

A Regulatory Guide to Geothermal Direct Use Development

WYOMING

Introduction

Geothermal resource temperatures range from low temperatures of 50 to 80 degrees F (10 to 27 °C), to temperatures exceeding 650 degrees F (343°C). Although power can be generated economically from resources as low as 218 degrees F (103° C), power generation projects typically favor resource temperatures above 300 degrees F (149° C). High temperature resources (>300 degrees F, 149° C) can also be used for direct-use applications. However, lower temperature resources (< 212° F, 100° C) are often better suited for these projects.

Low temperature, direct-use projects cover a variety of applications. Projects may include traditional space heating applications, as well as greenhouse heating, spas and swimming pools, aquaculture, crop drying, industrial processing and other activities requiring lower temperatures. Because these projects are primarily water use applications, they often fall under a different regulatory process than high temperature, power generation projects. Typically this process is shaped by water and wastewater laws and regulations, and administered by state, and in some cases, federal water resource agencies.

The intent of this document is to help guide developers of direct use geothermal projects through the regulatory process of drilling, using and disposing of low temperature geothermal fluids in Wyoming. This guide will provide background on the state regulatory process and identify contact information necessary for completing the various applications and permits. This guide; however, cannot substitute for direct communication with the regulatory agencies. These agencies need to be contacted early in the process so that any regulatory hurdles are identified upfront and in time. Projects that are located on federal lands are regulated according to the national Geothermal Steam Act and related federal regulations.

Regulatory Process for Direct Use Applications

There are abundant geothermal resources in Wyoming. However, unlike some other western states, geothermal resources remain largely untapped. This carries through to state statutes where the only mention of geothermal resources is under [Title 41-3-901 WS](#). Here, underground water is defined as “*..any water, including hot water and geothermal steam, under the surface of the land or the bed of any stream, lake, reservoir, or other body of surface water..*”. By way of reference, geothermal resources are therefore considered groundwater.

The Wyoming State Engineer's Office (SEO) administers the rules and regulations governing groundwater use in the State. Under SEO's administrative rules, [Chapter 1, Section 20](#), geothermal steam and hot water are identified as groundwater and administered as such. The rule states that *"..a permit to appropriate groundwater must be obtained from the Wyoming State Engineer to explore for or before geothermal steam or hot water can be utilized."* The rule further identifies the State Engineer's Office as the contact point for any person contemplating the development of geothermal steam or hot water projects.

The regulations governing low temperature, direct use geothermal projects differ from conventional water development projects in that direct use projects also need to dispose of the water once it has been used for its design application. Disposal is typically accomplished through direct injection of the geothermal water via an injection well, or through surface disposal.

The Wyoming State Engineer's Office (SEO) and the Department of Environmental Quality (DEQ) are the lead agencies in charge of administering and enforcing the various rules and regulations governing water use, water quality and waste-water disposal in the State of Wyoming. SEO is responsible for issuing water rights, well construction permits and is the lead agency in overseeing geothermal production wells. DEQ is responsible for administering surface and groundwater disposal of wastewater, including geothermal fluids. In addition to contacting state resource agencies, local and county agencies should be contacted early on in the development process to determine any local zoning issues and for construction permits.

The regulatory process for developing a low temperature, direct use geothermal project consists of the following steps:

- Gain access to lands either through lease or direct ownership.
- Contact local and/or county agencies to ensure compliance with local land use laws including building permits and zoning restrictions.
- Secure water right (**SEO**).
- Obtain well construction permit/develop production well (**SEO**).
- Determine fluid disposal plan and obtain permits for either underground injection or surface disposal (**DEQ**).
- Contact state fish and wildlife agency if developing an aquaculture project.

Water Rights

Background

The constitution and statutes of the State of Wyoming guarantee the right to appropriate the public waters of the State. *Title 41-Water, Wyoming Statutes* sets forth the regulations governing water use in the state and can be accessed by clicking [here](#). The Wyoming State Engineer's Office (SEO) is the lead agency regulating the appropriation and

distribution of water in the State of Wyoming, including geothermal wells. The administrative rules governing groundwater use are available for viewing at the Secretary of State's website [Documents 1804-1811](#).

Water rights are granted through the principal known as the Doctrine of Prior Appropriation. This means that those who first made beneficial use of water are entitled to continued use in preference to those who came later. The date the water right was established is called a priority date and determines who gets water when there is a shortage. A water right is a right to use the water of the state, when such use has been acquired by the beneficial application of water under the laws of the state. Beneficial use is the basis of the right, and in order of preference include: drinking water for people and animals; municipal use; water used for commercial activities including heating and power plants and industrial uses. In addition to any beneficial use specified by law or rule, the description of beneficial uses specifically identifies the use of water for the purpose of extracting heat as a beneficial use subject to prior rights.

