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Geothermal Development in Colorado Impacts to Existing Water Uses and Frequently Asked Questions

Introduction

Colorado water law specifically recognizes the development of geothermal resources and acknowledges that the development is in the public interest because it enhances local economies and provides an alternative to conventional fuel sources. The law also states that the development of geothermal resources should be undertaken in such a manner as to safeguard life, health, property, public welfare, and the environment and to encourage the maximum economic recovery of the resource and prevent its waste. The specific state statute that has this language is [§ 37-90.5-102, C.R.S.] When using the term "geothermal resource", the law refers to the energy that may be extracted from the natural heat of the earth and the naturally occurring ground water, brines, vapor and steam associated with the geothermal resource. [§ 37-90.5-103, C.R.S.]

Permit to Construct a Well and Permit to Appropriate Geothermal Fluid

The State Engineer, who is also the Director of the Colorado Division of Water Resources, is the regulatory authority for the purposes of permitting and administering the use of a geothermal resource in regard to the potential to impact other water users or geothermal resource users. First, this means that before any party can construct a geothermal resource well ("geothermal well"), that party needs to obtain a **permit to construct a well** from the State Engineer. As a part of this permitting responsibility for well construction, the State Engineer has the authority to adopt rules to protect the public health, safety, and welfare and the environment and to prevent the waste of any geothermal resource. [§ 37-90.5-106, C.R.S.] The State Engineer has adopted these rules and uses them for permitting geothermal wells.

Second, when performing this well construction permitting function, the State Engineer must evaluate the use of the geothermal resource with regard to the potential to cause *material injury* to other water rights and geothermal rights. The geothermal fluid, when it exists as *tributary* ground water is a public resource and as a result, the State Engineer must be mindful of the potential for *material injury* to other water rights. According to state law, there is no right to the geothermal resource that comes from simply owning the land overlying the resource [§ 37-90.5-104, C.R.S.]. To manage this important evaluation process, before a party can produce geothermal fluid from a well, the State Engineer requires that the party obtain a **permit to appropriate** the geothermal fluid. This permit requirement does not apply to uses of the geothermal fluid that do not actually divert that fluid from its source. The permit requirement may also be waived if the use of the geothermal fluid is nonconsumptive. For example, a geothermal application that extracts the geothermal fluid from a formation at a given depth, uses it above ground in a system that is closed to the atmosphere, and reinjects it into the same

formation at the same general depth, may be nonconsumptive and, therefore, may not require a permit to appropriate the geothermal fluid. [§ 37-90.5-107, C.R.S.]

Material Injury to Prior Water or Geothermal Rights

For any application that proposes to utilize the geothermal resource in Colorado, the State Engineer's permitting authority provides for the protection of prior water or geothermal rights to ensure they are not materially injured. The standard for material injury for the purposes of using geothermal resources means any diminution (reduction) or alteration in the quantity or quality of a valid, prior water right and, in the case of a geothermal right, any diminution in the temperature. [§ 37-90.5-107, C.R.S.]

Using water from a well does create a water right for the water user for the purpose of ensuring protection from material injury and, therefore, the State Engineer must consider all wells when permitting the appropriation from a new well, especially a geothermal well. Also, the State Engineer must consider the impact to surface water that may result from the appropriation of a geothermal fluid. However, even under the strict standard of "no reduction of quantity" the lowering of the water table in a well is not necessarily material injury. To do so has the potential to preclude the development of the ground water resource after the first well in a basin has been drilled. Instead, material injury for existing wells will be measured in terms of whether the well can continue to pump from that source such that it can satisfy the uses for which it has a right.

It is important to know that a geothermal right is not necessarily established by virtue of just using the geothermal resource from a well. Unlike certain domestic uses, a geothermal right is not established through the use from an unregistered well or a well that is permitted for domestic uses but exempt from administration ("exempt" well). In other words, a well must be specifically permitted for a geothermal use or it must have a court decree for it to have a geothermal right. **Note:** This does not mean that a well user with an unregistered or exempt well cannot legally make use of heat as a byproduct of the well's legal water use. But the use must be only incidental and there can be no increased diversion or consumption of ground water that results from that use of the geothermal resource.

The State Engineer must also consider the impact to surface water that may result from the appropriation of a geothermal fluid. While this is also a difficult evaluation, once an impact to the surface water has been identified, even a small impact, the solution is more straightforward. If the appropriation of the geothermal fluid takes place in a basin where the demands of the surface water rights exceed the expected flows of the stream system ("overappropriated basin"), the appropriation cannot take place without a plan to replace water to the surface stream. This is done through substitute water supply plans or augmentation plans decreed by the water court. Without such a plan, the appropriation cannot be allowed. [§ 37-92-308, C.R.S.]

