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SALUS POPULI SUPREMA LEX ESTO

"The welfare of the people shall be the supreme law."

JOHN R. ASHCROFT

SECRETARY OF STATE

MISSOURI REGISTER

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MISSOURI REGISTER

August 1, 2018 Vol. 43 No. 15 **Pages 1987–2450**

IN THIS ISSUE:

PART I

EMERGENCY RULES

Department of Social Services
MO HealthNet Division 1991

EXECUTIVE ORDERS 1996

PROPOSED RULES

Department of Agriculture
Weights, Measures and Consumer Protection 1998
Department of Elementary and Secondary Education
Division of Learning Services 2013
Department of Higher Education
Commissioner of Higher Education 2020
Department of Labor and Industrial Relations
Division of Labor Standards 2021
Department of Natural Resources
Director's Office 2039
Air Conservation Commission 2039
Dam and Reservoir Safety Council 2161
Well Installation 2170

PART II

Well Installation 2213
Petroleum and Hazardous Substance Storage Tanks 2263
Oil and Gas Council 2265
Solid Waste Management 2280
State Environmental Improvement and Energy Resources Authority 2308
Department of Social Services
MO HealthNet Division 2311
Department of Insurance, Financial Institutions and Professional Registration
State Board of Nursing 2319

ORDERS OF RULEMAKING

Department of Agriculture
Market Development 2331
Department of Natural Resources
Air Conservation Commission 2332
Clean Water Commission 2335
Safe Drinking Water Commission 2337
Petroleum Storage Tank Insurance Fund Board of Trustees 2338
Department of Public Safety
Peace Officer Standards and Training Program 2341
Department of Insurance, Financial Institutions and Professional Registration
Board of Cosmetology and Barber Examiners 2342
Real Estate Appraisers 2342
Missouri Board for Respiratory Care 2342
Office of Tattooing, Body Piercing, and Branding 2343

IN ADDITIONS

Department of Agriculture
Weights, Measures and Consumer Protection 2344
Department of Conservation
Conservation Commission 2344

CONSTRUCTION TRANSIENT LIST 2345

DISSOLUTIONS 2405

SOURCE GUIDES

RULE CHANGES SINCE UPDATE 2410
EMERGENCY RULES IN EFFECT 2429
EXECUTIVE ORDERS 2430
REGISTER INDEX 2432

Register Filing Deadlines	Register Publication Date	Code Publication Date	Code Effective Date
April 2, 2018	**May 1, 2018**	May 31, 2018	June 30, 2018
April 16, 2018	**May 15, 2018**	May 31, 2018	June 30, 2018
May 1, 2018	**June 1, 2018**	June 30, 2018	July 30, 2018
May 15, 2018	**June 15, 2018**	June 30, 2018	July 30, 2018
June 1, 2018	**July 2, 2018**	July 31, 2018	August 30, 2018
June 15, 2018	**July 16, 2018**	July 31, 2018	August 30, 2018
July 2, 2018	**August 1, 2018**	August 31, 2018	September 30, 2018
July 16, 2018	**August 15, 2018**	August 31, 2018	September 30, 2018
August 1, 2018	**September 4, 2018**	September 30, 2018	October 30, 2018
August 15, 2018	**September 17, 2018**	September 30, 2018	October 30, 2018
September 4, 2018	**October 1, 2018**	October 31, 2018	November 30, 2018
September 17, 2018	**October 15, 2018**	October 31, 2018	November 30, 2018

Documents will be accepted for filing on all regular workdays from 8:00 a.m. until 5:00 p.m. We encourage early filings to facilitate the timely publication of the *Missouri Register*. Orders of Rulemaking appearing in the *Missouri Register* will be published in the *Code of State Regulations* and become effective as listed in the chart above. Advance notice of large volume filings will facilitate their timely publication. We reserve the right to change the schedule due to special circumstances. Please check the latest publication to verify that no changes have been made in this schedule. To review the entire year's schedule, please check out the website at www.sos.mo.gov/adrules/pubsched.

HOW TO CITE RULES AND RSMO

RULES

The rules are codified in the *Code of State Regulations* in this system–

Title		Division	Chapter	Rule
3	CSR	10-	4	.115
Department	*Code of State Regulations*	Agency Division	General area regulated	Specific area regulated

and should be cited in this manner: 3 CSR 10-4.115.

Each department of state government is assigned a title. Each agency or division in the department is assigned a division number. The agency then groups its rules into general subject matter areas called chapters and specific areas called rules. Within a rule, the first breakdown is called a section and is designated as (1). Subsection is (A) with further breakdown into paragraphs 1., subparagraphs A., parts (I), subparts (a), items I. and subitems a.

The rule is properly cited by using the full citation, for example, 3 CSR 10-4.115 NOT Rule 10-4.115.

Citations of RSMo are to the *Missouri Revised Statutes* as of the date indicated.

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These websites contain rulemakings and regulations as they appear in the *Code* and *Registers*.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 3—Well Construction Code

PROPOSED RESCISSION

10 CSR 23-3.060 Certification and Registration Reports. This rule set required standards for certification and registration report form record submittal.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into a single new proposed rule 10 CSR 23-2.020 Certification and Registration.

*AUTHORITY: sections 256.606, 256.614, 256.623 and 256.626, RSMo 2000. Original rule filed April 2, 1987, effective July 27, 1987. For intervening history, please consult the **Code of State Regulations**. Rescinded: Filed June 27, 2018.*

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 3—Well Construction Code

PROPOSED RECISSION

10 CSR 23-3.070 Plastic Well Casing. This rule designated special standards for the use of plastic casing in construction of a water well.

PURPOSE: This rule is being rescinded and the substantive requirements for plastic well casing are being consolidated into 10 CSR 23-3.030 Standards for Construction of Water Wells.

*AUTHORITY: sections 256.606, 256.614, 256.615 and 256.626, RSMo 1994. Original rule filed April 2, 1987, effective July 27, 1987. For intervening history, please consult the **Code of State Regulations**. Rescinded: Filed June 27, 2018.*

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey] Well Installation*
Chapter 3—*Water* Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-3.080 Liners. The board is amending the division name, chapter name, rule purpose, sections (1)–(5), adding Table 3.8 and 3.9, and removing Table 5 and Table 6.

PURPOSE: This amendment clarifies the three (3) types of situations where a liner may be used and provides a clear method for each scenario.

*PURPOSE: This rule sets guidelines for the use of liners in **water** wells [in Missouri].*

[(1) Use of Liners. Liners are generally used for three (3) purposes. They are used to—

(A) Hold the well bore open when caving or spalling rock is encountered. These liners are usually slotted to allow water to enter the well from the aquifer; or

(B) Seal out problem areas below the existing casing or to correct inadequate grouting seals of the casing annulus and other problems arising concerning contamination of subsurface waters. Plastic liners may be used effectively to solve iron bacteria problems on steel casings. If a plastic liner is installed to seal out an iron bacteria problem, it must extend from the bottom of the steel casing and must have its upper end no deeper than ten feet (10') below the top of the well casing. The liner must also be grouted as stated in subsection (3)(B) of this rule; or

(C) If the liner is just used to solve a rust problem in the casing, a packer must be placed within five feet (5') of the bottom of the rusted casing interval. The liner must extend from the bottom of the steel casing to a point less than 10 feet (10') from the surface. The packer must be inside the casing and no grout is required.

(2) General Specifications and Guidelines.

(A) Liners may be composed of either steel or thermoplastic.

1. Steel liners must be new and have an inside diameter at least four inches (4") and have a minimum wall thickness not less than .188 inches.

2. Plastic liners must meet American Society for Testing and Materials (ASTM) standards concerning thermoplastic well casing and be composed of polyvinyl (PVC) or acrylonitrile-butadiene-styrene (ABS) materials formulated for well casing.

A. The inside diameter must not be smaller than four inches (4").

B. The Standard Dimension Ratio (SDR) ratings allowable for liner is SDR 26, SDR 21, SDR 17 and SDR 13.5. Schedule ratings allowable are SCH 40 and SCH 80.

(B) All liners used to seal out potential groundwater contamination areas below the existing casing or to correct inadequate grouting seals of the casing annulus, and other problems arising concerning the contamination of subsurface water must have their upper end set no deeper than ten

feet (10') below the top of the well casing. The liner must be secured in the hole.

(C) Packers shall be secured on plastic liners with screws (making sure they do not penetrate the liner) or other methods and on steel liners the packer shall be welded or mechanically attached so that it will not move during liner placement. Packers are not required on liners used only to hold open the well bore.

(D) Whenever a liner is needed it is recommended that the bottom of the liner be at the bottom of the well. This will help prevent potential future problems with pump replacement.

(3) Method of Installation.

(A) When liners are used only to hold open the well bore they may be placed in the well following normal industry installation procedures.

(B) All other liners must be sealed into place following these procedures:

1. The liner must have a rubber packer (first packer) secured near the bottom of the interval to be grouted. Another rubber packer (the second packer) must be secured about twenty feet (20') above the first packer. This will result in two (2) rubber packers spaced about twenty feet (20') apart on the liner. These packers must hold the grout in place. Grout must be placed between the first and second packer and completely fill this interval as the liner is being installed into the casing. Grout must also be placed on top of the second packer filling it to at least a point twenty feet (20') above the third packer. Care must be taken by the well installation contractor when selecting the type of grout used, keeping in mind the time of liner installation and grout set-up time. The liner shall be placed into the well casing being careful not to damage the packers or liner, or two (2) packers must be placed close together near the bottom of the liner and grouted after the liner is set by pressure grouting through a tremie pipe. The bottom sixty feet (60') of annulus created when installing a four and one-half-inch (4 1/2") or five-inch (5") outside diameter liner must be grouted. If a liner must be grouted, a minimum annulus of one-half inch (1/2") must be present. Tables 5 and 6 state the required amount of grout to fill the annulus sixty feet (60'); or

2. Alternate grouting procedures will be considered on a case-by-case basis. Written approval in advance by the division is required.

(4) Permittee Responsibility to Seal Liner. In wells that have a liner used for any purpose, other than holding the well bore open, it is the responsibility of the permittee to ensure that the annulus between the well bore and the liner is sealed.

(5) PVC and ABS liners may never be used when known gasoline or solvent contamination exists within one hundred (100) yards of the well being repaired or drilled. When gasoline or solvent contamination levels do not present a potential threat to the integrity of the pipe or liner, the use of PVC or ABS pipe material will be considered on a case-by-case basis. Approval must be received in advance.

TABLE 5

Number of Bags for Minimum Amount of Required Grout for Lining Water Wells

Outer Diameter of Plastic Liner: 4 1/2 inches—Minimum Length of Grout: 60 feet

Borehole Diameter	*6* **Ann.*	*^O.H.*	*8* **Ann.*	*^O.H.*	*10* **Ann.*	*^O.H.*
Type of Grout						
CEMENT						
Portland Type I	*5*	*11*	*13*	*19*	*24*	*30*
Portland Type III	*5*	*11*	*13*	*19*	*24*	*30*
BENTONITE						
Pellets—						
1/2" Baroid Pellets	*7*	*16*	*19*	*29*	*36*	*45*
3/8" Baroid Pellets	*7*	*17*	*21*	*30*	*37*	*47*
1/4" Baroid Pellets	*7*	*17*	*17*	*20*	*37*	*47*
Wyo-bend Tablets	*8*	*17*	*22*	*32*	*39*	*49*
Volclay 1/2"	*8*	*18*	*22*	*32*	*40*	*50*
Volclay 3/8"	*8*	*19*	*23*	*33*	*41*	*52*
Volclay 1/4"	*8*	*19*	*23*	*34*	*42*	*53*
Chips—						
Baroid HolePlug	*7*	*17*	*21*	*30*	*38*	*47*
Wyo-bend Coarse	*6*	*14*	*17*	*25*	*32*	*40*
Wyo-bend Medium	*6*	*15*	*18*	*26*	*33*	*41*
Volclay Coarse	*7*	*16*	*19*	*28*	*35*	*44*
Volclay Medium	*7*	*16*	*20*	*29*	*36*	*45*
Granular—						
Benseal	*6*	*15*	*18*	*26*	*33*	*41*
Wyo-bend No. 8	*6*	*14*	*17*	*25*	*32*	*40*
Wyo-bend No. 16	*6*	*14*	*17*	*25*	*32*	*40*
Slurry—						
Baroid	*2*	*3*	*4*	*6*	*8*	*10*
Wyo-bend	*2*	*4*	*4*	*7*	*8*	*10*
Volclay	*1*	*3*	*4*	*6*	*7*	*9*

**Ann. = Bags needed to fill Annular Space*
^O.H. = Bags needed to fill the Open Bore Hole

TABLE 6

Number of Bags for Minimum Amount of Required Grout for Lining Water Wells

Outer Diameter of Plastic Liner: 5 inches—Minimum Length of Grout: 60 feet

Borehole Diameter	*6* **Ann.^O.H.*	*8* **Ann.^O.H.*	*10* **Ann.^O.H.*
Type of Grout			
CEMENT			
Portland Type I	*3 11*	*12 19*	*23 30*
Portland Type III	*3 11*	*12 19*	*23 30*
BENTONITE			
Pellets—			
1/2" Baroid Pellets	*5 16*	*18 29*	*34 45*
3/8" Baroid Pellets	*5 17*	*19 30*	*35 47*
1/4" Baroid Pellets	*5 17*	*18 30*	*35 47*
Wyo-bend Tablets	*6 18*	*19 32*	*37 49*
Volclay 1/2"	*6 18*	*20 32*	*38 50*
Volclay 3/8"	*6 19*	*20 33*	*39 52*
Volclay 1/4"	*6 19*	*21 34*	*40 53*
Chips—			
Baroid HolePlug	*5 17*	*19 30*	*36 47*
Wyo-bend Coarse	*5 14*	*16 25*	*30 40*
Wyo-bend Medium	*5 15*	*16 26*	*31 41*
Volclay Coarse	*5 16*	*17 28*	*33 44*
Volclay Medium	*5 16*	*18 29*	*34 45*
Granular—			
Benseal	*5 15*	*16 26*	*31 41*
Wyo-bend No. 8	*5 14*	*16 25*	*30 40*
Wyo-bend No. 16	*5 14*	*16 25*	*30 40*
Slurry—			
Baroid	*1 3*	*4 6*	*7 10*
Wyo-bend	*1 4*	*4 7*	*8 10*
Volclay	*1 3*	*4 6*	*7 9*

**Ann. = Bags needed to fill Annular Space*
^O.H. = Bags needed to fill the Open Bore Hole]

(1) General specifications. All liners shall—

(A) Be new and follow minimum specifications in Table 3.8. Used pipe is considered new if it is salvaged within ninety (90) days of the installation of a new water well and is decontaminated.

Table 3.8 Minimum liner specifications.

Material	Wall thickness (inches)	Standard Dimension Ratio (SDR)	Schedule (SCH)
Steel	0.188	-	-
Plastic (PVC or ABS only)[1]	-	26	40

[1] Shall meet ASTM standards;

(B) Be suspended securely with a hanger or allowed to rest on bottom of the well;

(C) Be installed so that the top of the liner terminates within ten feet (10') of the top of the casing; and

(D) Be able to withstand forces encountered during installation.

(2) Packers or liner hangers when used shall be secured—

(A) For plastic liners, with screws that do not penetrate the inside of the liner; or

(B) For steel liners, with liner hangers welded or mechanically attached.

(3) Liners are used for three (3) general purposes. The following additional requirements apply based on the purpose of the liner:

(A) To hold the well bore open for any potential collapse or sloughing of loose material—

1. Grout material and packers are optional; and

2. Manufactured slotted liner, pipe-based screens, wire-wrapped liners, or manually perforated liners may be used;

(B) To prevent rust—

1. The liner shall extend from at least five feet (5') below the bottom of the casing to within ten feet (10') of the top of the casing; and

2. Shall have two (2) packers, with the first packer set within five feet (5') below the bottom of the casing and the second packer set inside the casing near the bottom; and

3. Grout material is optional; and

(C) To seal out undesirable conditions or to correct inadequate casing seals—

1. Have a minimum annular space of one-half inch (½"); and

2. Have a minimum of two (2) rubber packers secured below the bottom of the area of concern to be grouted; and

3. Have packers placed a maximum of ten feet (10') apart; and

4. Use one (1) of the following grout materials:

A. Cement slurry; or

B. Coated bentonite pellets; or

C. Other grout materials upon receiving advanced written approval by the department; and

5. Use one (1) of the following grout methods:

A. Gravity; or

B. Tremie; or

C. Other methods upon receiving advanced written approval by the department; and

6. Have a minimum thirty-foot (30') annular seal placed above the packers using specifications provided in Table 3.9; and

7. Have the top of the liner extend to within ten feet (10') of the top of casing; and

8. When used to correct inadequate casing seals, place the top packer twenty five feet (25') below the bottom of the casing. Emplace grout material from above the top packer to a minimum of five feet (5') into the casing for a total of thirty feet (30') of grout.

Table 3.9 Minimum number of bags of grout to achieve an annular grout seal of thirty feet (30') for lining water wells.

	Borehole Diameter (inches)					
	6	8	10	6	8	10
	Outer Diameter of Liner (inches)					
Type of Grout	4½"			5"		
CEMENT						
Portland Type I	2.2	6.1	11.2	1.5	5.5	10.5
Portland Type II	2.2	6.1	11.2	1.5	5.5	10.5
BENTONITE						
Pellets						
½ " Baroid Pellets	3.5	9.7	17.8	2.5	8.7	16.7
⅜" Baroid Pellets	3.7	10.3	18.7	2.6	9.2	17.6
¼ " Baroid Pellets	3.7	10.2	18.6	2.6	9.1	17.5
Wyo-bend Tablets	3.9	10.8	19.7	2.7	9.6	18.5
Volclay ½"	3.9	10.9	19.9	2.7	9.7	18.7
Volclay ⅜"	4.1	11.3	20.6	2.8	10.1	19.3
Volclay ¼"	4.2	11.6	21.2	2.9	10.4	20.0

(4) PVC or ABS liners are prohibited when known gasoline or solvent contamination exists within three hundred feet (300') of the well being repaired or drilled.

(5) It is the responsibility of the permittee to ensure the annulus between the borehole and liner is sealed for a period of three (3) years from the date the well construction or reconstruction is approved by the department, unless it can be proven that the annular seal has been damaged by another person. This applies to wells where the liner is installed to seal out undesirable conditions, correct inadequate grout seals of the casing annulus, and/or any other issue associated with the well casing.

*AUTHORITY: sections 256.606 and 256.626, RSMo [1994] **2016**. Original rule filed April 2, 1987, effective July 27, 1987. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey] Well Installation*
Chapter 3—*Water* Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-3.090 *[Regionalization] **Drilling Areas***. The board is amending the division name, chapter name, rule name, rule purpose, editor's note, and sections (1)–(6), and adding sections (7)–(13). The board is also adding Tables 3.10 through 3.15, Figures 3.1 through 3.10 and removing Figures 1 through 6. Note: Figures 7, 7A, 7B, 7C, 7D, and Figure 8 are also being removed (these were referenced in 10 CSR 23-3.100 Sensitive Areas which is being rescinded).

PURPOSE: This amendment incorporates substantive requirements from 10 CSR 23-3.100 Sensitive Areas and renames the rule to include all drilling areas. This amendment also renumbers drilling areas sequentially.

*PURPOSE: This rule sets [specific additional] **construction** standards [for certain regions in Missouri.] **in addition to 10 CSR 23-3.030 Standards for Construction of Water Wells. These additional standards apply to domestic and multifamily wells and vary by geographic area based on geologic, hydrologic, and/or environmental factors (see Figure 3.1).***

[Editor's Note: Area maps mentioned in this rule may be found following 10 CSR 23-3.110.]

(1) Area 1. *[All persons engaged in drilling domestic wells in Area 1, a limestone or dolomite area (Figure 1 and 8) shall—]* **This area encompasses portions of southwestern, central, east central, and southeastern Missouri (see Figure 3.2).**

(A) *[Set no less than eighty feet (80') of casing, extending not less than thirty feet (30') into bedrock. Example: if sixty feet (60') of residual (weathered rock) material is encountered in drilling before bedrock, then ninety feet (90') of casing must be set.]* **Bedrock wells.**

1. A minimum of eighty feet (80') of casing shall be installed and extend a minimum of thirty feet (30') into solid bedrock. Example: if sixty feet (60') of residual material or broken rock is encountered during drilling above solid bedrock, then ninety feet (90') of casing will be installed.

*[(B)]***2.** *[Construct t]***T**he *[drill]* **bore**hole **for a domestic well shall be** a minimum of eight and five-eighths inches (8 5/8") in diameter to the *[surface]* casing *[point]* **depth**.

