

Cheyenne, Wyoming.
January 28, 1921.

Hon. Robert D. Carey,
Governor of Wyoming,
Capitol Building,
Cheyenne, Wyoming.

Dear Governor:

Complying with your request I proceeded to Lovell, January 24th, and examined the Byron gas field and investigated the conditions in Lovell and Cowley relative to the use of the gas from this field on January 25th and 26th. In my examination of the field I took pains to be accurate and thorough, having previously tested my instruments. This examination consisted of taking the pressure of each well in the field that is being used to supply gas for the industrial plants of Lovell, Cowley, and Graybull. The pressure readings were taken after the wells were shut in, so that the highest readings could be taken. In one case the well had been shut in for three days and in another case the well had been shut in practically the entire period of its lifetime. I also obtained open flow measurements of two representative wells in the field, one of them being the largest well owned by the Lovell Gas & Electric Company and the other being the largest well owned by the Occidental Oil & Gas Company in this field. By largest well I mean the one having the greatest open flow capacity. It does not necessarily follow that the well having the highest pressure has the largest open flow capacity. It depends somewhat on the condition of the well and of the sand and depends mostly on which sand the well is drawing from. In the Byron field there are in reality three sands furnishing gas and also a so-called shale well which is not in any of the sands. For simplicity I will designate the sands as follows:

the first, or shallow, sand is a thin sand in the formation, having in one well the same pressure as the big sand, but a very small capacity.

The second, or big, sand, which may be designated as the Byron sand, furnishes by far the largest portion of gas from this field and is the sand upon which the users have to depend to a great extent for their future gas supply. This sand had a pressure of close to a thousand pounds per square inch when it was first opened up and it is reported that the first well from this sand flowed for over a year wasting probably 100 million cubic feet per day. It is a thick sand, loosely cemented, in which the gas easily flows from one well to another, thus making the pressure practically constant in every well. In the following table of pressures the wells that are not in this sand are noted.

The third, or deep, sand has also a high pressure, but is a small capacity sand. In other words, the Old Colony well, which is in this sand, has a pressure of 145 pounds, but a capacity of only about a million cubic feet per day.

With the exception of about 2,000,000 feet per day, which comes from the Old Colony well of the Ohio Oil Company, the shallow well of the Lovell Gas & Electric Company, and the shale well of the Occidental Gas Company, practically all of the gas in the Byron field comes from the second, or Byron, sand. For a while the Allen well produced a large quantity of gas from the third sand, but it is not producing now to any extent. Thus, it is this sand which requires the most careful consideration in prophesying the future of the Byron field. No doubt there are still deeper sands in this field as yet unexplored and probably they will contain gas, but as to how much gas could be obtained and as to many other practical problems involved, no one could safely venture an estimate at this time. The tables following speak for themselves and need no further comment.

Gas Pressures in Byron Field, January 25, 1921.

	Pressure in lbs. <u>per sq. in.</u>	
Lovell Gas & Electric Co. Well No. 1	108	(Well was shut in 3 days before test.)
Lovell Gas & Electric Co. Well No. 2	105	(Well was shut in 10 minutes)
Lovell Gas & Electric Co. Well No. 3	95	(Shallow sand well)

Note.- Pipe line pressure on above wells when gas is being drawn runs about 95 lbs.

Wise & Jackson well	108	(Well has never been drawn upon.)
Occidental Oil & Gas Co. Well No. 1	105	(Well shut in 1 hr. 10 min.)
Occidental Oil & Gas Co. Govt. well	225	(Well is in fault or broken shale above sand and draws from a high pressure, low volume gas pocket)
Occidental Oil & Gas Co. Well No. 3	90	(Well shut in 5 min.)

Note.- Pipe line pressure on above wells runs about 85 lbs. when gas is being drawn.

Ohio Oil Co. Sessions well	101	(Well shut in 10 min.)
Ohio Oil Co. Old Colony well	145	(Well shut in 10 min.)

Note.-Old Colony well is in 3d or deeper sand with higher pressure and less volume or capacity.

