



JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Oil, Gas and Mining

JOHN R. BAZA
Division Director

August 20, 2014

Barker Family
Mr. Dorrell and Verdis Barker
1568 Barker Lane
Price, UT 84501

Dear Mr. Barker:

The Division of Oil, Gas and Mining (the Division) has completed its review of the Citizen Complaint filed with our office on February 26, 2014. A technical memo outlining the information/data reviewed during this process has been provided for you (See attached).

At this time, the Division has not found evidence that coal mining activity conducted at the Centennial Mine and Soldier Canyon Mine has impacted your water rights. Please feel free to contact myself (801) 538-5350 or Daron Haddock (801) 538-5325 if you have any questions or want to discuss the matter.

Sincerely,

Steve Christensen
Environmental Scientist

SKC/ss

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August 20th, 2014

TO: Internal File

THRU: Daron Haddock, Coal Program Manager

FROM: Steve Christensen, Environmental Scientist

RE: Barker Citizen Complaint, Task ID #4516

SUMMARY:

On February 26th, 2014, the Division of Oil, Gas and Mining (the Division) received a citizen complaint (the complaint) from Mr. Dorrell Barker. Mr. Barker indicated in the complaint that springs on his families' private land had been drying up for the past 8-10 years. The complaint identified the areas where these springs were located as being in Hoffman Creek, Coal Creek, the right fork of Coal Creek and Clear Water Creek. The Centennial Mine is located adjacent to the south-western portion of the Barker property, with the Soldier Creek Mine located adjacent to the south-eastern property boundary. Mr. Barker asserted that the reason that the springs were showing diminished flow was as a result of coal mining activity at the Centennial and Soldier Creek Mines.

Mr. Barker requested an investigation as to whether coal mining activity may have had an impact on the springs on his families' property. Mr. Barker provided a list of water rights in the complaint that he claims to have been affected: 91-1208, 91-2570, 91-1209 to 91-1209, 91-1372, 91-1378, 91-1942, 91-1207, 91-1384, 91-1381, 91-3928, 91-1385, 91-1377, 91-1373 to 91-1373, 91-1374 to 91-1374, 91-1375 to 91-1375, 91-1207, 91-1210, 91-1211, 91-1376, 91-1380, 91-1382, 91-1383, 91-1284.

On May 15th, 2014, Division staff met with Dorrell and Verdis Barker to inspect several of the areas identified in the complaint.

The following discussion provides information/data for the Soldier Canyon Mine and Centennial Mine relative to: subsidence and geologic data obtained in the eastern most portion of the Centennial Mine permit area and the western extent of the Soldier Canyon permit area as well as an analysis of climatic and hydrologic conditions.

Background- Barker Property (Study Area)

As part of this review, Division staff obtained property records from the Carbon County Courthouse to delineate the Barker property. Based on those records, the Barker property that was most closely evaluated for possible impacts from coal mining activity due to its proximity to the mines was in Township 12 South (T 12S), Range 11 East (R 11E) and in sections 26, 27, 28, 33, 34 and 35 as well as in Township 13 South (T 13S), Range 11 East (R 11E), Sections 2 and 3. Additionally, Division staff contacted the Division of Water Rights (DWRi) in order to obtain the most accurate locations available of the water rights held by the Barker family.

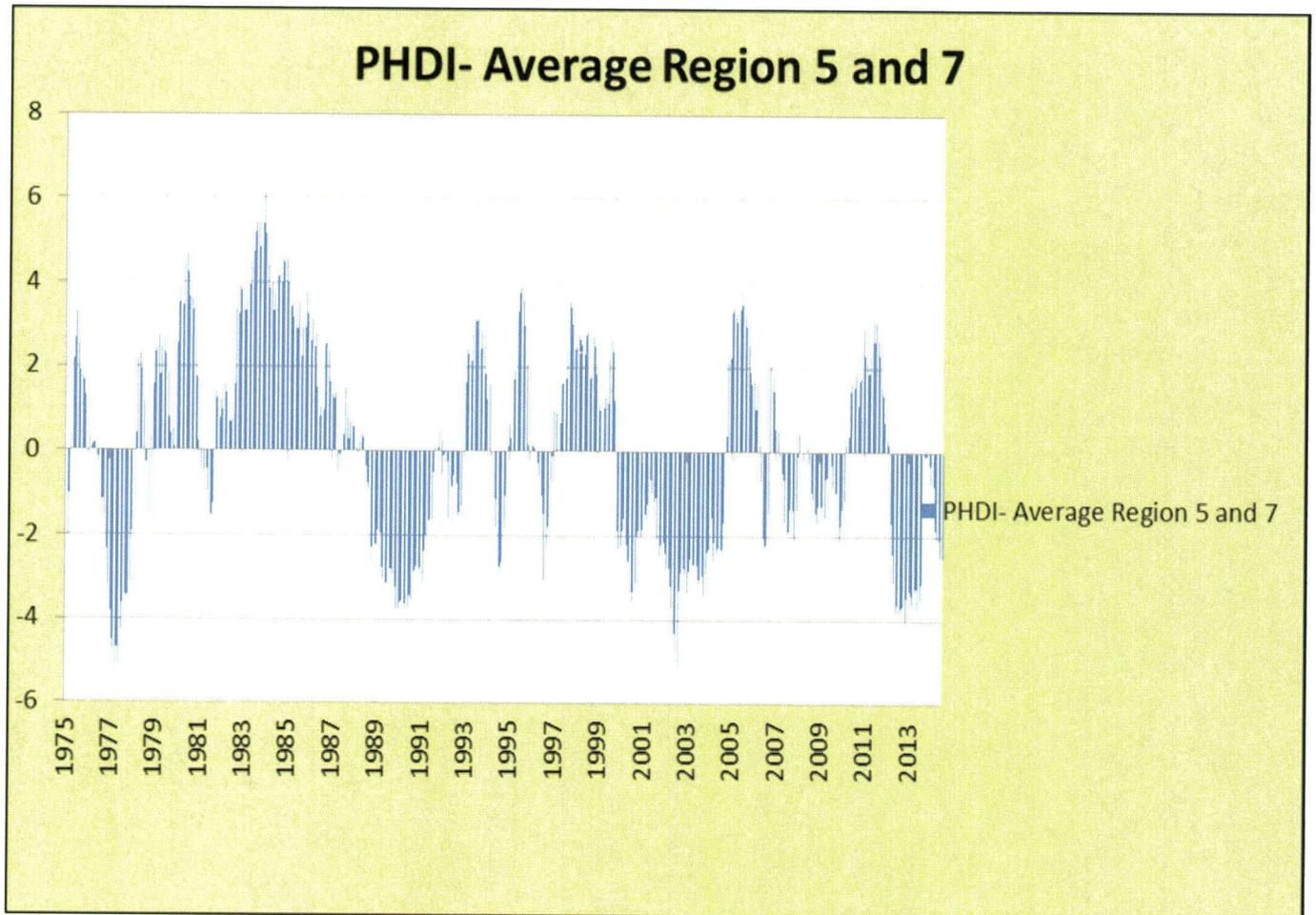
The data obtained from DWRi has been provided (See attached *Location Map, Water Rights*). The map shows the Barker family water rights as well as the land parcels owned by the Barker family. The map also shows the mine workings for both the Centennial Mine and the Soldier Canyon Mine (outlined in blue). The extent of these depicted mine workings have been verified as accurate based on information obtained from the Centennial and Soldier Canyon Mine engineers. The mine workings for the Soldier Canyon Mine and Centennial Mine have been included.

