

R655. Natural Resources, Water Rights.

R655-1. Wells Used for the Discovery and Production of Geothermal Energy in the State of Utah.

R655-1-1. General Provisions.

1.1 Authority: In Section 73-22-5, the Division of Water Rights is given jurisdiction and authority to require that all wells for the discovery and production of water and steam at temperatures greater than 120 degrees centigrade to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in a manner as to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery.

1.2 Definitions:

(a) "Applicant" means any person submitting an application to the Division of Water Rights to appropriate water, brine or steam for geothermal purposes and for the construction and operation of any well or injection well.

(b) "BOPE" is an abbreviation for Blow-Out Prevention Equipment which is designed to be attached to the casing in a geothermal well in order to prevent a blow-out.

(c) "Completion." A well is considered to be completed thirty days after drilling operations have ceased unless a suspension of operation is approved by the Division, or thirty days after it has commenced producing a geothermal resource, whichever occurs first, unless drilling operations are resumed before the end of the thirty-day period or at the end of the suspension.

(d) "Correlative Rights" means the owners' or operators' just and equitable share in the geothermal resource.

(e) "Division" means the Division of Water Rights, Department of Natural Resources, State of Utah.

(f) "Drilling Logs" means the recorded description of the lithologic sequence encountered in drilling a well.

(g) "Drilling Operations" means the actual drilling, redrilling, or recompletion of the well for production or injection including the running and cementing of casing and the installation of well head equipment. Drilling operations do not include perforating, logging, and related operations.

(h) "Exploratory Well" means a well drilled for the discovery or evaluation of geothermal resources either in an established geothermal field or in unexplored areas.

(i) "Geothermal Area" means the same general land area which in its subsurface is underlaid or reasonably appears to be underlaid by geothermal resources from or in a reservoir, pool, or other source or interrelated sources.

(j) "Geothermal Field" means an area designated by the Division which contains a well or wells capable of commercial

production of geothermal resources.

(k) "Geothermal Resource" means the natural heat energy of the earth, the energy in whatever form which may be found in any position and at any depth below the surface of the earth, present in, resulting from, or created by, or which may be extracted from natural heat and all minerals in solution or other products obtained from the material medium of any geothermal resource.

(l) "Injection Well" means any special well, converted producing well, or reactivated or converted abandoned well employed for injecting material into a geothermal area or adjacent area to maintain pressures in a geothermal reservoir, pool, or other source, or to provide new material to serve as a material medium therein, or for reinjecting any material medium or the residue thereof, or any by-product of geothermal resource exploration or development into the earth.

(m) "Material Medium" means any substance including, but not limited to, naturally heated fluids, brines, associated gases and steam in whatever form, found at any depth and in any position below the surface of the earth, which contains or transmits the natural heat energy of the earth, but excluding petroleum, oil, hydrocarbon gas, or other hydrocarbon substances.

(n) "Notice" means a statement to the Division that the applicant intends to do work.

(o) "Operator" means any person drilling, maintaining, operating, pumping, or in control of any well. The term operator also includes owner when any well is or has been or is about to be operated by or under the direction of the owner.

(p) "Owner" means the owner of the geothermal lease or well and includes operator when any well is operated or has been operated or is about to be operated by any person other than the owner.

(q) "Person" means any individual natural person, general or limited partnership, joint venture, association, cooperative organization, corporation, whether domestic or foreign, agency or subdivision of this or any other state or municipal or quasi-municipal entity whether or not it is incorporated.

(r) "Production Well" means any well which is commercially producing or is intended for commercial production of a geothermal resource.

(s) "State Engineer" is the Director of the Division of Water Rights, which is the agency having general administrative supervision over the waters of the State. The duties of this Division are primarily set forth in Title 73, Chapters 1 through 6.

(t) "Suspension of Operations" means the cessation of drilling, redrilling, or alteration of casing before the well is officially abandoned or completed. All suspensions must be

authorized by the Division.

(u) "Waste" means any physical waste including, but not limited to:

(1) Underground waste resulting from inefficient, excessive, or improper use, or dissipation of geothermal energy, or of any geothermal resource pool, reservoir, or other source; or the locating, spacing, constructing, equipping, operating, or producing of any well in a manner which results, or tends to result in reducing the quantity of geothermal energy to be recovered from any geothermal area in the State.

(2) The inefficient above-ground transporting and storage of geothermal energy; and the locating, spacing, equipping, operating, or producing of any well or injection well in a manner causing or tending to cause unnecessary or excessive surface loss or destruction of geothermal energy; the escape into the open air from a well of steam or hot water in excess of what is reasonably necessary in the efficient development or production of a well.

