

A Regulatory Guide to Geothermal Direct Use Development

NEW MEXICO

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 their respective state, and in some cases, federal water and wastewater 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 New Mexico. 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

In New Mexico, there are 359 discrete thermal wells and springs which have been identified. Of these, 12 communities, in eight counties, have been identified as potential sites to use geothermal energy for district heating and other applications. The eight counties are Doña Ana, Grant, Hidalgo, McKinley, Rio Arriba, San Miguel, Sandoval and Valencia. The Energy Conservation and Management Division of the New Mexico Energy, Mines and Natural Resources maintains a website that has information on New Mexico's geothermal resources including a geothermal map of the state. This site can be accessed by clicking [here](#). A developer interested in low temperature geothermal

resources may also want to contact the Geo-Heat Center, located in Klamath Falls, Oregon. The Center maintains an extensive database covering wells and springs greater than 50 °C (122 °F) for 16 western states, including New Mexico. Information on the database can be found at <http://geoheat.oit.edu/database.htm>.

Specific statutes pertaining to geothermal resources are codified in the New Mexico Geothermal Resources Conservation Act under NMSA 71-5. These statutes can be viewed by clicking [here](#). The Act defines geothermal resources “*as the natural heat of the earth or the energy, in whatever form, below the surface of the earth present in, resulting from, created by or which may be extracted from this natural heat and all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases and steam, in whatever form, found below the surface of the earth, but excluding oil, hydrocarbon gas and other hydrocarbon substances.*” The Act further defines low temperature geothermal resources as “*a geothermal reservoir containing low-temperature thermal water, which is defined as naturally heated water, the temperature of which is less than boiling at the altitude of occurrence, which has additional value by virtue of the heat contained therein and is found below the surface of the earth or in warm springs at the surface.*”

The Act identifies the New Mexico Oil Conservation Commission as having jurisdiction over geothermal resources with respect to the conservation of geothermal resources and the prevention of waste of potash as a result of geothermal operations. These powers are enumerated in NMSA 71-5-8.

The Geothermal Resources Act also has a clause allowing concurrent jurisdiction with other state agencies having regulatory jurisdiction. Storage and disposal for geothermal fluids are typically regulated under the New Mexico Water Quality Control Commission (WQCC) regulations, while drilling and production operations fall under the jurisdiction of OCC regulations and orders. The Oil Conservation Division (OCD) of the New Mexico Energy, Minerals and Natural Resources Department provides direct staffing for the Oil Conservation Commission. In cooperation with the State Engineer’s Office, the OCD oversees the permitting of geothermal wells, including but not limited to greenhouse heating, warm water aquaculture, space heating, irrigation swimming pools and spas. These wells are regulated in accordance with the rules and statutes governing groundwater appropriation and well drilling regulations.

As a result, a developer must acquire the geothermal resource by means of an application, permit and license similar to that required for a commercial water well.

The regulations governing low temperature, direct use geothermal projects differ from conventional water development projects however, 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 OCD in cooperation with the New Mexico Environment Department (NMED), has regulatory authority over geothermal discharge plans in the state. The OCD will also coordinate with the U.S. EPA Region 6, which has authority over wastewater discharge to surface waters in New Mexico. In addition to working with

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. **(OCD/SEO)**
- Obtain well construction permit/develop production well. **(SEO/OCD)**
- Determine fluid disposal plan and obtain permits for either underground injection or surface disposal. **(NMED/OCD)**
- Contact state fish and wildlife agency if developing an aquaculture project.

Two additional state resources may be of interest to a developer of direct use geothermal projects. The Energy Management and Conservation Division of the New Mexico Energy, Minerals and Natural Resources Department has resource staff available to discuss geothermal projects. Their website can be accessed by clicking [here](#). The Southwest Technology Development Institute (SWTDI) has been involved with geothermal developments in New Mexico for a number of years. SWTDI is affiliated with the New Mexico State University in Las Cruces and maintains a helpful website on geothermal resources in New Mexico. The SWTDI website can be accessed by clicking [here](#). Contact information for both of these organizations is presented in Appendix A.

Water Rights

Background

The constitution and statutes of the State of New Mexico guarantee the right to appropriate the public waters of the state for beneficial uses including the utilization of geothermal fluids for direct use applications. The New Mexico State Engineers Office (SEO) administers the rules and regulations governing groundwater withdrawals and use in the State of New Mexico. The state statutes governing groundwater appropriations are codified in Chapter 72, Article 12 NMSA 1978, which can be accessed by clicking [here](#).