Climate Setting

The Centennial and Soldier Canyon Mines are located in the northwestern portion of the Price River basin in eastern Utah. The basin is almost completely surrounded by mountains. The mountains act as a barrier to storms approaching from every direction except the south. As a result, clear days predominate with average annual precipitation values ranging from between approximately 10-20 inches. The climate is generally dry. Snowfall during the winter months is generally light, particularly at lower elevations. However; historical records have noted years where accumulated snowfall has exceeded 100 inches. The precipitation in the area is largely controlled by elevation and can result in wide variations from the portal areas to the upper reaches of area watersheds. Variation from 5” to 20” is not uncommon in this area. The principal rainfall events occur in the late summer months when the area is receives moisture-laden air masses from the Gulf of Mexico.

The climatic conditions in the vicinity of the Centennial and Soldier Canyon mines have varied fairly dramatically in recent decades. The variation is illustrated in a plot of the Palmer Hydrologic Drought Index (PHDI) for the area. The PHDI is a monthly value generated by the National Climatic Data Center that indicates relative wet and dry periods for a given region. The PHDI takes into account several hydrologic measurements including precipitation, temperature, evapotranspiration, soil water recharge, soil water loss and runoff. It is a useful tool in looking at the relationships between climate and ground and surface water data. A chart of the PHDI values for the area of the Centennial and Soldier Canyon Mines has been provided (See Figure 1 below). Upon review of Figure 1, it's evident that the region has experienced alternating periods of good water years and drought conditions. Notable wet years occurred during 1983-1984, 1997-1998, 2004-2005 and 2011. Notable drought conditions were encountered in 1977-1978, 1988-1993, 2000-2004 and 2012 to the present. Normal moisture conditions (between -1 and 1 on the PHDI index) for the area are relatively infrequent. The relative wet/dry periods have been rather extreme in recent decades. The chart shows that the last years for the region have experienced “extreme drought” conditions.

Figure 1



-1 to -2 Mild Drought
-2 to -3 Moderate Drought
-3 to -4 Severe Drought
-4 to -5 Extreme Drought

1 to 2 Mild Wet Spell
2 to 3 Moderate Wet Spell
3 to 4 Severe Wet Spell
4 to 5 Extreme Wet Spell

Coal Creek Watershed

The Coal Creek Watershed is part of the Price River Basin drainage. Coal Creek originates in the upland areas above the mine sites and drains an area of approximately 25 square miles. Historical stream data obtained from the United States Geological Survey from October 1979 to 1981 (Site No. S37.7, 09313975) recorded a maximum discharge of 75 cubic feet per second (cfs) during the peak of the spring runoff and over 100 cfs during summer thunderstorm events. The low flow measured during this period (which was significantly wetter than normal. See Figure 1 PHDI) was approximately 0.25 cfs. During periods of drought, Coal Creek has been observed to be completely dry. The historic data shows that the Coal Creek watershed is characterized by significant variations in flow from the spring snowmelt period (spring to early summer) to low/base-flow conditions (late summer/early fall).

Field Visit of Property

On May 15th, 2014 Division staff (Steve Christensen and Daron Haddock) conducted a field visit of the Barker property. Mr. Dorrell Barker and Verdis Barker were present. During the field visit, the Barkers showed several locations of concern. The first location was Hoffman Creek. Although the Barkers do not have water rights on this specific drainage, Mr. Dorrell Barker indicated that historically the drainage produced considerably more water, but had become increasingly drier over time. It should be noted that Hoffman Creek is tributary to Coal Creek where the Barkers do hold point-to-point water rights.

A stop at a spring location that Mr. Dorrell Barker indicated was 91-1372 was conducted. According to the DWRi, water right 91-1372 is a stock-watering point to point water right on Coal Creek. The location of this point is approximately 1.4 miles north of the nearest mining activity conducted by the Centennial Mine in the Clearwater drainage. Other spring locations were visited adjacent to Coal Creek towards the Barker family ranch house and beyond. For reference purposes, the Barker family ranch house is approximately 2 miles from the western extent of mining activity in the Soldier Canyon Mine and approximately 1.7 miles from the eastern most extent of mining at the Centennial Canyon Mine. These distances are noteworthy in that a number of the water rights provided by the Barker family in the February 3rd letter are located further north of the ranch house (approximately 2-3 miles away from the nearest mining activity).

Evidence of surface impacts due to subsidence (e.g. cracks, fracturing, depressions) were not noted during the field visit.

Mining/Subsidence Discussion

The following is a discussion of the mining that has occurred at the Centennial and Soldier Canyon Mines: the type of mining, the coal seam mined, the subsidence produced/measured and the location of this mining activity relative to the Barker property. Division staff contacted mining engineers for both the Centennial and Soldier Canyon Mines in order to obtain the most accurate, professionally surveyed information that shows the location of mining at each facility. (See provided mine maps)

Additionally, a Division mining engineer evaluated the subsidence monitoring data provided by the Centennial and Soldier Canyon Mines (See attached).

Soldier Canyon Mine

The closest coal mining activity the Soldier Canyon Mine conducted to the Barker family property/water rights was in Section 2 of T 13S, R 11E. The mining occurred in the Rock Canyon coal seam. Production in the Rock Canyon seam ended in 1998. According to Division records and verbal confirmation from Soldier Canyon Mine engineering staff, first mining only was conducted in Section 2 of T 13S, R 11E. Long wall/second mining was not conducted in the area closest to the Barker family property/water rights. Upon review of the mine workings map provided by the Soldier Canyon Mine, mining activity came within approximately 0.4 miles from the un-named tributary located in T 12S, R 11E Section 35. Mining activity occurred within just over 1 mile away from the main channel of Coal Creek. Based on data within the approved Mining and Reclamation Plan (MRP) for the Soldier Canyon Mine, the overburden in this area was approximately 1,500'-1,750'.