(v) "Well" means any well drilled for the discovery or production of geothermal resources or any well on lands producing geothermal resources or reasonably presumed to contain geothermal resources, or any special well, converted producing well or reactivated or converted abandoned well employed for reinjecting geothermal resources or the residue thereof.

1.3 All administrative procedures involving applications, approvals, hearings, notices, revocations, orders and their judicial review, and all other administrative procedures required or allowed by these rules are governed by rules for administrative procedures adopted by the Division, including R655-6, Administrative Procedures for Informal Proceedings Before the Division of Water Rights of the State of Utah.

1.4 The approval of the Division is required prior to commencing drilling, rehabilitating, renovating, deepening, redrilling, or plugging and abandonment operations.

R655-1-2. Drilling.

2.1 Applications:

2.1.1 Application to drill for Geothermal Resources.

Any person, owner or operator, who proposes to drill a well for the production of geothermal resources or to drill an injection well shall first apply to the Division in accordance with Title 73, Chapter 3. Applications to appropriate water for geothermal purposes will be processed and investigated by the Division, and if they meet the requirements of Section 73-3-8, they will be approved by the State Engineer on a well-to-well basis or as a group of wells which comprise an operating unit and have like characteristics.

Appropriation of water for geothermal purposes shall not be

considered mutually interchangeable with water for any other purpose. Water, brine, steam or condensate produced during a geothermal operation may be subject to further appropriation if physical conditions permit.

2.1.1.1 The driller must have a current well driller's license and bond from the State Engineer in accordance with R655-4 UAC. The driller must also adhere to the rules of R655-4 UAC when drilling through groundwater aquifers. 2.1.2 Plan of Operations:

Before drilling an exploratory, production well, or injection well, the applicant shall submit a plan of operations to the State Engineer for his approval. The plan shall include:

(a) Location, elevation and layout including a map showing the parcel boundaries and well location.

(b) Lease identification and Well Number.

(c) Tools and equipment description including maximum capacity and depth rating.

(d) Expected depth and geology.

(e) Drilling, mud, cementing and casing program.

(f) BOPE installation and test.

(g) Logging, coring and testing program.

(h) Methods for disposal of waste materials.

(i) Environmental considerations such as the placement of pits or sumps, the disposal of solid and liquid wastes, and the handling of test fluids.

(j) Emergency procedures.

(k) Other information as the State Engineer may require.

2.1.3 Application to deepen or modify an existing well.

If the owner or operator plans to deepen, redrill, plug, or perform any operation that will in any manner modify the well, an application shall be filed with the Division and written approval must be received prior to beginning work; however, in an emergency, the owner or operator may take action to prevent damage without receiving prior written approval from the Division, but in those cases the owner or operator shall report his action to the Division as soon as possible.

2.1.4 Application for permit to convert to injection.

If the owner or operator plans to convert an existing geothermal well into an injection well with no change of mechanical condition, written request shall be filed with the Division and written approval must be received prior to beginning injection.

2.1.5 Amendment of permit.

No changes in the point of diversion, place or nature of use shall be allowed until an amendment to the application is approved by the State Engineer in accordance with Section 73-3-3.

2.1.6 Notice to other agencies.

Notice of applications, permits, orders, or other actions

received or issued by the Division may be given to any other agency or entity which may have information, comments, or interest in the activity involved.

2.2 Fees: Any application or plan of operation filed with the State Engineer shall be accompanied by a filing fee in accordance with Section 73-2-14.

2.3 Bonds:

2.3.1 Any operator having approval to drill, re-enter, test, alter or operate a well, prior to any construction or operation, shall file with the Division of Water Rights and obtain its approval of a surety bond, payable to the Division of Water Rights for not less than \$10,000 for each individual well or \$50,000 for all wells. The surety bond shall be on a form prescribed by the Division and shall be conditioned on faithful compliance with all statutes and these rules. A cash bond can be submitted in lieu of a surety bond upon approval of the Division of Water Rights.

2.3.2 Bonds shall remain in force for the life of the well or wells and may not be released until the well or wells are properly abandoned or another valid bond is substituted.

2.3.3 Transfer of property does not release the bond. If any property is transferred and the principal desires to be released from his bond, the operator shall:

a. Assign or transfer ownership in the manner prescribed in Sections 73-1-10 and 73-3-18, identifying the right by application number, well number or location and,

b. Provide the Division with a declaration in writing from the assignee or transferee that he accepts the assignment and tenders his own bond therewith or therein accepts responsibility under his blanket bond on file with the Division.