*[(C)]***3.** Install new*[, steel or plastic]* casing *[as specified in]* **pursuant to** 10 CSR 23-3.030**(1)(A)** *[(steel) or 10 CSR 23-3.070 (plastic)]*.

*[(D)]***4.** *[Install and seal casing as follows:]* **Grouting Requirements.**

*[1.]***A.** *[Full-length grout is preferred and will ensure a better annular seal but sealing t]* **T**he lowermost thirty feet (30') of casing *[using approved grout material and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above the grouted*

interval to fill in the annular space—] **shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.**

[A. If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

B. If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes;

C. The following times must be followed for curing grout when no packer is used:

(I) Hi-early cement—minimum set time of twelve (12) hours.

(II) Portland Type I cement—minimum set time of seventy-two (72) hours;

(III) Chipped bentonite—minimum hydration time of four (4) hours; and

(IV) High solids bentonite slurry—varies based on additives and manufacturer's specifications;]

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. The annular space above the grouted interval shall be filled with clean fill.

*[(E)]***(B)** *[If the well is to be drilled as an alluvial well—]* **Unconsolidated material wells.**

1. *[No less than]* **A minimum of** twenty feet (20') of casing shall be *[set]* **installed** above the screened or perforated interval *[of the well;]***.**

2. *[The drill hole shall be constructed a minimum of ten and five-eighths inches (105/8") in diameter being at least four inches (4") larger than the casing to be placed into it. Well casing must be at least six inch (6") nominal diameter. Graded, chlorinated gravel may be placed into the annular space adjacent to the well screen or natural gravels in the formation being drilled can be allowed to cave back against the screen;]* **The borehole for a domestic well shall be a minimum of ten and five-eighths inches (10 ⅝") in diameter to the casing depth. The borehole shall be a minimum of four inches (4") larger in diameter than the casing being installed.**

3. *[Full-length grout is preferred (above the screened interval) and will ensure a better annular seal but sealing the upper twenty feet (20') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required.]* **Install new casing pursuant to 10 CSR 23-3.030(1)(A).**

4. Grouting Requirements.

A. The upper twenty feet (20') of casing shall be grouted. Table 3.11 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting methods and materials shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against the well screen or perforated interval.

(2) Area 2. *[All persons engaged in drilling domestic wells in Area 2, Central Western Missouri (Figure 2) shall—]* **This area encompasses west central Missouri and is delineated separately because the bedrock has the potential to produce groundwater with high dissolved solids compared to other areas of the state (see Figure 3.3).**

(A) *[Set no less than forty feet (40') of casing, extending not less than fifteen feet (15') into bedrock. Areas where Cherokee Group sediments are present; set casing through caving zones and into waterbearing sands. In some instances this might require several hundred feet of casing. Liners may be used with minimum amount of casing listed for this area;]* **Bedrock wells.**

1. A minimum of forty feet (40') of casing shall be installed and extend a minimum of fifteen feet (15') into solid bedrock.

*[(B)]***2.** *[Construct t]***T**he *[drill]* **bore**hole **for domestic wells shall be** a minimum of eight and five-eighths inches (8 5/8") in diameter to the *[surface]* casing *[point;]* **depth.**

*[(C)]***3.** Install new *[steel or plastic]* casing*[s as specified in]* **pursuant to** 10 CSR 23-3.030**(1)(A)** *[(steel) or 10 CSR 23.3.070 (plastic)]*.

[(D) Install and seal casing as follows: Full-length grout is preferred and will ensure a better annular seal but sealing the lowermost thirty feet (30') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout material. Drill cuttings may be placed above the grouted interval to fill in the annular space—

1. If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

2. If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes;

3. The following times must be followed for curing grout when no packer is used:

A. Hi-early cement—minimum set time of twelve (12) hours;

B. Portland Type I cement—minimum set time of seventy-two (72) hours;

C. Chipped bentonite—minimum hydration time of four (4) hours; and

D. High solids bentonite slurry—varies based on additives and manufacturer's specifications;

(E) In areas where shale or shaley material is present above the waterbearing zones, casing or liner shall be set so as to exclude intervals which would cave into the drill hole or cause muddy water to be pumped;]

4. Grouting Requirements.

A. The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

*[(F)]***(B)** *[If the well is to be drilled as an alluvial well—]* **Unconsolidated material wells.**

1. *[No less than]* **A minimum of** twenty feet (20') of casing shall be *[set]* **installed** above the screened or perforated interval *[of the well;]***.**

2. The *[drill]* **bore**hole shall be *[constructed]* a minimum of ten and five-eighths inches (10 5/8") in diameter *[being at least]* **to the casing depth. The borehole for domestic wells shall be a minimum of** four inches (4") larger in diameter *[than the casing to be placed into it]. [Well casing must be at least six-inch (6") nominal diameter. Graded, chlorinated gravel may be placed into the annular space adjacent to the well screen or natural gravels in the formation being drilled can be allowed to cave back against the screen; and*

3. Full-length grout is preferred (above the screened interval) and will ensure a better annular seal but sealing the upper twenty feet (20') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required.

(G) Five-Inch (5") Casing Wells. A well may be completed using a five-inch (5") nominal casing if the following standards are met:

1. The casing must be set full length and be slotted

across the producing horizons.

2. The drill hole must be eight and five-eighths inches (8 5/8") in diameter with the upper forty feet (40') to be reamed out to ten and five-eighths inches (10 5/8") in diameter; and

3. The upper forty feet (40') of annular space must be grouted and the remainder of the borehole below the grout must be gravel packed.]

3. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

4. Grouting Requirements.

A. The upper twenty feet (20') of casing shall be grouted. Table 3.11 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against the well screen or perforated interval.

(3) Area 3. *[All persons engaged in drilling domestic wells in area 3, northwest Missouri area, (Figure 3) shall—]* **This area encompasses northwestern and north central Missouri and is delineated separately because glacial till overlies bedrock that has the potential to produce groundwater with high dissolved solids compared to other areas of the state (see Figure 3.4).**

[(A) If the well is to be drilled as a glacial drift or alluvial well;

1. No less than twenty feet (20') of casing shall be set above the screened or perforated interval of the well;

2. The drill hole shall be constructed a minimum of ten and five-eighths inches (10 5/8") in diameter being at least four inches (4") larger in diameter than the casing to be placed into it. Well casing must be at least six-inch (6") nominal diameter. Graded, chlorinated gravel may be placed into the annular space adjacent to the well screen or natural (native) gravels in the formation being drilled can be allowed to cave back against the screen;

3. Full-length grout is preferred (above the screened interval) and will ensure a better annular seal but sealing the upper twenty feet (20') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required.

(B) If the well is to be drilled as a bedrock well—

1. Set no less than forty feet (40') of casing, extending not less than fifteen feet (15') into bedrock;

2. Construct the drill hole a minimum of eight and five-eighths inches (8 5/8") in diameter to the surface casing point;

3. Install new steel or plastic casing as specified in 10 CSR 23-3.030 (steel) or 10 CSR 23-3.070 (plastic); and

4. Install and seal casing as follows:

A. Full-length grout is preferred and will ensure a better annular seal, but sealing the lowermost thirty feet (30') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above grouted interval to fill in the annular space—

(I) If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

(II) If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes;

(III) The following times must be followed for curing grout when no packer is used:

(a) Hi-early cement—minimum set time of twelve (12) hours;

(b) Portland Type I cement—minimum set time of seventy-two (72) hours;

(c) Chipped bentonite—minimum hydration time of four (4) hours; and

(d) High solids bentonite slurry—varies based on additives and manufacturer's specifications;]

(A) Bedrock wells.

1. A minimum of forty feet (40') of casing shall be installed and extend a minimum of fifteen feet (15') into solid bedrock.

2. Construct the borehole for domestic wells a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

3. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

4. The casing shall be a minimum of five and one-half inches (5 ½") in diameter and the borehole shall be a minimum of two inches (2") larger in diameter than the casing being installed.

5. Grouting Requirements

A. The lowermost thirty feet (30') of casing shall be grouted. Table 3.12 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. The annular space above the grouted interval shall be filled with clean fill.

*[(C)]***6. Shallow Bedrock Well—**If usable *[amounts]* **quantities** of water are not expected to be available in deeper bedrock horizons *[and water is only available from the upper, fractured and weathered portion of bedrock, and if the water is coming from a zone that is at least forty feet (40') deep, you must set a minimum of forty feet (40') of casing but only one foot (1') of this casing need be set into the bedrock. This allows the use of shallower water horizons under some circumstances; and]* **one (1) of the following construction methods may be used.**

[(D) Five-Inch (5") Casing Wells. A well may be completed using a five-inch (5") nominal casing if the following standards are met:

1. The casing must be set full-length and be slotted across the producing horizons;

2. The drillhole must be eight and five-eighths inches (8 5/8") in diameter with the upper forty feet (40') to be reamed out to ten and five-eighths inches (10 5/8") in diameter; and

3. The upper forty feet (40') of annular space must be grouted and the remainder of the borehole below the grout must be gravel packed.]

A. Method 1.

(I) A minimum of forty feet (40') of casing shall be installed pursuant to 10 CSR 23-3.030(1)(A).

(II) A minimum of one foot (1') of casing shall extend into solid bedrock.

(III) The borehole for domestic wells shall be a minimum of eight and five eighths (8 ⅝") in diameter to the casing depth.

(IV) The casing shall be a minimum of five and one-half inches (5 ½") in diameter and the borehole shall be a minimum of two inches (2") larger in diameter than the casing being installed.

(V) The lower thirty feet (30') of casing shall be grouted. Table 3.12 lists the minimum amount of grout required by type and size of annulus or open hole.

(VI) Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

(VII) The annular space above the grouted interval shall be filled with clean fill.

B. Method 2.

(I) The casing shall be installed full-length pursuant to

10 CSR 23-3.030(1)(A) and perforated below twenty (20') feet across the producing horizon.

(II) The borehole for domestic wells shall be eight and five-eighths inches (8 ⅝") in diameter with the upper twenty feet (20') reamed out to ten and five-eighths inches (10 ⅝") in diameter.

(III) The casing shall be a minimum of five and one-half inches (5 ½") in diameter.

(IV) The upper twenty feet (20') of annular space shall be grouted and the remainder of the borehole below the grout shall be gravel packed if a packer is not installed. Table 3.13 lists the minimum amount of grout required by type and size of annulus or open hole.

7. All construction requirements pursuant to 10 CSR 23-3.030 shall be met except as stated in 10 CSR 23-3.090(3)(A)6.

(B) Unconsolidated material wells and glacial drift wells.

1. A minimum of twenty feet (20') of casing shall be installed above the screened or perforated interval.

2. The borehole for domestic wells shall be a minimum of ten and five-eighths inches (10 ⅝") in diameter to casing depth. The borehole shall be a minimum of four inches (4") larger in diameter than the casing being installed.

3. Well casing shall be a minimum of five and one-half inches (5 ½") in diameter.

4. Grouting Requirements.

A. The upper twenty feet (20') of casing shall be grouted. Table 3.13 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against the screen or perforated interval.

(4) Area 4. *[All persons engaged in drilling domestic wells in Area 4, northeast Missouri area, (Figure 7) shall—]* **This area encompasses northeastern Missouri and is delineated separately because the glacial till overlies bedrock that has the potential to produce groundwater with high dissolved solids compared to other areas of the state (see Figure 3.5).**

(A) *[If the well is to be drilled as a bedrock well—]* **Bedrock wells.**

1. *[Set no less than]* **A minimum of** forty feet (40') of casing*[, extending not less than]* **shall be installed and extend a minimum of** fifteen feet (15') into bedrock*[;]***.**

2. Construct the *[drill]* **bore**hole **for domestic wells** a minimum of eight and five-eighths inches (8 5/8") in diameter to the *[surface]* casing *[point;]* **depth.**

3. Install new *[steel or plastic]* casing *[as specified in]* **pursuant to** 10 CSR 23-3.030**(1)(A).** *[(steel) or 10 CSR 23-3.070 (plastic); and]*

4. The casing shall be a minimum of five and one-half inches (5 ½") in diameter and the borehole shall be a minimum of two inches (2") larger in diameter than the casing being installed.

*[4.]***5.** *[Install and seal casing as follows:]* **Grouting Requirements.**

A. *[Full-length grout is preferred and will ensure a better annular seal but sealing t]***T**he lowermost thirty **feet** (30') of casing *[using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above grouted interval to fill in the annular space—]* **shall be grouted.**

[(I) If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

(II) If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes; and

(III) The following times must be followed for curing grout when no packer is used:

(a) Hi-early cement—minimum set time of twelve (12) hours;

(b) Portland Type I cement—minimum set time of seventy-two (72) hours;

(c) Chipped bentonite—minimum hydration time of four (4) hours; and

(d) High solids bentonite slurry—varies based on additives and manufacturer's specifications;

(B) If the well is to be drilled as an unconsolidated materials well—

1. No less than twenty feet (20') of casing shall be set above the screened or perforated interval of the well;

2. The drill hole shall be constructed a minimum of ten and five-eighths inches (10 5/8") in diameter being at least four inches (4") larger in diameter than the casing to be placed into it. Well casing must be at least six-inch (6") nominal diameter. Graded, chlorinated gravel may be placed into the annular space adjacent to the well screen or natural (native) gravels in the formation being drilled can be allowed to cave back against the screen; and

3. Full-length grout is preferred (above the screened interval) and will ensure a better annular seal but sealing the upper twenty feet (20') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required.

(C) If usable amounts of water or water of acceptable quality are not expected to be available in deeper bedrock horizons and water is only available from the upper, fractured and weathered portion of bedrock, and if the water is coming from a zone that is at least forty feet (40') deep, a minimum of forty feet (40') of casing must be set but only one foot (1') of this casing need be set into the bedrock. This allows the use of shallower water horizons under some circumstances.]

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. The annular space above the grouted interval shall be filled with clean fill.

6. Shallow bedrock wells - If usable quantities of water are not expected to be available in deeper bedrock horizons the following construction method may be used.

A. Method 1.

(I) A minimum of forty feet (40') of casing shall be installed pursuant to 10 CSR 23-3.030(1)(A).

(II) A minimum of one foot (1') of casing shall extend into solid bedrock.

(III) The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to the casing depth.

(IV) The casing shall be a minimum of five and a half inches (5 ½") in diameter and the borehole shall be a minimum of two inches (2") larger in diameter than the casing being installed.

(V) The lower thirty feet (30') of casing shall be grouted. Table 3.12 lists the minimum amount of grout required by type and size of annulus or open hole.

(VI) Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

(VII) The annular space above the grouted interval shall be filled with clean fill.

7. All construction requirements pursuant to 10 CSR 23-3.030 shall be met except as stated in 10 CSR 23-3.090(4)(A)6.

(B) Unconsolidated material wells and glacial drift wells.

1. A minimum of twenty feet (20') of casing shall be installed above the screened or perforated interval.

2. The borehole for domestic wells shall be a minimum of ten and five-eighths inches (10 ⅝") in diameter to casing depth. The borehole shall be a minimum of four inches (4") larger in diameter than the casing being installed.

3. Well casing shall be a minimum of five and one-half inches (5 ½") in diameter.

4. Grouting Requirements.

A. The upper twenty feet (20') of casing shall be grouted. Table 3.13 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against the screen or perforated interval.

(5) Area 5. *[All persons engaged in drilling domestic wells in area 5, Missouri Bootheel and all major stream alluvial areas (Figure 5) shall—]* **This area encompasses the Missouri and Mississippi River floodplains and is delineated separately because the uppermost aquifer consists of unconsolidated alluvium (see Figure 3.6).**

(A) *[If the well is to be drilled as a bedrock well—]* **Bedrock wells.**

1. *[Set no less than]* **A minimum of** eighty feet (80') of casing*[, extending not less than]* **shall extend a minimum of** thirty feet (30') into bedrock*[;]***.**

2. Construct the *[drill]* **bore**hole a minimum of eight and five-eighths inches (8 5/8") in diameter to the *[surface]* casing *[point;]* **depth.**

3. Install new *[steel or plastic]* casing *[as specified in]* **pursuant to** 10 CSR 23-3.030**(1)(A)** *[(steel) or 10 CSR 23-3.070 (plastic);]***.**

[4. Install and seal casing as follows:]

*[A.]***4.** *[Full-length grout is preferred and will ensure a better annular seal but sealing t]***T**he lowermost thirty feet (30') of casing *[using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above grouted interval to fill in the annular space;]* **shall be grouted pursuant to 10 CSR 23-3.030(1)(C). Table 3.10 lists the minimum amount of grout by type and size of annulus or open hole. The annular space above the grouted interval shall be filled with clean fill.**

[(I) If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

(II) If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes; and

(III) The following times must be followed for curing grout when no packer is used:

(a) Hi-early cement—minimum set time of twelve (12) hours;

(b) Portland Type I cement—minimum set time of seventy-two (72) hours;

(c) Chipped bentonite—minimum hydration time of four (4) hours; and

(d) High solids bentonite slurry—varies based on additives and manufacturer's specifications;]

(B) *[If the well is to be drilled as an u]***U**nconsolidated material*[s]* wells*[—]***.**

1. *[No less than]* **A minimum of** twenty feet (20') of casing shall be *[set]* **installed** above the screened or perforated interval *[of the well;]***.**

2. *[The drill hole shall be constructed a minimum of four inches (4") larger than the casing to be placed into it. Well casing must be at least four-inch (4") nominal diameter. Graded, chlorinated gravel may be placed into the annular space adjacent to the well screen or natural (native) gravels in the formation being drilled can be allowed to cave back against the screen; and]* **The borehole for domestic wells shall be a minimum of four inches (4") larger than the casing diameter installed. Unconsolidated material wells that have a casing diameter less than four inches (<4") in diameter are exempt from these rules.**

3. *[Full-length grout is preferred (above the screened interval) and will ensure a better annular seal but sealing t]***T**he upper twenty feet (20') of casing *[using approved grout materials and procedures set out in 10 CSR 23-3.030 is required.]* **shall be grouted pursuant to 10 CSR 23-3.030(1)(C). Table 3.14 lists the minimum amount of grout required by type and size of annulus or open hole.**

[(C) Shallow unconsolidated wells located in Area 5, the Missouri Bootheel (Figure 8) and all major stream alluvial areas may be exempted from this rule. If the wells and drillers of the wells meet the following specifications they are exempted:

1. Wells are drilled, jetted, driven, washed or constructed in other ways;

2. Wells are constructed in unconsolidated materials; and

3. Well casing diameters are no larger than two inches (2").]

4. A chlorinated gravel pack may be placed into the annular space adjacent to the well screen or native materials may be allowed to collapse against the screen or perforated interval.

5. All construction requirements pursuant to 10 CSR 23-3.030 shall be met except as stated in 10 CSR 23-3.090(5)(B)2. and 3.

(6) Area 6. *[All persons engaged in drilling domestic wells in Area 6, St. Francois Mountain area (Figure 6) shall—]* **This area encompasses the St. Francois Mountains and is delineated separately because igneous bedrock, which has low permeability, occurs close to the ground surface (Figure 3.7).**

[(A) Where granite or igneous rock is within one hundred feet (100') below the surface, set not less than forty feet (40') of casing extending not less than fifteen feet (15') into bedrock—

1. Construct the drill hole a minimum of eight and five-eighths inches (8 5/8") in diameter to the surface casing point;

2. Install new steel or plastic casing as specified in 10 CSR 23-3.030 (steel) or 10 CSR 23-3.070 (plastic);

3. Install and seal casing as follows:

A. Full-length grout is preferred and will ensure a better annular seal, but sealing the lowermost thirty feet (30') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above the grouted interval to fill in the annular space;

(I) If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

(II) If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes; and

(III) The following times must be followed for curing

grout when no packer is used:

(a) Hi-early cement—minimum set time of twelve (12) hours;

(b) Portland Type I cement—minimum set time of seventy-two (72) hours;

(c) Chipped bentonite—minimum hydration time of four (4) hours; and

(d) High solids bentonite slurry—varies based on additives and manufacturer's specifications.

(B) In areas where granite is more than one hundred feet (100') below the surface, set not less than eighty feet (80') of casing not less than thirty feet (30') into bedrock.

1. Construct the drillhole a minimum of eight and five-eighths inches (8 5/8") in diameter to the surface casing point.

2. Install new steel or plastic casing as specified in 10 CSR 23-3.030 (steel) or 10 CSR 23-3.070 (plastic);

3. Install and seal casing as follows:

A. Full-length grout is preferred and will ensure a better annular seal, but sealing the lowermost thirty feet (30') of casing using approved grout materials and procedures set out in 10 CSR 23-3.030 is required. Drill cuttings and a drive shoe or drill cuttings used by themselves are not approved grout materials. Drill cuttings may be placed above the grouted interval to fill in the annular space;

(I) If steel casing is used, a drive shoe is required except on wells where the grout is allowed to cure before drilling resumes;

(II) If plastic casing is used, a packer, coupling or inverted bell is required to be secured near the bottom of the casing and must hold the grout in place while drilling continues. No packer, coupling or inverted bell is required if grout is allowed to cure before drilling resumes; and

(III) The following times must be followed for curing grout when no packer is used:

(a) Hi-early cement—minimum set time of twelve (12) hours;

(b) Portland Type I cement—minimum set time of seventy-two (72) hours;

(c) Chipped bentonite—minimum hydration time of four (4) hours; and

(d) High solids bentonite slurry—varies based on additives and manufacturer's specifications.]