Upon review of the subsidence data provided by the Soldier Canyon Mine, the maximum subsidence observed over the period analyzed was 1.74'. This amount of subsidence is considered minimal. With no additional mining planned for the western portion of the Soldier Canyon Mine, additional subsidence would not be anticipated. Additionally, given the relatively large amount of overburden in the area, it's very unlikely that subsidence cracks or sumps (that could impact ground and surface water) would form at the surface, particularly given that only first mining was conducted in this area. Based on the field visit by Division staff, discussions with the mine operator and the Barker family, no evidence of surface cracks or sumps have been observed.

Centennial Mine

The closest coal mining activity the Centennial Mine conducted to the Barker family property/water rights occurred in Section 4 and 9 of T 13S, R 11E. The mining that occurred in this area was conducted in the Gilson coal seam as part of the Pinnacle Mine. Mining occurred in this area between the years of 1989 and 1995. Based on data within the approved MRP, the overburden in this area ranged from approximately 600' to 1,200'. Upon review of the mine plan for the Gilson seam, mining activity came within approximately 0.63 miles from the Coal Creek drainage. The other area where mining was conducted in close proximity to Barker property was the area of the un-named tributary to Coal Creek in Sections 33 and 34 of T 12S, R 11E (approximately 0.34 miles from the development mining and 0.44 miles from the panel that was mined in that area).

As with Soldier Canyon, a Division mine engineer reviewed the subsidence data provided by the Centennial Mine. Based on that data, the maximum subsidence observed over a 10-year period of data was 0.5 feet. This amount of subsidence is very low. With no additional mining planned for this area, it's unlikely that further subsidence will occur. Unlike Soldier Canyon, there are areas where the overburden is considerably less (approximately 600 feet). In areas with thinner overburden, it follows that subsidence cracks or sumps would be evident at the surface. Based on the field visit by Division staff, discussions with the mine operator and the Barker family, no evidence of surface cracks or sumps have been observed.

Geology/Hydrology Discussion

Upon review of the geologic data provided in the Centennial and Soldier Canyon MRP's, six bedrock formations outcrop in the area. In descending order (i.e. from the surface down) they are: the Flagstaff Limestone, North Horn formation, Price River Formation, Castlegate Sandstone, Blackhawk Formation and the Mancos Shale. The springs located in the area of the Soldier Canyon Mine, Centennial Mine and the Barker property are predominantly found in the Flagstaff /North Horn Formation and the Price River Formation. These geologic units are the primary surficial/cap rock geologic units found in this area. Exhibit 6.22-7, Geology Map, from the Soldier Canyon Mine MRP depicts the surface geology in the Coal Creek/Clearwater Creek area.

The flow characteristics of the springs from these formations have been well documented. Flow from these springs show pronounced responses to season and climate; indicating relatively short flow paths and recharge from snowmelt. It's common for springs that discharge from the Flagstaff, North Horn Formation and Price River formations to cease flowing in late summer early fall, particularly during dry, drought periods.

As the springs in the area of the Centennial Mine, Soldier Canyon Mine and the Barker family property discharge from the top of the geologic strata, the overburdens outlined above are important to keep in mind. Given the volume of overlying material between the mine workings and overlying springs in the Flagstaff, North Horn formations and Price River formation (i.e. 600-1,750'), the potential for mining induced subsidence to reach to these discharge locations is minimal for springs located directly above the mining. In the case of the Barker property, the nearest springs that could potentially be impacted by mining activity are approximately ½ - 1 mile away from the Centennial and Soldier Canyon mine workings.

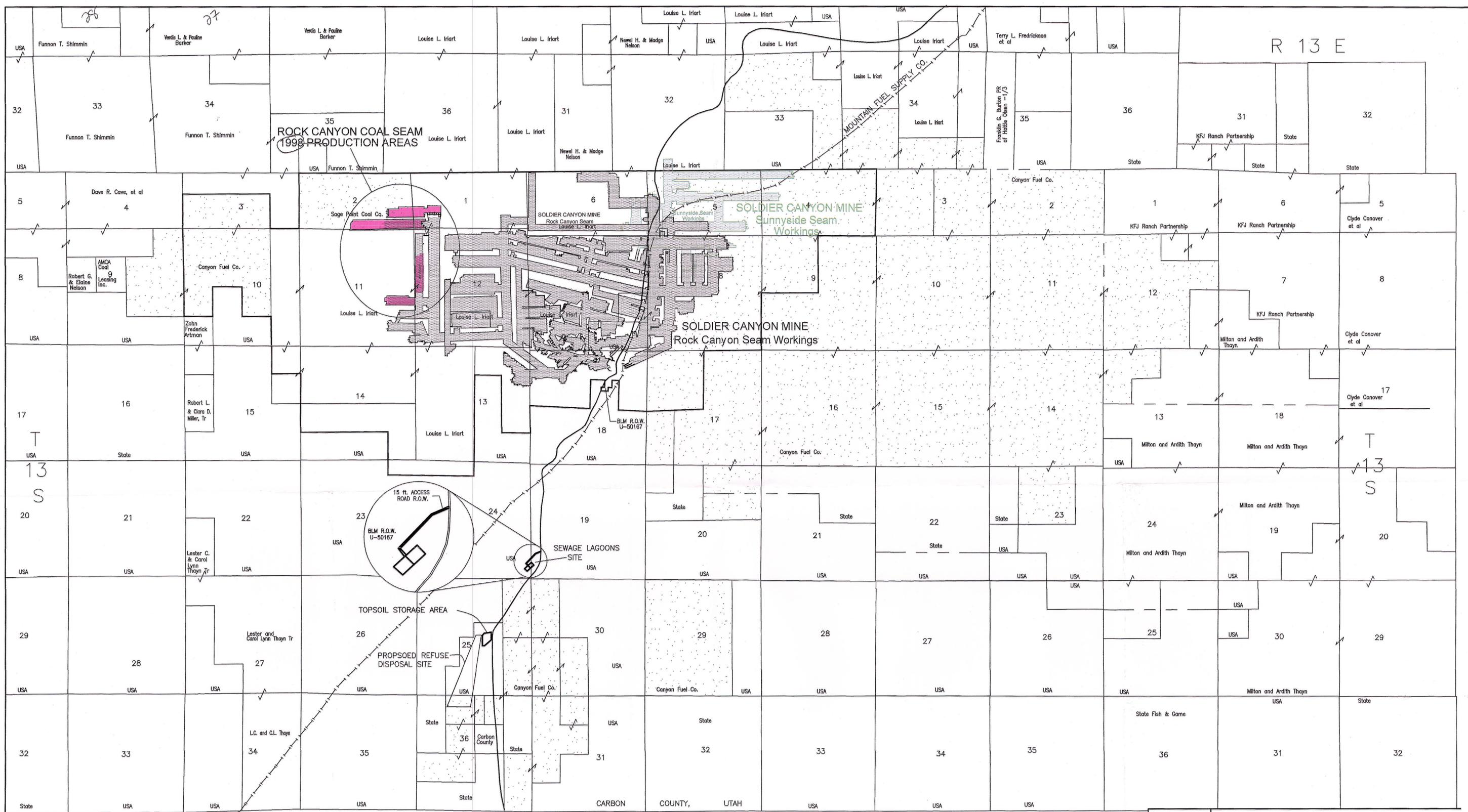
Numerous geologic investigations have been undertaken for the Centennial and Soldier Canyon Mines. Upon reviewing the geologic data that has been obtained, no appreciable faults/fractures have been identified within the Centennial and Soldier Canyon Mine areas (including the Barker family property). If the area had appreciable faulting, it's possible that subsidence related fracturing could intercept area faults and thus provide a vertical hydraulic connection between the mine works and overlying springs. However; this is not the case here. Typically when subsidence causes impacts to surface springs and streams in the Utah coal fields; fractures and cracks at the land surface have been readily apparent. Evidence of such cracks/fractures at the surface were not observed during the field visit and have not been observed by mine personnel.