2.4 Well Spacing:

2.4.1 Any well drilled for the discovery or production of geothermal resources or as an injection well shall be located 100 feet or more from and within the outer boundary of the parcel of land on which the well is situated, or 100 feet or more from a public road, street, or highway dedicated prior to the commencement of drilling. This requirement may be modified or waived by the State Engineer upon written request if it can be demonstrated that public safety is preserved and that the integrity of the geothermal source is not jeopardized.

2.4.2 For several contiguous parcels of land in one or different ownerships that are operated as a single geothermal field, the term outer boundary line means the outer boundary line of the land included in the field. In determining the contiguity of parcels of land, no street, road, or alley lying within the lease or field shall be determined to interrupt such contiguity.

2.4.3 The State Engineer shall approve the proposed well spacing programs or prescribe modifications to the programs as he

deems necessary for proper development giving consideration to factors as, but not limited to, topographic characteristics of the area, the number of wells that can be economically drilled to provide the necessary volume of geothermal resources for the intended use, protecting correlative rights, minimizing well interference, unreasonable interference with multiple use of lands, and protection of the environment.

2.4.4 Directional drilling.

Where the surface of the parcel of land is unavailable for drilling, the surface well location may be located upon property which may or may not be contiguous. Surface well locations shall not be less than 25 feet from the outer boundary of the parcel on which it is located, nor less than 25 feet from an existing street or road. The production or injection interval of the well shall not be less than 100 feet from the outer boundary of the parcel into which it is drilled. Directional surveys must be filed with the Division for all wells directionally drilled.

2.5 Identification: Each well being drilled or drilled and not abandoned shall be identified by a durable sign posted in a conspicuous place near the well. The lettering shall be large enough to be legible at 50 feet under normal conditions and shall show the name of the applicant, well number, location by 10-acre tract, and name of lease.

The well number shall be according to the modified Kettleman Well Numbering System adopted by the U.S. Geological Survey.

2.6 Unit Agreements: At the request of any interested party or on his own initiative, the State Engineer may establish a unit plan or agreement for a geothermal area to prevent waste, protect correlative rights and avoid drilling unnecessary wells. Proper notice to interested parties must be given and a hearing held before the State Engineer before the unit may be created.

2.7 Casing Requirements:

2.7.1 General.

All wells shall be cased in a manner to protect or minimize damage to the environment, usable ground waters and surface waters, geothermal resources, life, health, and property. The permanent well head completion equipment shall be attached to the production casing or to the intermediate casing if production casing does not reach the surface.

Specifications for casing strings shall be determined or approved on a well-to-well basis. All casing strings reaching the surface shall provide adequate anchorage for blowout-prevention equipment, hole pressure control and protection for all natural resources. The casing requirements given are general but should be used as guidelines in submitting proposals to drill (Plan of Operations).

2.7.2 Conductor Casing.

A minimum of 40 feet of conductor casing shall be installed. The annular space is to be cemented solid to the surface. A 24-hour cure period for the grout must be allowed prior to drilling out the shoe unless additives approved by the State Engineer are used to obtain early strength. An annular blowout preventer shall be installed on all exploratory wells and on development wells when deemed necessary by the Division. For low-temperature geothermal wells less than 90 degrees C. this requirement may be reduced or waived by the State Engineer.

2.7.3 Surface Casing.

Except in the case of low-temperature geothermal wells, the surface casing hole shall be logged with an induction electrical log, or equivalent, before running casing or by gamma-neutron log. This requirement may vary from area to area, depending upon the amount of pre-existing subsurface geological data available. If sufficient subsurface geologic data is available, the State Engineer may not require additional logging of the surface casing hole. However, permission to omit this requirement must be granted by the Division prior to running surface casing.

Surface casing shall provide for control of formation fluids, for protection of shallow usable ground water and for adequate anchorage for blowout-prevention equipment. All surface casing shall be cemented solid to the surface. A 24-hour cure period shall be allowed prior to drilling out the shoe of the surface casing unless additives approved by the State Engineer are used to obtain early strength.

2.7.3.1 Length of Surface Casing.

(a) In areas where subsurface geological conditions are variable or unknown, surface casing in general shall be set at a depth of wells drilled in those areas. A minimum of surface casing shall be set through a sufficient series of low permeability, competent lithologic units to ensure a solid anchor for blowout-prevention equipment and to protect usable ground water and surface water from contamination. A second string or intermediate casing may be required if the first string has not been cemented through a sufficient series of low permeability, competent lithologic units and either a rapidly increasing geothermal gradient or rapidly increasing formation pressures are encountered.

(b) In areas of known high formation pressure, surface casing shall be set at a depth approved by the Division after a careful study of geological conditions.

