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Four Seasons
Environmental Centre

Coal

What is it?

The name of the fuel we know as coal originated from the Anglo-Saxon word for charcoal which is 'col'. Coal is a fossil fuel which began forming during the Carboniferous era (280 to 345 million years ago). Coal is mostly carbon with hydrogen, oxygen and nitrogen making up the remainder. Graphite formed from high ranked coal is pure carbon.

Overtime silt and sediment buried large deposits of prehistoric vegetation and tectonic movements of the earth's crust caused high temperatures and great pressure to change this vegetation into peat. Over millions of years this transformation continued, changing the peat into the many types of fuel we know today. Coal is ranked according to its moisture content and its potential energy production. As coal rank increases water is lost rapidly and volatiles more slowly, ash and fixed carbon are retained. The quality of each coal deposit is determined by the temperature , pressure and length of time in formation. This is usually referred to as its 'organic maturity'.

PEAT forms when plant material is inhibited from decay by acidic conditions. It is soft and can be used as fuel when dried. Peat has a very high moisture content and burns slowly so was often used by poorer families in Europe as a cheap fuel which would

produce heat for a long period of time. Ireland is the country most associated with using peat as a fuel and the first recorded use was in the 7th century .In 1926 over 6 million tonnes of hand cut peat was used in Ireland. In Canada we associate peat with the peat moss cut from upper layers of peat bogs and used in gardens to improve the soil. Canada is the world's leading producer of peat moss.

LIGNITE or brown coal is the lowest ranked fuel because it contains the most moisture and has a high sulphur content. Lignite was formed approximately 50 million years ago. It is soft and has a low energy content -around 8 -10 MJ/Kg. It is generally used in steam-electric power generation plants situated close to the mine because it is an inefficient producer of energy. Fossil evidence is best preserved in lignite. Over millions of years lignite is transformed into sub-bituminous coal.

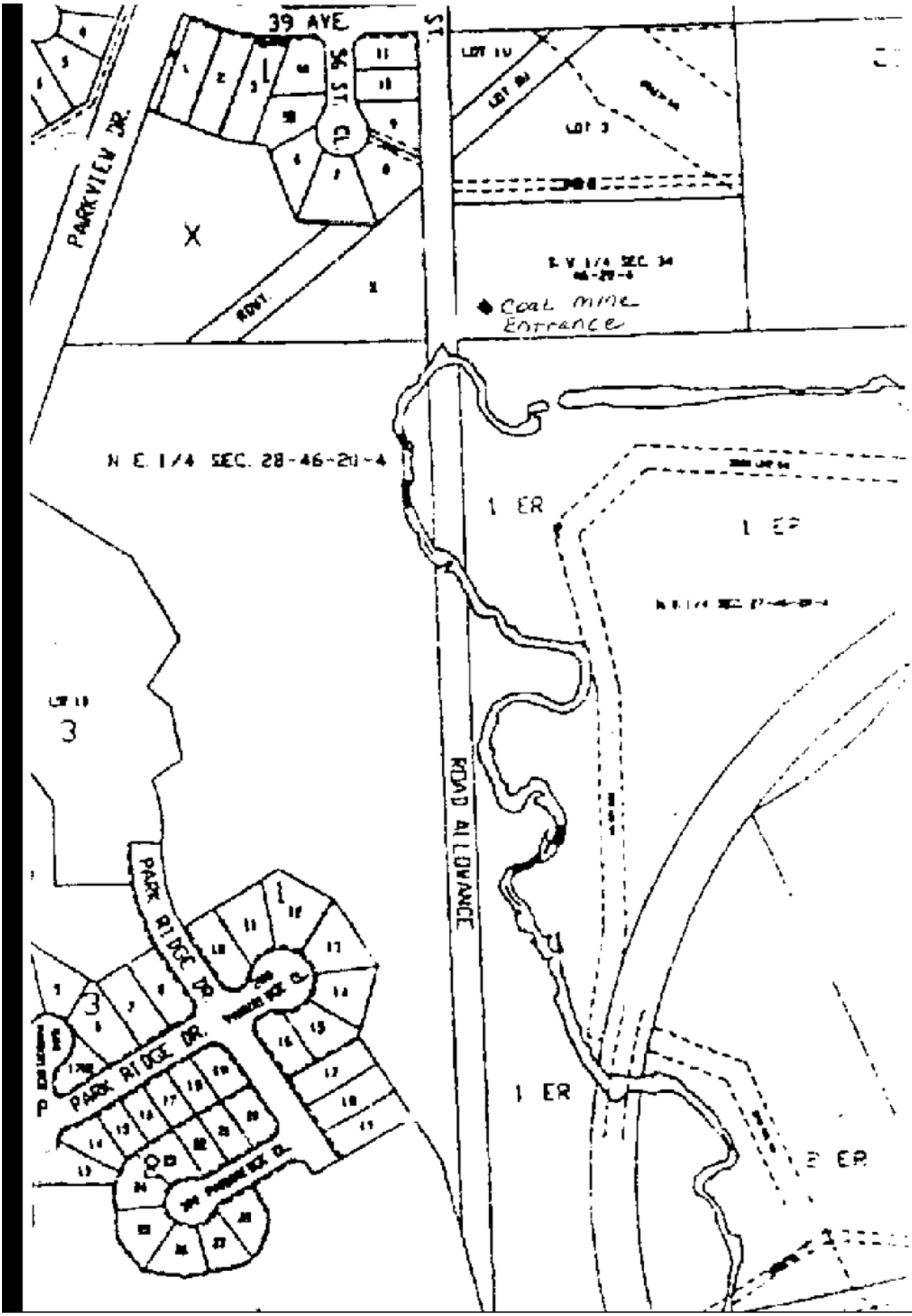
SUB-BITUMINOUS COAL has a higher carbon content and less moisture than lignite. There are varying ranges of sub-bituminous coal again depending on the length of time it has been subjected to high temperatures and pressure over millions of years. Most sub-bituminous coal mined today is 35-45% carbon and has a lower sulphur content although its high moisture content makes it less economical to transport and its fuel value is lower than high ranked coal.