Note.- The Occidental Oil & Gas Company has a well called the Byron-Union well in a small dome northeast of the Byron field. This well has a pressure of 220 pounds and a capacity of about 1 1/2 million cu. ft. per day. It is not being considered in connection with the possible exhaustion of the Byron field.

Gas Pressures in Byron Field Oct. 29, 1919.

Lovell Gas & Electric Well No. 1	}	198	(Line pressure)
Lovell Gas & Electric Well No. 2			
Ohio Sessions Well	}	200	(Line pressure)
Ohio Co. Old Colony well			
Occidental Oil & Gas Co. Well No. 1		167	(Line pressure)
Occidental Oil & Gas Co. Well No. 2		165	(Line pressure)

Note.- Shutting off above wells for 25 min. raised the pressure from 10 to 15 pounds.

Open Flow Capacity of Wells in Byron Field
January 25, 1921.

Lovell Gas & Electric Co. Well No. 1	14,146,000 cu. ft. per day.
Occidental Oil & Gas Co. Well No. 2	5,500,000 cu. ft. per day.

Note.- The above wells are believed to be the largest capacity wells owned by these companies in the Byron field.

It is clearly seen from the above that the pressure on the Byron sand has decreased from about 215 pounds in October, 1919, to about 106 pounds in January, 1921, or practically one-half the pressure has been lost in that time. This has happened in spite of the fact that the consumption from the Byron sand is approximately no greater than it was in 1919. The consumption from the field is much greater, but the lower sand has been more heavily drawn upon during the last year.

In view of the above I cannot help but believe that, if the present use of the gas is continued, especially from this sand, a pressure will soon be reached which will be so low that pumping apparatus will have to be installed to push the gas through the pipe lines. Consequently early depletion of the field may be looked for. Unless the third sand is much stronger than it appears now or unless new sands or new fields are available, it would seem that the Byron sand would be practically exhausted for commercial purposes within two years, although there might a large quantity of gas remaining in the sand at that time. But the pressure would be so low and the flow consequently so light that it would not be profitable to keep the field open.

The next tabulation, which is important in this discussion, is that on the use of the gas in the Byron field. In the following tables of gas consumption, the various amounts of gas have been reduced to a common pressure base of 14 pounds per square inch, assumed for comparative purposes, as the different companies use different bases for computing volumes.

Use of Gas from Byron Field.

Gas Taken by Midland Carbon Company
in Millions of Cubic Feet.

	<u>1919</u> Millions Cu. Ft.	<u>1920</u> Millions Cu. Ft.
Total gas used	3,145	2,740
Gas used for carbon black	3,064	2,140

Handwritten calculations:

$$\begin{array}{r} 365 \overline{) 3064} \\ \underline{1220} \\ 1844 \\ \underline{1440} \\ 404 \\ \underline{400} \\ 4 \end{array}$$

$$\begin{array}{r} 365 \overline{) 2740} \\ \underline{1220} \\ 1520 \\ \underline{1140} \\ 380 \\ \underline{380} \\ 0 \end{array}$$

Gas Taken by Ohio Oil Company for Greybull Refinery.

Gas from Old Colony well - third sand	276
Gas from second or Byron sand	<u>142</u>
Total	418

Gas Taken by Lovell Gas & Electric Company
and distributed.

Lovell industries and domestic	595	501
Greybull refinery	<u>876</u>	<u>91</u>
Total	1,471	1,194

Gas Taken from Allen Oil Company Well in Third Sand

Greybull refinery	1,804 692
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Summary of Above Table.

Average Daily Consumption of Gas from Byron Field.

	<u>1919</u>	<u>1920.</u>
Midland Carbon Company -	8.4 million Cu. Ft.	6 Mill. Cu. Ft.
Carbon black	.2 " " "	1.6 " " "
Other industries	---	---
Lovell Gas & Electric Company -	1.63 " " "	1.64 " " "
Domestic and industries	---	0.25 " " "
Greybull Refinery (Byron sand)	---	---
" " (third sand)	---	---

From the above table it is seen that the daily consumption in 1919 for carbon black was 8.4 million cubic feet and for other industries about ¹⁶⁵1.8 million cubic feet. For the Greybull refinery we do not have the complete data for 1919. For 1920 the daily consumption for carbon black was 6 million cubic feet and for other industries it was ³²⁴~~207~~ million cubic feet. For the Greybull refinery it was ²¹⁴~~200~~ million cubic feet.

