' maps and it is shown not to be a McCombs' monument on Powell's traverse map. This construction was accepted in conference with Herman Forbes and C. Ben Thompson in the General Land Office on July 14, 1988, in conjunction with this survey.

OTHER CONSTRUCTIONS CONSIDERED

Two other constructions were considered and presented to the General Land Office on July 14, 1988 and rejected. They included a construction proposed by W. C. Wilson, Licensed State Surveyor, in his report of survey on the Public School Lands known as the Mrs. A. L. Daugherty Surveys and Lillian E. Gibbs Surveys, El Paso County, Texas. On page 18 of his report under the title "Construction", he states the area of which his proposed construction should cover, and I quote, "The separate area of the Texas and Pacific Railway 80 mile reservation to be considered and constructed here is comprised of Block 71, Township 6 & 7; Blocks 72 and 73, Township 7; Blocks 74, Townships 6 & 7; Block 75, Township 5 & 6; Block 76, Township 4, 5, & 6; Block 77, Township 1, 3, 4, & 5; Block 78, Township 1, 2, 3, & 4; Block 79, Township 1, 2, & 3; Block 80, Township 1 & 2; Block 81, Township 1 & 2; Block 82, Township 1, all being in Hudspeth and El Paso Counties, Texas."

Mr. Wilson follows in the last paragraph of page 18, "Where McCombs corners were not found that position was determined by prorating any excess or shortage found between existing McCombs' corners. I then placed all North-South lines through said McCombs corners parallel (N2°54'54"E Grid) to aforesaid meridian and I placed all East-West lines through said McCombs corners at right angles or perpendicular (S87°05'06"E Grid) to said North-South lines. This construction uses the consistently long recognized McCombs' corners while disregarding those corners inconsistent with same."

This construction has not had any conforming field notes filed, except in the case of the Public School Lands, covered by the report. Mr. Wilson's construction has several imperfections when applied to our area: (1) The tier of sections South of the North boundary line of Blocks 73 & 74, Township 7, converge to a minimum of 1797.12 varas at the West line of Section 6, Block 74, Township 7; (2) the tier of sections established between the Northwest corner of Section 35, Block 72, Township 7, and the Southeast corner of Section 33, Block 71, Township 7, is only 1840.76 varas in a North-South dimension. All of the sections in this area, according to the original notes and maps by McCombs, are called to be of equal size and 1900 varas to the side. The distortion caused by constraining the bearings to this baseline and not relating the bearings to the monuments on the ground caused most of this problem.

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The other construction submitted to the General Land Office was also based on Paul McCombs' monuments. The system used to calculate the other corners in these blocks and townships was to parallel the established lines found in the field. This allows the East-West lines to conform to the boundaries as monumented by McCombs, be an arc of latitude or not. Also, this method allows each row and column of sections to maintain an equal width as established by the monuments. The North-South lines are also parallels of the adjacent lines, which is what McCombs' map shows with each section being 1900 x 1900 varas in this area.

The issue arose of how to establish the East-West and North-South lines where McCombs' corner monuments are in a Northwest-Southeast diagonal line. The best systematical solution to this problem was to inverse between the existing McCombs' corners, calculate the intended angle (Example 45° on a diagonal section) then add the angle. This is then repeated for each line. Monuments with two lines exiting are then averaged. This method yields an angular roll factor between McCombs North and Grid North at each of McCombs' corners. These roll factors are then prorated between monuments to determine a bearing for each row and column of sections. The distances along the inverse lines between McCombs corners were prorated to locate the position of lines without monuments.

The exception to the rule was between the Northwest corner of Section 18 and the Southeast corner of Section 17 in Block 72, Township 7. The excessive drop in latitude (difference in the North-South dimension) distorted the bearings by an approximate magnitude of one and one half degrees. This simply distorts the system too much to be used. In many cases, Mr. McCombs would run a random traverse summing latitudes and departures to determine his position. The Northwest corner of Section 18 is on top of a large finger or ridge on the North side of Arroyo Balluco, and the Southeast corner of Section 17 is on a large ridge on the South side of said Arroyo. Mr. McCombs probably descended the North ridge, measured East along the flat bottomed Arroyo, then ascended the ridge to the South. The excessive error leads me to believe that his chainman made a chaining error or Mr. McCombs made an error in summing the latitudes between these points. Nothing will be gained from attempting to move this excess, so it is best left in the tier of sections that it exists in.