BITUMINOUS COAL is 45-85% carbon and has therefore less moisture. It is usually black with well defined bands of shiny material alternating with dull bands. Because of its lower moisture content it is more easily transported and produces more energy when burnt. When heated in the absence of oxygen some bituminous coals form a high grade carbon product called 'coke' which is used in the manufacture of steel.

ANTHRACITE is the top ranked and most desirable form of coal. It was discovered in 1769. It is the blackest and hardest kind of coal because of the 85-95% carbon content. It burns cleanly and has a high heat value. It can be stored on the ground for long periods of time without causing environmental problems.

WHERE IS COAL FOUND.

Of the three fossil fuels coal has the most widely distributed reserves. It is mined in over 100 countries and on all continents except Antarctica. The largest reserves are in the USA, Russia, China, Germany, India, Australia and South Africa. Canada ranks 13th in the world with production of higher ranked coal such as bituminous and anthracite. It is estimated that there is enough coal to last 300 years ,although this does not take into account an increase in the world population and a resulting decrease in natural gas and petroleum reserves.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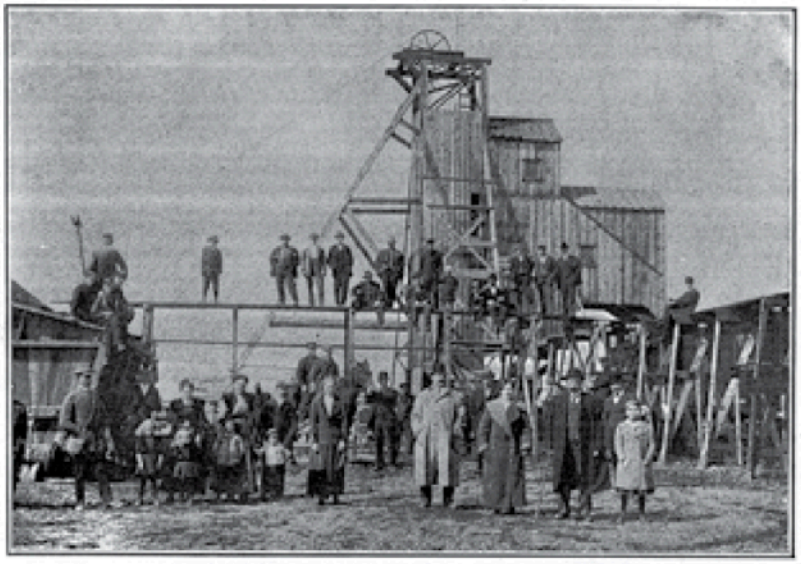
Coal---
A Wonderful Source of Wealth to the Camrose District--- The Key to Unlimited Commercial and Industrial Expansion

A Primitive Coal Mine in the Camrose District. Many farmers have private mines and supply coal to their immediate neighborhood at from $2 to $3 per ton.