(c) Within the confines of designated geothermal fields, the depth to which surface casing shall be set shall be approved by the Division on the basis of known field conditions.

(d) These requirements may be reduced or waived by the State Engineer for low-temperature geothermal wells.

2.7.3.2 Mud Return Temperatures.

The temperature of the return mud shall be monitored regularly during the drilling of the surface casing hole. Either a continuous temperature monitoring device shall be installed and maintained in working condition, or the temperature shall be read manually. In either case, return mud temperature shall be logged after each joint of pipe has been drilled down 30 feet.

2.7.3.3 Blowout-Prevention Equipment.

BOPE capable of shutting-in the well during any operation shall be installed on the surface casing and maintained ready for use at all times. BOPE pressure tests shall be witnessed by Division personnel on all exploratory wells prior to drilling out the shoe of the surface casing. The decision to require and witness BOPE pressure tests on all other wells shall be made on a well-to-well basis. The Division must be contacted 24 hours in advance of a scheduled pressure test. The State Engineer may give verbal permission to proceed with the test upon request by the operator.

2.7.4 Intermediate Casing.

Intermediate casing shall be required for protection against unusual pressure zones, cave-ins, wash-outs, abnormal temperature zones, uncontrollable lost circulation zones or other drilling hazards. Intermediate casing strings shall be cemented solid to the surface or to the top of the liner hanger whenever the intermediate casing string is run as a liner. The liner lap shall be pressure tested prior to resumption of drilling.

2.7.5 Production Casing.

Production casing may be set above or through the producing or injection zone and cemented above the injection zones. Sufficient cement shall be used to exclude overlying formation fluids from the geothermal zone, to segregate zones and to prevent movement of fluids behind the casing into zones that contain usable ground water. Production casing shall either be cemented solid to the surface or lapped into intermediate casing, if run. If the production casing is lapped into an intermediate casing, the casing overlap shall be at least 100 feet, the lap shall be cemented solid, and it shall be pressure tested to ensure its integrity.

2.8 Electric Logging:

All wells, except observation wells for monitoring purposes only, shall be logged with an induction electrical log or equivalent or gamma-neutron log from the bottom of the hole to the bottom of the conductor pipe. This requirement may be modified or waived by the Division upon written request if such request demonstrates sufficient existing data of surrounding wells.

2.9 Cementing Casing.

Cements used in cementing casing and sealing formations must

be of a grade and type best suited for expected reservoir temperature, formation water chemistry and bonding properties. Cements acceptable for use in high-temperature holes include Modified Type A or G, Alumina Silica Flour, Phosphate Bonded Glass, or other equivalent high-temperature design cement as approved by the Division.

R655-1-3. Blowout Prevention.

3.1 General.

3.1.1 Blowout-Prevention Equipment (BOPE) installations shall meet the minimum specifications for assemblies prescribed by the most recent version of the American Petroleum Institute's Standard 53 (Blowout Prevention Equipment Systems for Drilling Wells) which are incorporated herein by reference or as may be otherwise prescribed by the Division. The American Petroleum Institute Standard 53 is available from the American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070, phone 202-682-8000, www.api.org. Equipment for the prevention of a blowout, capable of shutting in the well during any operation, must be installed on the surface casing and maintained in good operating condition at all times. This equipment must have a rating for pressure greater than the maximum anticipated pressure at the wellhead. Equipment for the prevention of a blowout is required on any well where temperatures may exceed 120_C. A BOPE plan including testing must be included in the plan of operations. BOPE shall have a minimum working-pressure rating equal to or greater than the lesser of:

(a) A pressure equal to the product of the depth of the BOPE anchor string in feet times one psi per foot.

(b) A pressure equal to the rated burst pressure of the BOPE anchor string.

(c) A pressure equal to 2,000 psi.

Specific inspections and tests of the BOPE may be made by the Division. The Division shall be notified at least 48 hours prior to the commencement of a BOPE test. The requirements for tests will be included in the Division's answer to the notice of the intention to drill. The operator shall test the equipment for the prevention of a blowout under pressure. The operator shall submit to the Division the pressure data and supporting information for the equipment for the prevention of a blowout as soon as practicable after the conclusion of the testing. All blowout preventers and related equipment that may be exposed to well pressure must be tested first to a low pressure and then to a high pressure:

(a) A pressure decline of 10 percent or less in 30 minutes is for the low pressure test considered satisfactory prior to initiating the high-pressure test;

(b) When performing the low-pressure test, it is not acceptable to apply a higher pressure and bleed down to the low test pressure;

(c) The high-pressure test must be to the rated working pressure of the ram type blowout prevention equipment and related equipment, or to the rated working pressure of the wellhead on which the stack is installed, whichever is lower. A pressure decline of 10 percent or less in 30 minutes is considered satisfactory;

(d) Annular blowout prevention equipment must be high-pressure tested to 50 percent of the rated working pressure;

(e) The blowout prevention equipment must be pressure tested: when installed, prior to drilling out casing shoes, and following repairs or reassembly of the preventers that require disconnecting a pressure seal in the assembly.