(A) Bedrock wells.

1. Bedrock wells where granite is less than one hundred feet (<100') below the surface.

A. A minimum of forty feet (40') of casing shall be installed and extend a minimum of fifteen feet (15') into solid bedrock. Example: If sixty feet (60') of residual material or broken rock is encountered during drilling above solid bedrock, then seventy-five feet (75') of casing shall be installed.

B. Construct the borehole for domestic wells a minimum of eight and five-eighths inches (8 ⅝") in diameter to the casing depth.

C. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

D. The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole. The annular space above the grouted interval shall be filled with clean fill.

E. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

2. Bedrock wells where granite is one hundred feet or more (≥100') below the surface.

A. A minimum of eighty feet (80') of casing shall be installed and shall extend a minimum of thirty feet (30') into solid bedrock.

B. Construct the borehole for domestic wells a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

C. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

D. The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole. The annular space above the grouted interval shall be filled with clean fill.

E. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

(B) Unconsolidated material wells.

1. A minimum of twenty feet (20') of casing shall be installed above the screened or perforated interval.

2. The borehole for domestic wells shall be a minimum of ten and five-eighths inches (10 ⅝") in diameter. The borehole shall be a minimum of four inches (4") larger in diameter than the casing being installed.

3. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

4. The upper twenty feet (20') of casing shall be grouted. Table 3.11 lists the minimum amount of grout required by type and size of annulus or open hole.

5. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

6. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against the well screen or perforated interval.

(7) Area 7 (formerly Sensitive Area A). This area encompasses Osage, Gasconade, Maries, and parts of Phelps, Crawford, and Franklin counties and is delineated separately because it is overlain in part by Pennsylvanian-aged bedrock which is capable of producing groundwater with high dissolved solids (see Figure 3.2).

(A) Bedrock Wells.

1. A minimum of eighty feet (80') of casing shall be installed and extend a minimum of thirty feet (30') into solid bedrock. Example: If sixty feet (60') of residual material or broken rock is encountered during drilling above solid bedrock, then ninety feet (90') of casing shall be installed.

2. In areas where Pennsylvanian-age strata (shale, sandstone, and/or clay) are present, a minimum of one hundred fifty feet (150') of casing shall be installed and extend at least thirty feet (30') below the Pennsylvanian age strata (shale, sandstone, and/or clay).

3. The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

4. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

5. Grouting Requirements.

A. The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. The annular space above the grouted interval shall be filled with clean fill.

(B) Unconsolidated material wells.

1. A minimum of twenty feet (20') of casing shall be installed above the screened or perforated interval.

2. The borehole for domestic wells shall be a minimum of ten and five-eighths inches (10 ⅝") in diameter and a minimum of four inches (4") larger in diameter than the casing being installed.

3. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

4. Grouting Requirements.

A. The upper twenty feet (20') of casing shall be grouted. Table 3.11 lists the minimum amount of grout required by and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. A chlorinated gravel pack may be placed into the annular space or native materials may be allowed to collapse against

the well screen or perforated interval.

(8) Area 8 (formerly Sensitive Area B). This area encompasses a one-quarter (¼) mile buffer from the twenty foot (20') water depth contour line of major lakes in Missouri (see Figure 3.2).

(A) The major lakes include:

1. Truman;

2. Stockton;

3. Table Rock;

4. Bull Shoals;

5. Lake of the Ozarks;

6. Pomme de Terre;

7. Norfolk; and

8. Clearwater.

(B) Bedrock Wells.

1. Casing shall be installed fifty feet (50') below the deepest point of the lake within one-quarter (¼) mile radius of the well location. Casing shall not be less than the minimum requirements outlined in Drill Area 1 (10 CSR 23.090(1)) a minimum of eighty feet (80') and extend thirty feet (30') into bedrock. Formula: well site elevation (feet) – deepest lake elevation within one-quarter (¼) mile (feet) + fifty feet (50') = casing depth. Example: 1000' (well site elevation) - 850' (deepest lake elevation within one-quarter (¼) mile) + 50' = 200' casing depth.

2. A casing point may be requested prior to drilling in Drill Area 8.

3. The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

4. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

5. When plastic casing is used liner shall not be used in lieu of casing.

6. When steel casing is used and the minimum casing depth cannot be achieved due to geologic reasons, casing shall be installed to a minimum of eighty feet (80') extending a minimum of thirty feet (30') into bedrock and a liner used to achieve the remaining casing depth provided the following requirements are met:

A. Have a minimum annular space of one-half inch (½");

B. Have a minimum of two (2) three (3)-ribbed rubber packers (K-packers) secured at or below the bottom of the minimum casing depth;

C. Have the top of the liner extend to within ten feet (10') of the top of casing.

D. Have packers placed a maximum of ten feet (10') apart; and

E. Grout pursuant to 10 CSR 23-3.090(8)(B)7. using the gravity or tremie grouting method using cement slurry or coated bentonite pellets.

F. Liner specifications shall be followed pursuant to 10 CSR 23-3.080(1), (2), (4), and (5).

7. Grouting Requirements.

A. The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.

B. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

C. The annular space above the grouted interval shall be filled with clean fill.

(C) Unconsolidated material wells. The unconsolidated requirements for the Drill Area adjacent to the lake apply.

(9) Area 9 (formerly Sensitive Area C). This area encompasses Greene and parts of Christian county where rapid urbanization is occurring in a sensitive geologic and hydrologic setting. The upper aquifer (Springfield Plateau Aquifer) and lower aquifer (Ozark Aquifer) are separated by low-permeability bedrock (Ozark Confining Unit). This low-permeability bedrock limits migration of groundwater and any associated contamination from the upper aquifer to the lower aquifer (see Figure 3.2).

(A) Bedrock Wells.

1. The casing shall be installed a minimum of ten feet (10') below the Ozark Confining Unit or as indicated in the digital geospatial dataset "DRILL AREAS" developed by the Missouri Department of Natural Resources, Missouri Geological Survey. Hard copies may be obtained by contacting the Missouri Department of Natural Resources, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

2. A casing point request may be submitted to the department.

3. The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

4. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

5. When plastic casing is used liner shall not be used in lieu of casing.

6. When steel casing is used and the minimum casing depth cannot be achieved due to geologic reasons, casing shall be installed to a minimum of one hundred feet (100') extending a minimum of thirty feet (30') into bedrock and a liner used to achieve the remaining casing depth provided the following requirements are met:

A. Have a minimum annular space of one-half inch (½");

B. Have a minimum of two (2) three (3)-ribbed rubber packers (K-packers) secured at or below the bottom of the Ozark Confining Unit pursuant to 10 CSR 23-3.090(9)(A)1.;

C. Have the top of the liner extend to within ten feet (10') of the top of casing;

D. Have packers placed a maximum of ten feet (10') apart; and

E. Grout pursuant to 10 CSR 23-3.090(9)(A)7. using the gravity or tremie grouting method using cement slurry or coated bentonite pellets;

F. Liner specifications shall be followed pursuant to 10 CSR 23-3.080(1), (2), (4), and (5).

7. Grouting Requirements.

A. The Ozark Confining Unit shall be grouted from ten feet (10') below the formation to the top of the shale and at a minimum the lowermost thirty feet (30') of casing shall be grouted.

B. When the casing extends more than ten feet (10') below the bottom of the Ozark Confining Unit, more than thirty feet (30') of grout will be required to seal off the Ozark Confining Unit.

C. Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

D. The annular space above the grouted interval shall be filled with clean fill.

(B) Unconsolidated material wells. The unconsolidated requirements for Drill Area 1 apply.

(10) Area 10 (formerly Special Area 1). This area encompasses a portion of southeastern Missouri and is composed of deeply weathered and highly fractured bedrock where openings may be filled with mud extending deep into bedrock (see Figure 3.8).

(A) Bedrock Wells.

1. A minimum of eighty feet (80') of casing shall be installed and extend a minimum of fifteen feet (15') into solid bedrock. Example: If sixty feet (60') of residual material or broken rock is encountered during drilling above solid bedrock, then seventy five feet (75') of casing shall be installed. If solid bedrock is not encountered within one hundred and fifty feet (150') the contractor may consult the department for further instructions regarding a variance or install casing into deeper solid bedrock.

2. The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

3. In areas where poor drilling conditions exist and it is necessary to drive multiple strings of smaller diameter casing

through the surface casing, each succeeding smaller diameter casing shall extend into the preceding casing at least twenty feet (20').

4. Install new steel casing pursuant to 10 CSR 23-3.030(1)(A).

5. Grouting Requirements.

A. If casing is driven, see 10 CSR 23-3.030(1)(D) for liner and grouting requirements.

B. If casing is not driven, the lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.

(I) Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

(II) The annular space above the grouted interval shall be filled with clean fill.

(B) If unconsolidated material wells are drilled in Area 10, Drill Area 1 requirements for unconsolidated wells apply.

(11) Area 11 (formerly Special Area 2). This area encompasses Newton and Jasper County and is delineated separately due to the contamination of portions of the upper aquifer by one (1) or more of the following: lead, cadmium, chlorinated VOCs including TCE, TCE degradation products, or other contaminants pursuant to 10 CSR 60-4. The upper aquifer (Springfield Plateau Aquifer) and lower aquifer (Ozark Aquifer) are separated by low-permeability bedrock (Ozark Confining Unit). This low-permeability bedrock limits migration of groundwater and any associated contamination from the upper aquifer to the lower aquifer (see Figure 3.2).

(A) Bedrock Wells.

1. Consult the digital geospatial dataset "DRILL AREAS" developed by the Missouri Department of Natural Resources, Missouri Geological Survey. Hard copies may be obtained by contacting the Missouri Department of Natural Resources, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401. This dataset identifies the maximum well depth for wells completed in the upper aquifer; the required casing depth for a lower aquifer well; TCE Concern Areas; and TCE Impact Areas.

2. Wells outside of the TCE Impact Area may be installed in the upper aquifer provided they do not penetrate the Ozark Confining Unit; or wells may be installed and cased/sealed through the Ozark Confining Unit and open to only the lower aquifer.

3. New upper aquifer wells outside of the TCE Impact Area.

A. Total depth of the well shall not penetrate the Ozark Confining Unit and not exceed the upper depth indicated digital geospatial dataset "DRILL AREAS".

B. A minimum of eighty feet (80') of casing shall be installed and extend a minimum of thirty feet (30') into solid bedrock. Example: If sixty feet (60') of residual material or broken rock is encountered during drilling above solid bedrock, then ninety feet (90') of casing will be installed.

C. The borehole for domestic wells shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

D. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

E. Grouting Requirements.

(I) The lowermost thirty feet (30') of casing shall be grouted. Table 3.10 lists the minimum amount of grout required by type and size of annulus or open hole.

(II) Grouting materials and methods shall be followed pursuant to 10 CSR 23-3.030(1)(C).

(III) The annular space above the grouted interval shall be filled with clean fill.

F. New upper aquifer wells within the TCE Concern Area shall follow sampling requirements pursuant to 10 CSR 23-3.090(11)(A)6.

4. New lower aquifer wells outside of the TCE Impact Area.

A. The casing shall be installed a minimum of ten feet (10') below the Ozark Confining Unit or to the lower depth indicated on the digital geospatial dataset "DRILL AREAS".

B. A casing point request may be submitted to the department.

C. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

D. If steel casing is used, the borehole shall be a minimum of eight and five-eighths inches (8 ⅝") in diameter to casing depth.

E. When steel casing is used and the minimum casing depth cannot be achieved due to geologic reasons, casing shall be installed to a minimum of eighty feet (80') extending thirty feet (30') into bedrock and a liner used to achieve the remaining casing depth provided the following requirements are met:

(I) Have a minimum annular space of one-half inch (½");

(II) Have a minimum of two (2) three (3)-ribbed rubber packers (K-packers) secured at or below the bottom of the Ozark Confining Unit pursuant to 10 CSR 23-3.090(11)(A)4.A.;

(III) Have the top of the liner extend to within ten feet (10') of the top of casing;

(IV) Have packers placed a maximum of ten feet (10') apart; and

(V) Grout pursuant to 10 CSR 23-3.090(11)(A)4.G. from the top packer to extend ten feet (10') inside the casing using the gravity or tremie grouting method using cement slurry or coated bentonite pellets;

(VI) Liner specifications shall be followed pursuant to 10 CSR 23-3.080(1), (2), (4), and (5).

F. If plastic casing is used, the borehole shall be a minimum of ten inches (10") in diameter to the casing depth. When plastic casing is used liner shall not be used in lieu of casing.

G. Grouting Requirements.

(I) Full length grout is required.

(II) Grouting methods shall be Tremie Pressure, Pressure, or Positive Displacement pursuant to 10 CSR 23-3.030(1)(C)1.C., 10 CSR 23-3.030(1)(C)1.D., and 10 CSR 23-3.030(1)(C)1.F.

(III) Grouting materials shall be cement slurry or high-solids bentonite slurry.

(IV) Wells with eighty feet (80') of casing may use grouting materials and methods pursuant to 10 CSR 23-3.030(1)(C).

H. All construction requirements pursuant to 10 CSR 23-3.030 shall be met except as provided in 10 CSR 23-3.090(11)(A)4.G.

I. New lower aquifer wells within the TCE Concern Area shall follow sampling requirements pursuant to 10 CSR 23-3.090(11)(A)6.

5. Major reconstruction of wells in Area 11 that involves exceeding the upper depth indicated in the digital geospatial dataset "DRILL AREAS" or penetrating the Ozark Confining Unit requires advanced written approval from the department.

6. Additional Requirements for wells in TCE Concern Areas.

A. Water sampling and analysis shall be performed for TCE and its degradation products for new wells.

B. Permitted pump installers and owners who self-install pumps are responsible for ensuring sampling is completed according to laboratory sampling protocol and submitting sample results within sixty (60) days of pump installation.

C. The laboratory that analyzes the sample shall be certified by the EPA or the department for such analyses.

D. Prior to sampling, the well shall be purged continuously for a minimum of two (2) hours and water samples collected from the tap closest to the well.

E. All wells in a TCE Concern Area shall be constructed with a sampling port or tap within twenty feet (20') of the wellhead.

F. If an upper aquifer well contains detectable levels of

TCE or its degradation products, the well shall—

(I) Be plugged full length with approved grout material; or

(II) Be reconstructed and sealed through the Ozark Confining Unit pursuant to 10 CSR 23-3.090(11)(A)5.

7. Well installation in TCE Impact Areas.

A. The casing shall be installed a minimum of ten feet (10') below the Ozark Confining Unit or to the lower depth indicated in the digital geospatial dataset "DRILL AREAS".

B. A casing point request may be submitted to the department.

C. Install new casing pursuant to 10 CSR 23-3.030(1)(A).

D. The borehole shall be a minimum of ten inches (10") in diameter to casing depth.

E. Grouting Requirements.

(I) Full length grout is required.

(II) Grouting methods shall be Tremie Pressure, Pressure, or Positive Displacement pursuant to 10 CSR 23-3.030(1)(C)1.C., 10 CSR 23-3.030(1)(C)1.D., and 10 CSR 23-3.030(1)(C)1.F.

(III) Grouting materials shall be cement slurry or high-solids bentonite slurry.

F. Water sampling and analysis shall be performed for TCE and its degradation products for new wells.

G. Permitted pump installers and owners who self-install pumps are responsible for ensuring sampling is completed according to laboratory sampling protocol and submitting sample results within sixty (60) days of pump installation.

H. The laboratory that analyzes the sample shall be certified by the EPA or the department for such analyses.

I. Prior to sampling, the well shall be purged continuously for a minimum of two (2) hours and water samples collected from the tap closest to the well.

J. All wells in the TCE impact areas shall be constructed with a sampling port or tap within twenty feet (20') of the wellhead.

(B) Unconsolidated Material Wells.

1. If unconsolidated material wells are drilled in Area 11 outside TCE Concern and TCE Impact areas, Drill Area 1 requirements for unconsolidated wells apply.

2. Advanced written approval from the department is required if unconsolidated material wells are drilled in TCE Concern or TCE Impact areas.

(12) Area 12 (formerly Special Area 3). This area encompasses portions of Franklin County within and south of the city of New Haven and is delineated separately due to the contamination of portions of the aquifer by one (1) or more of the following known contaminants: tetrachloroethylene or perchloroethylene (PCE), trichloroethylene (TCE), TCE degradation products, and may include other contaminants pursuant to 10 CSR 60-4. It is necessary to implement more stringent well construction standards for new wells that are drilled into the aquifer and to limit the deepening of existing upper aquifer wells (see Figure 3.9).

(A) New Wells.

1. Prior written approval and construction specifications shall be obtained from the department for any new wells constructed in Area 12.

2. Water sampling for contaminants will be required pursuant to 10 CSR 23-3.090(12)(C).

3. Drilling shall cease and the department is to be notified immediately if PCE or TCE is encountered above the maximum contaminant level (MCL) or action level (AL). The department will determine further action.

(B) Reconstruction of Existing Wells.

1. Prior written approval and reconstruction specifications shall be obtained from the department for any reconstructed wells in Area 12.

2. Water sampling for contaminants will be required pursuant to 10 CSR 23-3.090(12)(C). Wells that are contaminated at levels exceeding maximum contaminant levels (MCLs) and/or action levels (ALs) shall not be deepened.

3. Drilling shall cease and the department is to be notified immediately if PCE or TCE is encountered above the maximum contaminant level (MCL) or action level (AL) during reconstruction. The department will determine further action.

(C) Water Sampling.

1. Groundwater sampling for contaminants is required according to laboratory sampling protocol for any new well or reconstruction and methods will be established on a case-by-case basis by the department.

2. The well installation contractor is responsible for ensuring sampling is conducted throughout the drilling process and results submitted in accordance with pre-approved department sampling methods. Final sampling of the well shall be completed by the pump installation contractor within sixty (60) days of pump installation. Wells will not be certified or registered until all sampling has been completed.

3. Sampling and analysis shall be performed for known contaminants listed in 10 CSR 23-3.090(12) and other contaminants as determined by the department.

4. The laboratory that analyzes the sample shall be certified by the EPA or the department for analyses being requested.

5. All new and deepened wells shall be constructed with a sampling port or tap at or before the pressure tank within twenty feet (20') of the wellhead.

(D) Plugging.

1. Wells shall be plugged full length using bentonite slurry or cement grout via one of the tremie methods.

2. All plugging requirements in 10 CSR 23-3.110 shall be met except as required in 10 CSR 23-3.090(12)(D).

(E) All drilling-derived fluids, displaced water, and solid materials shall be containerized and sampled before disposal in accordance with federal, state, and local regulations based on analytical results.

(F) Any completed (new or reconstructed) well in which PCE and/or TCE is encountered at levels above MCL and/or AL shall be plugged full-length pursuant to 10 CSR 23-3.090(12)(D).

(13) Area 13 (formerly Special Area 4). This area encompasses portions of St. Charles County west of the city of Weldon Spring and is delineated separately due to contamination of portions of the aquifer by one (1) or more of the following known contaminants listed by source in Table 3.15. In this area it is necessary to implement more stringent well construction standards for new wells that are drilled into the aquifer and to limit the deepening of existing upper aquifer wells (see Figure 3.10).

Table 3.15. Known contaminants of Drill Area 13 by source.

Source	Known Contaminants[1]
U.S. Army Corps of Engineers	trinitrotoluene (TNT), dinitrotoluene (DNT)
Department of Energy Main Site	2,4,6-TNT, 2,4-DNT, 2,6-DNT, dinitrobenzene (1,3-DNB), nitrobenzene (NB), nitrate, uranium, and trichloroethylene (TCE)
Department of Energy Quarry	uranium and 2,4-DNT

[1]May also include other contaminants pursuant to 10 CSR 60-4.

(A) New Wells.

1. Prior written approval and construction specifications shall be obtained from the department for any wells constructed in Area 13.

2. Water sampling for contaminants will be required pursuant to 10 CSR 23-3.090(13)(C).

3. Drilling shall cease and the department is to be notified immediately if contaminants listed in Table 3.15 or other contaminants pursuant to 10 CSR 60-4 are encountered at levels above the maximum contaminant level (MCL) or action level (AL). The department will determine further action.

(B) Reconstruction of Existing Wells.

1. Prior written approval and construction specifications shall be obtained from the department for any reconstructed wells in Area 13.