A review of area springs and streams located directly above the Centennial and Soldier Canyon Mines were reviewed. Significant drops in discharge rates that could be correlated with the type and timing of mining in those areas was not evident.

Summary:

Based on the aforementioned discussion, at this time the Division does not find evidence of coal mining related impacts to the Barker family water rights located in the vicinity of the Centennial and Soldier Canyon Mines. This finding is based upon the following:

- 1) No evidence of surface cracking, slumping or deformations as a result of subsidence were noted during the field visit, or have been reported.
- 2) Minimal subsidence/movement of the surface directly overlying the mine workings for both the Centennial and Soldier Canyon Mines.
- 3) The distance between the mined areas for the Centennial and Soldier Canyon Mines relative to the Barker family property and water rights is outside the potentially affected area as a result of mining activity. The closest Barker water rights to mining activity for both the Centennial and Soldier Canyon mines are ½ to 1 mile away
- 4) Discharge rates for springs and streams located directly above long-wall sections of the Centennial and Soldier Canyon Mines have not shown changes in flow values that can be correlated with the type and timing of mining in those areas.
- 5) Based on review of the Palmer Hydrologic Drought Index for the area, extreme drought periods have been far more persistent and longer in duration than moderate wet years. In light of that, the ground water systems (i.e. springs) on the Barker family property have not had sufficiently long wet durations to recharge. The last three years 2012-2014 have experienced “extreme drought” conditions.

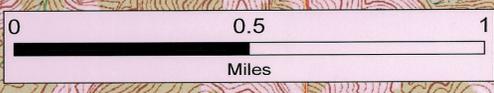
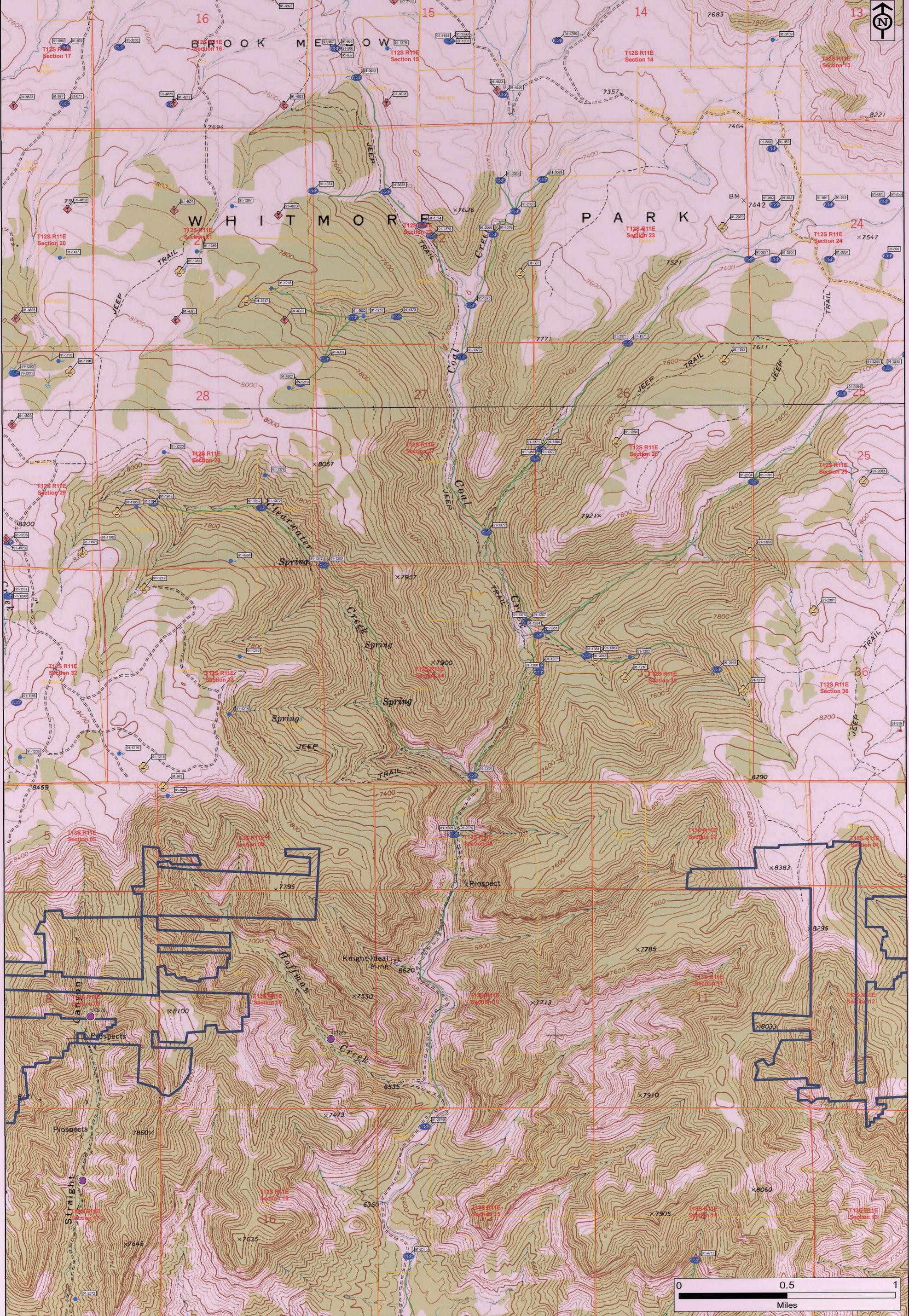