Permit process

Under the Geothermal Resources Act, the Oil Conservation Division (OCD) has statutory control over geothermal resources. However, the Act does not pre-empt the State Engineer's Office (SEO) control over ground water use. Accordingly, the SEO has prior right of approval for geothermal production wells drilled on state, private and federal lands for water under 250 degrees F (121 °F). The OCD has primacy for projects exceeding this temperature.

The process for obtaining a right to appropriate groundwater for geothermal use mirrors that of a conventional water well application. The first step is to file an application with the State Engineer's Office. The permit is entitled *Application for Permit to Appropriate Underground Water* or form WR-05. The form requires the applicant to submit information on the location of the well, the amount of water to be withdrawn, the source, the intended use, and other related data. The form is available on-line by clicking [here](#), or can be obtained from SEO District offices. The application fee is \$25. Appendix 1 includes SEO regional contacts for water right forms and other related issues.

Upon filing, SEO mails the applicant a legal notice of appropriation, which the applicant must post in a local newspaper for 3 weeks. If there are no protests, the SEO reviews the application for completeness and decides whether to approve, modify or deny the application. If the application is approved, the SEO sends a letter approving the permit application including permit conditions. This process takes approximately 6 to 8 weeks, provided there are no protests. If the application is challenged, the SEO will conduct hearings to determine whether the application should be approved, modified or denied.

Once approved, a developer can begin to drill a well. The well must be constructed in full compliance with the terms of the permit and the rules and regulations governing well construction in the state, including the use of a licensed well driller. To assist developers, the State Engineer's Office has published a guidebook entitled *Rules and Regulations Governing Drilling of Wells and the Appropriation of Groundwater in New Mexico*. The guidebook can be downloaded from the SEO website by clicking [here](#).

As soon as practicable after completing the well an applicant should submit a Proof of Completion form, and if required by the permit, a Final Inspection and Report form. Both of these forms can be obtained from a district office, or can be downloaded by clicking [here](#). The SEO does not collect a fee for the Proof of Completion form, however, a \$25 filing fee is charged for the Final Inspection report. If required by permit, the final inspection form is generally prepared by a registered Professional Engineer or by a registered land surveyor.

Upon receipt of the Final Inspection and Report form or the Proof of Completion form, and any other provisions required by the permit, the SEO will issue a "Certificate and License to Appropriate".

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.

The New Mexico Oil Conservation Division (OCD) administers, through delegation, all New Mexico Water Quality Control Commission (WQCC) regulations pertaining to surface and ground water at geothermal installations. However, the New Mexico Environment Department Ground Water Quality Bureau (GWQB) may take the lead for projects involving heat pump return flow wells. Storage and disposal for geothermal fluids are regulated under [WQCC Regulations](#) Part 3 and Part 5 and under the Geothermal Resource Conservation Act.

Underground Injection Control

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.

From a resource perspective, the preferred method of disposing of geothermal fluids is to return them to the ground by way of injection wells. Underground injection wells are wells that are used as an entry point for some type of fluid (such as geothermal fluid), which is injected underground for temporary or permanent disposal or storage. To protect groundwater from contamination by injection wells, the federal government established the Underground Injection Control (UIC) Program as part of the Safe Drinking Water Act.

New Mexico has primacy for administration of the UIC Program, which is jointly implemented by the New Mexico Environment Department Ground Water Quality Bureau (GWQB) and the New Mexico Energy, Minerals & Natural Resources Department - Oil Conservation Division (OCD). These agencies administer the UIC Program under authority granted by the New Mexico Water Quality Act and Water Quality Control Commission (WQCC) Regulations, the New Mexico Oil and Gas Act, and the New Mexico Geothermal Resources Act. The OCD is the lead agency in regulating geothermal injection wells. Both of these agencies maintain useful websites explaining the UIC Program and their respective roles. Click [here](#) to view the OCD website. The NMED website can be accessed by clicking [here](#).

Geothermal facilities that discharge fluids into UIC wells are required to have ground water discharge permits approved by the Oil Conservation Division (OCD). Discharge permits contain operational, monitoring, contingency, and closure plans with specific requirements to prevent and remediate any negative impacts that UIC wells may have on ground water quality. These requirements are presented under Part 5 of WQCC regulations. A public hearing may be held on each application. At this point, the operator of the proposed project may be required to present evidence demonstrating that the injected fluids will not migrate out of the injection zone. The application process will also require a description of how the well(s) will be constructed to ensure it is properly sealed. A copy of the application form can be downloaded by clicking [here](#). It is the same form as that used for permitting groundwater discharges.