IN considering the tremendous importance of the coal mining industry in the Camrose district, no time need be lost in setting forth the result of scientific investigations. The fact is that the best lignite coal in seams of an average thickness of six feet, is being mined at various points in the district within a radius of sixteen miles from the town of Camrose. These mines, all well located on railway lines, are near the eastern extremity of Central Alberta coal areas and thus supply enormous quantities of coal to Saskatoon and other Saskatchewan points.



Scene at the Mine of the Battle River Collieries Ltd., Ten Miles East of Camrose

Coal Makes Big Pay Roll

The five large company mines in the Camrose district and the score of smaller concerns easily mine a total of 1000 tons of coal per day during the winter months. These mines give employment to about 300 men and put a pay roll into circulation of not less than $6,000 per week.

HOW DO WE MINE COAL

Coal is extracted from the ground by underground mining or surface mining known as open pit mining. Outcrop coal which was close to the surface was used in Britain during the Bronze age (2-3000 years BCE) and was commonly used during the late Roman occupation of Britain. These easily accessible sources were largely exhausted by the 13th century and underground mining using shafts was developed. The first shafts were known as “bell pits”. These were little more than wells widened at the bottom to reach larger amounts of coal. Often women and children were employed to carry the coal up ladders to the surface. Later, mines were enlarged and by 1683 were using timbers to support the roof. This enabled coal to be mined further away from the entrance shaft.
By 1832 a method known as “board and pillar” was being used in deeper mines. The coal was extracted and pillars of coal were left to support the roof. When the seam was exhausted the miners worked backwards removing the pillars as they moved back to the mine entrance. This technique was also known as pillar and stall, room and pillar and stoop and stall depending upon the area in Britain where the coal was mined. When British miners came to Canada to open the first coal mines they used the name most familiar to them. The Mines and Collieries Act of 1842 banned all women and children under 10 from working underground although young children were still employed at the pit surface to lead the pit ponies and haul coal.

Modern methods of mining include :

Longwall mining - a machine known as a longwall shearer uses a rotating drum to move across a coal seam. The loosened coal falls onto a conveyer belt and is removed to the outside. These systems have hydraulic roof supports which move forwards as the machine advances through the coal face. Over 50 % of underground production uses this method.

Continuous mining - This uses a machine with large metal teeth which scrapes coal from the seam . This accounts for 45% of all underground coal production.

Conventional mining - This uses explosives to loosen the coal and accounts for less than 5% of underground production. Explosives used in underground mining are generally restricted to specially formulated materials which reduce, but do not entirely eliminate, the possibility of methane or dust explosions.

Surface mining - simply strips the soil from the top of shallow seams and the coal - mostly bituminous in the US - is extracted. This is the most environmentally damaging of all methods since the soil is often not replaced and trees and plants will never cover the scars on the earth. Instead of excavating the contour of a ridge side they now blast the entire mountain top off and almost everything that isn't coal is pushed down into the valleys below, covering creeks, forests and healthy streams. This dismantles the entire ecosystem. In Alberta the Cheviot mine permit application to extend the mine adjacent to Jasper National Park has been opposed. Roughly 25 tonnes of the mountain will be stripped away and dumped onto the surrounding landscape for every tonne of coal exported. Destroyed would be a mountain wildland including eight creeks and valleys of the headwaters of the Mc Leod and Cardinal rivers. Both the company's and Parks Canada experts

concluded that the Cheviot mine would result in the direct loss of quality habitat and wildlife travel routes for at least 100 years. In 2006 the governor of Montana opposed an application by the Cline Mining Corporation to remove a mountain ridge in southeastern British Columbia. For every 2 tonnes of coal mined the company would leave 16 tonnes of waste in the Folsey creek drainage , a tributary of the Canadian Flathead river. Contaminants dropped into the river would reach Flathead Lake in Montana in 48-72 hours.