2. Groundwater sampling for contaminants listed in Table 3.15 or other contaminants pursuant to 10 CSR 60-4 will be required in advance of any deepening. Wells that are contaminated at levels exceeding maximum contaminant levels (MCLs) and/or action levels (ALs) shall not be deepened.

3. Any well approved to be deepened which encounters contaminants listed in Table 3.15 or other contaminants pursuant to 10 CSR 60-4 at levels above MCL and/or AL, drilling shall cease and the department shall be notified immediately. The department will determine further action.

(C) Water Sampling.

1. Groundwater sampling for contaminants is required according to laboratory sampling protocol for any new well or reconstruction and methods will be established on a case-by-case basis by the department.

2. The well installation contractor is responsible for ensuring sampling is conducted throughout the drilling process and results submitted in accordance with pre-approved department sampling methods. Final sampling of the well shall be completed by the pump installation contractor within sixty (60) days of pump installation. Wells will not be certified or registered until all sampling has been completed.

3. Sampling and analysis shall be performed for contaminants listed in Table 3.15.

4. The laboratory that analyzes the sample shall be certified by the EPA or the department for such analyses.

5. All new and deepened wells shall be constructed with a sampling port or tap at or before the pressure tank within twenty feet (20') of the wellhead.

(D) Plugging.

1. Wells shall be plugged full length using bentonite slurry or cement grout via one (1) of the tremie methods.

2. All plugging requirements in 10 CSR 23-3.110 shall be met except as required in 10 CSR 23-3.090(13)(D).

(E) All drilling-derived fluids, displaced water, and solid materials shall be containerized and sampled before disposal in accordance with federal, state, and local regulations based on analytical results.

(F) Any completed (new or reconstructed) well in which contaminants listed in Table 3.15 or other contaminants pursuant to 10 CSR 60-4 are encountered at levels above the MCL and/or AL shall be plugged full-length (10 CSR 23-3.090(13)(D)) or with approval from the department the well owner may be allowed to use the well provided groundwater quality will not be degraded further.

(G) Notwithstanding these provisions, the federal government does not waive its rights and authority under federal law, regulations, or executive order within the boundaries and applicable jurisdiction of federal property.

Table 3.10 All Drilling Areas (Bedrock Water Wells). Minimum Number of Bags of Grout Required in Annular Space (Ann.) or Open Hole (O.H.) for Sealing Casing with a Minimum Grout Seal of Thirty Feet (30').

CASING OUTER DIAMETER 6 ⅝" (6" NOMINAL) – APPLIES TO ALL DRILLING AREAS

Type of Grout	Borehole Diameter (inches)													
	8 ⅝		8 ¾		9		9 ½		10		10 ⅝		12 ⅝	
	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.
CEMENT														
Portland Type I	4.3	10.4	4.6	10.7	5.2	11.3	6.5	12.6	7.8	14.0	9.6	15.8	16.2	22.3
Portland Type III	4.3	10.4	4.6	10.7	5.2	11.3	6.5	12.6	7.8	14.0	9.6	15.8	16.2	22.3
BENTONITE														
Pellets														
½" Baroid Pellets	6.8	16.6	7.3	17.1	8.3	18.0	10.3	20.1	12.5	22.3	15.4	25.2	25.7	35.5
⅜" Baroid Pellets	7.2	17.5	7.7	18.0	8.7	19.0	10.9	21.2	13.2	23.5	16.2	26.5	27.1	37.4
¼"Baroid Pellets	7.1	17.4	7.6	17.9	8.7	18.9	10.8	21.1	13.1	23.4	16.1	26.4	27.0	37.3
Wyo-Bend Tablets	7.5	18.4	8.1	18.9	9.2	20.0	11.4	22.3	13.9	24.7	17.0	27.9	28.5	39.3
Volclay ½"	7.6	18.6	8.2	19.1	9.3	20.2	11.6	22.6	14.0	25.0	17.2	28.2	28.9	39.8
Volclay ⅜"	7.9	19.2	8.4	19.7	9.6	20.9	12.0	23.3	14.5	25.8	17.8	29.1	29.8	41.1
Volclay ¼"	8.1	19.8	8.7	20.4	9.9	21.6	12.3	24.0	14.9	26.6	18.4	30.0	30.8	42.4
Chips														
Baroid HolePlug	7.2	17.7	7.8	18.2	8.8	19.2	11.0	21.4	13.3	23.7	16.4	26.8	27.4	37.8
Wyo-Bend Coarse	6.1	14.8	6.5	15.2	7.4	16.1	9.2	18.0	11.2	19.9	13.7	22.5	23.0	31.7
Wyo-Bend Medium	6.3	15.3	6.7	15.7	7.6	16.7	9.5	18.6	11.5	20.6	14.2	23.2	23.8	32.8
Volclay Coarse	6.7	16.4	7.2	16.8	8.2	17.8	10.2	19.9	12.3	22.0	15.2	24.8	25.4	35.1
Volclay Medium	6.9	16.8	7.4	17.3	8.4	18.3	10.5	20.4	12.7	22.6	15.6	25.5	26.1	36.0
Granular														
Benseal	6.3	15.3	6.7	15.8	7.7	16.7	9.6	18.6	11.6	20.6	14.2	23.3	23.8	32.9
Wyo-bend No. 8	6.1	14.8	6.5	15.2	7.4	16.1	9.2	18.0	11.2	19.9	13.7	22.5	23.0	31.7
Wyo-bend No. 16	6.1	14.8	6.5	15.2	7.4	16.1	9.2	18.0	11.2	19.9	13.7	22.5	23.0	31.7
Slurry														
Baroid	1.5	3.6	1.6	3.7	1.8	3.9	2.3	4.4	2.7	4.9	3.4	5.5	5.6	7.7
Hi-yield	1.1	2.7	1.2	2.8	1.3	2.9	1.7	3.3	2.0	3.6	2.5	4.1	4.2	5.8
Wyo-bend	1.6	3.8	1.7	3.9	1.9	4.2	2.4	4.6	2.9	5.1	3.6	5.8	5.9	8.2
Volclay	1.4	3.5	1.5	3.6	1.7	3.8	2.2	4.2	2.6	4.6	3.2	5.3	5.4	7.4

Table 3.11 All Drilling Areas (Unconsolidated Water Wells). Minimum Number of Bags of Grout Required in Annular Space (Ann.) or Open Hole (O.H.) for Sealing Casing with a Minimum Upper Grout Seal of Twenty Feet (20').

CASING OUTER DIAMETER 6 ⅝" (6" NOMINAL) – APPLIES TO ALL DRILLING AREAS

Type of Grout	Borehole Diameter (inches)													
	10 ⅝		12 ⅝		14 ⅝		16		18		20		24	
	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.
CEMENT														
Portland Type I	6.4	10.5	10.8	14.9	15.9	20.0	19.8	23.9	26.1	30.2	33.2	37.3	49.6	53.7
Portland Type III	6.4	10.5	10.8	14.9	15.9	20.0	19.8	23.9	26.1	30.2	33.2	37.3	49.6	53.7
BENTONITE														
Pellets														
½" Baroid Pellets	10.3	16.8	17.2	23.7	25.3	31.8	31.5	38.0	41.6	48.1	52.9	59.4	79.0	85.6
⅜" Baroid Pellets	10.8	17.7	18.1	25.0	26.6	33.5	33.2	40.1	43.8	50.7	55.7	62.6	83.3	90.2
¼"Baroid Pellets	10.8	17.6	18.0	24.9	26.5	33.4	33.0	39.9	43.6	50.5	55.5	62.3	82.9	89.8
Wyo-Bend Tablets	11.4	18.6	19.0	26.3	28.0	35.2	34.9	42.1	46.1	53.3	58.6	65.8	87.6	94.8
Volclay ½"	11.5	18.8	19.3	26.6	28.3	35.7	35.3	42.7	46.7	54.0	59.3	66.7	88.7	96.0
Volclay ⅜"	11.9	19.4	19.9	27.4	29.2	36.8	36.4	44.0	48.1	55.7	61.2	68.8	91.4	99.0
Volclay ¼"	12.2	20.0	20.5	28.3	30.2	38.0	37.6	45.4	49.7	57.5	63.2	71.0	94.4	102.2
Chips														
Baroid HolePlug	10.9	17.9	18.3	25.2	26.9	33.9	33.6	40.5	44.3	51.3	56.3	63.3	84.2	91.1
Wyo-Bend Coarse	9.2	15.0	15.3	21.2	22.6	28.4	28.1	34.0	37.2	43.0	47.3	53.1	70.6	76.4
Wyo-Bend Medium	9.5	15.5	15.9	21.9	23.3	29.4	29.1	35.1	38.4	44.4	48.8	54.9	73.0	79.0
Volclay Coarse	10.1	16.6	17.0	23.4	24.9	31.4	31.1	37.5	41.1	47.5	52.2	58.7	78.0	84.5
Volclay Medium	10.4	17.0	17.4	24.0	25.6	32.3	32.0	38.6	42.2	48.8	53.7	60.3	80.2	86.8
Granular														
Benseal	9.5	15.5	15.9	21.9	23.4	29.4	29.2	35.2	38.5	44.6	49.0	55.0	73.2	79.2
Wyo-bend No. 8	9.2	15.0	15.3	21.2	22.6	28.4	28.1	34.0	37.2	43.0	47.3	53.1	70.6	76.4
Wyo-bend No. 16	9.2	15.0	15.3	21.2	22.6	28.4	28.1	34.0	37.2	43.0	47.3	53.1	70.6	76.4
Slurry														
Baroid	2.2	3.7	3.7	5.2	5.5	6.9	6.9	8.3	9.1	10.5	11.5	13.0	17.2	18.7
Hi-yield	1.7	2.7	2.8	3.9	4.1	5.2	5.1	6.2	6.8	7.8	8.6	9.7	12.9	13.9
Wyo-bend	2.4	3.9	4.0	5.5	5.8	7.3	7.3	8.8	9.6	11.1	12.2	13.7	18.2	19.7
Volclay	2.1	3.5	3.6	4.9	5.3	6.6	6.6	7.9	8.7	10.0	11.0	12.4	16.5	17.8

Table 3.12 Drilling Areas 3 and 4 (Bedrock or Shallow Bedrock Wells Method 1 Using Five and One-half Inch (5 ½") Casing Diameter). Minimum Number of Bags of Grout Required in Annular Space (Ann.) or Open Hole (O.H.) for Sealing Casing with a Minimum Grout Seal of Thirty Feet (30').

CASING OUTER DIAMETER 5 ½" (5" NOMINAL) – APPLIES TO DRILLING AREAS 3 AND 4 ONLY

Type of Grout	Borehole Diameter (inches)					
	9 ½		10		10 ⅝	
	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.
CEMENT						
Portland Type I	8.4	12.6	9.8	14.0	11.6	15.8
Portland Type III	8.4	12.6	9.8	14.0	11.6	15.8
BENTONITE						
Pellets						
½" Baroid Pellets	13.4	20.1	15.5	22.3	18.4	25.2
⅜" Baroid Pellets	14.1	21.2	16.4	23.5	19.4	26.5
¼" Baroid Pellets	14.0	21.1	16.3	23.4	19.3	26.4
Wyo-Bend Tablets	14.8	22.3	17.2	24.7	20.4	27.9
Volclay ½"	15.0	22.6	17.4	25.0	20.7	28.2
Volclay ⅜"	15.5	23.3	18.0	25.8	21.3	29.1
Volclay ¼"	16.0	24.0	18.6	26.6	22.0	30.1
Chips						
Baroid Hole Plug	14.2	21.4	16.6	23.7	19.6	26.8
Wyo-Bend Coarse	11.9	18.0	13.9	19.9	16.5	22.5
Wyo-Bend Medium	12.3	18.6	14.3	20.6	17.0	23.2
Volclay Coarse	13.2	19.9	15.3	22.0	18.2	24.9
Volclay Medium	13.6	20.4	15.8	22.6	18.7	25.5
Granular						
Benseal	12.4	18.6	14.4	20.6	17.1	23.3
Wyo-bend No. 8	11.9	18.0	13.9	19.9	16.5	22.5
Wyo-bend No. 16	11.9	18.0	13.9	19.9	16.5	22.5
Slurry						
Baroid	2.9	4.4	3.4	4.9	4.0	5.5
Hi-yield	2.2	3.3	2.5	3.6	3.0	4.1
Wyo-Bend	3.1	4.6	3.6	5.1	4.3	5.8
Volclay	2.8	4.2	3.2	4.6	3.8	5.3

Table 3.13 Drilling Areas 3 and 4 (Unconsolidated or Shallow Bedrock Water Wells Method 2 Using Five and One-half Inch (5 ½") Casing Diameter). Minimum Number of Bags of Grout Required in the Annular Space (Ann.) or Open Hole (O.H.) for Sealing Casing for with a Minimum Upper Grout Seal of Twenty (20').

CASING OUTER DIAMETER 5 ½" (5" NOMINAL) – APPLIES TO DRILLING AREAS 3 AND 4 ONLY.

Type of Grout	Borehole Diameter (inches)													
	10 ⅝		12 ⅝		14 ⅝		16		18		20		24	
	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.	Ann.	O.H.
CEMENT														
Portland Type I	7.7	10.5	12.1	14.9	17.1	20.0	20.0	23.9	27.4	30.2	34.5	37.3	50.9	53.7
Portland Type III	7.7	10.5	12.1	14.9	17.1	20.0	20.0	23.9	27.4	30.2	34.5	37.3	50.9	53.7
BENTONITE														
Pellets														
½" Baroid Pellets	12.3	16.8	19.2	23.7	27.3	31.8	31.5	38.0	43.6	48.1	54.9	59.4	81.1	85.6
⅜" Baroid Pellets	13.0	17.7	20.2	25.0	28.8	33.5	33.2	40.1	46.0	50.7	57.9	62.6	85.4	90.2
¼"Baroid Pellets	12.9	17.6	20.1	24.9	28.6	33.4	33.1	39.9	45.8	50.5	57.6	62.3	85.0	89.8
Wyo-Bend Tablets	13.6	18.6	21.3	26.3	30.2	35.2	34.9	42.1	48.3	53.3	60.8	65.8	89.8	94.8
Volclay ½"	13.8	18.8	21.5	26.6	30.6	35.7	35.4	42.7	49.0	54.0	61.6	66.7	91.0	96.0
Volclay ⅜"	14.2	19.4	22.2	27.4	31.6	36.8	36.5	44.0	50.5	55.7	63.6	68.8	93.8	99.0
Volclay ¼"	14.7	20.0	22.9	28.3	32.6	38.0	37.6	45.4	52.1	57.5	65.6	71.0	96.8	102
Chips														
Baroid HolePlug	13.1	17.9	20.5	25.2	29.1	33.9	33.6	40.5	46.5	51.3	58.5	63.3	86.4	91.1
Wyo-Bend Coarse	11.0	15.0	17.2	21.2	24.4	28.4	28.1	34.0	39.0	43.0	49.1	53.1	72.4	76.4
Wyo-Bend Medium	11.3	15.5	17.7	21.9	25.2	29.4	29.1	35.1	40.3	44.4	50.7	54.9	74.8	79.0
Volclay Coarse	12.1	16.6	19.0	23.4	27.0	31.4	31.1	37.5	43.1	47.5	54.2	58.7	80.0	84.5
Volclay Medium	12.5	17.0	19.5	24.0	27.7	32.3	32.0	38.6	44.3	48.8	55.7	60.3	82.2	86.8
Granular														
Benseal	11.4	15.5	17.8	21.9	25.3	29.4	29.2	35.2	40.4	44.6	50.8	55.0	75.0	79.2
Wyo-bend No. 8	11.0	15.0	17.2	21.2	24.4	28.4	28.1	34.0	39.0	43.0	49.1	53.1	72.4	76.4
Wyo-bend No. 16	11.0	15.0	17.2	21.2	24.4	28.4	28.1	34.0	39.0	43.0	49.1	53.1	72.4	76.4
Slurry														
Baroid	2.7	3.7	4.2	5.2	6.0	6.9	6.9	8.3	9.5	10.5	12.0	13.0	17.7	18.7
Hi-yield	2.0	2.7	3.1	3.9	4.4	5.2	5.1	6.2	7.1	7.8	8.9	9.7	13.2	13.9
Wyo-bend	2.8	3.9	4.4	5.5	6.3	7.3	7.3	8.8	10.1	11.1	12.7	13.7	18.7	19.7
Volclay	2.6	3.5	4.0	4.9	5.7	6.6	6.6	7.9	9.1	10.0	11.5	12.4	16.9	17.8

Table 3.14 Drill Area 5 (Unconsolidated Water Wells Using Four and One-half Inch (4 ½") Casing Diameter). Minimum Number of Bags of Grout Required in Annular Space (Ann.) or Open Hole (O.H.) for Sealing Casing with a Minimum Upper Grout Seal of Twenty Feet (20').

CASING OUTER DIAMETER 4 ½" (4" NOMINAL) – APPLIES TO DRILLING AREA 5 ONLY

Type of Grout	Borehole Diameter (inches)			
	8 ½		9	
	Ann.	O.H.	Ann.	O.H.
CEMENT				
Portland Type I	4.8	6.7	5.7	7.6
Portland Type III	4.8	6.7	5.7	7.6
BENTONITE				
Pellets				
½" Baroid Pellets	7.7	10.7	9.0	12.0
⅜" Baroid Pellets	8.1	11.3	9.5	12.7
¼" Baroid Pellets	8.1	11.3	9.5	12.6
Wyo-Bend Tablets	8.6	11.9	10.0	13.3
Volclay ½"	8.7	12.0	10.1	13.5
Volclay ⅜"	8.9	12.4	10.4	13.9
Volclay ¼"	9.2	12.8	10.8	14.4
Chips				
Baroid Hole Plug	8.2	11.4	9.6	12.8
Wyo-Bend Coarse	6.9	9.6	8.1	10.7
Wyo-Bend Medium	7.1	9.9	8.3	11.1
Volclay Coarse	7.6	10.6	8.9	11.9
Volclay Medium	7.8	10.9	9.2	12.2
Granular				
Benseal	7.2	9.9	8.4	11.1
Wyo-bend No. 8	6.9	9.6	8.1	10.7
Wyo-bend No. 16	6.9	9.6	8.1	10.7
Slurry				
Baroid	1.7	2.3	2.0	2.6
Hi-yield	1.3	1.7	1.5	2.0
Wyo-Bend	1.8	2.5	2.1	2.8
Volclay	1.6	2.2	1.9	2.5

Figure 3.1 All Drilling Areas.

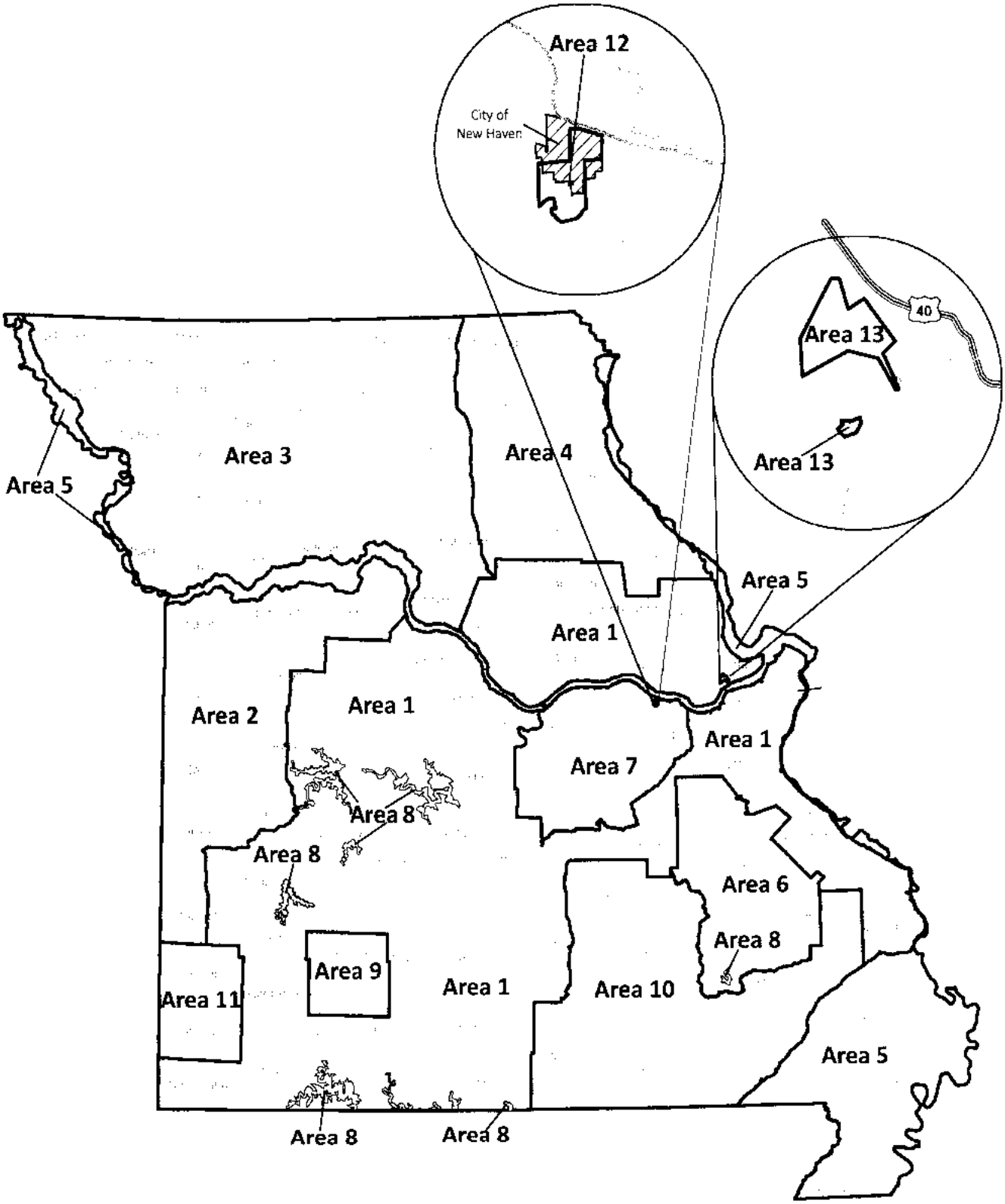


Figure 3.2 Drilling Areas 1, 7, 8, 9, and 11.