The weakness of this construction is that it lacks a systematical approach, in that it has a break in bearings at every section corner. Also, it depends in some cases on a parallel bearing established several miles away to locate a line when closer corners are available. The plotting of each construction on a set of topographical maps showed that this construction and the accepted construction to be close to the same location.

FIELD WORK PERFORMED ON SURVEY

Horizontal control traverse was extended from USC&GS and
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USGS stations, as shown in coordinate table on map, using conventional electronic traverse with a one second Kern DKM-2AT theodolite and an AGA Geodimeter 112 distance meter. Horizontal and vertical angles were read in both direct and reverse motions, with at least two sets of horizontal measurements on all traverse legs. Distance measurements were taken in two different units and compared, to eliminate blunders in reading and recording.

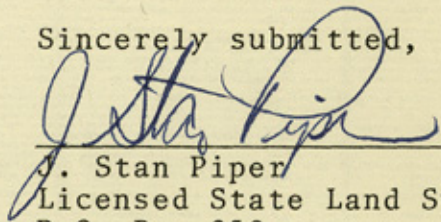
Mr. W. C. Wilson supplied coordinates on all of the monuments that he had tied in this area. During the performance of our field work, we verified coordinate values on at least a dozen of his positions. They all checked very closely, being an average of one half foot in position. I then meaned between his values and my values for the construction calculations. For the purpose of showing relative positions, I also used several of his values on monuments that we did not locate in the field.

The monuments set as shown on the prepared map, were located from the traverse points described in the above paragraph. They were then checked by occupying a different traverse point and checking the angle to the monument set. This assures us that monuments were located in the correct calculated position.

CONCLUSION

I have performed a very careful and diligent survey, based on careful research, making a complete search for the footsteps of the original surveyors in this area. These footsteps were tied into the State Plane Coordinate System, with the best methods feasible. I studied the intent of parties which located these surveys, the history of other retracements, and derived a construction that is logical, equitable, and legal. I have prepared a map, and this report showing the results of this survey. I hope this report and survey will meet with your approval, if you have any questions please feel free to contact me.

Sincerely submitted,



 J. Stan Piper
 Licensed State Land Surveyor
 P.O. Box 252
 Gardendale, Texas 79758

GENERAL LAND OFFICE RECORDING INFORMATION

Sketch file no. 50 Hudspeth County, Texas
 Filed for record the 5th day of August 1988.
 Garry Mauro, Commissioner of the General Land Office.

By: C. B. Thomson

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File No. Sk File 50

Hudspeth County

(See also Hudspeth Co. Rld. Sk. 65)

Filed 5 August 1988

GARRY MAURO, COMMISSIONER

By C. B. Thomson

See Rolled Sk. 65

Mr. W. C. Wilson supplied coordinates on all of the monuments that he had filed in this area. During the performance of our field work, we verified coordinate values on at least a dozen or six positions. They all checked very closely, being an average of one half foot in position. I then assessed between his values and my values for the construction calculations. For the purpose of showing relative positions, I also used several of his values on monuments that we did not locate in the field.

The monuments set as shown on the attached map, were located from the traverse points described in the above paragraph. They were then checked by occupying a different traverse point and checking the angle to the monument set. This shows us that monuments were located in the correct calculated position.

CONCLUSION

I have performed a very careful and diligent survey, based on careful research, making a complete search for the locations of the original surveys in this area. These footings were tied into the State Plane Coordinate System, with the best methods feasible. I studied the layout of parties which located these surveys, the history of their relationships, and derived a construction that is logical, accurate, and legal. I have prepared a map, and this report showing the results of this survey. I hope this report and survey will meet with your approval. If you have any questions please feel free to contact me.

Sincerely submitted,

[Handwritten Signature]

Stan Egan
Licensed State Land Surveyor
P.O. Box 351
Gardendale, Texas 75758



GENERAL LAND OFFICE RECORDING INFORMATION

Sketch file no. 50
Filed for record the 5th day of August 1988
Garry Mauro, Commissioner of the General Land Office

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