If the Division approves the project, the operator submits an application to drill new injection wells, and/or convert producing wells, to the appropriate [OCD District Office](#). District Field Inspectors inspect various phases of well construction. After a completed injection well has been successfully tested for mechanical integrity, the District office issues a permit to inject. An injection pressure limitation is specified for each well to prevent fracturing of the rock above the injection zone which could lead to fluid migrating into the fresh water aquifers above.

Periodically thereafter, the wells are inspected and tested under the supervision of District Field Inspectors to ensure that they have not developed leaks. Operators must report the volume and pressure of injected fluids monthly. When the well is no longer being used for injection, it must be safely plugged in a manner approved by the OCD District Supervisor.

Surface Disposal of Geothermal Fluids

The New Mexico Water Quality Control Commission Regulations (NMAC 20.6.2) sets forth the administrative rules governing water quality in the state of New Mexico. Discharges to water of the State (surface and groundwater) and discharges to municipal wastewater treatment plants are covered under these regulations. The Oil Conservation Division of the New Mexico Energy, Minerals and Natural Resources Department administers the treatment and disposal of geothermal fluids in the state.

In general, surface disposal to ground is preferable to discharging into surface waters. Discharging to ground minimizes the chance of degrading existing water quality. Land or ground application also keeps the water within the same geographic resource area. Regardless of whether a project proposes to discharge to the surface or groundwater, a developer will need to submit a discharge plan application to OCD. The application is one page in length and can be downloaded by clicking [here](#). Based on the information provided in the notice, OCD will determine whether a groundwater discharge permit is needed.

Groundwater Discharge Permit

The state of New Mexico has initiated various groundwater protection efforts and pollution abatement strategies to protect New Mexico's groundwater resources and to prevent water pollution to the maximum degree possible. As part of this effort, geothermal projects that are discharging fluids either to the ground surface or to underground injection wells may need to obtain a Groundwater Discharge Permit if OCD determines that the project may jeopardize ground water resources. The discharge permit application requires information on the location, operation, monitoring, contingency and closure plans appropriate for the proposed treatment and disposal system as per WQCC regulations. The application must be submitted in triplicate to OCD, and must be accompanied by a \$100 filing fee. A copy of the form can be downloaded by clicking [here](#).

The OCD must review the application for technical and administrative completeness within 30 days of submittal and notify the applicant of their findings. During this same time period, the applicant must provide public notice of the project as outlined in NMAC 20.6.2.3108, and provide OCD with proof of this activity.

Following this, OCD has 30 days to notify any affected parties including federal, state and local regulatory agencies. Within 60 days after OCD determines that the application is complete and all required technical information is available, OCD will notify the applicant if the permit was approved or denied and provide public notice of this decision. Following the public notice, a 30 day period is set aside for public comments. If sufficient public interest is identified during this period, OCD will hold a public hearing. Once the administrative record is complete including a public hearing if needed, OCD will notify the applicant within 30 days whether the permit was approved, modified or denied.

National Pollution Discharge Elimination System Permit

The National Pollution Discharge Elimination System (NPDES) program requires that all point source discharges into U.S. waters obtain permits. NPDES permits contain limits on what can be discharged and other provisions to ensure that the discharge does not harm water quality or the public's health. Discharge of low temperature geothermal fluids to surface waters would most likely require an NPDES permit. The federal Environmental Protection Agency (EPA) currently retains "primacy" for the NPDES program in New Mexico. This means that EPA Region 6 is responsible for permitting and enforcing all NPDES permits in the state. OCD must certify the permit once issued by EPA and may also require an NPDES permitted project to also obtain a groundwater discharge permit if groundwater is impacted.

EPA Region 6 has developed procedures with respect to NPDES permits. Under current practices, EPA will inform OCD when permits are applied for and will provide OCD copies of the application. EPA then issues a draft permit and posts a public notice that the state will consider 401 certification. After considering public comments, EPA prepares a proposed final permit and provides this permit to OCD for certification. OCD typically

has 30 days to provide or deny certification. Subsequent to OCD's certification decision, EPA will make its final decision regarding the NPDES permit and issue a final permit.

The most likely permit forms covering a direct use, geothermal application are EPA NPDES forms 1 and 2D or 2E. Form 1 collects general information from the applicant and must be filled out in addition to a supplemental form. Form 2D covers projects which discharge wastewater. Form 2E was designed by the US Environmental Protection Agency to cover projects which do not discharge process wastewater. Non-contact, direct use geothermal projects will typically need to complete Form 2E, however discussions with EPA staff to determine the correct form should take place. EPA contact information can be found in Appendix A. NPDES forms can be downloaded from the EPA Region 6 website by clicking [here](#). EPA also has on-line a software program to assist in the completion of NPDES forms. The software program, called Permit Application Software System or PASS, can be downloaded by clicking [here](#).