3.1.2 A Division employee may be present at the well at any time during the drilling.

3.1.3 A logging unit equipped to regularly record the following data shall be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth.

- (a) Drilling mud temperature.
- (b) Drilling mud pit level.
- (c) Drilling mud pump volume.
- (d) Drilling mud weight.
- (e) Drilling rate.
- (f) Hydrogen sulfide gas volume.

The Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs a. through d. The drilling rate required in subparagraph e shall be logged with standard industry recording devices, and hydrogen sulfide monitoring and safety equipment shall be provided whenever needed to satisfy the requirement of subparagraph f.

3.2 Requirements Using Mud as the Drilling Fluid.

The following requirements are for exploratory areas, unstable areas containing fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi. These requirements may be reduced by the State Engineer where the geothermal formations are known to be shallow and of low pressure and temperature.

(a) An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe may be required to ensure against possible gas blowouts during the drilling of the surface casing hole.

(b) Annular BOPE and pipe-ram/blind-ram BOPE with a minimum working pressure rating of 2,000 psi shall be installed on the surface casing so that the well can be shut-in at any time. The double-ram preventer shall have a mechanical locking device.

(c) A hydraulic actuating system utilizing an accumulator of sufficient capacity and a high pressure auxiliary back-up system. This total system shall be equipped with dual controls: one at the driller's station and one at least 50 feet away from the well head.

(d) Kelly cock and standpipe valve.

(e) A fill-up line installed above the BOPE.

(f) A kill line installed below the BOPE, leading directly to the mud pumps and fitted with a valve through which cement could be pumped if necessary.

(g) A blow-down line fitted with two valves installed below the BOPE. The blow-down line shall be directed in a manner to permit containment of produced fluids and to minimize any safety hazard to personnel.

(h) All lines and fittings shall be steel and have a minimum working-pressure rating of at least that required of the BOPE.

(i) The temperature of the return mud during the drilling of the surface casing hole shall be monitored regularly. Either a continuous temperature monitoring device shall be installed and maintained in working condition, or the temperature shall be read manually. In either case, return mud temperatures shall be logged after each joint of pipe is drilled down every 30 feet.

3.3 Requirements Using Air as the Drilling Fluid.

The following requirements are for areas where it is known that dry steam exists at depth or formation pressures are less than hydrostatic:

(a) A rotating-head installed at the top of the BOPE stack.

(b) A pipe-ram/blind-ram BOPE, with a minimum working-pressure rating of 1,000 psi, installed below the rotating-head so that the well can be shut-in at any time.

(c) A banjo-box or mud-cross steam diversion unit installed below the double-ram BOPE fitted with a muffler capable of lowering sound emissions to within State standards.

(d) A blind-ram BOPE, with a minimum working-pressure rating of 1,000 psi, installed below the banjo-box or mud-cross so that the well can be shut-in while removing the rotating-head during bit changes.

(e) A master gate valve, with a minimum working-pressure rating of 600 psi, installed below the blind-ram so that the well can be shut-in after the well has been completed, prior to removal of the BOPE stack.

(f) All ram-type BOPE shall have a hydraulic actuating system utilizing an accumulator of sufficient capacity and a high-

pressure backup system.

(g) Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the well head.

(h) Float and standpipe valves.

(i) A kill line installed below the BOPE, leading directly to the mud pumps and fitted with a valve through which cement could be pumped if necessary.

(j) All lines and fittings must be steel and have a minimum working-pressure rating of 1,000 psi.

R655-1-4. Records.

4.1 General: The owner or operator of any well shall keep or cause to be kept a careful and accurate log, core record, and history of the drilling of the well. These records shall be kept in the nearest office of the owner or operator or at the well site and together with all other reports of the owner and operator regarding the well shall be subject to the inspection by the Division during business hours. All records, unless otherwise specified, must be filed with the Division within 90 days after completion of the well.