Water Rights Permit Process

The Wyoming State Engineer's Office administers the appropriation and use of water in the State of Wyoming. Any person intending to acquire the right to beneficially use any underground water in the State must obtain a water right permit. A developer interested in low temperature geothermal resources may want to review data from other wells in the area. The Geo-Heat Center, located in Klamath Falls, Oregon maintains an extensive database covering wells and springs greater than 50 °C (122°F) for 11 western states. Information on the database can be found at <http://geoheat.oit.edu/databse.htm>

A geothermal well is permitted the same as any other well in the state. The first step is to complete an application for appropriation as described under [41-3-930 WS](#). The application contains the name and post-office address of the applicant, a detailed description of the proposed use, the location by legal subdivision of the proposed well, the estimated depth of the proposed well, the quantity of water proposed to be withdrawn and beneficially utilized in gallons per minute and acre-feet per calendar year, where the water is to be used, and any other information the state engineer may require. A copy of the application form, U.W.5, can be downloaded by clicking [here](#). When submitting the form, the applicant should include a \$2 filing fee.

In addition, applications for permits to appropriate groundwater, geothermal or otherwise, located within fifteen (15) miles of the boundary of Yellowstone National Park must include an engineering report presenting geologic, hydrologic and other information showing that the project will not adversely effect the hydrothermal system or hydrothermal features located within the boundaries of Yellowstone National Park .

An application for a well permit in any areas not designated as a critical area will be granted if the proposed use is beneficial and, if the state engineer finds that the proposed means of diversion and construction are adequate. Upon receiving the application, the state engineer will publish, at the applicant's expense, a notice of the permit in a newspaper of general circulation in the county where the proposed well will be located, for at least once a week for three (3) consecutive weeks. Objections to the permit application must be filed within ten (10) days after the last publication of the notice.

If objections are filed against the application, or the state engineer finds that the application is not in public's water interest, than a public hearing may be held. The hearing will be held before the control area advisory board and the state engineer or the state board of control in the county in which the proposed well is located. The cost of the hearing may be borne by both the applicant and petitioner.

The water right permit is issued only if the state engineer finds, after receiving the advice of the control area advisory board, that there are unappropriated waters in the proposed source, that the proposed means of diversion or construction is adequate, that the location of the proposed well or other work does not conflict with any well spacing or well distribution regulation, and that the proposed use would not be detrimental to the public interest. If the state engineer determines that the application is deficient, he may return the application for correction. If such correction is not made within ninety (90) days, the state engineer will cancel the application

If the permit is granted, the applicant must complete the construction and apply the water to beneficial use before the date specified in the permit conditions, a period not to exceed three (3) years after the date of approval. The state engineer may extend the period or cancel the permit in accordance with the procedures set forth in W.S. 41-4-506 . The Wyoming State Engineer's Office provides well design requirements in their Regulations and Instructions, Part III, Water Well Minimum Construction Standards. It is the joint responsibility of the owner and the well driller to comply with the requirements presented in the SEO Construction Standards. A copy of the standards can be obtained by contacting the State Engineer's Office. Contact information is presented in Appendix A.

Within thirty (30) days after the completion of the permitted well, the applicant must complete a well log and submit this information to the state engineer's office. A copy of the Well Completion form, U.W.6, can be downloaded by clicking [here](#). A well is considered complete when it is possible to install a pump and pump water.

Adjudication of ground water rights will proceed once the well is finished according to the terms of the permit. As part of these conditions, the applicant may be required to complete a Proof of Beneficial Use form ([U.W.8](#)) and file a map, signed by a Wyoming licensed professional engineer or land surveyor, showing the location of the well and the point or points of use. At this point, the state engineer will inspect the project, and once approved, a water right is issued with the priority of appropriation date set as the application filing date.

Disposal of Geothermal Fluids

The regulations governing the disposal of low temperature geothermal fluids will depend on the type of application. Non contact geothermal projects, where the geothermal fluids are kept in a closed system and do not come in contact with outside contaminants, will typically have an easier compliance path than projects where contact with potential contaminants is made. When contact is made and water quality is potentially degraded, regulatory requirements may become more stringent to ensure that water quality is maintained.

There are basically three disposal options available to a developer of a direct use geothermal project: underground injection; disposal to surface waters; and/or, disposal to the ground or land application. In some cases, the regulatory agency(s) will specify the preferred disposal method. For example, in critical groundwater areas, reinjection may be required to ensure that the aquifer is maintained. However, in most cases, it will be up to the project developer to determine the best disposal method based on regulatory requirements and the cost of compliance.