An NPDES applicant will need to provide mapping information, flow data, an estimate of the type and quantities of pollutants discharged and a brief description of any planned treatment. This information will be used to determine the conditions of the permit including appropriate control or treatment strategies, monitoring and reporting requirements. Since most direct use applications involve non-contact geothermal heat exchange, the water quality of the source water is unaffected. For these type of projects, permit conditions should be strait-forward. Even so, a developer may still be required to cool the geothermal water before discharging into a surface water source.

In some instances a developer may be able to proceed with a general permit versus an individual permit. A general permit covers a set of like facilities, such as a coal facility or a fish farm. Here, a set of conditions are already developed which meet the general operating conditions of these similar facilities. In these cases, a developer would complete Form 1 to see if they qualify under the general permit. If eligible the developer would also need to submit a Notice of Intent form or equivalent, which provides additional information needed by the resources agency administering the NPDES program. The advantage of the general form is that the resource agency can issue the permit as soon as all information needs are satisfied. For individual permits, there is an additional 30 day public notice process, as well as the potential for intervention on the terms and conditions of the permit.

Appendix A

State Contact Information

General Geothermal Information

Energy Conservation and Management Division
New Mexico Energy, Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico, 87505
Brian Johnson
Phone 505/476-3313
Email: bkjohnson@state.nm.us

Southwest Technology Development Institute
New Mexico State University
Box 30001, MSC 3SOLAR
Las Cruces, New Mexico 88003-8001
Tel: (505) 646-1846
Fax: (505)646-2960
Website: <http://www.nmsu.edu/~tdi/geothermal.htm>

Water Rights and Production Well Permitting

Oil Conservation Division
New Mexico Energy, Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico, 87505
Roy Johnson
Phone: 505/476-3470

State Engineers Office

**District 1 - Rio Grande, Estancia, Bluewater,
Gallup, Sandia, San Juan ground water basins**
Office of the State Engineer
121 Tijeras, NE, Suite 2000
Albuquerque NM 87102
1-505-764-3888
Fax: 1-505-764-3892

District 2 - *Roswell, Carlsbad, Lea County, Portales, Hondo, Penasco, Jal, Fort Sumner, Capitan, Curry County groundwater basins*
Office of the State Engineer
1900 West Second Street
Roswell NM 88201
1-505-622-6521
Fax: 1-505-623-8559

District 3 - *Mimbres Valley, Virden Valley, Animas Valley, Playas Valley, Gila-San Francisco, San Simon, Lordsburg Valley, Nutt-Hockett groundwater basins*
Office of the State Engineer
PO Box 844
216 South Silver
Deming NM 88031
1-505-546-2851
Fax: 1-505-546-2290

District 4 - Hot Springs, Hueco, Lower Rio Grande, Las Animas Creek, Salt, Tularosa groundwater basins
Office of the State Engineer
P.O. Box 729
1680 Hickory Loop, Suite J
Las Cruces NM 88004
1-505-524-6161
Fax: 1-505-524-6160

Santa Fe Office - *Canadian River, Tucumcari, Upper Pecos ground water basins*
Office of the State Engineer
Water Rights Division
PO Box 25102
Bataan Memorial Building
Santa Fe NM 87504
1-505-827-6120
Fax: 1-505-827-6682

Aztec Sub-Office - San Juan area.
Office of the State Engineer
Aztec Sub-Office
112 South Mesa Verde
Aztec NM 87410
1-505-334-9481
Fax: 1-505-334-3168

Underground Injection Well Permit

David Catanach
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505
Phone: (505) 476-3466
Email: dcatanach@state.nm.us

Groundwater Discharge Permit

Bill Olson
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505
Phone: 505-476-3470
Email: WOlson@state.nm.us

National Pollution Discharge Elimination System (NPDES) Permit

EPA Region 6
Compliance Assurance and Enforcement Division
Water Enforcement Branch (6EN-W)
1445 Ross Avenue
Dallas, Texas 75202-2733

Main Branch Phone: (214)665-6468
[24 Hour Hotline](tel:(214)665-6595): (214)665-6595
Fax: (214)665-2168
Website: <http://www.epa.gov/earth1r6/6en/w/cwa.htm>

Appendix B

Geothermal References and Contacts

References

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Rafferty, Kevin, 2000, Geothermal Power Generation, A Primer on Low-Temperature, Small-Scale Applications: Oregon Institute of Technology, pp. 1-11.

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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.

Lund, John W., **date**, Balneological Use of Thermal Waters: Geo-Heat Center, Oregon Institute of Technology, pp. 1-10.

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>