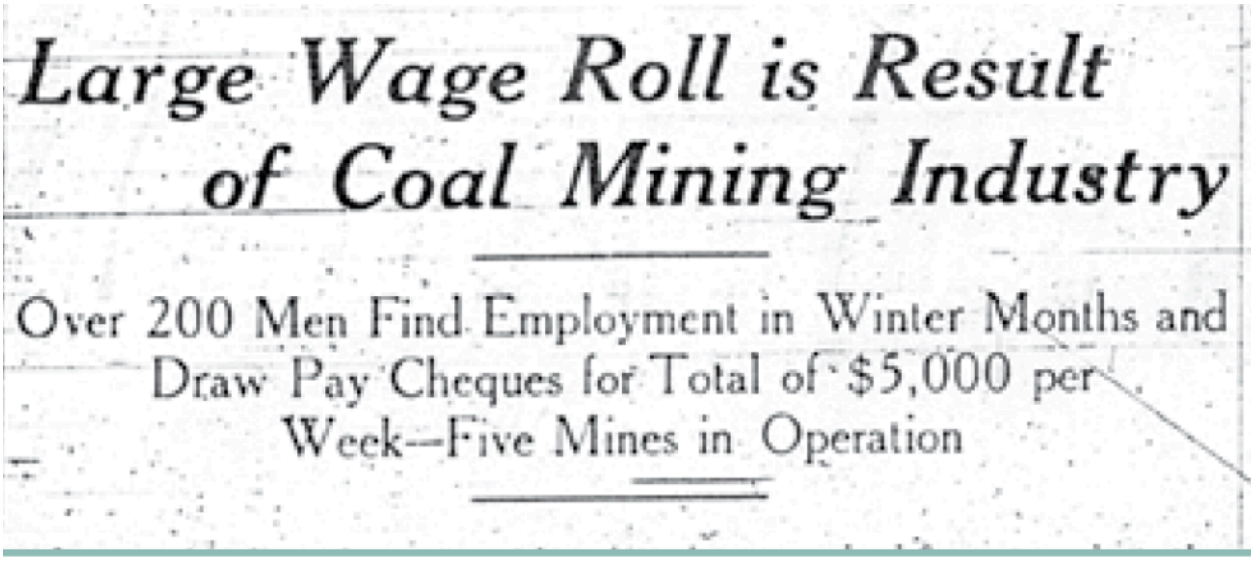
Underground mining was and still is a very dangerous occupation. Hazards include roof collapse, fire and gas explosions from buildup of methane. Improvements over the centuries include the Davy lamp, electronic gas monitors, improved ventilation systems and the use of heavy machinery to cut the coal instead of explosives. HOW

THE WORLD USES COAL

Coal is used most significantly in electricity production , steel and cement manufacturing and for domestic use as heating fuel. Coal generates 39% of all electricity production, more than double the amount produced individually by hydro, gas, nuclear or oil generation. In western Canada, where most of Canada's coal resources are found, increasing demand for electricity could result in additional coal fired generating plants. By products of burning coal, such as ash and slag, are used in the manufacture of many household products including fertilizer, paint, insulation, rubber bands, golf balls, batteries and chalk. Coal can also be converted into liquid fuels such as gasoline and diesel but the process releases large amounts of carbon dioxide and is not viable while oil and natural gas reserves are easily available.

Concerns have been raised over the ability to produce electricity from coal without increasing carbon based emissions. Combustion of coal releases carbon dioxide and nitrous oxides as well as sulfur dioxide. Some of these emissions when mixed with water fall to the earth as acid rain. Coal mining also emits methane, another cause of global warming. Coal and coal waste products including ash, slag and flue gas contain heavy metals such as arsenic, lead, mercury, nickel, cadmium, copper and radium. These emissions are trace impurities but paradoxically result in more radioactive waste than nuclear plants. In Ontario the government has pledged to close all

coal fired power plants . The goal is to clean the air and cut carbon emissions in the province. European nations such as Great Britain and Germany have cut coal use by 40% in the years from 1990 up to 2002 and have consequently cut carbon emissions to produce cleaner, safer air resulting in fewer deaths from asthma and other lung diseases. The German government, in 2007, announced that they would close all coal mines in Germany by 2010. The movement to phase out coal production is gaining momentum. Many nations are proposing a "carbon tax" to discourage coal use. Other ideas have been discussed such as the use of filters on coal generating plants to burn 'clean' coal, but these are expensive and still leave the problem of where to dispose of the gases produced by these methods. Until the world can agree on cleaner methods of producing energy it is likely that coal production will continue as it has for centuries.



Large Wage Roll is Result of Coal Mining Industry

Over 200 Men Find Employment in Winter Months and Draw Pay Cheques for Total of $5,000 per Week—Five Mines in Operation

Record of Progress for 1911 Shows Great Development in the Camrose District

Coal Mining Operations one of the Strongest Assets of the District—Farmers Digging Into Mixed Farming Responsible for Strong Economic Conditions.

The steady acquisition of marketing facilities, the development of the coal mining industry the increased attention given to all branches of mixed farming and important municipal undertakings mark unprecedented progress in Camrose and in the Camrose district during the past year.