The next line of comparison that should be taken up in this report is the comparative status of the Cowley and Lovell districts. The tables given below show the plant investment, the men employed, and the pay-roll for 1920 for the various industries operating in Cowley and Lovell and depending on the gas from the Byron field for their existence. The tables are self-explanatory. Except where the word "estimated" is written, the figures are accurate, having been taken from books of the several companies or from sworn statements of the officials.

Status of Cowley Industries.

	<u>Investment</u>	<u>Men Em- ployed</u>	<u>Pay-roll 1920</u>
Midland Carbon Company -			
Carbon plant	\$461,096.43	26	\$45,089.47
Dehydrating plant	142,024.96	35 (Est.)	
Work under construction	12,000.00		15,266.99
Occidental Oil & Gas Co.	119,539.70	15	15,266.99
Hope Natural Gas Company -			
Gasoline plant	85,000.00	10	25,000.00
	(estimated)		(estimated)
Total	<u>\$619,661.09</u>	<u>86</u>	<u>\$85,356.46</u>

Status of Lovell Industries.

Lovell Gas & Electric Co.	\$294,873.07	10	\$21,178.34
Lovell Gasoline Co.	50,000.00	3	700.00
	(estimated)		
Lovell Refinery	130,000.00	13	26,403.42
	(estimated)		
Big Horn Glass Co.	309,959.09	178	175,727.44 (6 mos.)
Big Horn Clay Products Co.	182,243.75	65	42,190.00
Great Western Sugar Co.	1,250,000.00	75	233,000.00
	(estimated)	351	
Total	<u>\$2,217,075.91</u>		<u>\$501,199.20</u>

The above table does not include the domestic users of gas in Lovell, Cowley, and Byron. To my mind domestic use is the highest use to which natural gas can be put and domestic users should have preference over all others when the supply of gas begins to fall off. However, in small communities domestic users are dependent on the use of gas for industrial purposes, because it does not pay to pipe and distribute gas in small quantities. Then if the industries are cut off from lack of fuel, the domestic users will likewise be cut off from lack of distribution. In this report I have endeavored to give you the facts exactly as I have found them in this district.

In regard to the condition at the carbon plant, I may state that at present the carbon plant is operating only one unit and burning probably not over 2 million cubic feet per day, one half of which amount probably comes from the Byron-Union well in the small structure and the other half from the Byron sand in the Byron field.

The dehydrating plant has been operating to some extent, but was shut down for repairs and adjustments. This plant appears to be a practical undertaking, although I am not familiar with this line of business. They have on hand about 2,000,000 pounds of potatoes, bought for 20 cents per hundred weight. About 10,000 pounds of potatoes have been worked up for starch. The starch extraction is about 8 % of the whole potato. I was informed that the plant has a capacity of 100,000 pounds of potato culls per day. The potatoes are ground up and washed repeatedly, the wash waters carrying away the starch. The starch is settled out and screened and taken to drying kilns for the final process. The only part that the carbon plant plays in the dehydrating process is to furnish hot air for drying the starch. The hot air comes from two

located in the tops of the buildings. It is heated to several hundred degrees F. and is finally collected in a 3-^{foot}~~inch~~ insulated pipe which takes it to the dehydrating plant. In the dehydrating plant machinery has been installed and they are about ready to make potato flour. The hot air from the carbon plant has no part in the flour-making process, although the hot air is very useful in drying the starch. A comparative^y small amount of gas for used for making steam would answer the same purpose.

The gasoline plant located near the carbon plant is producing about 500,000 gallons of gasoline per year.

I trust that this report is sufficient to give you a clear insight of the actual conditions existing in the Byron field and that community.

I remain

Very respectfully yours,

B. B. Cunningham
State Geologist.