

Cryptocurrency mining

A land use analysis of an emerging tech industry.

While the news media follows the ups and downs of cryptocurrency across the globe, cryptocurrency mining is an emerging land use in southern Albertan municipalities. Defining what it is and understanding its potential impacts will enable local decision makers the ability to determine if it is a good fit in individual communities.



What is cryptocurrency mining?

Cryptocurrency mining (crypto mining) is the process by which crypto miners use specialized computers, data, codes, and calculations to validate crypto currency transactions and subsequently earn cryptocurrency as compensation for their work. While traditional mining takes place in a physical mine or specific geographic place, crypto mining takes place in a decentralized system where anyone with a computer and power source—anywhere in the world—can be a part of the digital data recordkeeping required for cryptocurrency transactions. Crypto miners range from companies with multiple facilities and miner machines to individual’s small computer setups to verify cryptocurrency.

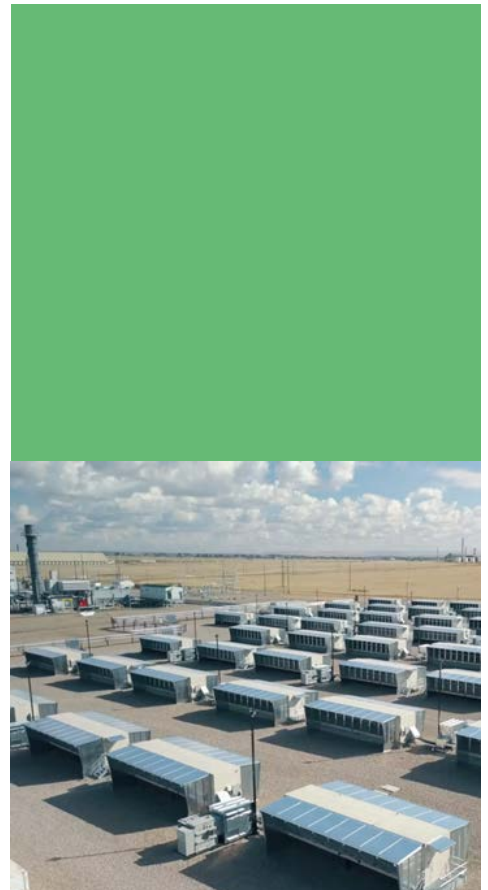
Several southern Alberta communities have already processed and provided approvals for this new use including the Town of Bassano, City of Medicine Hat, and the MD of Willow Creek. Others have inquired with ORRSC as to the nature of these operations and whether they should have concerns. This use is subject to local development permit processes and comes with many considerations that may not be familiar.

Among the common considerations for this type of use are the energy source, noise from HVAC systems (and energy generators), the type of buildings being used, and the environmental footprint of a high energy consumer. This periodical will explore the nuance of this development type and provide insight for communities to consider when contemplating the use.

Land use context

In the context of land use, cryptocurrency mining externalities equate to an industrial use and are best suited to industrial-zoned property, although some agricultural or commercial zones may be able to accommodate the development. In the early days of cryptocurrency, small scale mining operations did occur in residential locations, but as the difficulty of the processing work increased, the number of computers and power needs outstripped the ability to work mines in neighborhoods without disrupting power capacity or annoying neighbours. Current facilities involve banks of computers that utilize a ‘power plant’ to operate but they house very few employees. The lack of employees and large scale of the facilities make it a use that runs counter to traditional planning policy, which promotes creating vibrant commercial areas. Therefore, including the use in commercial zoning may not be the best fit for most southern Alberta urban communities.

Access to cheap and reliable electricity is everything for crypto mining operations. In Alberta, a deregulated electrical system, green energy power sources, availability of natural gas, and a government open for



*Hut 8 Mining Facility,
City of Medicine Hat*

Electrical Deregulation

The evolution to a deregulated market began in 1996, when the Power Pool of Alberta was created to dispatch energy across Alberta through a real-time energy market. The goal of this market was to encourage efficiencies by introducing competition in the electricity generation sector. The market was set up for energy to be dispatched through an economic merit order with a single equilibrium price.

The market evolved to full deregulation in 2001, following the auction of Power Purchase Arrangements (PPAs) in 2000. PPAs allowed the existing utility owners to continue to own and operate their facilities, but auctioned the dispatch rights of the associated energy to new buyers. This framework provided a competitive landscape by immediately introducing new players into the market.

- Alberta Electric System Operator

Municipal Government Act Part 1 Section 3(a.1) was added in 2017 and among other purposes states: "The purpose of a municipality is to foster the well-being of the environment".

development has this up-start industry seeking local approvals. For most crypto mining applications, the proponent will be tying into the local electrical grid as its 'power plant'. Communities unsure of their capacity to feed a high energy demand development should consult their local service provider to better understand capacity of their electrical infrastructure. Communities with established industrial parks may have already received the necessary upgrades to substations and feeder lines to accommodate the use.