Beginning the year with a local C. P. R. service so successful has the town been in the acquiring of railway facilities that it now has the distinction of being the only city or town in province with three competing railway lines in active operation. With the completion of these railway lines to their various destinations, with the additional lines which will be under construction in the coming year and with the ever extending territory which they will serve Camrose will more than ever lay claim to being the logical distributing point for a large part of central and eastern Alberta. The advantages which Camrose offers in the way of favorable freight rates, industrial spur privileges and an unique trackage system are factors which during the past year, have contributed immensely to the growth of business done by the wholesale houses already located here. Additions to the stalls have been made necessary and all the available space for the [illegible] ed. Inquiries at the board of trade [illegible] coming interested. They realise that with the rapid development of central Alberta and with the exceptional railway facilities that Camrose affords they will find here a distributing centre that meets all their requirements.

Centre of Coal Mining Industry

With railway lines above ground and with unlimited quantities of coal below, Camrose is fast becoming an important coal mining centre. There are now three coal mines in active operation in this district, giving employment to 100 men and having an output of over 400 tons of coal per day. The coal is marketed in every direction. One mine close to town supplies the local demand at from $2.75 to $3.50 per ton and ships the surplus to towns along the C. P. R. line between Edmonton and Calgary. Another mine to the north ships 100 tons per day to towns along the G. T. P. main line. The Round Hill mine on the C. N. R. has an output of over 200 tons per day and ships to C. N. R. points in Saskatchewan and even as far east as Manitoba. The difficulty is not in finding a market but to get the coal out fast enough to supply the demand. It is estimated that the output for the winter months will average 600 tons of coal per day and that the miners' wages will [illegible] $3,000 per week. The coal is [illegible] and gives entire satisfaction wherever tried.

Industrial Development

During the past year the Camrose tannery, which is the pioneer industry of this district, has been entirely reconstructed. Modern machinery has been installed thus making the plant the best equipped for its size in the Dominion. Its capacity will easily be 2,500 hides per year. Harness leather will be the largest product, but chrome, oil tanned and russet leathers will also be made. Farmers of the district will have the opportunity of sending hides to the tannery and having them returned in the form of warm robes or fur coats. An outgrowth of the tannery is a wholesale harness factory which, ever since its operation, has been purchasing from $400 to $600 worth of leather a month. Another industry soon to be in operation is a shoe factory for the manufacture of shoe packs and heavy railroaders' boots. The machinery for this has already been purchased and work will commence as soon as the tannery is working to the required capacity.

Farmers in Good Shape

With good prices prevailing for grain, live stock, dairy products and poultry the farmers of the district have had an exceptionally good year. In marked contrast with other districts the grain crop has been successfully harvested and much of it was converted into cash by the first week in December. Samples of grain sent to Calgary for the germination test showed that while some has been

Continued on page 4

On the Left Bank of Mirror Lake is Located the Municipal Power Plant. The Gas Well Lies directly beyond but is not shown in this illustration.

What Does the Coal Situation Mean for Those Who Come to Live in Camrose?

The Coal Bin Can Always be Kept Full and the Coal Bill is Always Low—Residences and Business Places May Have All Public Utilities Without Being Charged Exorbitant Rates—There is no Danger of Depleting the Supply as the Town Rests on a Huge Coal Area—Coal is of Splendid Quality and Especially Suitable for Domestic Uses.