LEGEND:

- SOLDIER CANYON MINE FIVE-YEAR TERM PERMIT AREAS
- CANYON FUEL CO. - SURFACE OWNERSHIP

REVISION		Canyon Fuel Company LLC	
DATE:	BY:		
8/21/96	DDH		
2/11/97	DDH		
12/11/02	JLS		
		SURFACE OWNERSHIP MAP	
		Soldier Canyon Mine	
DRAWN BY:	DDH	DATE:	MAY 27, 1996
APPROVED BY:		SCALE:	1" = 2000'
		DRAWING OR MAP NUMBER:	EXHIBIT 1.12-1

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Legend

Coal Water Monitoring Location	Rediversion	Dorrell-Barker Point-to-Point
Abandoned Well	Return	Mine Works
Drain	Spring	Parcel Boundary
Point to Point	Surface	PLSS Section Boundary
Pond	Underground	

**Pine Creek Headwaters
Preliminary Jurisdictional Assessment**

	Date: August 25 2014	
	Scale: 1 Inch = 1,000 Feet	
	Author: RF GISP	

SOURCES | Imagery: AGRC Topographic 2014 | Topographic Quadrangles Shown: COORDINATE SYSTEM | UTM NAD 1983 Zone 12 North



LOCATION MAP
Water Rights

Centennial (Tower) – Soldier Canyon Subsidence Analysis

July, 2014

Centennial / Tower

Tower Resources uses GPS trilateration as a data collection method for subsidence analysis. Subsidence information for the eastern area of the Tower mine is available from 2003-2013. New points were established on the West side in 2007, and raw data is available for that area from 2007 to 2013. For the east side, 3 stationary control points were used to establish a baseline reference point. For analysis purposes, seven points were selected in the eastern section, which have been consistently monitored for a period of 10+ years. The station names, along with elevation information from 2003 and 2013 are included in the table below.

Station	2003 Elev	2013 Elev	Diff
S16	8809.53	8809.69	0.16
S17	8624.48	8624.44	-0.04
99-1	8572.35	8572.12	-0.23
99-2	8551.12	8550.99	-0.13
S20	8574.26	8573.8	-0.46
S21	8489.9	8489.42	-0.48
S32	8548.93	8548.8	-0.13

As can be seen from the data above, the maximum subsidence observed over the ten year period was less than 0.5 feet. This amount of subsidence is within the expected range based on the approved MRP. The data also shows one site (S16) demonstrating upheaval. This may be due to the expected ranges of the margin of error for the type of subsidence monitoring used. The raw subsidence data for the Centennial Tower mine for both East and West sides is attached to this report. There has been minimal subsidence observed for this site. If there is no additional mining, there will not likely be further subsidence for these areas, based on the data provided by the mine. The overburden above mined out areas is shallower than surrounding areas (600+ feet), therefore subsidence cracks or sumps would manifest themselves clearly on the surface if they are present.

Soldier Canyon

Canyon Fuel Company used standard trigonometric surveying techniques (total station) as a data collection method for subsidence analysis. This method provides the least amount of data and requires the most work, but is also the most cost-effective. The most recently provided subsidence information was submitted to the Division in 2000. Each time updated subsidence data was provided, it was compared to the original elevations that were measured when the station was established. Data was also provided for changes in the easting and northing measurements for the monitoring stations. In 2000, only 3 points were monitored, while there were 7 points monitored in 1999. As many as 17 points were monitored in 1993. For analysis purposes, seven points were selected which have been consistently monitored for a period from 3 to 20 years. The station names, along with elevation information are included in the table below.

Station	Initial Elev	Year	1999 Elev	2000 Elev	Diff
112	7691.43	1980	7691.74		0.31
113	7755.71	1980	7755.1	7755.08	-0.63
921	7816.7	1992	7816.42	7816.46	-0.24
931	7734.21	1993	7732.68	7732.47	-1.74
932	7739.36	1993	7739.47		0.11
974	7705.47	1997	7705.36		-0.11
975	8003.01	1997	8002.97		-0.04

As can be seen from the data above, the maximum subsidence observed over the period analyzed was 1.74 feet. This amount of subsidence is within the expected range based on the approved MRP. The data also shows one site (112) demonstrating upheaval. This may be due to the expected ranges of the margin of error for the type of subsidence monitoring used. The raw subsidence data for the Soldier Canyon mine is attached to this report. There has been minimal subsidence observed for this site. If there is no additional mining, there will not likely be further subsidence for these areas, based on the data provided by the mine. The average overburden above mined out areas is fairly deep (+1100 feet), therefore subsidence cracks or sumps are less likely to manifest on the surface.

Summary

The data provided by the operators of the Centennial and Solder Canyon mines shows subsidence to be minimal. The maximum subsidence possible is equal to the height the mined coal seam, and neither mine has reported subsidence anywhere near that range. The majority of subsidence is likely to occur within 6 months to a year after mining, and neither mine has been operating within that timeframe, so while additional subsidence is possible, the Division does not expect to see any *significant* additional subsidence in these areas. See the attached documents to reference raw subsidence data.