4.2 Records to be Filed with the Division:

4.2.1 Drilling Logs and Core Record -- the drilling log shall include the lithologic characteristics and depths of formations encountered, the depth and temperatures, chemical compositions and other chemical and physical characteristics of fluids encountered from time to time so far as ascertained. The core record shall show the depth, lithologic character, and fluid content of cores obtained so far as determined. The collection of cuttings at least every 30 feet, or more often if a significant change in lithology occurs, and filing thereof, is a condition for approval of the Plan of Operations. The cuttings must be cleaned, dried, marked for location and depth and placed in envelopes, sample bags, or chip trays. The cuttings and a split of any core must be submitted to the Division within 30 days after the well is completed.

4.2.2 Well History -- the history shall describe in detail in chronological order on a daily basis all significant operations carried out and equipment used during all phases of drilling, testing, completion, and abandonment of any well.

4.2.3 Well Summary Report -- the well summary report shall accompany the core record and well history reports. It is designed to show data pertinent to the construction and condition of a well at the time of completion of work done.

4.2.4 Production Records -- the owner or operator of any well producing geothermal resources shall file with the Division on or before the tenth day of each month for the preceding month,

a statement of production utilized in a form as the Division may designate.

4.2.5 Injection Records -- the owner or operator of any well injecting geothermal fluids or waste water for any purpose shall file with the Division on or before the tenth day of each month for the preceding month a report of the injection as the Division may designate.

4.2.6 Electric Logs and Directional Surveys if Conducted -- electric logs and directional surveys shall be filed upon recompletion of any well. Like copies shall be filed upon recompletion of any well. Upon a showing of hardship, the Division may extend the time within which to comply for a period not to exceed one year.

4.3 Confidential Status: Any reports, logs, records, or histories filed with the Division shall not be available for public inspection and shall be kept confidential by the Division unless agreed to by the owner, provided, however, that the Division may use any reports, logs, records, or histories in any action in any court to enforce the provisions of Title 73, Chapter 22, or any order adopted hereunder. The following information may be made public by the Division:

- (a) Owner or operator's name.
- (b) Well designation or number.
- (c) Elevation of derrick floor or ground elevation.
- (d) Location of well.
- (e) The application and all information pertaining to it, including its current status.

4.4 Inspection of Records: The records filed by an operator with the Division shall be open to inspection only to those authorized in writing by the operator and to designated Division personnel. The records of any operator filed for a completed or producing well that has been transferred by sale, lease, or otherwise shall be available to the new owner or lessee for his inspection or copying and shall be available for inspection or copying by others upon written authorization of new owner or lessee.

R655-1-5. Injection Wells.

Unless the Division approves an alternative method of disposal, all fluids derived from the geothermal resources must be reinjected into the same reservoir from which the fluids were produced.

5.1 Construction: The owner or operator of a proposed injection well or series of injection wells shall provide the Division with information it deems necessary for evaluation of the impact of injection on the geothermal reservoir and other natural resources. Information shall include the items listed for a plan

of operations as per Section 2.1.2 of this section (R655-1), existing reservoir conditions, method of injection, source of injection fluid, estimates of daily amount of material medium to be injected, zones or formations affected, description of the effects of injection on such factors as potable water, seismicity, and local tectonic conditions, proposed downhole and surface injection equipment and metering facilities with capacity, design capabilities, and design safety factors in sufficient detail to enable adequate environmental analysis including construction and engineering design plans, proposed injectivity surveys, seismic surveys, seismic monitoring, and other means to monitor injection, and analysis of fluid to be injected and of the fluid from the intended zone of the injection, if available. The bonding for an injection well is the same as those required for an exploratory well or production well.

5.2 Convert to Injection Well: An owner or operator planning to convert an existing well to an injection well, even if there will be no change to the mechanical condition, must submit an injection well conversion plan with the Division and the Division must approve the plan before injection is commenced.

5.3 Surveillance:

5.3.1 When an operator or owner proposes to drill or modify an injection well or convert a well to an injection well, he shall be required to demonstrate to the Division by means of internal and external tests that the casing and annular cement seals have complete mechanical integrity. These tests shall be conducted in a method approved by the Division as proposed in the injection well plan of operations. In the case of the annular cement seal survey for a new or converted injection well, the owner or operator shall make sufficient surveys within thirty days after injection is started into a well to prove that all the injected fluid is confined to the intended zone of injection.

5.3.2 On a continuing basis and in order to establish that all injected water is confined to the intended zone of injection, mechanical integrity surveys on the well casing and annular cement seals shall be made at least every five years or more often if necessary on a well-to-well basis. The Division must be notified in writing with a testing plan for each injection well at least three weeks before mechanical integrity testing commences. Specific internal and external mechanical integrity tests shall be proposed in the testing plan and must conform to the most current industry and regulatory standards for geothermal injection well mechanical integrity testing. The Division shall approve each testing plan and issue a written notice to proceed with testing approval to the operator prior to commencing. A mechanical integrity testing plan shall be submitted by the owner or operator to the Division for approval prior to each testing cycle. The

Division shall be notified 48 hours in advance of surveys in order that a representative may be present if deemed necessary. If the operator can substantiate by existing data that these tests are not necessary, then, after review of the data, the State Engineer may grant a waiver exempting the operator from the tests.