In the case of other power sources (natural gas, solar, wind etc.) for 'power plants', proponents are to consult with the Alberta Utilities Commission (AUC) to ensure they comply with provincial requirements. The AUC governs the generation of electric energy under the *Hydro and Electric Energy Act*. The electricity market is deregulated in Alberta, so AUC focuses its decisions primarily on the siting of power plants, having regard to noise and environmental impacts. An entity who wishes to operate a power plant must apply to AUC for approval under Rule 007: Applications for Power Plans, Substations, Transmission Lines, Industrial System Designations and Hydro Developments. Most crypto applications will need less than a 10 MW power plant. In such a case, the proponent must file a Checklist Application for New Power Plants Equal or Greater than 1 MW and Less than 10 MW with the AUC. The AUC will review and determine eligibility. Municipalities are advised to request a copy of the AUC approval during the development process.

The types of buildings and structures being used can vary with each proposal. Whereas reuse of an existing warehouse style building may be ideal many applications are housing the computers within shipping containers. Shipping containers may have development control requirements within a land use bylaw and should be reviewed with the applicant proposing the development. Each type of building may be able to mitigate sound where needed but the mitigation measures will need to be understood prior to moving forward with the application. Additionally, the cost of the equipment housed in the building requires heightened security measures including security fencing and lighting which may have an effect on adjacent properties. Requesting information regarding these needs is prudent at the development application submittal stage.

The environmental consideration for impacts related to crypto mining in a municipality relates to higher level planning documents including the South Saskatchewan Regional Plan, the *Municipal Government Act* (section 3(a.1)), Municipal Development Plan, or Sustainability Plan. At a municipal level the two main concerns are the carbon footprint and noise impact. The high energy consumption of cryptocurrency mining operations may run counter to a municipalities objective to reduce its carbon footprint. As well, some crypto mining operations are designed to use water as a coolant at quantities that are not easily obtainable without affecting water need elsewhere in the local economy.

In general, the power usage of one crypto mining computer per month uses the equivalent electrical energy used by one Alberta household. When the development is designed to house hundreds of computers public concern rises because the transmission infrastructure bill in Alberta to support such development is borne by each consumer. Conversely, rural locations where transmission infrastructure has been built to support wind and solar development may provide opportunity for a development location.

Noise is the largest byproduct of a crypto mining development. The design requirement for cooling fans to ensure the banks of computers do not burn out and the exhausting of these fans to the exterior on a 24/7/365 running time should be cause for concern in any municipality. Understanding the decibel (dBA) levels at various distances from the development can alleviate concern or expose the need to mitigate. In a MD of Willow Creek development approval located at the Claresholm Airport, the applicant running 280 computers and five fans in shipping containers declared the design noise to be 85.5 dBA (equal to a gas powered mower running 24/7) when 8m away and 36.5 dBA (equal to a library) at the nearest dwelling 224m away.

Noise control

Most municipalities will have an adopted noise control bylaw. This bylaw is unlikely to control external development noise, and many will exempt noise produced in an industrial area. It therefore necessitates that noise, as the key concern for development, be addressed.