The Nature of Geothermal Applications in Colorado and the Potential for Material Injury

The State Engineer expects that new large geothermal development in overappropriated basins will use a nonconsumptive approach. This is likely for two reasons. First, it allows for the preservation of the geothermal resource, both in terms of the quantity of the geothermal fluid and the temperature of the geothermal resource. Second, by using the geothermal fluid nonconsumptively, that is, reinjecting it into the same formation as that from which it was

extracted, the user minimizes the potential for impacts to surface streams and other wells. As a matter of fact, other states, like Nevada, with more prolific development of geothermal wells than Colorado, have evolved into favoring nonconsumptive approaches.

With nonconsumptive development combined with the fact that large geothermal development often goes to greater depths to recover the geothermal resource, the potential for an impact to water quantity and quality is small. The State Engineer still must consider the potential reduction or impact to any valid geothermal right. As stated earlier, that consideration is given only to geothermal uses that have a well permit issued pursuant to § 37-90.5-107, C.R.S. or has a water court decree. The table below explains this.

Existing Use	Consideration of Material Injury		
	Quantity ¹	Quality	Temperature
Exempt Domestic Well <ul style="list-style-type: none"> • Permitted (37-92-602) or unregistered • May or may not make incidental use of the heat resource 	Yes	Yes	No
Commercial Well <ul style="list-style-type: none"> • Permitted (37-90-137) • Not permitted for geothermal uses • May or may not make incidental use of the heat resource 	Yes	Yes	No
Commercial Well <ul style="list-style-type: none"> • Permitted (37-90.5-107) • Permitted for geothermal uses • Uses the heat resource • May or may not have a geothermal right granted by water court decree 	Yes	Yes	Yes
Surface Water Use, specifically, Springs <ul style="list-style-type: none"> • Decreed geothermal use 	Yes	Yes	Yes
Surface Water Use (Stream) <ul style="list-style-type: none"> • Decreed water right 	Yes	Yes	N/A

1. The lowering of the water table at a well does not necessarily constitute material injury

Frequently Asked Questions

Question: I have a valid residential well permit for inside uses only. I have configured my plumbing to cool the water before I use it because the temperature is too high for normal use. Is it okay that that I use that heat to warm my house in the winter? How likely is it that the temperature will change as a result of geothermal development?

Answer: It is okay that you use the energy from the water you pump to heat your home. Your use is only incidental since the amount of water you divert and consume is influenced only by

your household use needs. However, if you were to pump more water, just for the sake of the heat benefits, you would be out of compliance with your residential well permit.

The potential for a change in temperature can only be determined on a case-by-case basis. Since you do not have a "geothermal right", rather just a well permit for certain uses of water that don't include geothermal, you do not have a geothermal right according to Colorado water law that would allow you to claim injury from a change in temperature. The Division of Water Resources believes that large-scale geothermal use entailing a significant investment in plant and infrastructure will conduct its operations to maintain the temperature of the resource to ensure long-term operation.

Question: Does this same answer apply if I have a residential or commercial well permit that operates according to an augmentation plan since my permit does not identify geothermal as a use? I currently purchase water from the Upper Arkansas Water Conservancy District.

Answer: Yes, the answer is the same.

Question: How is my well protected?

Answer: For all wells, the law does not allow the State Engineer to issue a well permit if another well will be materially injured. That does not mean that the water level in your well is guaranteed to stay the same. But it does offer you protection that a geothermal well cannot create a situation where the aquifer is so severely impacted that you cannot use the water for your permitted uses.

Question: I have rights to divert water from a ditch that is fed from the Arkansas River. I use the water for irrigating pasture. During dry years, there is often not enough water in the river to allow my ditch to operate and I am unable to irrigate. Will geothermal wells increase the frequency of that event?

Answer: We anticipate that geothermal development will use the nonconsumptive approach. By reinjecting the water into the same formation from which it was withdrawn, it should have no effect on surface water flows. Nonetheless, we will carefully evaluate plans to confirm there is no impact to surface water. Should we find an impact, or should there be a proposed geothermal well that is not nonconsumptive in an overappropriated basin, Colorado water law requires that the applicant develop an engineered plan to ensure that surface flows will not be impacted to the detriment of water rights, and that plan is subject to public review and comment.