Raw Subsidence Data Used for Analysis

TOWER RESOURCES, INC.
2013 RTK GPS SURVEY

11/20/2013

STATION	NORTHING (FEET)	EASTING (FEET)	2003 ELEVATION	2004 ELEVATION	2005 ELEVATION	2006 ELEVATION	2007 ELEVATION	2008 ELEVATION	2009 ELEVATION	2010 ELEVATION	2011 ELEVATION	2012 ELEVATION	2013 ELEVATION	NOTES
Rebar on ridge	505,141.02	2,217,281.07	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	8,241.62	CONTROL
Yellow Rebar	507,073.59	2,223,128.18	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	8,534.90	CONTROL
S-10	507,824.28	2,217,196.61	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	8,594.59	CONTROL
S16	508,650.48	2,210,725.70	8,809.53	8,809.58	8,809.66	8,809.64	8,809.64	8,809.75	8,809.71	8,809.72	8,809.70	8,809.68	8,809.69	---
S17	508,190.63	2,213,802.51	8,624.48	8,624.50	8,624.51	8,624.46	8,624.43	8,624.43	8,624.44	8,624.43	8,624.45	8,624.46	8,624.44	---
99-1	508,942.12	2,215,063.90	8,572.35	8,572.32	8,572.26	8,572.17	8,572.13	8,572.14	8,572.12	8,572.14	8,572.13	8,572.13	8,572.12	---
99-2	509,023.29	2,218,624.20	8,551.12	8,551.01	8,551.03	8,550.95	8,551.01	8,550.98	8,550.96	8,551.00	8,550.98	8,550.97	8,550.99	---
S20	510,331.29	2,217,642.56	8,574.26	8,574.07	8,574.07	8,573.90	8,573.87	8,573.78	8,573.77	8,573.78	8,573.82	8,573.79	8,573.80	---
S21	510,581.75	2,214,956.87	8,489.90	8,490.02	8,489.80	8,489.37	8,489.22	8,489.35	8,489.39	8,489.48	8,489.45	8,489.41	8,489.42	---
S32	509,739.02	2,218,933.12	8,548.93	8,548.88	8,548.85	8,548.78	8,548.80	8,548.81	8,548.79	8,548.77	8,548.80	8,548.81	8,548.80	---
G 17	513,692.46	2,210,938.01	---	---	---	---	8,488.24	8,488.23	8,488.22	8,488.24	8,488.25	8,488.23	8,488.23	---
G-12	513,184.13	2,216,526.83	---	---	---	---	8,311.00	8,311.02	8,311.00	8,311.01	8,311.02	8,311.03	8,311.01	---
E1/4 36	513,118.57	2,214,340.00	---	---	---	---	8,280.66	8,280.65	8,280.61	8,280.61	8,280.64	8,280.60	8,280.62	Section cor.
S1/4 36	510,454.70	2,211,696.79	---	---	---	---	8,606.46	8,606.43	8,606.44	8,606.43	8,606.43	8,606.43	8,606.44	Section cor
West Side Subeidence Line, Set In 2007														
1	509,702.03	2,211,401.87	---	---	---	---	8,702.64	8,702.59	8,702.60	8,702.61	8,702.62	8,702.63	8,702.61	W side line
2	509,802.00	2,211,401.17	---	---	---	---	8,693.70	8,693.69	8,693.69	8,693.69	8,693.67	8,693.68	8,693.70	W side line
3	509,905.87	2,211,391.89	---	---	---	---	8,684.35	8,684.35	8,684.36	8,684.34	8,684.35	8,684.37	8,684.37	W side line
4	510,003.89	2,211,387.55	---	---	---	---	8,673.73	8,673.77	8,673.77	8,673.75	8,673.75	8,673.78	8,673.75	W side line
5	510,100.53	2,211,381.55	---	---	---	---	8,663.92	8,663.94	8,663.94	8,663.92	8,663.94	8,663.92	8,663.91	W side line
6	510,205.72	2,211,424.42	---	---	---	---	8,646.43	8,646.50	8,646.49	8,646.51	8,646.53	8,646.54	8,646.52	W side line
7	510,305.04	2,211,417.01	---	---	---	---	8,635.74	8,635.70	8,635.68	8,635.70	8,635.69	8,635.70	8,635.72	W side line
8	510,401.40	2,211,415.19	---	---	---	---	8,625.82	8,625.81	8,625.80	8,625.81	8,625.80	8,625.83	8,625.81	W side line
9	510,505.68	2,211,402.20	---	---	---	---	8,614.38	8,614.39	8,614.39	8,614.38	8,614.38	8,614.39	8,614.37	W side line
10	510,608.91	2,211,401.63	---	---	---	---	8,603.45	8,603.45	8,603.46	8,603.45	8,603.47	8,603.46	8,603.47	W side line
11	510,709.16	2,211,393.00	---	---	---	---	8,596.31	8,596.29	8,596.29	8,596.30	8,596.28	8,596.30	8,596.30	W side line
12	510,798.94	2,211,380.99	---	---	---	---	8,588.76	8,588.74	8,588.72	8,588.72	8,588.75	8,588.73	8,588.74	W side line
13	510,898.92	2,211,375.38	---	---	---	---	8,576.09	8,576.10	8,576.09	8,576.09	8,576.11	8,576.09	8,576.12	W side line
14	511,010.59	2,211,370.03	---	---	---	---	8,561.49	8,561.50	8,561.47	8,561.49	8,561.47	8,561.48	8,561.50	W side line
15	511,112.19	2,211,366.93	---	---	---	---	8,548.90	8,548.83	8,548.81	8,548.81	8,548.82	8,548.80	8,548.83	W side line
16	511,228.34	2,211,359.45	---	---	---	---	8,543.69	8,543.65	8,543.61	8,543.63	8,543.63	8,543.63	8,543.62	W side line
17	511,338.04	2,211,366.01	---	---	---	---	8,542.64	8,542.59	8,542.57	8,542.60	8,542.59	8,542.58	8,542.57	W side line
18	511,437.15	2,211,396.56	---	---	---	---	8,535.12	8,535.08	8,535.06	8,535.10	8,535.08	8,535.09	8,535.07	W side line
19	511,563.98	2,211,419.93	---	---	---	---	8,526.12	8,526.05	8,526.02	8,526.04	8,526.05	8,526.03	8,526.06	W side line
20	511,693.22	2,211,455.79	---	---	---	---	8,517.15	8,517.08	8,517.07	8,517.06	8,517.11	8,517.12	8,517.10	W side line
21	511,807.12	2,211,469.85	---	---	---	---	8,512.56	8,512.50	8,512.49	8,512.47	8,512.52	8,512.50	8,512.50	W side line
22	511,915.39	2,211,478.19	---	---	---	---	8,510.95	8,510.89	8,510.90	8,510.87	8,510.90	8,510.91	8,510.89	W side line
23	512,092.42	2,211,408.58	---	---	---	---	8,505.00	8,504.98	8,504.98	8,504.93	8,504.95	8,504.98	8,504.95	W side line
24	512,192.21	2,211,384.74	---	---	---	---	8,495.80	8,495.72	8,495.71	8,495.71	8,495.73	8,495.71	8,495.72	W side line
25	512,292.93	2,211,375.13	---	---	---	---	8,483.93	8,483.94	8,483.94	8,483.94	8,483.92	8,483.92	8,483.95	W side line
26	512,408.97	2,211,358.60	---	---	---	---	8,471.08	8,471.04	8,471.05	8,471.04	8,471.06	8,471.07	8,471.05	W side line
27	512,515.37	2,211,308.35	---	---	---	---	8,462.95	8,462.90	8,462.89	8,462.91	8,462.92	8,462.90	8,462.91	W side line
28	512,650.10	2,211,333.27	---	---	---	---	8,449.75	8,449.72	8,449.72	8,449.73	8,448.73	8,449.74	8,449.72	W side line
29	512,873.07	2,211,295.54	---	---	---	---	8,430.09	8,430.05	8,430.03	8,430.06	8,430.04	8,430.04	8,430.06	W side line
30	512,993.25	2,211,287.69	---	---	---	---	8,428.71	8,428.68	8,428.69	8,428.74	8,428.76	8,428.75	8,428.71	W side line
31	513,091.16	2,211,285.96	---	---	---	---	8,427.18	8,427.16	8,427.15	8,427.18	8,427.20	8,427.20	8,427.19	W side line
32	513,217.13	2,211,297.36	---	---	---	---	8,423.25	8,423.21	8,423.20	8,423.24	8,423.23	8,423.21	8,423.22	W side line
33	513,353.03	2,211,313.87	---	---	---	---	8,425.43	8,425.38	8,425.38	8,425.40	8,425.39	8,425.40	8,425.41	W side line
34	513,491.93	2,211,317.92	---	---	---	---	8,407.84	8,407.78	8,407.79	8,407.80	8,407.79	8,407.79	8,407.78	W side line
35	513,607.49	2,211,335.06	---	---	---	---	8,406.22	8,406.17	8,406.17	8,406.18	8,406.18	8,406.16	8,406.16	W side line
36	513,719.38	2,211,366.06	---	---	---	---	8,403.71	8,403.69	8,403.66	8,403.69	8,403.66	8,403.68	8,403.69	W side line
37	513,810.83	2,211,402.93	---	---	---	---	8,400.29	8,400.24	8,400.26	8,400.26	8,400.25	8,400.27	8,400.30	W side line
38	513,932.97	2,211,450.36	---	---	---	---	8,396.17	8,396.14	8,396.14	8,396.15	8,396.13	8,396.15	8,396.14	W side line
39	514,038.94	2,211,482.97	---	---	---	---	8,394.29	8,394.25	8,394.24	8,394.26	8,394.25	8,394.25	8,394.26	W side line