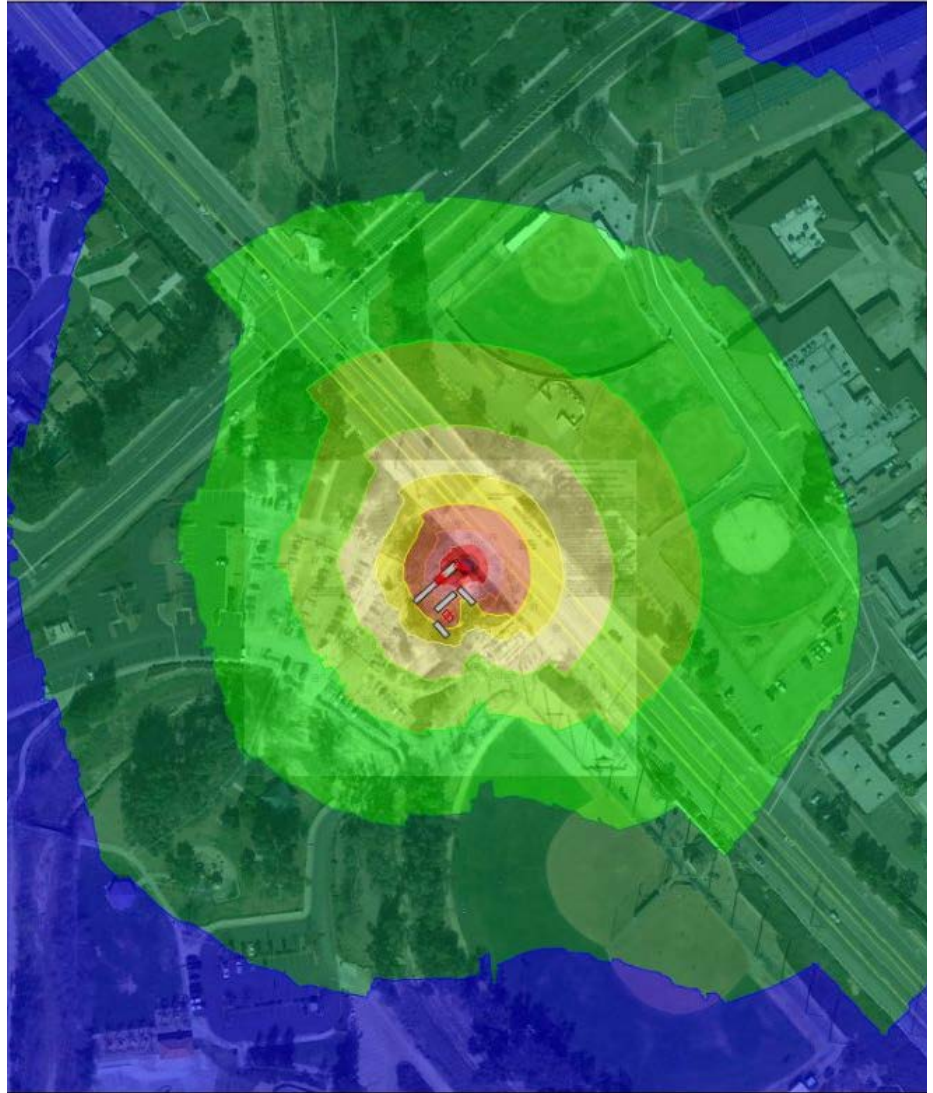
Southern Alberta's experience with noise control in an industrial context has been utilized under the AUC Rule 012 for power plants. Each wind farm and solar development have had to comply with Rule 012 for approvals. Among the approval submittals for wind turbine proponents has been an analysis of sound through computer modeling. These models consider the ambient sound of the area and then add the generated sound from the engineered locations for the turbines.

Rule 012 defines ambient sound level (ASL) as the sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The average nighttime ASL in rural Alberta is approximately 35 dBA and daytime is approximately 45 dBA. In the MD of Willow Creek example, the receptor (house) at 224 m away would still enjoy the accepted nighttime ASL.

Sound modelling may be a new concept to urban municipalities, but there are many companies that provide the service, and it can be relied upon to assure neighborhood concerns. In a draft bylaw amendment for the Town of Bassano, ORRSC utilized the AUC sound table to outline the requirements for cryptocurrency mining sound requirements.

Predictive Sound Modelling is the computer generated assessment of point source noise using calculation standards accepted by the the International Organization for Standardization (ISO).

The sound modelling image depicts a typical noise gradient being emitted from a point source development and emanating into the surrounding community. The sound level in the darker reds represent 85 dBA and the blue 40 dBA.



Mining proposals that cannot meet the standard may propose mitigation strategies. These include choosing different venting equipment, sound proofing, barrier walls, advanced sound monitoring equipment that makes operational adjustments to reduce sound levels in real time, or simply choose a more remote site. Proper choice of location given the nature of mining operations is an issue that may require the mining operation to provide sound analysis ahead of the application being processed. There is no use contemplating the location if it cannot meet the noise level requirements at the nearest residences or hotels.

The industry is also producing quieter computers and investigating alternatives to fans. Immersion cooling eliminates the sound by submerging the hardware in dielectric fluid. These methods are a hopeful means by which a new industry as well as similar industries can fit into municipalities in southern Alberta.

Concluding remarks

Because of its high energy use, noise, use of non-traditional buildings and structures, and climate footprint, the cryptocurrency mining business is one to be prepared for locally. The province's recently passed *Financial Innovation Act* supports cryptocurrency companies by temporarily relaxing rules that will facilitate the launch of financial products and services outside the scope of traditional offerings. Although, the financial markets and the industry themselves suggests that the long term need for cryptocurrency mining may have a horizon where it is no longer necessary. Municipalities may choose not to open their community up to this use and thereby avoid the externalities. Those that do include the use are advised to seek planning advice and consider other municipal experiences as to what is working and what is not in relation to approvals.

For more information on this topic contact admin@orrsc.com or visit our website at orrsc.com.

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ORRSC
3105 16 Ave N
Lethbridge AB T1H 5E8

phone: 403.329.1344
toll-free: 844.279.8760
e-mail: admin@orrsc.com