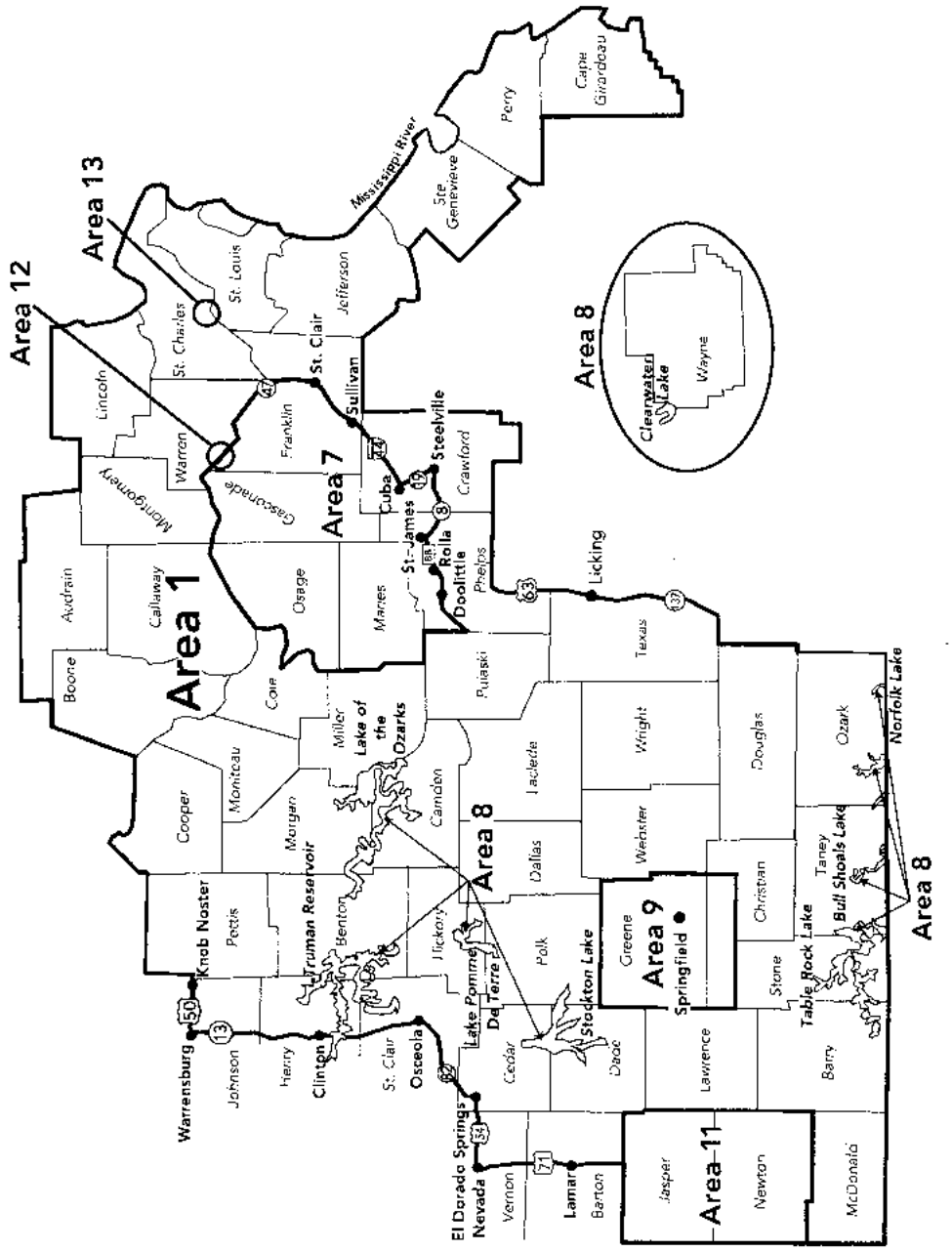


Figure 3.3 Drilling Area 2.

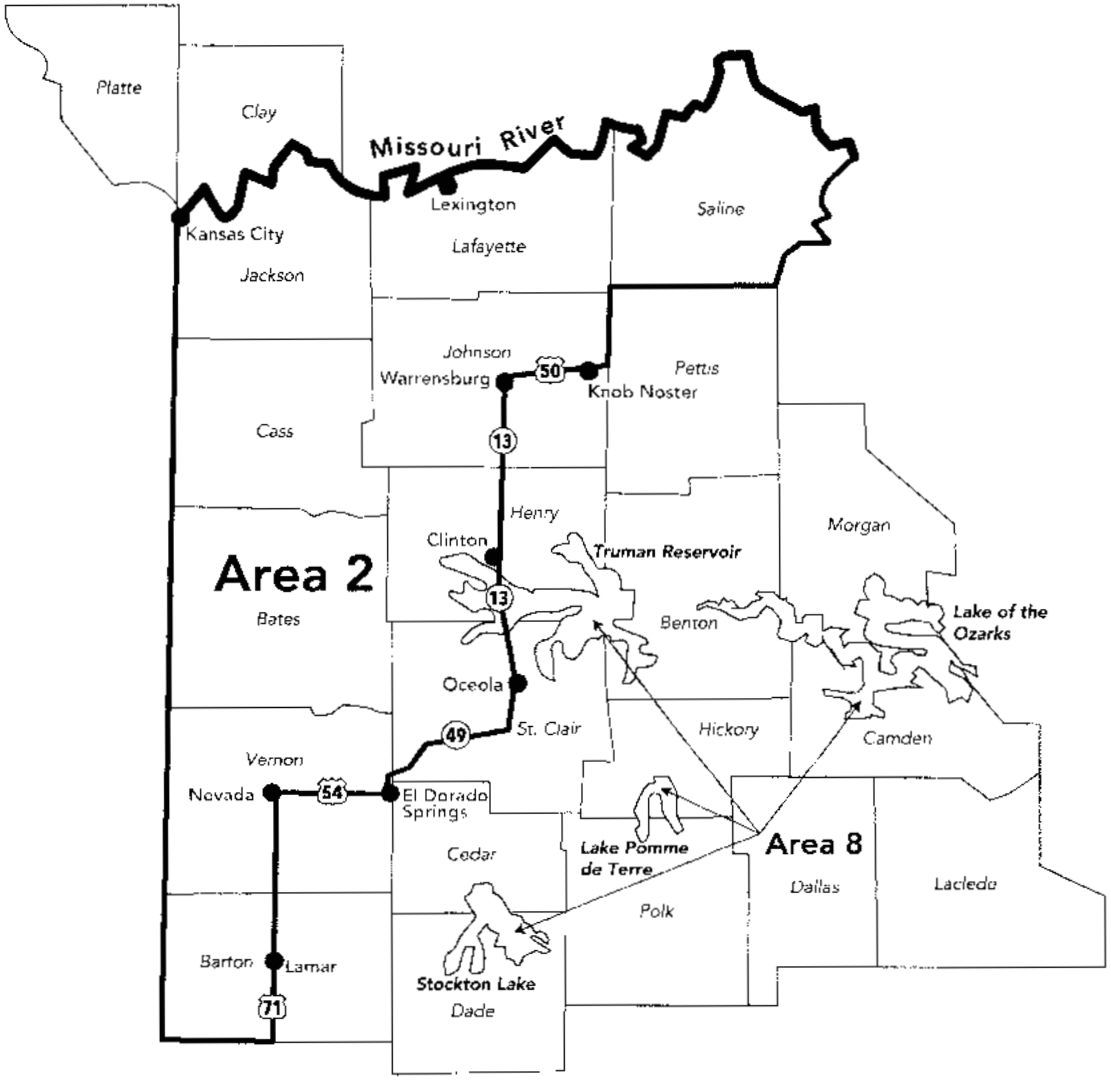


Figure 3.4 Drilling Area 3.

Figure 3.5 Drilling Area 4.

Figure 3.6 Drilling Area 5. This area includes the alluvial plains of the Missouri and Mississippi rivers.

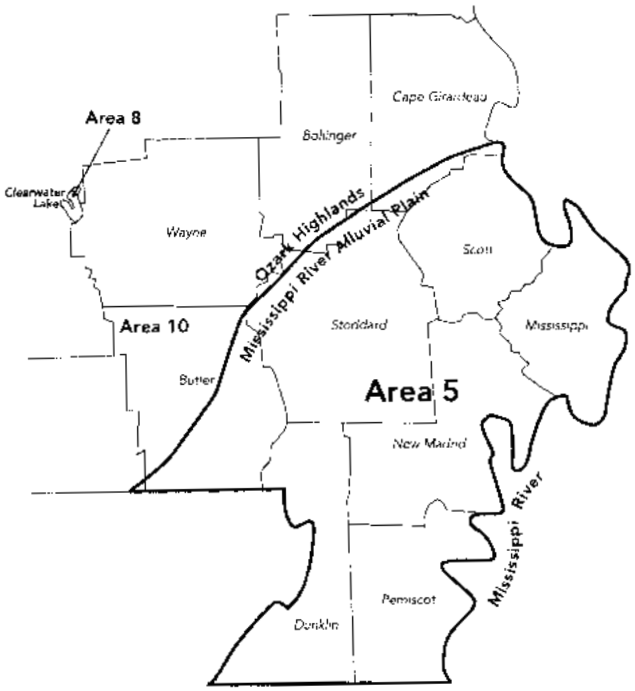


Figure 3.7 Drilling Area 6.

Figure 3.8 Drilling Area 10.

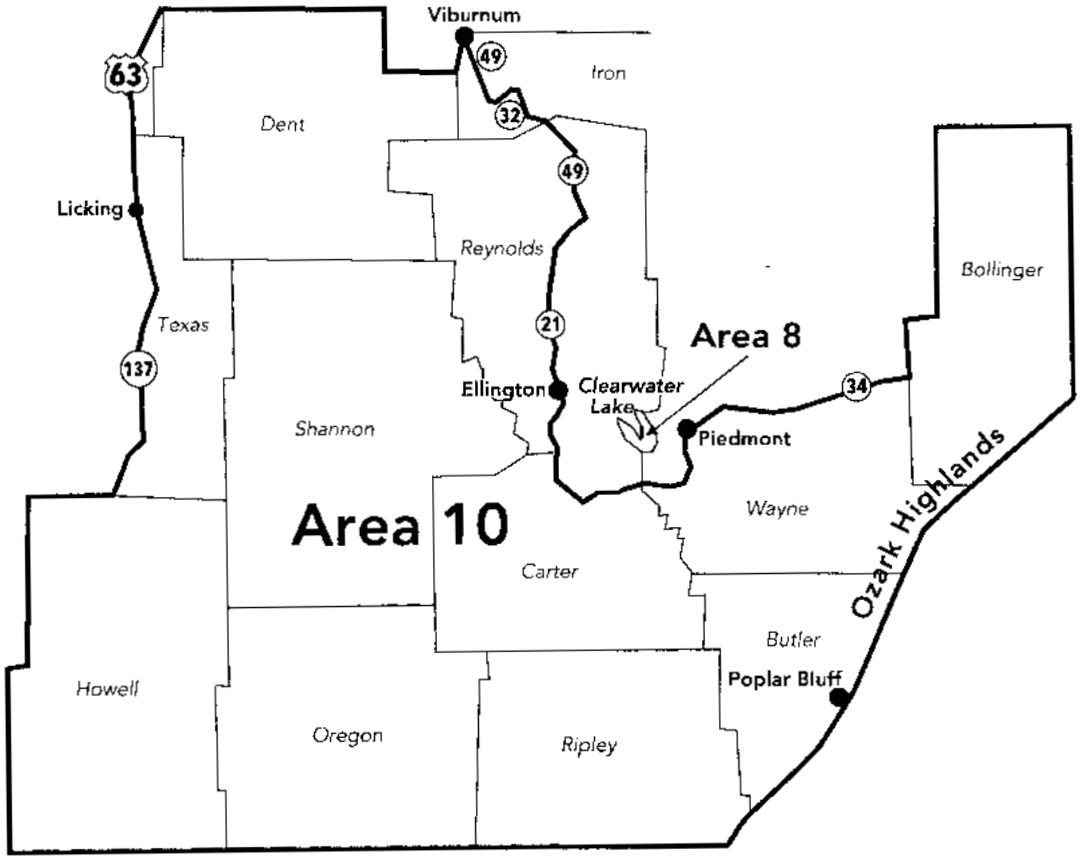


Figure 3.9 Drilling Area 12.

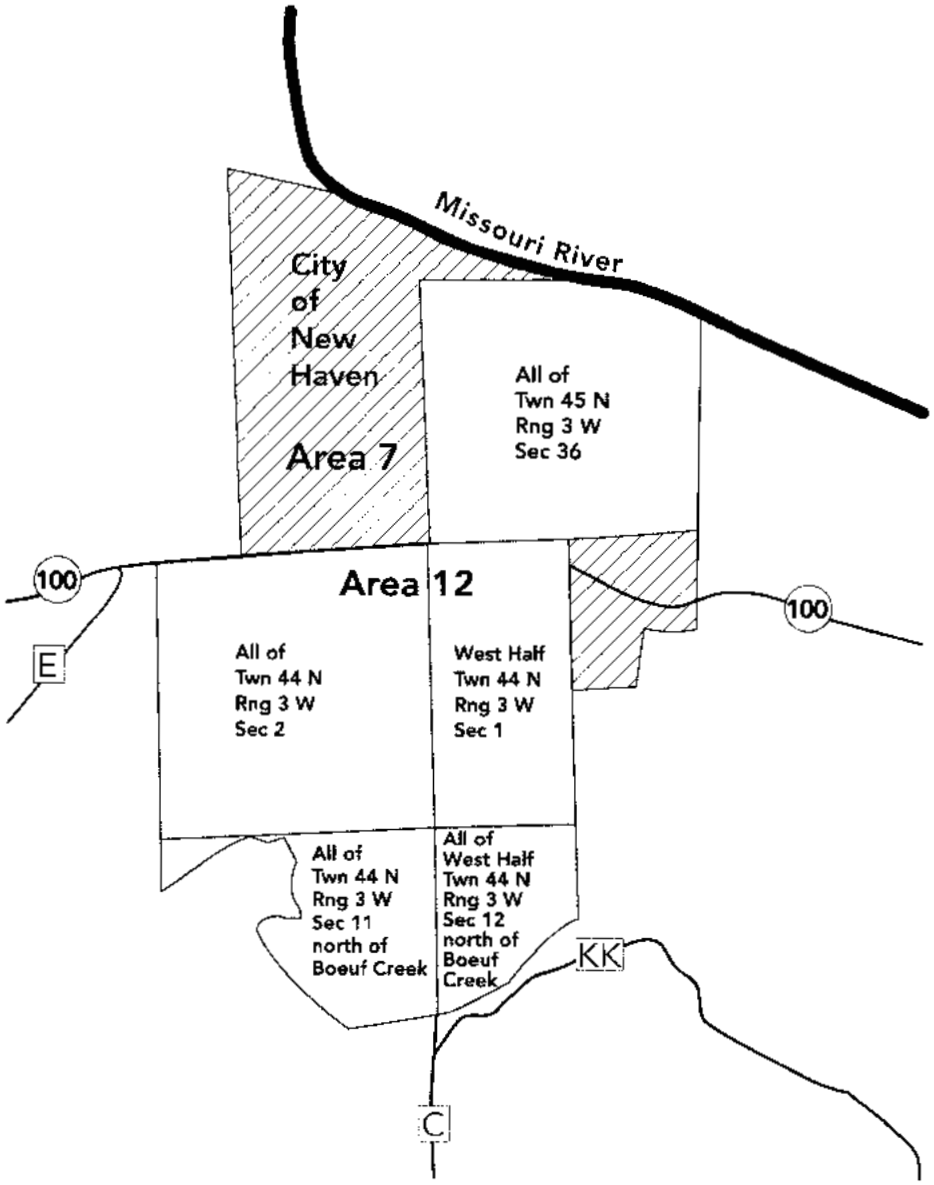
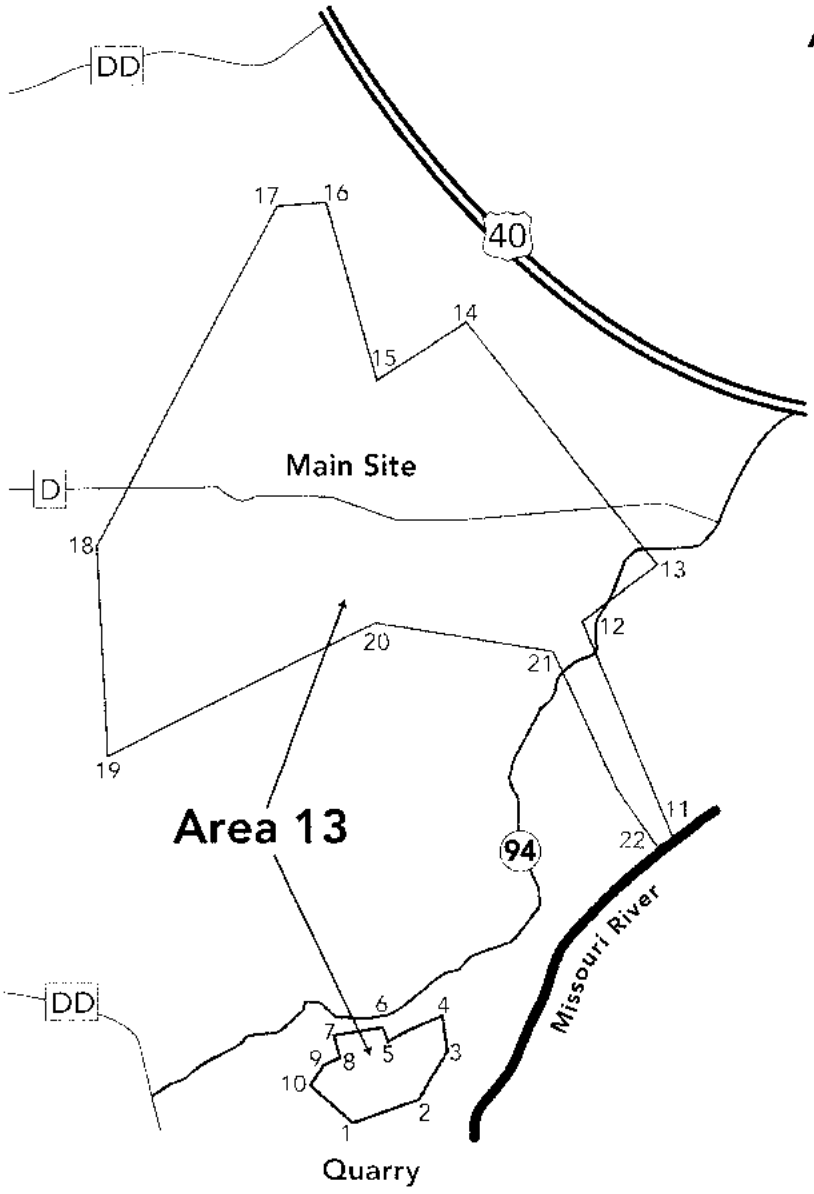


Figure 3.10 Drilling Area 13.