CANYON FUEL COMPANY
Soldier Canyon Mine
2000 Subsidence Monitoring Survey

Point #	Description	Year est.	1999		2000		Original Elevation	2000 Elevation	Differences		delta Elev (2000-Original)
			Northing	Easting	Northing	Easting			delta North	delta East	
112	112-SS	1980							0.00	0.00	0.00
113	113-SS	1980	102,786.99	44,217.07	102,786.98	44,216.93	7,755.71	7,755.08	0.01	0.14	-0.63
921	92-1SS	1992	103,218.02	43,526.49	103,218.00	43,526.37	7,816.70	7,816.46	0.01	0.11	-0.24
931	93-1SS	1993	101,961.91	44,207.35	101,961.91	44,207.25	7,734.21	7,732.47	0.00	0.10	-1.74
932	93-2SS	1993							0.00	0.00	0.00
974	97-4	1997							0.00	0.00	0.00
975	97-5	1997							0.00	0.00	0.00

NOTES

- Visual checks for subsidence were made during this survey and evidence of subsidence was not detected.
- All subsidence points were surveyed October 17, 2000
- This ground survey was done using standard trigonometric surveying techniques with:
 - Sokkisha Set 5-total station
 - Lietz SDR22-data collector
- Note: Differences in elevation can be attributed to the accuracy of the vertical angle - 5" and the distance between the survey instrument and point surveyed, approx. 2,400 to 3,000 ft.
- No subsidence was detected to cause any mitigative action.
- No changes have been done to the monitoring plan due to economic conditions or technical advancements in subsidence monitoring.
- Points with no data were not surveyed. Previous data indicated no change in elevation.

CANYON FUEL COMPANY

Soldier Canyon Mine 1999 Subsidence Monitoring Survey

Point #	Description	Year est.	1998		1999		Original Elevation	1999 Elevation	Differences		delta Elev (1998-Original)
			Northing	Easting	Northing	Easting			delta North	delta East	
112	112-SS	1980	100,663.72	44,629.75	100,663.64	44,629.65	7,691.43	7,691.74	0.09	0.10	0.31
113	113-SS	1980	102,787.48	44,217.03	102,786.99	44,217.07	7,755.71	7,755.10	0.49	-0.04	-0.61
921	92-1SS	1992	103,218.20	43,526.54	103,218.02	43,526.49	7,816.70	7,816.42	0.18	0.06	-0.28
931	93-1SS	1993	101,962.11	44,207.43	101,961.91	44,207.35	7,734.21	7,732.68	0.20	0.08	-1.53
932	93-2SS	1993	101,119.78	44,511.96	101,119.59	44,511.97	7,739.36	7,739.47	0.18	-0.01	0.11
974	97-4	1997	103,381.66	41,918.24	103,381.51	41,918.39	7,705.47	7,705.36	0.14	-0.14	-0.11
975	97-5	1997	103,648.60	41,370.94	103,648.48	41,370.91	8,003.01	8,002.97	0.11	0.02	-0.04

NOTES

- Visual checks for subsidence were made during this survey and evidence of subsidence was not detected.
- All subsidence points were surveyed July 9, 1999
- This ground survey was done using standard trigonometric surveying techniques with:
 - Sokkisha Set 3-total station
 - Lietz SDR22-data collector
- No subsidence was detected to cause any mitigative action.
- No changes have been done to the monitoring plan due to economic conditions or technical advancements in subsidence monitoring.

**SOLDIER CRE... COAL COMPANY
1993 SUBSIDENCE MONITORING SURVEY**

POINT NO.	NORTHING	EASTING	ELEVATION	COMMENTS
53 SS	105,669.434	44,483.229	8142.40	
91-1SS	104,848.515	44,564.932	7840.74	
92-1SS	103,218.282	43,526.100	7816.47	
113-SS	102,787.432	44,216.366	7755.81	
93-1SS	101,962.333	44206.549	7734.21	NEW POINT SET THIS YEAR
93-2SS	101,119.877	44,511.320	7739.36	NEW POINT SET THIS YEAR
112-SS	100,663.936	44,629.354	7691.60	OLD POINT RESURVEYED FOR SUBSIDENCE MONITORING
92-3SS	106,594.026	52,863.738	6989.61	NEW POINT SET TO REPLACE POINT 101 WHICH WAS DESTROYED BY CONSTRUCTION @ MOUTH PINE CANYON
15-SS	99,262.812	51,474.549	6877.07	
87-0SS	100,460.512	51,558.323	6776.04	
87-1SS	101,584.967	52,049.836	6873.91	
106-SS	102,618.016	52,214.516	6863.98	
3044	103,268.112	52,399.694	6931.14	
36-SS	104,940.686	52,460.252	6999.78	
87-47SS	102,402.718	55,047.935	7479.99	
92-2SS	103,573,887	54,788.154	7802.73	
3046	104,115.719	55,479.578	8052.31	