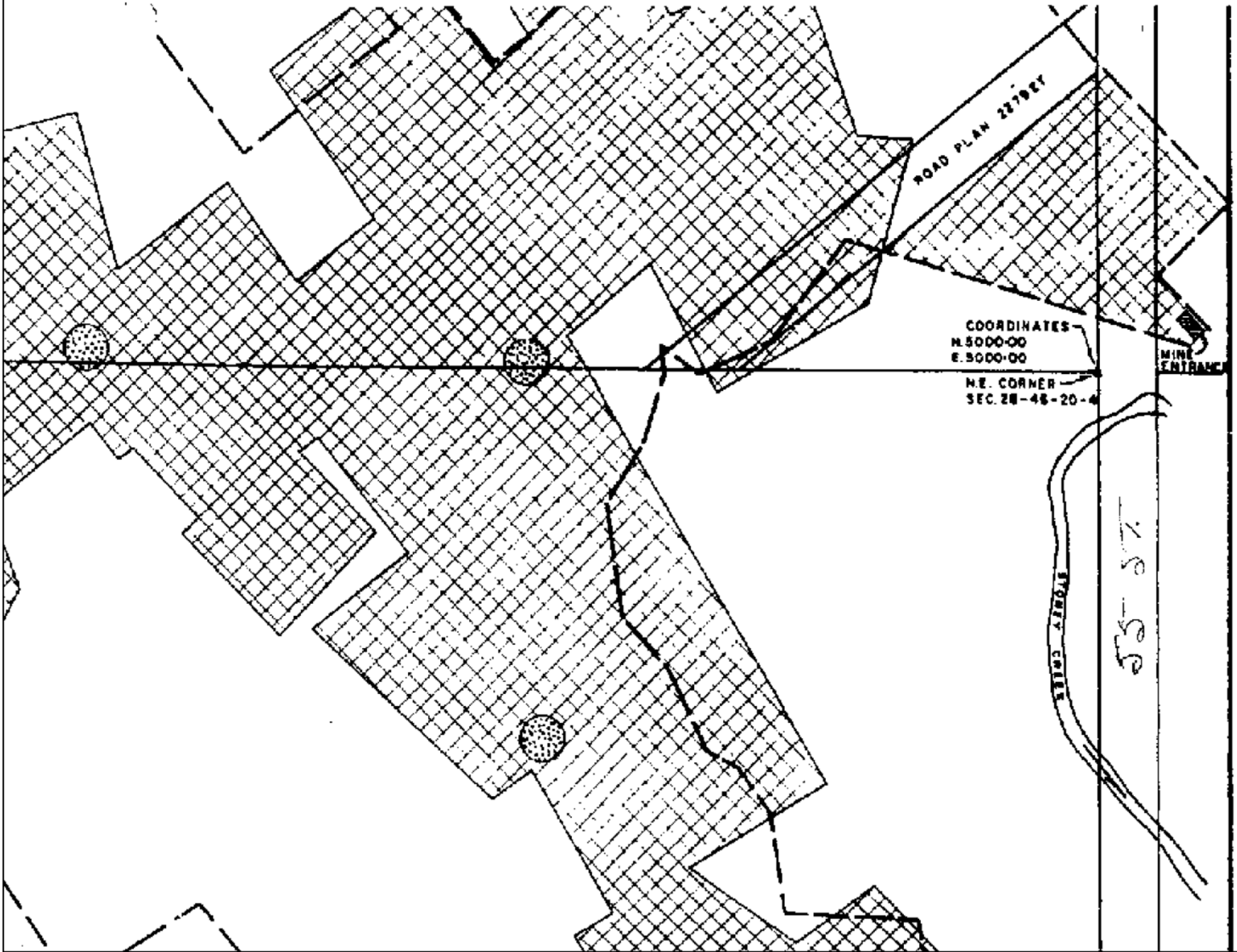
IN sinking the gas well at Camrose a fifteen-foot seam of coal was located at a depth of 400 feet. This demonstrates that the townsite rests on an unlimited supply of coal of excellent quality.

Most of the coal at present mined in the Camrose district is secured at a depth of from twenty to one hundred feet and in seams of from six to seven feet in thickness. Under these circumstances the coal is easily extracted, which to some extent accounts for the present large output of the district. In 1907 only 5,000 tons of coal were mined in the district. To-day the annual output has reached over 60,000 tons, and the real development of the coal mining industry has only commenced.

One of the greatest boons to the town of Camrose is the unlimited supply of coal at a price which is no hardship on the poorest resident. While in many parts of Saskatchewan coal is retailed at from $8.00 or $9.00 per ton, this same coal is available in Camrose at from $3.00 to $4.00 per ton. An analysis of the coal has frequently been made, and it has been shown to be a lignite of semi-bituminous quality admirably suited for domestic and industrial purposes.

With coal so readily to hand, it naturally follows that Camrose maintains a municipally-owned electric light and power plant at a high state of efficiency, and that in comparison to the number of services installed the town can supply electric light and power at the lowest possible rates. Coal is supplied to the power plant at the remarkable low rate of $2.50 per ton on a yearly contract. It is, therefore, safe to say that electric power can be generated from steam cheaper at Camrose than in any part of Alberta. When to this is added natural gas as a factor in producing power, the situation will have a far reaching effect on our industrial development.

The surplus of coal required for the Camrose district will always find a market eastward. New railway lines are opening up to serve the country of the middle west, and to all this country Camrose will have favorable access for the coal business. It will thus be seen that, considered from any standpoint, the coal mining industry of the Camrose district is fraught with tremendous possibilities.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