5.3.3 Injection wells shall be monitored to ensure that there is no escape of geothermal fluids from the casings or through the annular space between casings and open hole except in the zone for which injection is permitted. Monitoring required by the Division may include gauging pressure between casings, periodic testing for casing leaks, surveys to detect movement of fluid in adjacent rock formations, cement bond logs, temperature measurements, analysis of water chemistry, special wellhead equipment or other methods employed by industry to monitor re-injection operations.

5.3.4 After a well has been placed into injection, the injection well site will be visited periodically by Division personnel. The operator or owner will be notified of any necessary remedial work. Unless modified by the State Engineer, this work must be performed within ninety days of approval for the injection well, or approval for the injection well issued by the Division will be rescinded.

5.3.5 Injection pressures shall be recorded and compared with the pressures reported on the monthly injection reports. Any discrepancies shall be rectified immediately by the operator. A graph of pressures and rates versus time shall be maintained by the operator. Reasons for anomalies shall be promptly ascertained. If these reasons are such that it appears damage is being done, approval by the Division may be rescinded, and injection shall cease.

5.3.6 The pressure for injection at the wellhead of an injection well must not exceed that which is calculated to initiate new fractures or propagate existing fractures in the zone for injection or the confining formation between the zone of injection and underground sources of drinking water. The operator shall calculate the maximum injection pressure based upon industry standards and submit those to the Division for approval.

5.3.7 The chemical, physical, and biological nature of the injected fluid must be analyzed with sufficient frequency to yield representative data on its characteristics. When requested by the Division, or at any time the injected fluid is modified, a new analysis shall be made and the results sent to the Division.

R655-1-6. Abandonment and Sealing.

6.1 Objectives: The objectives of abandonment are to block interzonal migration of fluids so as to:

- (a) Prevent contamination of fresh waters or other natural

resources.

- (b) Prevent damage to geothermal reservoirs.
- (c) Prevent loss of reservoir energy.
- (d) Protect life, health, environment and property.

6.2 General Requirements: The following are general requirements which are subject to review and modification for individual wells or field conditions:

(a) A notice of intent to abandon geothermal resource wells is required to be filed with the Division five days prior to beginning abandonment procedures. A permit to abandon may be given orally by the State Engineer provided the operator submits a written request for abandonment within 24 hours of the oral request.

(b) A history of geothermal resource wells shall be filed within sixty days after completion of abandonment procedures.

(c) All wells abandoned shall be monumented and the description of the monument shall be included in the history of well report. Monument shall consist of a four-inch diameter pipe 10 feet in length of which four feet shall be above ground. The remainder shall be imbedded in concrete. The applicant's name, application number, and location of the well shall be shown on the monument. An abandoned well on tilled land shall be marked in a manner approved by the State Engineer.

(d) Good quality, heavy drilling fluid shall be used to replace any water in the hole and to fill all portions of the hole not plugged with grout.

(e) All grout plugs with a possible exception of the surface plug shall be pumped into the hole through drill pipe or tubing.

(f) All open annuli shall be filled solid with grout to the surface.

(g) A minimum of 100 feet of grout shall be emplaced straddling the interface or transition zone at the base of ground water aquifers.

(h) One hundred feet of grout shall straddle the placement of the shoe plug on all casings including conductor pipe.

(i) A surface plug of either neat cement or concrete mix shall be in place from the top of the casing to at least 50 feet below the top of the casing.

(j) All casing shall be cut off at least five feet below land surface.

(k) Grout plugs shall extend at least 50 feet over the top of any liner installed in the well.

(l) Injection wells are required to be abandoned in the same manner as other wells.

(m) Other abandonment procedures may be approved by the Division if the owner or operator can demonstrate that the geothermal resource, ground waters, and other natural resources

will be protected. Approval must be given in writing prior to the beginning of any abandonment procedures.

(n) Within five days after the completion of the abandonment of any well or injection well, the owner or operator of the abandoned well or injection well shall report in writing to the Division on all work done with respect to the abandonment.

R655-1-7. Maintenance.

7.1 General: All well heads, separators, pumps, mufflers, manifolds, valves, pipelines, and other equipment used for the production of geothermal resources shall be maintained in good condition in order to prevent loss of or damage to life, health, property, and natural resources.