[Title 35, Chapter 11, Article 3](#) of Wyoming Statutes establishes the laws governing water quality in the State of Wyoming. The rules and regulations for enforcing these laws can be found at the Secretary of State website under Department of Environmental Quality-[Water Quality](#).

Underground Injection Wells

The Underground Injection Control (UIC) Program was established in 1982 when Congress passed the Safe Drinking Water Act. This program regulates, to one degree or the other, every "injection" of "fluid" into the subsurface. An "injection" is the emplacement of "fluids" regardless of whether the injection requires the application of pressure or not, and a fluid is defined as any liquid, gas or semisolid which can be made to flow. The intent of the program is to preserve and protect underground water from becoming polluted.

Wyoming is a primacy state under both section 1422 and section 1425 of the Safe Drinking Water Act. Under Section 1422, the Wyoming Department of Environmental Quality administers the permitting of Class I, III, IV and V UIC facilities. The DEQ has developed an Underground Injection Control webpage which can be accessed by clicking [here](#). Water Quality Rules and Regulations Chapters 3, 8, 11 and 16 cover ground water quality and underground injection wells. These Rules can be accessed by clicking [here](#).

Direct use geothermal wells are characterized as Class V wells and are further identified as Class VA1 (direct heat reinjection facilities) or Class VA2 (heat pump return flow

facilities). The Department of Environmental Quality has developed a general permit for both of these classes of facilities. A general permit is a blanket permit containing terms and conditions that cover like facilities. Most direct use geothermal projects should qualify under the general permit. However, upon reviewing the application, DEQ may decide that an open loop facility (where pollutants may be introduced into the fluid stream) may need to obtain an individual permit.

The process for obtaining a general permit requires the applicant to submit the following information:

- All property boundaries and adjacent property land use;
- All water wells within 1/4 mile of the facility and the use of these wells;
- All surface water bodies and springs within 1/4 mile of the facility;
- All known potential sources of groundwater contamination or pollution within 1/4 mile of the facility;
- Provide design information for the system including well depth and design, system design, maximum flow, heat exchanger design, heat exchange fluids, leak detection and prevention;
- Depth to groundwater table at the injection well and the depth below ground surface of the distribution piping for the injection well; and
- Any available information on the lithology, geology, hydrogeology, and groundwater quality of the groundwater in the injection and withdrawal intervals. All operators of open loop systems must provide an analysis of the groundwater to be affected sufficient to classify the groundwater under Chapter 8, Wyoming Water Quality Rules and Regulations.

Permit conditions are included on the application. Coverage under this permit is allowed when the department issues a written authorization to the permit applicant. The permit becomes effective on the date of issuance and will be reviewed every five (5) years, subject to public notice, and may be modified at these intervals. The general permit form is not yet posted on the DEQ website. Copies of the form can be obtained by contacting DEQ's Underground Injection control program. Contact information is presented in Appendix A.

Surface Disposal of Geothermal Fluids

The Wyoming Environmental Quality Act-[Water Quality](#) and the accompanying administrative rules set forth the statutes and administrative rules governing water quality in the state of Wyoming. Discharges to water of the State (surface and ground) and discharges to municipal wastewater treatment plants are covered under these laws and regulations which are administered by the Wyoming Department of Environmental Quality (DEQ). The Department of Environmental Quality-Water Quality Division website can be accessed by clicking [here](#).

In general, surface disposal of geothermal fluids to ground is preferable to discharging into surface waters. Discharging to ground minimizes the chance of degrading existing water quality. Disposal to the ground surface or land application also keeps the water within the same geographic resource area.

National Pollution Discharge Elimination System (NPDES) Permit

The federal Clean Water Act provides that the discharge of any pollutants from a point source into surface water of the United States must be regulated under the National Pollutant Discharge Elimination System (NPDES) Program. Through this program, operators of a point source discharge are required to receive coverage under a NPDES discharge permit. The permits contain limitations and conditions that will assure that the state's surface water quality standards are protected. The State of Wyoming has primacy for the NPDES program which is administered by the Wyoming Department of Environmental Quality.

All point sources of wastewater discharge are required to obtain and comply with NPDES permits. This includes any direct use geothermal project. The effluent limitations and other conditions contained in NPDES permits are based upon preservation of the water quality standard (WQS), with certain categories of wastewaters being required to be treated to a federally-specified minimum level (technology-based treatment) in addition to WQS requirements.