Area Boundary Points

	LAT	LONG
1	38 39' 03"	90 45' 13"
2	38 39' 10"	90 44' 44'
3	38 39' 26"	90 44' 32"
4	38 39' 37"	90 44' 33"
5	38 39' 30"	90 44' 58"
6	38 39' 33"	90 44' 59"
7	38 39' 32"	90 45' 19"
8	38 39' 25"	90 45' 16"
9	38 39' 22"	90 45' 22'
10	38 39' 18"	90 45' 29"
11	38 40' 28"	90 42' 58"
12	38 41' 31"	90 43' 32'
13	38 41' 52"	90 43' 02'
14	38 43' 11"	90 44' 15'
15	38 42' 53"	90 44' 54'
16	38 43' 49"	90 45' 13'
17	38 43' 50"	90 45' 33'
18	38 42' 02"	90 46' 52'
19	38 40' 53"	90 46' 49'
20	38 41' 37"	90 44' 57'
21	38 41' 22"	90 43' 44'
22	38 40' 24"	90 43' 04'

*AUTHORITY: sections 256.606 and 256.626, RSMo [Supp. 1991] **2016**. Original rule filed April 2, 1987, effective July 27, 1987. Emergency amendment filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Amended: Filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will cost private entities six hundred twenty-four dollars ($624) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

FISCAL NOTE

PRIVATE COST

I. RULE NUMBER

Rule Number and Name	10 CSR 23-3.090 Drilling Areas Sections (8), (9), and (11).
Type of Rulemaking	Amendment

II. SUMMARY OF FISCAL IMPACT

Estimate of the number of entities by class which would likely be affected by the adoption of the proposed rule:	Classification by types of the business entities which would likely be affected:	Estimate in the aggregate as to the cost of compliance with the rule by the affected entities:
The total average number of wells installed per year that are affected by this rule is 180.[13] Well owners are the affected entity. Well installation businesses will be indirectly affected and will pass the cost along to individual consumers.	1781 Water Well Drilling Private Well Owners	$624

III. WORKSHEET

10 CSR 23-3.090(8) – Drilling Area 8
A well installed in this area must have casing installed to a depth determined by land surface elevation and lake depth.

Currently, liner may substitute for a portion of the required casing amount. In this scenario, 80 feet of casing is installed, and the remaining casing amount may be accomplished by using liner. The average casing depth requirement in this area is 165 feet[7].

The following calculation shows the current liner materials cost charged to the well owner.
(165 feet of liner – 10 feet of liner[1] =155 feet of liner)*($5/feet[4]) = $775
(2 rubber conical packers) *($20/packer[2]) = $40
60 vertical feet of bentonite slurry[3] = $21
Total material cost = $836

To effectively protect groundwater, the proposed amendment will allow liner to substitute for a portion of the required casing amount when plastic liner cannot be used due to geologic reasons and steel casing is used. In this scenario, when plastic casing cannot be used, 80 feet of steel casing is installed and the remaining casing amount may be accomplished by using liner. The amendment requires the use of ribbed K-Packers and limits the grout materials that can be used. The following calculation shows the increased cost.

(165 feet of liner – 10 feet of liner[1] =155 feet of liner)*($5/feet[4]) = $775
(2 ribbed K-Packers)*($40/packer[3]) = $80
60 vertical feet of cement grout[5] = $60
Total material cost = $915

This results in an average of $79 per well increase.
$915-$836 = $79

The average price increase per well multiplied by the average number of wells installed in this area per year with liners equals the total cost increase.
($79)*(50 wells[10]) = $3,950

10 CSR 23-3.090(9) – Drilling Area 9

A well installed in this area must have casing installed to a depth determined by quarter section.

Currently, liner may substitute for a portion of the required casing amount. In this scenario, 100 feet of steel casing must be installed, and the remaining casing amount may be accomplished by using liner. The average casing depth requirement in this area is 225 feet[8].

The following calculation shows the current liner materials cost charged to the well owner.
(225 feet of liner – 10 feet[1] = 215 feet of liner)*($5/feet[4]) = $1075
(2 rubber conical packers)*($20/packer[2]) = $40
60 vertical feet of the most inexpensive allowable grout (bentonite slurry)[5] = $21
Total material cost = $1,136

To effectively protect groundwater, the proposed amendment will allow liner to substitute for a portion of the required casing amount when plastic liner cannot be used due to geologic reasons and steel casing is used. In this scenario, when plastic casing cannot be used, 100 feet of steel casing is installed and the remaining casing amount may be accomplished by using liner. The amendment requires the use of ribbed K-Packers and limits the grout materials that can be used.

The following calculation shows the increased cost.
(225 feet of liner – 10 feet[1] = 215 feet of liner)*($5/feet[1]) = $1,075
(2 ribbed K-Packers)*($40/packer[3]) = $80
60 vertical feet of cement grout[5] = $60
Total material cost = $1,215

This results in an average of $79 per well increase.
$1,215-$1,136 = $79

The average price increase per well multiplied by the average number of wells installed in this area per year with liners equals the total cost increase.
($79)*(115 wells[11]) = $9,085

10 CSR 23-3.090(11) – Drilling Area 11

A well installed in this area must have casing installed to a depth determined by quarter section.

Currently, liner may substitute for a portion of the required casing amount. In this scenario, 100 feet of steel casing must be installed, and the remaining casing amount may be accomplished by using liner. The average casing depth requirement in this area is 450 feet[9].

The following calculation shows the current liner materials cost charged to the well owner.
(450 feet of liner – 10 feet[1] = 440 feet of liner)*($5/feet[4]) = $2,200
(2 rubber conical packers) *($20/packer[2]) = $40
60 vertical feet of the bentonite slurry[5] = $21
Total material cost = $2261

To effectively protect groundwater, the proposed amendment will allow liner to substitute for a portion of the required casing amount when plastic liner cannot be used due to geologic reasons and steel casing is used. In this scenario, when plastic casing cannot be used, 100 feet of steel casing is installed and the remaining casing amount may be accomplished by using liner. The amendment requires the use of ribbed K-Packers and limits the grout materials that can be used.

(450 feet of liner – 10 feet[1] = 440 feet of liner)*($5/feet[4]) = $2,200
(2 ribbed K-Packers)*($40/packer[3]) = $80
380 vertical feet of cement grout[6] = $360
Total material cost = $2,640

This results in an average of $380 per well increase.
$2640-$2,261 = $379

The average price increase per well multiplied by the average number of wells installed in this area per year with liners equals the total cost increase.
($379)*(15 wells[12]) = $5,685

Totals for 10 CSR 23-3.090

The total cost increase per year for the proposed rule changes in Drilling Areas 8, 9, and 11 is shown in the following calculation.
$3,950 + $9,085 + $5,685 = $18,720

This cost can be distributed over the life of the rule (expected life of well) to determine the aggregate cost of the proposed rule.
($18,720)/(30 years[14]) = $624

$624 is the aggregate cost increase of wells, constructed with liners, installed in Drilling Areas 8, 9, and 11 of 10 CSR 23-3.090 over the life of the proposed rule. Note that not all wells installed in these areas use liners. Annually, an average of 50.7% (180/355*100%) of wells installed in these areas are affected by this rule.

IV. ASSUMPTIONS AND FOOTNOTES

[1] Generally 10 feet less liner is installed to account for surface apparatus clearance.

Table 1. Applicable packer costs.*

Conical packer	K-Packer	Liner
$20[2]	$40[3]	$5/feet[4]

*Determined by averaging the packer material cost from six vendors and liner material cost charged by six well installation businesses in the affected Drilling Areas.

Table 2. Applicable grout material costs.*

Grout price for 60 vertical feet[5]			
Grout	price per unit	volume (units) needed for 60'	total price
cement	12	5	60
coated pellets	85	9	765
chips	9.5	8	76
granules	9.5	7	66.5
slurry	10.5	2	21
Grout price for 380 vertical feet[6]			
cement	12	30	360
coated pellets	85	50	4250

*Determined by multiplying the allowable grout material unit price by the number of units needed to achieve the required 60 foot vertical seal giving the volumetric grout material cost.

Table 3. Average Required Casing by Drill Area.

Drill Area	Average Required Casing Depth
8*	165 feet[7]
9**	225 feet[8]
11**	450 feet[9]

* Average required casing depth determined by averaging all issued casing points.
** Average required casing depth determined by taking average quarter section casing depth requirement for all quarter sections in area.

Table 4. Average Number of Wells with Liners Installed by Drill Area.*

Drill Area	Average Number of Wells Installed With Liners per Year
8	50[10]
9	115[11]
11	15[12]
Total	180[13]

* Determined by averaging totals from 2015, 2016, and 2017.
[14] Average life of the well is equal to the average life of the rule (i.e., 30 years)

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 3—Well Construction Code

PROPOSED RECISSION

10 CSR 23-3.100 Sensitive Areas. This rule set specific additional construction standards for sensitive areas that had been designated on the basis of either naturally occurring problems caused by unique groundwater chemistry, anthropogenic contamination, or because they were located in a fragile groundwater environment that was experiencing rapid population growth or urbanization.

PURPOSE: This rule is being rescinded and the substantive requirements are being incorporated into 10 CSR 23-3.090 Drilling Areas (formerly Regionalization) to clearly state the differences in water well drilling requirements based on geographic, geologic, hydrologic, and anthropogenic differences throughout Missouri.

AUTHORITY: sections 256.606 and 256.626, RSMo 2000. Original rule filed April 2, 1987, effective July 27, 1987. For intervening history, please consult the ***Code of State Regulations****. Rescinded: Filed June 27, 2018.*

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* ***Well Installation***
Chapter 3—*Water* Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-3.110 Plugging of *Water* Wells. The board is amending the division name, chapter name, rule purpose, sections (1)–(5) and removing sections (6) and (7). The board is also removing Figures 9 through 11.

PURPOSE: This amendment clarifies how to plug a well based on well type.

PURPOSE: This rule establishes [criteria for the proper plugging procedures to be followed when abandoning] ***standards for plugging*** *a* ***water*** *well. [Plugging procedures for monitoring wells are contained in 10 CSR 23-4.080, for heat pump wells in 10 CSR 23-5.080 and for test holes in 10 CSR 23-6.050.]*

[Editor's Note: This rule was originally filed as part of 10 CSR 23-3.020 General Protection of Groundwater. It is proposed as a separate rule because of added emphasis given to abandonment procedures in the amendment to the law.

(1) Any well which is to be abandoned must be plugged in accordance with these rules. If a well has been determined to present a threat to groundwater, the division may order that the well be permanently plugged. If a well is in such a state of disrepair (such as the pump has been removed or the water line disconnected) that continued use for purposes of obtaining groundwater is impractical and the well has not been in use for a period of two (2) years or more, the division may order that the well be permanently plugged.

(2) Permanent Abandonment of Wells.

(A) Plugging the Well.

1. A well that is to be permanently abandoned shall be disconnected from the water distribution system and the hole filled to prevent contaminating materials from entering the subsurface water-bearing formations and groundwater from one (1) aquifer mixing with that of another aquifer. Bentonite or cement grout shall be used for grouting material. If the well is so large that the use of these materials is not practical, the division will determine a proper plugging schedule. All materials, debris and obstructions that may interfere with plugging operations shall be removed from the well. Liner pipe shall be removed or perforated when necessary to assure placement of an effective plug.

2. The division must be consulted for instruction in case of abandonment of a contaminated well or where there is a question of proper procedure. Sampling of the fluids in the well may be required. A permitted well installation or pump installation contractor must be utilized to plug the well.

(B) An abandoned well shall be plugged by one (1) of the following methods in this section in accordance with the materials penetrated, in such a manner as to prevent it from acting as a channel for pollution. A report of the method of plugging shall be filed with the division on a registration report form that is provided by the division.

(C) Plugging requirements contained in 10 CSR 23-3.010—10 CSR 23-3.100 do not pertain to bedrock irrigation wells and public water supply wells which include community, noncommunity and nontransient noncommunity type wells. Plugging requirements for these types of wells will be determined on a case-by-case basis by the division and must be performed by a permitted contractor, and may be more stringent than those for domestic and multifamily wells.

1. Hand dug wells and bored wells no deeper than eighty feet (80'). To plug this type of well, the following steps must be followed (see Figure 9):

A. Remove all pumps, pipe, debris and surface coverings or concrete cap;

B. Push in top three feet (3') of well lining. Lining may be composed of rock, brick or tile. If lining is composed of any other material consult the division for further instructions;

C. Fill well to within three feet (3') from the surface with clean fill such as gravel, sand, varied sized agricultural lime or other approved material;

D. Disinfect fill material. If there is water in the well, chlorine must be added to bring its concentration to at least one hundred (100) parts per million (ppm) (see Table 1 in 10 CSR 23-3.050). As the fill material is poured into the well, it is disinfected as it comes in contact with the chlorinated water. If there is no water in the well to be plugged, disinfect the fill material before it is placed into the well;

E. Fill the remaining hole with clay or clay-rich soil. Soil should be mounded slightly at the top to help offset settling; and

F. Submit the registration report form and fee to the

division.

2. Wells completed in unconsolidated deposits. This type of well includes alluvial wells, glacial drift wells and nonbedrock wells. To plug this type of well, the following steps must be followed:

A. Remove all pumps, pipe and debris from well;

B. Dig around casing and remove top three feet (3') of casing. The remaining hole must be at least two feet (2') in diameter larger than the existing casing (see Figure 10);

C. Fill well from total depth to fifty feet (50') from surface with clean fill such as gravel, sand, varied sized agricultural lime or other approved material;

D. Disinfect fill material. If there is water in the well, you must add chlorine to the water bringing it to a concentration of at least one hundred (100 ppm) (see Table 1 in 10 CSR 23-3.050). As the fill material is poured into the well, it is disinfected as it comes in contact with the chlorinated water. If there is no water in the well to be plugged, disinfect the fill material before it is placed into the well;

E. Place a grout plug that fills the upper fifty feet (50') of casing and extends into the larger excavated area, at least one foot (1'). In agricultural or yard settings the remaining hole above the grout plug must be filled with soil. In other settings, the remaining hole above the grout plug may be filled with clean fill if the well site is to be paved; and

F. Submit registration report form and fee to the division.

3. Wells completed in bedrock. This type of well includes any domestic well that produces water from bedrock aquifers (see Figure 11). To plug this type of well, the following steps must be followed:

A. Remove all pumps, pipe and debris from well. Any liner must be removed or perforated if possible;

B. Dig around casing and remove top three feet (3') of casing. The remaining hole must be at least two feet (2') in diameter larger than the existing casing;

C. Fill well from total depth to fifty feet (50') below bottom of casing with clean fill such as gravel, sand, varied sized agricultural lime or other approved fill material;

D. Disinfect fill material. If there is water in the well, you must add chlorine to the water bringing it to a concentration of at least one hundred (100) ppm (see Table 1 in 10 CSR 23-3.050). As the fill material is poured into the well, it is disinfected as it comes in contact with the chlorinated water. If there is no water in the well to be plugged, disinfect any fill material used before it is placed into the well;

E. Place cement or bentonite from a point fifty feet (50') below the bottom of the casing to two feet (2') from the surface making sure the grout extends into the excavated area at least one foot (1'). If the water level is above a point fifty feet (50') below the bottom of the casing, then bentonite chips must be used or the cement or bentonite slurry must be emplaced through a tremie pipe lowered through the water level to the top of the fill. Under no circumstances may cement or bentonite slurry be poured through large columns of water without the use of a tremie pipe (see paragraph (2)(C)6. for alternative cement plugging technique);

F. May plug the well, if the well has one hundred fifty feet (150') or more of casing, by filling the well with clean aggregate to a point fifty feet (50') below the bottom of the casing, placing a grout plug from this point extending up into the casing thirty feet (30'). From this point to within fifty feet (50') of the surface, clean aggregate fill may be used. From fifty feet (50') to two feet (2') must be filled with grout making sure the grout extends into the excavated area at least one foot (1');

G. Cut casing off at top of bedrock, if bedrock is encountered when digging around the casing, and fill remaining hole with cement slurry. In agricultural or yard settings, the plug must terminate at least two feet (2') below the finished surface grade and the remaining hole filled with soil. In other settings, the remaining hole may be filled with clean fill if the well site is to be paved; and

H. Submit registration report form and fee to division.

4. For those wells which casing depth, water level and total depth are not known and cannot be determined, plugging instructions will be determined on a case-by-case basis and may be more stringent.

5. As clean fill is being placed into a well, periodic measurements should be taken to ensure that the fill does not reach a point closer than fifty feet (50') below the bottom of the existing casing. If fill is placed above this point, plugging schedules will be determined by the division and may result in removal of fill material.

6. When plugging a well that contains water that is above a point of fifty feet (50') below the bottom of the casing or liner, whichever is deeper, cement slurry may be poured into the well if a tremie pipe is placed in the well to near the bottom and acts as a conduit for the water to escape through as the cement slurry is poured into the well casing from the surface. The cement slurry must be poured in one (1) continuous operation. Mixing small batches and pouring is not permitted.

7. The flow in a flowing well shall be confined, if possible, and the well plugged in accordance with well plugging requirements supplied by the division which will be determined on a case-by-case basis. Proper judgment shall be exercised in the feasibility of plugging flowing wells. In some cases the confining formation may have been so badly disturbed that plugging may only cause the flow to discharge in a less appropriate location. In other situations, the flow may have eroded so much material that the landscape has taken on the appearance of a natural spring. The plugging in this case may be impractical, if not impossible.

(3) Owners Responsibility for Plugging Well. The owner shall be responsible for the permanent plugging of an abandoned well except when the permittee improperly locates, constructs or completes the well. The permittee shall then be responsible for the plugging of the well.

(4) Wells Abandoned by Landowners. Wells abandoned by landowners after August 28, 1991, shall be plugged or cause to be plugged, in accordance with this rule. Landowners may plug their own wells located on property they own or lease, if the wells were intended for use only in single-family houses which are their permanent residences, or were intended for use only for farming purposes on their farms, and where the waters that were produced were not intended for use by the public or in any residence other than their own. If a landowner pays someone to assist with the plugging of the well, that person must hold a current Missouri well installation contractor permit or Missouri pump installation contractor permit except as stated in 10 CSR 23-1.090(2) concerning hand dug wells. If the division makes a finding that certain unusual conditions exist at a well that is to be plugged, the division may require that the well be plugged by a permitted well installation contractor or a permitted pump installation contractor. Unusual conditions exist at a well that is to be plugged if the total depth, amount of casing and water level are not known; a liner is in the well; foreign objects are stuck in the well; the well is contaminated with pollutants other than bacteria; or other conditions determined by the division on a case-by-case basis.

(5) A permittee or landowner who permanently abandons any well that is removed from service shall report the abandonment to the division on a registration report form provided by the division. A permittee or landowner shall report to the division any unplugged abandoned wells existing on his/her property (landowner) or property on which a permittee is hired to perform well drilling repair or pump installation.

(6) All wells may be plugged by filling the well via tremie or pressure grouting with cement slurry, bentonite or bentonite slurry from total depth to two feet (2') from the surface, if this method exceeds other minimum standards.

(7) If the division finds that certain conditions for high potential of groundwater contamination exist at a well, the division may require that a permitted well installation contractor or pump installation contractor be contracted to plug the well.]

(1) General Plugging Requirements for Water Wells.

(A) Abandoned wells shall be plugged in accordance with these rules pursuant to sections 256.603(1) and 256.615, RSMo. If a well presents a contamination threat to groundwater, the department may order that the well be plugged.

(B) A permittee shall report to the department any unplugged abandoned wells existing on property where the permittee performed work under these rules.

(C) The well owner shall be responsible for plugging abandoned wells or causing the well to be plugged, except as follows:

1. When the permittee improperly locates, constructs, or completes a well, then the permittee is be responsible for plugging the well unless the department has set a timeframe for remediation of the well;

2. A dry hole shall be plugged within thirty (30) days and a plugging registration record submitted. A certification record is not required; or

3. Wells that produce saline water shall be plugged within thirty (30) days and a plugging registration record submitted. A certification record is not required.

(2) General Plugging Methods.

(A) A well that is to be plugged shall be disconnected from the water distribution system and the borehole sealed to prevent contaminants from entering an aquifer or prevent aquifer mixing.

(B) Contaminated wells shall be plugged by a permitted contractor. The department shall be consulted for plugging specifications. Groundwater sampling may be required.

(C) Wells contaminated by bacteria only may be plugged by the well owner.

(D) Wells that have an unknown casing depth shall be plugged full length with grout materials pursuant to 10 CSR 23-3.110(2)(E).

(E) Grout Materials—

1. Cement slurry;

2. Bentonite;

3. Bentonite slurry; or

4. Other approved grout.

(F) Grout Placement Methods—

1. Tremie;

2. Reverse tremie;

3. Gravity; or

4. Pressure.

(G) The top portion of the casing shall be removed and the excavated area filled by well type pursuant to 10 CSR 23-3.110(3).