7.2 Corrosion: All surface well head equipment and pipelines and subsurface casing and tubing will be subject to periodic corrosion surveillance in order to safeguard health, life, property, and natural resources.

7.3 Tests: The Division may require tests or remedial work as in its judgment are necessary to prevent damage to life, health, property, and natural resources, to protect geothermal reservoirs from damage or to prevent the infiltration of detrimental substances into underground or surface water suitable for irrigation or other beneficial uses to the best interest of the neighboring property owners and the public. Tests may include, but are not limited to, casing tests, cementing tests, and equipment tests.

7.4 Miscellaneous Activities. The owner or operator of the geothermal resource shall notify the Division of intention to: 1) Make minor change in the manner in which a well is operated; 2) Conduct temperature or pressure survey; 3) Conduct a flow test; or 4) Perform routine maintenance of a well. The notice must be submitted to the Division prior to the commencement of work. Minor changes can include installing or changing capillary tubing; pulling or replacing a pump; or any other change for which the Division takes little or no action other than acknowledging the notice and filing it. The Division reserves the right to inspect any of the noticed activities listed in this subsection.

7.5 Other Permitted Activities. The owner or operator of a geothermal resource shall submit application for permission to engage in the following activities:

- (a) Increasing the depth of a well;
- (b) Testing of water shut-off;
- (c) Entering or opening a plugged well;
- (d) Shooting, acidizing or fracture treating;
- (e) Drilling in a direction which is not intended to be vertical, including directional drilling;
- (f) Changing the construction of a hole or well including

placing a plug in the hole or well and recovering or altering the casing.

- (g) Conducting a major work over or cleaning of a well;
- (h) Changing a well's ownership, status, name, or location'
- (i) Abandoning and plugging a well

7.5.1 The owner or operator of the geothermal resource shall report to the Division any progress regarding or the completion of an activity for which permission was required pursuant to this section and any supplemental history of the well.

R655-1-8. Temperature Gradient Wells.

8.1 General: Wells may be drilled upon approval of the State Engineer for measurement of subsurface temperatures and conductive heat flow.

8.2 Information: Request for a temperature gradient well program shall include the following information:

- (a) Well number.
- (b) Well location, elevation and expected depth.
- (c) Geologic interpretation of area under investigation, including any known or inferred temperature data.
- (d) Proposed drilling program, including method and casing schedule.
- (e) Proposed method of abandonment.
- (f) The State Engineer may require other data and impose restrictions or supervision by the Division as his studies may indicate.

8.3 Conditions: The following general conditions shall apply to temperature gradient wells:

(a) The depth of the hole shall not exceed 1,000 feet unless otherwise authorized by the State Engineer.

(b) The wells are to be cased and sealed against the water in the formations to be drilled.

(c) Return mud or air temperatures shall be monitored at, at least 30 foot intervals and should the temperature reach 125 degrees F. the drilling shall cease and the casing installed or the hole abandoned. Plastic casing may be used at temperatures under 125 degrees F.; otherwise, steel casing shall be used.

(d) Upon completion of the testing program, the casings are to be capped, or the casings are to be pulled and the holes cemented from bottom to top.

(e) The driller must have a current well driller's license from the State Engineer in accordance with R655-4 UAC. The driller shall also comply with the rules and regulations of R644-4 UAC when drilling temperature gradient wells. At least 48 hours before starting, the driller must give this Division notice of the day that drilling will commence.

- (f) A well completion report, including temperature data,

shall be submitted to the State Engineer within 90-days of completion. The well completion report shall be public record unless the owner or operator requests, in writing, that the records be held confidential in accordance with Section 73-22-6(1) (c).

(g) The driller shall exercise due caution in all drilling operations to prevent blowouts, explosions or fires.

R655-1-9. Environment.

9.1 General: The owner shall conduct exploration and development operations in a manner that provides maximum protection of the environment; rehabilitate disturbed lands; take all necessary precautions to protect the public health and safety; and conduct operations in accordance with the spirit and objectives of all applicable environmental legislation, and executive orders.

Adverse environmental impacts from geothermal-related activity shall be prevented or mitigated through enforcement of applicable Federal, State, and local standards, and the application of existing technology. Inability to meet these environmental standards or continued violation of environmental standards due to operations of the lessee, after notification, may be construed as grounds for the State Engineer to order a suspension of operations.

R655-1-10. Penalties.

As stated in Section 73-22-10, any willful violation of or failure to comply with any provision of these rules shall be a misdemeanor and each day that the violation continues shall constitute a separate offense.

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