The Nondegradation Rules are a part of the WQS that apply to new or increased sources of pollution. These rules prohibit increases in discharge of toxic and deleterious materials to state waters, unless it is affirmatively demonstrated to the DEQ that a change is justifiable as a result of necessary economic or social development and will not preclude present and anticipated use of these waters. Some common pollutants that are limited under nondegradation are nutrients, heavy metals, and toxic organic pollutants. These same pollutants could also be limited under the WQS in existing dischargers' permits.

Each NPDES permit issued is designed to protect the receiving stream quality at the point of discharge. In addition, NPDES permits may also address stream reach or basin wide pollution problems. A calculation process called total maximum daily load (TMDL) is used to apportion allowable pollutant discharge levels among the various dischargers. If reductions of a given pollutant in a stream reach or basin are found necessary to meet WQS, the TMDL process is used to apportion the reductions among the dischargers in that reach or basin.

Wyoming does not have a general permit for geothermal projects. As such, a developer will need to complete a general form, or EPA Form 1. This form provides general details on the project such as location, discharge points, and amount and quality of the discharge. DEQ will use this information to determine how the project should be regulated and whether the applicant needs to complete EPA Form 2E, which covers nonprocess wastewater discharges, or Form 2D, which covers process wastewater discharges. The

general form must be completed 180 days prior to discharging. DEQ estimates approximately 60 to 90 days from this point to complete the permitting process. This of course assumes that the applicant is able to provide the information necessary to complete the forms in a timely manner. At present, DEQ does not charge any NPDES permitting fees. DEQ does maintain an NPDES [website](#) with information on the process. However, some of the forms may not be posted on the site. Contact information is included in Appendix A. All NPDES permits are issued for a fixed term, not to exceed 5 years.

Aquaculture Permit

Title 23 of Wyoming Statutes establishes the laws governing the propagation and culture of fish and related species. The statute authorizes the Wyoming Game and Fish Commission and the Game and Fish Department to administer all related rules and regulations. Commercial aquaculture operations are required to get an operator's license. The cost of the license is \$125, and is reissued annually. The license application forms are not currently posted on the Game and Fish [website](#). To obtain an application form contact the Game and Fish Department. Contact information is presented in Appendix A.

Appendix A

State Contact Information

Water Right and Well Construction Permit

State Engineer's Office
Ground Water Division
Cheryl Verplanke
Herschler Building, 4th Floor East
Cheyenne, WY 82002
Phone: 307-777-6164
Email: cverpl@state.wy.us

Underground Injection Well Permit

Wyoming Department of Environmental Quality,
Water Quality Division,
Robert Lucht, UIC Program Supervisor,
Herschler Building, 4th Floor West,
122 West 25th Street,
Cheyenne, Wyoming 82002
307) 777-7095, (307) 777-5973 FAX
e-mail blucht@state.wy.us

NPDES Permit

Department of Environmental Quality
Point Source Program (NPDES)
Leah Krafft, Permitting Supervisor
122 West 25th St, Herscheler Building
Cheyenne, WY 82002
Phone: 307-777-7093
Email: lkraff@state.wy.us

Aquaculture License

Wyoming Game and Fish Department
License Sales
5400 Bishop Boulevard
Cheyenne, WY 82006
Phone: 307-777-4559
Website: <http://gf.state.wy.us>

Appendix B

Geothermal References and Contacts

References

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Rafferty, Kevin, 2001, An Information Survival Kit for the Prospective Geothermal Heat Pump Owner: Geo-Heat Center, Oregon Institute of Technology, Grant No. DE-FG07-90ID 13040, pp. 1-23.

Rafferty, Kevin, 2001, Small Geothermal Systems: A Guide For The Do-It Yourselfer: Geo-Heat Center, Oregon Institute of Technology, Contract No. FG01-99-EE35098, pp. 1-30.

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Boyd, Tanya, Rafferty, Kevin, **date**, Aquaculture Information Package: Geo-Heat Center, Oregon Institute of Technology, Contract No. DE-FG07-90ID 13040, pp. 1-60.

Rafferty, Kevin, Boyd, Tonya, **date**, Geothermal Greenhouse Information Package: Geo-Heat Center, Oregon Institute of Technology, Contract No. DE-FG07-90ID 13040, pp.1-80.

Contacts

Geo-Heat Center

Website: www.oit.edu/-geoheat

Geothermal Education Office

Website: www.geothermal.marin.org

Geothermal Resources Council

Website: www.geothermal.org

Geothermal Heat Pump Consortium

Website: www.geoexchange.org

International Ground-Source Heat Pump Association

Website: www.igshpa.okstate.edu

U.S. Department of Energy

Website: www.eren.doe.gov/geothermal

Washington State University Energy Program

Website: <http://www.energy.wsu.edu/projects/renewables/geothermal.cfm>