(H) New or existing wells that have unusual conditions, includes but not limited to, contamination, a liner, a foreign object, or pump stuck in the borehole shall be plugged full length by a permitted contractor using cement, emplacing the cement grout by one (1) of the following methods: tremie, tremie pressure, or reverse tremie. Alternate plugging methods may be used upon advanced written approval by the department.

(3) Domestic and Multifamily Water Well Plugging Requirements.

(A) Hand dug and augered wells less than eighty feet (<80') in depth may be plugged by the landowner or a non-permitted person.

1. Remove the pump, pipe, debris, and surface covering.

2. Remove at a minimum the top one foot (1') of well lining unless the well is located in an agricultural setting where the removal of well lining shall be three feet (3') below ground surface. Lining may be composed of rock, brick, tile, tin, or clay pipe.

3. Disinfect the well. If water is in the well, add chlorine to the water pursuant to 10 CSR 23-3.050(7). If no water is in the well, disinfect the fill material as it is placed into the well.

4. Fill the well with clean fill from total depth to one foot (1') from ground surface or if in an agricultural setting three feet (3') from ground surface.

5. Fill the remaining hole with clay or clay-rich soil. Soil should be mounded slightly to help offset settling.

(B) Unconsolidated material wells.

1. Remove the pump, pipe, and any debris from the well.

2. Remove the top two feet (2') of casing. If well is located in an agricultural setting remove the top three feet (3') of casing below ground surface. Excavate the area at least two feet (2') in diameter larger than the existing casing. If the well casing is surrounded by a concrete pad or asphalt, the casing may be cut off flush.

3. Disinfect the well. If water is in the well, add chlorine to the water pursuant to 10 CSR 23-3.050(7). If no water is in the well, disinfect the fill material as it is placed into the well.

4. Add clean fill.

A. Wells less than or equal to two hundred feet (≤ 200') total depth, add clean fill from total depth to approximately twenty feet (20') below ground surface.

B. Wells greater than two hundred feet (200') total depth, add clean fill from total depth to approximately fifty feet (50') below ground surface.

5. Add grout plug.

A. Wells less than or equal to two hundred feet (≤200') total depth, add grout from top of clean fill to one foot (1') below ground surface in yard or non-agricultural setting or three feet (3') below ground surface in an agricultural setting. Grout plug shall total twenty feet (20').

B. Wells greater than two hundred feet (>200') total depth, add grout from top of fill to one foot (1') below ground surface in yard or non-agricultural setting or three feet (3') below ground surface in agricultural setting. Grout plug shall total fifty feet (50').

6. Add soil or clean fill.

A. Completely fill the excavated area above the grout plug with soil or clean fill.

B. If the well casing is surrounded by a concrete pad or asphalt, fill the top one foot (1') of casing above the grout plug with cement grout or quick-setting concrete.

7. If the well casing and screen are removed from the well, native material is allowed to collapse into the borehole; fill any remaining borehole with grout and add a minimum one foot (1') soil cap in a yard or non-agricultural setting or a three foot (3') soil cap in an agricultural setting.

(C) Bedrock wells.

1. Remove the pump, pipe, liner, and debris from well. If any item is left in the well, see 10 CSR 23-3.110(2)(H) for plugging requirements.

2. Remove the top two feet (2') of casing. If well is located in an agricultural setting remove the top three feet (3') of casing below ground surface. Excavate the area at least two feet (2') in diameter larger than the existing casing. If the well casing is surrounded by a concrete pad or asphalt, the casing may be cut off flush. If the top two feet (2') of casing cannot be removed due to encountering bedrock or hard impervious material when digging around the casing, cut the casing flush with the top of bedrock or impervious material.

3. Disinfect the well. If water is in the well, add chlorine to the water pursuant to 10 CSR 23-3.050(7). If no water is in the well, disinfect the fill material as it is placed into the well.

4. Add clean fill. If the well is not filled full length with grout, then fill the well from total depth to fifty feet (50') below the bottom of the casing with clean fill.

5. Add a grout plug. Place a grout plug on top of clean fill from a point fifty feet (50') below the bottom of the casing completely filling the casing to one foot (1') below ground surface.

6. Add soil or clean fill. Fill the excavated area above the grout plug and with soil. Clean fill may be used to fill the excavated area above the grout plug if the well site is to be paved. If the well casing is surrounded by a concrete pad or asphalt, then fill the top one foot (1') of casing with cement grout or quick-setting concrete.

7. For a well with greater than eighty feet (>80') of casing the well may be plugged as follows.

A. Add clean fill. Fill the well with clean fill from total depth to fifty feet (50') below the bottom of the casing.

B. Add a lower grout plug. The lower grout plug shall extend from fifty feet (50') below the bottom of the casing to at least thirty feet (30') into the casing.

C. Add clean fill. Clean fill may be added on top of the lower grout plug and extend to fifty feet (50') below ground surface.

D. Add an upper grout plug. The upper grout plug shall extend from the top of clean fill (fifty feet (50') below ground surface) to one foot (1') below ground surface.

E. Add soil or clean fill pursuant to 10 CSR 23-3.110(3)(C)6.

8. For a well that has greater than one hundred feet (>100') of standing water, the grout plug shall be emplaced by one (1) of the following methods: tremie, tremie pressure, reverse tremie, or gravity. If the gravity method is used only bentonite chips or pellets are allowed and shall be added slowly to avoid bridging. For reverse tremie, pour the cement slurry in one (1) continuous operation. For all methods, the tremie pipe shall be no greater than twenty feet (20') from the bottom of the well or the top of the fill material.

9. If the borehole does not have casing, the borehole may be filled with clean fill from total depth to fifty feet (50') below ground surface. From fifty feet (50') to within one foot (1') of ground surface, the borehole shall be filled with grout. Fill the top one foot (1') with soil or clean fill pursuant to 10 CSR 23-3.110(3)(C)6.

(4) High Yield Well Plugging Requirements.

(A) Bedrock Wells.

1. All high yield wells may be plugged using the following method without prior approval from the department.

A. Remove all materials from the well prior to plugging.

B. Cut the casing two feet (2') below ground surface or flush with bedrock if encountered. If the well is located in an agricultural setting remove the top three feet (3') of casing below ground surface.

C. Disinfect the well. If water is in the well, add chlorine to the water pursuant to 10 CSR 23-3.050(7).

D. Fill the well full length from total depth to the top of casing with cement slurry using one (1) of the tremie or reverse tremie methods.

E. Fill the remaining hole above the cut off casing with soil or fill material.

2. Other methods including the use of fill material may be used upon receiving advanced written approval by the department.

(B) Unconsolidated wells.

1. Wells two hundred feet or less (≤200') in total depth may be plugged as follows:

A. Remove all materials prior to plugging;

B. Cut the casing two feet (2') below ground surface. If well is located in an agricultural setting remove the top three feet (3') of casing below ground surface;

C. Fill the well from total depth to twenty feet (20') from surface with disinfected clean fill;

D. Plug the upper twenty feet (20') with bentonite or cement grout; and

E. Fill the remaining hole above the cut off casing with soil or fill material.

2. Wells greater than two hundred feet (>200') total depth may be plugged pursuant to 10 CSR 23-3.110(3)(B).

3. Other plugging materials and methods may be used upon receiving advanced written approval by the department.

(5) Inactive Water Wells may remain unplugged for a period no longer than five (5) years from the date the well became inactive provided the well owner obtains written approval from the department.

(A) Certified wells. Upon approval of inactive water well status, the pump must be removed and the wellhead provided with a permanent steel plate welded or a PVC cap glued. At the end of the five (5) year period, the well is considered abandoned and shall be plugged if not in service pursuant to 10 CSR 23-3.110.

(B) Noncertified wells. Prior to approval of inactive water well status, the following shall be completed:

1. The well owner or permitted pump installation contractor shall remove the pump;

2. Allow the department to inspect the well by use of a downhole camera;

3. Protect the wellhead by a permanent steel plate welded or a PVC cap glued; and

4. The well casing length shall meet the construction requirement for the drill area the well is located in.

(C) The department will deny the request for inactive status if any of the requirements listed under 10 CSR 23-3.110(4)(B) are not met, the well does not meet minimum construction standards, or the well is found to be in a state of disrepair.

1. The well owner may reconstruct the well to meet minimum construction standards. Once the reconstruction report is approved, the well owner may reapply for inactive well status.

2. If the well is not operational at the end of the five (5) year period, the well is considered abandoned and shall be plugged if not in service pursuant to 10 CSR 23-3.110.

*AUTHORITY: sections 256.606, 256.614, 256.615, and 256.626, RSMo [Supp. 1991] **2016**. This rule was previously filed as 10 CSR 23-3.020(3)–(9). Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed July 13, 1994, effective Jan. 29, 1995. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 4—Monitoring Well Construction Code

PROPOSED RESCISSION

10 CSR 23-4.010 Definitions. This rule specifically defined words used in Chapter 4 concerning monitoring wells, otherwise the definitions contained in 10 CSR 23-1.010 applied.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into 10 CSR 23-1.010 Definitions.

AUTHORITY: sections 256.603, 256.606, and 256.626, RSMo 2000. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. For intervening history, please consult the ***Code of State Regulations****. Rescinded: Filed June 27, 2018.*

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 4—Monitoring Well Construction Code

PROPOSED RESCISSION

10 CSR 23-4.020 Certification and Registration for Monitoring Wells. This rule set required standards for certification report form submittal.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into a single new proposed rule 10 CSR 23-2.020 Certification and Registration.

AUTHORITY: sections 256.606, 256.614, and 256.626, RSMo 2000. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed Nov. 18, 2010, effective July 30, 2011. Rescinded: Filed June 27, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 4—Monitoring Well Construction Code

PROPOSED RESCISSION

10 CSR 23-4.030 Location of Wells. This rule set criteria for the locations where monitoring well should be placed.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into 10 CSR 23-4.060.

AUTHORITY: sections 256.606 and 256.626, RSMo 2000. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 18, 2010, effective July 30, 2011. Rescinded: Filed June 27, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* ***Well Installation***
Chapter 4—Monitoring Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-4.050 General Protection of Groundwater Quality and Resources. The board is amending the division name, sections (1) and (2), and removing sections (3) and (4).

PURPOSE: This amendment improves readability by removing

unnecessary language.

(1) Monitoring wells shall not be converted to any other type of well unless *[approved in advance by the division]* **advanced written approval is obtained from the department**.

(2) *[When strict application of these rules presents practical difficulties or unusual hardships, the division, on a case-by-case basis, may modify the application of these rules consistent with the general purpose and intent of these rules and the law. The division may then impose certain conditions as are necessary, in the opinion of the division, to protect the groundwater of the state and health, safety, and general well-being of persons using, or potential users, of the groundwater (see 10 CSR 23-1.040 Modification by the Division for procedures concerning variances).]* **Monitoring wells shall be constructed so that aquifer mixing does not occur and may not be screened through the soil-bedrock horizon unless advanced written approval is obtained from the department. Drilling water shall be of potable quality.**

[(3) It is the obligation and responsibility of the monitoring well installation contractor to ensure that the monitoring well is constructed according to these rules and that the annular space, if one exists, is sealed. The monitoring well must be properly plugged or repaired when the annular space is no longer sealed or the well is no longer performing its intended function.

(4) When drilling water is needed, it must be of potable quality.]

*AUTHORITY: sections 256.606 and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed Nov. 18, 2010, effective July 30, 2011. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 4—Monitoring Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-4.060 Construction Standards for Monitoring Wells. The board is amending the division name, rule purpose, sections (1)–(10) and (12), deleting section (11), renumbering as needed, and adding section (13).

PURPOSE: This amendment improves readability by removing unnecessary language, updates language to be more in line with current industry standards, and incorporates substantive requirements from 10 CSR 23-4.030 Location of Wells.

*PURPOSE: This rule describes the minimum **construction** standards for [a properly constructed] monitoring wells.*

(1) Riser Pipe and Screen Material.

(A) Chemical Compatibility. If used in a monitoring well, the riser pipe and screen material selected *[must]* **shall** resist chemical corrosion for the life of the proposed monitoring program **and be new and free from contaminants that would adversely affect the quality of the groundwater**. *[Well construction material must not alter the results of any groundwater analysis.]*

(B) *[Types of]* Riser Pipe and Screen Materials. The **following** types of riser pipe and screen materials *[are divided into four (4) categories—]* **may be used:**

1.Thermoplastic materials, including polyvinyl chloride (PVC) and acrylonitrilebutadiene-styrene (ABS);

2. Metallic materials, including carbon steel, low-carbon steel, galvanized steel, and stainless steel (304 and 316);

3. Fluoropolymer materials, including polytetrafluoroethylene (PTFE), tetrafluoroethylene (TFE), fluorinated ethylene propylene (FEP), perfluoroalkoxy (PFA), polyvinylidene fluoride (PVDF), and polamides (such as Nylon); and

4. Other types of riser pipe and screen may be used *[if]* **upon advanced written** approval *[is obtained in advance]* from the *[division]* **department**.

5. Industry standard mesh material or pre-manufactured slotted screen is the only approved material for screening; hand-cut solid wall pipe is not allowed.

(C) *[All t]***T**hermoplastic and fluoropolymer riser pipe *[must meet the requirements set out in 10 CSR 23-3.070(1)(D). Thermoplastic and fluoropolymer riser pipe used in monitoring well construction must meet the following minimum standards:]* **shall—**

1. Be new and meet ASTM standards;

*[1.]***2.** *[The]* **Be a** minimum *[nominal]* diameter *[for riser pipe and screen installed in monitoring wells is]* **of** two inches (2") except that direct-push wells may have riser pipe *[and screen]* with a minimum nominal diameter of three-quarters of an inch (3/4"). *[Monitoring wells that are greater than one hundred feet (100') in depth must use Schedule 80 pipe]*;

*[2.]***3.** *[The wall thickness of the riser pipe or screen must not be less than the]* **Be a minimum of** Schedule 40 for *[the nominal size riser pipe or screen selected, except for]* **wells one hundred feet or less (≤100') and a minimum of Schedule 80 for wells greater than one hundred feet (>100').** *[g]***G**as-migration wells *[utilizing]* **using** a soil gas implant and tubing **are exempt from this requirement**; **and**

*[3.]***4.** *[Thermoplastic riser pipe and screen must b]***B**e joined **to screen** by a **watertight** mechanical type joint. *[The joint must be watertight. If O-rings or fluoropolymer tape is used, they must be of inert materials which will not adversely affect the function of the monitoring well; and]*

[4. Riser pipe and screen must be new and free from contaminants that would affect the quality of the groundwater or would adversely affect the monitoring.]

(D) *[All m]***M**etallic riser pipe *[must meet the following minimum standards:]* **shall—**

1. *[The]* **Be a** minimum *[nominal]* diameter *[for riser pipe and screen installed in monitoring wells is]* **of** two inches (2") except that direct-push wells may have riser pipe and screen with a minimum *[nominal]* diameter of three-quarters of an inch (3/4").

2. *[The]* **Have an equivalent** wall thickness**—**

A. *[f]***F**or carbon, low-carbon, and galvanized steel *[must]* not *[be]* less than Schedule 40*[.]***;**

B. *[The wall thickness of]* **For** stainless *[304 and 316 must]* **steel** not *[be]* less than Schedule 5*[.]***; and**

C. *[The]* **For** joint wall thickness *[must]* **shall** not *[be]* less than Schedule 40*[, with exception for soil gas-monitoring wells utilizing a soil gas implant and tubing]*; **and**

3. *[Metallic riser pipe must b]***B**e joined by a watertight mechanical joint or welded. *[The well should be checked for the presence of explosive gases before welding begins; and]*

[4. Riser pipe and screen material must be new and free from contaminants which would affect the quality of the groundwater or would adversely affect the monitoring.]

(2) Casing Material. *[If geologic conditions require the installation of casing material, the following requirements must be met:]*

[(A) Chemical Compatibility. The casing and casing joints selected must resist chemical corrosion for the life of the proposed monitoring program. The joining of two (2) dissimilar metals is not allowed;]

*[(B)]***(A)** *[Types of]* Casing Materials. The **following** types of casing *[materials are divided into four (4) categories—]* **shall be used:**

1.Thermoplastic materials*[, including polyvinyl chloride (PVC) and acrylonitrilebutadiene-styrene (ABS)]*;

2. Fluoropolymer materials*[, including polytetrafluoroethylene (PTFE), tetrafluoroethylene (TFE), fluorinated ethylene propylene (FEP), perfluoroalkoxy (PFA), and polyvinylidene fluoride (PVDF). All thermoplastic and fluoropolymer casing material must meet the requirements set out in 10 CSR 23-3.070(1)(D)]*;

3. Metallic materials, including *[carbon steel, low-carbon steel, galvanized steel, and stainless steel (304 and 316). S]***s**teel casing material *[must meet the requirements set out in]* **that meets the minimum specifications pursuant to** 10 CSR 23-3.030(1)*[; and]***. The joining of two (2) dissimilar metals is not allowed; or**

4. Other types of casing may be used *[if approval is obtained in advance from the division]* **upon advanced written approval from the department.**

*[(C)]***(B)** Casing *[D]***d**iameter*[. The inside diameter of the casing must]* **shall** be a minimum of four inches (4") larger than the *[nominal]* outside diameter of the riser pipe being installed*[;]***.**

*[(D)]***(C)** Casing *[B]***b**orehole *[D]***d**iameter*[. When installing casing, the borehole for casing must]* **shall** be a minimum of four inches (4") larger in diameter than the *[nominal]* outside diameter of the casing *[being used; and]***.**

*[(E)]***(D)** *[Casing Grouting Requirements. If casing is required to be installed for a monitoring well completion, t]***T**he casing *[must]***, if installed, shall** be grouted full-length *[utilizing]* **with** high solids bentonite slurry or cement slurry *[as approved under]* **pursuant to** 10 CSR 23-4.060(9)*[. The casing must be grouted full-length utilizing]* **using** the tremie method or one (1) of the pressure grouting methods *[set out in]* **pursuant to** 10 CSR 23-3.030*[(3)]***(1)(B)**. *[If the casing cannot be sealed to prevent surface contamination from entering the well,]* **Extend** the annular seal for the riser *[must extend]* from a point at least two feet (2') below the base of the casing up to the base of the surface completion.

(3) Monitoring *[W]***w**ell *[B]***b**oreholes *[Preparation.]* **shall—**

(A) *[All boreholes constructed in the installation of monitoring wells must b]***B**e clean and free of obstructions*[.]***;**

(B) Have a diameter that is at least four inches (4") larger than the outside diameter of the riser pipe and screen;

*[(B)]***(C)** *[Boreholes constructed for the installation of]* **For** gas-migration type wells *[utilizing]* **using** soil vapor implants *[must]***,** be a minimum of one inch (1") in diameter*[.]* **and be exempt from these borehole standards if properly plugged within thirty (30) days of completion; and**

*[(C)]***(D)** *[Boreholes constructed f]***F**or direct-push wells *[must]***,** be a minimum of three and one-quarter inches (3.25") in diameter **and be exempt from these borehole standards if properly plugged within thirty (30) days of completion**.

[(D) The diameter of a borehole constructed for the installation of other types of monitoring wells must be at least four inches (4") larger than the outside diameter of the riser pipe and screen. Field testing methods such as gas-migration monitoring and direct-push wells are exempt from these borehole standards if properly plugged within thirty (30) days of completion. When constructing a monitoring well that utilizes hollow-stem augers to bedrock, then rock drilling to total depth, the following exceptions apply:

1. When using an industry-standard-size six and one-quarter-inch (6 1/4") internal diameter hollow stem auger to drill the unconsolidated material portion of the well, the bedrock portion of the well must be drilled with a bit which creates a hole that is at least six inches (6") in diameter for a well constructed using a nominal two-inch (2") diameter riser pipe; and

2. When using an industry standard size eight and one-quarter-inch (8 1/4") internal diameter hollow stem auger to drill the unconsolidated material portion of the well, the bedrock portion of the well must be drilled with a bit which creates a hole that is at least eight inches (8") in diameter for a well constructed using a nominal four-inch (4") diameter riser pipe.]

(4) Open-*[H]***h**ole *[C]***c**ompletions*[. Open-hole completed monitoring wells are allowed only upon written approval in advance from the division. In all cases, the open-hole portion of the well must]* **may be allowed upon advanced written approval by the department. If approved, the open-hole portion shall** be in competent, consolidated bedrock, *[and]* **with** the casing *[must]* extend**ing** from the surface to the minimum total depth and minimum depth into bedrock *[required, under]* **pursuant to** 10 CSR 23-3.090 *[or 10 CSR 23-3.100]* for a domestic well at that location. The casing *[must]* **shall** be grouted full-length using methods and materials *[as required under]* **pursuant to** 10 CSR 23-4.060(2)(E).