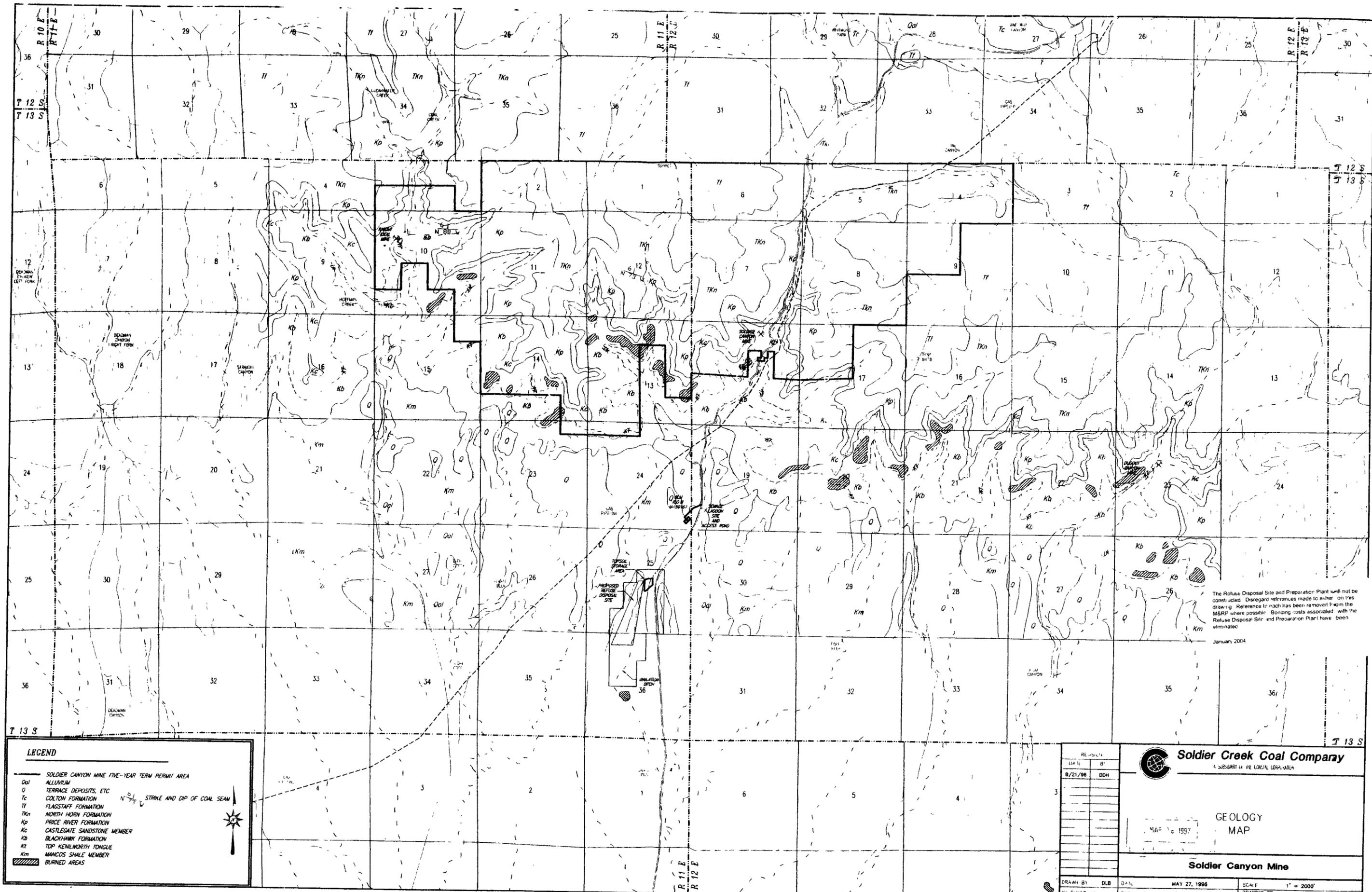
1992 SUBSIDENCE MONITORING SUMMARY

ORIGINAL ESTABLISHED CONTROL

1992 SURVEY CONTROL

<u>Station</u>	<u>Date</u>	<u>Coordinates</u>			<u>Date</u>	<u>Elevation</u>	<u>Change In Elevation</u>
	<u>Established</u>	<u>North</u>	<u>East</u>	<u>Elevation</u>	<u>Resurveyed</u>		
15 SS	1979	499,046.40	2,250,498.62	6,877.08	11-17-92	6877.06	-0.01
36 SS	1979	504,721.47	2,251,483.38	6,999.88	11-17-92	6999.79	-0.20
106 SS	1979	502,400.01	2,251,238.02	6,864.11	11-17-92	6863.99	-0.09
3044	1983	503,050.26	2,251,423.30	6,930.90	11-17-92	6931.18	-0.10
87-0 SS	1987	500,243.55	2,250,582.43	6,776.05	11-17-92	6676.04	+0.01
87-1 SS	1987	501,367.65	2,251,073.81	6,873.89	11-17-92	6873.89	-0.03
1001	10/14/89*	506,470.79	2,252,015.42	7,007.86	11-17-92	7007.50	-0.36
91-1 SS	12/17/91	504,629.65	2,243,590.99	7,841.00	11-17-92	7840.75	-.25
53 SS	12/17/91	505,450.34	2,243,510.125	8,142.59	11-17-92	8142.42	-.17
92-1SS	11/17/92	503,000.198	2,242,553.783	7,816.70			
92-2SS	11/17/92	503,355.440	2,253,811.044	7,802.96			

*Point destroyed during construction activities. Will be re-established in 1993.



The Refuse Disposal Site and Preparation Plant will not be constructed. Disregard references made to either on this drawing. Reference to each has been removed from the M&RP where possible. Bonding costs associated with the Refuse Disposal Site and Preparation Plant have been eliminated.

January 2004

LEGEND

SOLDIER CANYON MINE FIVE-YEAR TERM PERMIT AREA

- Qal ALLUVIUM
- O TERRACE DEPOSITS, ETC
- Tc COLTON FORMATION
- Tf FLAGSTAFF FORMATION
- Tkn NORTH HORN FORMATION
- Kp PRICE RIVER FORMATION
- Kc CASTLEGATE SANDSTONE MEMBER
- Kb BLACKHAWK FORMATION
- Kt TOP KENILWORTH TONGUE
- Km MANCOS SHALE MEMBER
- /// BURNED AREAS

STRIKE AND DIP OF COAL SEAM

REVISIONS		Soldier Creek Coal Company <small>A SUBSIDIARY OF THE LOUISIANA LUMBER COMPANY</small>
DATE	BY	
8/21/96	DDH	GEOLOGY MAP MAP No. 1997
Soldier Canyon Mine		
DRAWN BY	DATE	SCALE
DLB	MAY 27, 1996	1" = 2000'
APPROVED BY	FILE NAME	DRAWING OR MAP NUMBER
	I:\PERMIT\0414.DWG	6.22 - 7