(5) Installation of Well Screen and Riser Assembly. The well screen and riser assembly *[must]* **shall** be centered in the borehole before the installation of the filter pack, unless a prepack filter is used. **Extend** *[T]***t**he riser pipe *[must extend]* from the well screen into the surface completion. *[In a flood prone area, the riser pipe must be at least two feet (2') above the finished surface grade and be equipped with a watertight cap. Wells installed in traffic ways may be flush mounted (subsection (11)(B)). Unless they are direct-push wells or wells constructed through hollow stem augers, monitoring wells in excess of fifty feet (50') in depth must have centralizers to ensure the well string is properly plumbed. A centralizer must be placed at the base of the well screen and on the riser at the top of the filter pack. The specific placement intervals for additional centralizers on the riser should be based on site-specific conditions and ensure the placement of the filter pack, bentonite seal, and annular seal will not be hindered. The use of centralizers in wells constructed through hollow stem augers is not required.]* **Monitoring wells greater than fifty feet (>50') in depth shall have centralizers installed at the base of the well screen and at the top of the filter pack. A centralizer is not necessary for direct-push wells or wells constructed through hollow-stem augers.**

(6) *[Installation of]* Primary Filter Pack. *[After the well screen and riser assembly are installed in the well, the filter pack materials must be emplaced.]* **All monitoring wells shall have a primary filter pack installed using one (1) of the following methods. Other methods may be used upon advanced written approval by the department.**

(A) Artificially Constructed Filter Pack Placement. **Place** *[T]***t**he filter pack material *[must be placed]* evenly around the well screen via a tremie pipe. The tremie pipe must be placed *[near the]* **within five feet (5') of the** bottom of the well screen and the filter pack material poured into the tremie pipe while the pipe is slowly removed. *[A weighted measuring device must be used to ensure that the filter pack is properly installed to the desired depth. All volumes of filter pack material anticipated for construction must be calculated prior to placement.]* **Fill** *[T]***t**he **borehole with** filter pack material *[must fill from the bottom of the borehole]* to within one to five feet (1'–5') above the well screen. If the well is drilled *[utilizing]* **using** the hollow stem auger method, the filter pack material may be poured through the hollow stem auger as it is removed from the borehole. *[If the screen is set more than twenty-five feet (25') into the saturated zone or placed into drilling fluid other than clean water or air, the filter pack placement must be via tremie, unless hollow stem augers are used.]* Prepacked filter pack assemblies *[and prepack seals which are hydrated may be used]* **may be used in lieu of artificially constructed filter pack placement**.

(B) Naturally Developed Filter Pack Placement. *[Allowing t]***T**he existing geologic material **may be allowed** to collapse around the well screen *[is an acceptable method of filter pack emplacement in only a few geologic conditions. Naturally developed filter packs are only allowable when they can be developed properly]* **provided the well can be developed**.

(C) *[When installing a monitoring well for shallow monitoring, the primary filter pack must]* **The primary filter pack on shallow monitoring wells shall** extend a minimum of six inches (6") above the top of the well screen.

(D) Soil vapor implants *[are required to]* **shall** have a minimum primary filter pack of six inches (6") above and below each implant.

(7) *[The installation of a]* **Secondary Filter Pack. All monitoring wells shall have a** secondary filter pack *[is required]* unless nonslurry bentonite is used as a bentonite seal or annular seal. *[The purpose of a secondary filter pack, which is placed directly on top of the primary filter pack, is to ensure that annular seal slurry grouts do not infiltrate into the primary filter pack.]* The secondary filter pack *[must]* **shall** extend from one foot to two feet (1'–2') above the primary filter pack and *[shall]* consist of one foot to two feet (1'–2') of clean fine sand.

(8) *[The installation of a b]***B**entonite *[s]***S**eal**. A bentonite seal of two feet (2') or greater** is required if the annular seal is composed of slurry grout material and a secondary filter pack is not used. *[The purpose of the bentonite seal is to keep the slurry grout which is emplaced above from mixing with the primary and secondary filter pack materials. If required, the bentonite seal must be a minimum of two feet (2') thick.]*

(A) Placement of the Bentonite Seal in the Saturated Zone. When the bentonite seal is to be emplaced in the saturated zone, only *[chipped or pelletized bentonite that is designed to fall through standing water before it hydrates]* **bentonite chips or pellets** may be used. To avoid flash swelling and bridging, the fine bentonite material, which may develop during transport, *[must]* **shall** not be introduced into the well bore. *[A weighted measuring device must be utilized to ensure]* **Place** the bentonite chips *[are]* evenly *[placed]* around the riser pipe.

(B) Placement of the Bentonite Seal in the Unsaturated Zone. When the top of the secondary filter pack is in the unsaturated zone, *[the use of chipped, pelletized, or granular]* bentonite *[is permitted only if]* **chips, pellets, or granules may be used provided** the bentonite is hydrated in place with potable water. Bentonite slurry may be used *[and must]* **to** fill the annular space from the top of the secondary filter pack**, if present,** to the surface seal **via a tremie pipe**. *[The bentonite slurry must be emplaced through a tremie pipe.]* If the total depth of the slurry being placed exceeds five feet (5'), **use** a side discharge *[is required so as]* to limit disruption of the filter packs.

[(C) Nested well construction will be considered on a case-by-case basis. Pre-approval by the division is required, via the variance process, before construction begins, except that gas-migration wells constructed using soil vapor implants do not require a variance as long as they meet, the requirements of subsection (6)(D) of this rule, have a minimum bentonite seal of one foot (1') between each primary filter pack, and a minimum of one and one-half feet (1.5') of bentonite seal between the uppermost primary filter pack and that base of the surface completion.]

(9) Installation of the Annular Seal. *[The monitoring well environment may contain many chemicals or organic compounds that could affect the sealing capabilities of various kinds of grout. The type of grout used must be able to function to one hundred percent (100%) of its designed sealing capabilities until the well is properly plugged. The type of grout used must not influence, contaminate, or hinder the use of the monitoring well for its designed purpose.]* The annular seal must extend from the secondary filter pack or bentonite seal to the base of the surface completion. The combined annular seal and bentonite seal (if a bentonite seal is utilized) must be at least two feet (2') thick unless monitoring for shallow contaminants. Monitoring wells constructed for shallow monitoring*[, as defined in 10 CSR 23-4.010,]* must have a minimum combined annular seal and bentonite seal (if a bentonite seal is *[utilized]* **used**) of at least one foot (1'). The following grout types are permitted in monitoring wells:

(A) Bentonite Slurry-Grout. High solids sodium bentonite slurry, at least twenty to thirty percent (20%–30%) by weight solids, must be tremie grouted from the bottom to the top of the annular space in one (1) continual operation;

(B) Nonslurry Bentonite. *[Sodium bentonite comes in many shapes and sizes. Nonslurry bentonite includes chips, pellets, granules, and powdered varieties.]* Chipped or pelletized varieties that are designed to fall through standing water may be used when sealing the annulus of a well that is below the saturated zone. Granulated and powdered bentonite must never be poured through standing water because they will flash swell and bridge off before *[it gets]* **getting** to the bottom of the annular space. Bentonite chips or pellets may be used to seal portions of the annular space that are in the unsaturated zone. Granulated and powdered varieties are not permitted to be used in the unsaturated zone unless they are used to create a slurry, due to their flash swelling properties which would prevent hydration of the complete column of bentonite. When using bentonite chips or pellets in the unsaturated zone, it must be hydrated after each three feet (3') interval has been emplaced. To properly hydrate the bentonite, a minimum of three (3) times as much water as bentonite must be used. Water used must be of potable quality;

(C) Cement Slurry. *[Neat cement slurry is a mixture of one (1) ninety-four pound (94 lb.) bag of Portland Type I cement and six (6) gallons of clean water. Five (5) general types of cement are produced: Type I, for general use; Type II, for moderate sulfate resistance or moderate heat of hydration; Type III, for hi-early strength; Type IV, for low heat of hydration; and Type V, for high sulfate resistance. Following are some problems associated with cement slurry grout usage:]*

[1. Type III cement used to produce a hi-early strength and additives that are used to speed up set times of cement slurries cause higher than normal heat of hydration temperatures. These can only be used in association with metallic

casings or riser pipes with prior approval by the division;]

*[2.]***1.** Cement slurry may only be used if additives are incorporated to minimize shrinkage.

A. *[Bentonite is the most commonly used additive to prevent shrinkage of cement slurries.]* The powdered bentonite **additive** must be thoroughly mixed with the water before it is added to the cement. Powdered bentonite from two percent to six percent (2%–6%) by weight must be added. *[The added bentonite improves the workability of the slurry, reduces shrinkage, and reduces the heat of hydration. This additive does reduce the strength of the seal but is adequate for annular sealing. For each percent of bentonite by weight added to a ninety-four pound (94 lb.) bag of Type I cement an additional six-tenths (.6) gallon of water must be added. The following table sets out the amount of bentonite and water needed to be a ninety-four pound (94 lb.) bag of Type I cement to get from one to six percent (1%–6%) cement-bentonite mixture.]*

[CEMENT/BENTONITE SLURRY CALCULATIONS

Product	*% bentonite added/ sk cement*	*total water requirement (gallons)*
Type I Portland 1 sack = 94 lbs.		
	1% bentonite = .94 lbs. bentonite/sk of cement	*5.8 to 6.6*
	2% bentonite = 1.9 lbs. bentonite/sk of cement	*6.4 to 7.2*
	3% bentonite = 2.8 lbs. bentonite/sk of cement	*7 to 7.8*
	4% bentonite = 3.8 lbs. bentonite/sk of cement	*7.6 to 8.4*
	5% bentonite = 4.7 lbs. bentonite/sk of cement	*8.2 to 9*
	6% bentonite = 5.7 lbs. bentonite/sk of cement	*8.8 to 9.6]*

B. Other shrinkage reducing additives *[must be approved in advance by]* **may be used provided advanced written approval is obtained from** the *[division]* **department**;

*[3.]***2.** The water used to mix cement slurry must be of potable quality; and

*[4.]***3.** Cement slurry must be emplaced in the annulus via a tremie pipe placed to the bottom of the annular space. The tremie pipe must have a side discharge which directs the grout away from the bentonite seal, reducing the potential for infiltration. *[Care must be taken so as not to dislodge the bentonite seal that is above the primary filter pack.]* The grouting of the annular space must be completed in one (1) continual operation, lifting the tremie pipe as the space fills. *[If determined necessary by the division, a staged grouting procedure will be approved]* **A staged grouting procedure may be used provided advanced written approval is obtained from the department**; **or**

(D) *[Other types of grout may be used when necessary and for good cause if prior approval by the division is granted; and]* **Other types of grout may be used provided advanced written approval is obtained from the department.**

[(E) When zones of high grout loss are anticipated or experienced, contact the division for alternative methods to seal the annulus.]

(10) *[Well Protection.]* Surface *[protection]* **completion** on all monitoring wells is required *[to deter unauthorized entry, prevent surface water from entering the annular space, and protect the well from accidental damage caused by collision from vehicles or heavy equipment. The two (2) types of surface completion designs are above-ground completions and flush-mount completions]*.

(A) Above-Ground Completions. Above-ground completions must meet the following standards:

1. The protective casing must extend from at least one and one-half feet (1 1/2') above the finished grade of the ground surface to a point at least two feet (2') below the finished grade, except as stated in *[subsection (11)]* **10 CSR 23-4.060(10)**(B) of this rule for flush-mount completions. *[The riser pipe must be at least two inches (2″) below the top of the above-ground completion.]* The above-ground completion must be placed in a hole that is at least eight inches (8") in diameter larger than the above-ground completion size. *[Care must be taken so that the shape of this hole, when filled with concrete, does not encourage frost heaving.]* **Protective posts are required for above-ground completed monitoring wells in traffic areas.** The protective casing must be centered in this hole and concrete poured around the casing to secure it. Cement or bentonite slurry is not allowed. All water must be removed from the enlarged hole before concrete is added. The surface of the concrete must slope away from the protective casing so that pooling of surface water does not occur;

2. A weep hole or alternate method must be employed to ensure water does not accumulate inside the protective casing to the point that the top of the riser is submerged*[, except on temporary wells that are plugged within forty-eight (48) hours of initial installation]*; **and**

3. A locking well cap and a suitable lock must be attached to the top of the above-ground completion. The riser pipe must be sealed with a watertight cap and must extend at least two feet (2') above the finished surface grade in flood prone areas. *[Temporary monitoring wells are exempt from this paragraph if they are plugged within forty-eight (48) hours of initial installation; and]*

[4. All monitoring wells must be uniquely identified so as to distinguish one (1) well from another on the monitoring site and on the monitoring well certification form.]

(B) Flush-Mount Well Completions. *[Flush-mount completions must meet the following standards. In a flush-to-ground completion, the flush-mount assembly is installed around the riser pipe that has been cut off below grade.]* The flush-mount assembly must be at least eight inches (8") in length and have a tamper-resistant watertight lid. The riser pipe must be sealed with a watertight cap. The flush-mount surface completion must be set into a hole that is at least eight inches (8") in diameter larger than the diameter of the flush-mount assembly and set in concrete. *[This completion must withstand all stresses due to traffic and to freeze thaw processes.]* If the monitoring well is being placed through asphalt or concrete, a hole that is a least four inches (4") in diameter larger than the diameter of the flush-mount assembly must be constructed. The flush mount must then be set in concrete. Cement or bentonite slurry is not allowed.

(C) All monitoring wells must be uniquely identified at the surface completion.

[(11) Wells must be adequate in size and design for the intended use. Wells should be properly developed in order to allow the collection of representative samples from the horizon being monitored.]

*[(12)]***(11)** Alternate monitoring well construction procedures, methods, or technologies *[will be considered on a case-by-case basis. Written approval in advance by the division is required]* **may be used provided advanced written approval is obtained from the department**.

*[(13)]***(12)** The installation and use of sampling, development, maintenance, or testing devices and equipment in monitoring wells is not

regulated except that the installation of a pumping system in wells used for remediation or clean-up must be performed by a nonrestricted pump installation contractor.

(13) Nested well construction may be allowed upon advanced written approval by the department. Gas-migration wells constructed using soil vapor implants shall meet minimum primary filter pack requirements pursuant to 10 CSR 23-4.060(6), have a minimum bentonite seal of one foot (1') placed between each primary filter pack, and have a minimum of one and one-half feet (1.5') of bentonite seal placed between the uppermost primary filter pack and the base of the surface completion.

*AUTHORITY: sections 256.606 and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 4—Monitoring Well Construction Code

PROPOSED AMENDMENT

10 CSR 23-4.080 Plugging of Monitoring Wells. The board is amending the division name, removing sections (1), (3), and (4), renumbering as needed, and amending newly renumbered sections (1) and (2).

PURPOSE: This amendment removes unnecessary regulatory burdens and moves substantive certification and registration requirements to 10 CSR 23-2.020 Certification and Registration.

[(1) A monitoring well that is abandoned as defined in 10 CSR 23-1.010(1) must be plugged. If a monitoring well has been determined to present a threat to groundwater, or determined to be in such a state of disrepair that the well cannot be used for its intended purpose, the division may order that the well be permanently plugged.]

*[(2)]***(1)** When plugging a monitoring well, the following minimum requirements shall be met:

(A) **Remove** *[A]***a**ll pumps, sampling equipment, debris, or other substances *[must be removed]*;

(B) *[All]* **Remove the** surface completion *[and permanent casing, riser pipe, and well screen must be removed]* from the borehole **ensuring that the grout seal is not disturbed**. *[If, when removing the casing, the borehole begins to collapse, grout must be simultaneously emplaced while the casing is removed to ensure a proper seal]* **Cut off riser pipe and/or casing two feet (2') below ground surface**;

(C) **Fill** *[T]***t**he well *[must be filled]* from bottom to *[top]* **within one foot (1') of ground surface** with grout*[.]* **pursuant to** 10 CSR 23-4.060(9) *[sets standards for grout types that may be used when plugging monitoring wells]*;

(D) *[If bentonite grout is used, a]***A**fter the grout is fully cured, check for settlement and top off if necessary. Fill **remaining hole** with soil *[and compact the upper two feet (2') of hole]* or pave. *[The purpose of the compacted soil is to ensure that dehydration of the bentonite grout does not occur over time. If cement-slurry grout is used, fill the upper two feet (2') with soil or pave; and]*

(E) Flush mount completions in paved areas may be left in place and filled with asphalt or concrete;

*[(E)]***(F)** A monitoring well *[that is less than twenty-four feet (24') in total depth]* may be completely excavated as opposed to being plugged with grout. *[If the remaining hole is ten feet (10') or more in depth, it must be filled with clean replacement material that is compactable to a permeability less than, or equal to, the minimum permeability of the encompassing native materials.]* **If the well is over drilled, the borehole shall be completely filled with grout pursuant to 10 CSR 23-4.060(9); and**

(G) A **nonrestricted** monitoring well installation contractor must be on site at all times during the excavation and *[filling]* **plugging** operations.

[(3) The plugging or complete excavation of a monitoring well must be reported on a registration report form supplied by the division.

(4) Monitoring wells must be plugged by a nonrestricted monitoring well installation contractor.]

*[(5)]***(2)** Temporary monitoring wells ten feet (10') or greater in depth must be plugged by removing any temporary pipe and filling the well from total depth to *[three feet (3')]* **two feet (2')** from the **ground** surface with approved grout, with the remainder of the well filled with compacted uncontaminated native material or grout. **Temporary monitoring wells shall be plugged within thirty (30) days of the date of completion.**

*AUTHORITY: sections 256.606, 256.615, and 256.623, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 5—Heat Pump Construction Code

PROPOSED RESCISSION

10 CSR 23-5.010 Definitions. This rule specifically defined words used in Chapter 5 concerning heat pump wells, otherwise the definitions contained in 10 CSR 23-1.010 applied.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into 10 CSR 23-1.010 Definitions.

AUTHORITY: sections 256.603, 256.606, and 256.626, RSMo 2000. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Rescinded: Filed June 27, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 5—Heat Pump Construction Code

PROPOSED RESCISSION

10 CSR 23-5.020 Certification and Registration of Heat Pump Systems. This rule set required standards for certification report form submittal.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into a single new proposed rule 10 CSR 23-2.020 Certification and Registration.

AUTHORITY: sections 256.606, 256.623, and 256.626, RSMo 2000. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Rescinded: Filed June 27, 2018.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 5—Heat Pump Construction Code

PROPOSED AMENDMENT

10 CSR 23-5.030 General Protection of Groundwater Quality and Resources. The board is amending the division name and sections (1) and (2).

PURPOSE: This rule is being amended to remove obsolete and unnecessary language.

(1) Heat pump wells *[once constructed]* shall not be converted to any other type of well*[, except by written approval by the division]* **unless advanced written approval is obtained from the department**.

(2) *[It is the obligation and responsibility of the heat pump installation contractor to verify that the heat pump system is constructed according to the rules.]* On open-loop systems that utilize groundwater wells, it is the responsibility of the water well installation contractor to ensure that the integrity of the annular seal remains viable for three (3) years after the date of certification unless it can be shown that the well seal has been damaged by other persons.

*AUTHORITY: sections 256.606 and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Amended: Filed June 27, 2018.*

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 5—Heat Pump Construction Code

PROPOSED AMENDMENT

10 CSR 23-5.040 Location of Heat Pump Wells. The board is amending the division name, section (2) and (5), removing section

(3) and (4), and renumbering as needed.

PURPOSE: This rule is being amended to improve readability by removing unnecessary language.

(2) *[Vertical heat pump wells shall not be located within certain d]***D**istances from pollution or contamination sources. A vertical heat pump well shall be at least—

[(3) Horizontal heat pump loops should be at least two feet (2') above or below any other intersecting underground piping (to prevent freezing of the water lines) or wiring on the property, except a soaker pipe for the heat pump system used to keep the soil moisture constant.

(4) A variance may be applied for if setback distances cannot be met. The variance must be obtained in advance from the division.]

*[(5)]***(3)** Any heat pump well *[installed in the state of Missouri, which]* **that** encounters oil and/or gas*[,]* must have a grout plug from fifty feet (50') below the oil and/or gas bearing zone to fifty feet (50') above the oil and/or gas bearing zone. The grout plug must be composed of neat cement grout with a two percent–six percent (2%–6%) bentonite additive and be placed via tremie. The well must be grouted *[as stated in]* **pursuant to** 10 CSR 23-5.050(7)(A), from the bottom of the neat cement grout plug to total depth and from the top of the neat cement grout plug to the surface. If the well terminates in the oil and/or gas bearing zone, a grout plug composed of neat cement with a two percent–six percent (2%–6%) bentonite additive and placed via tremie must be placed from total depth to fifty feet (50') above the oil and/or gas bearing zone. The well must be grouted *[as stated in]* **pursuant to** 10 CSR 23-5.050(7)(A), from the top of the neat cement grout plug to the surface.

*AUTHORITY: sections 256.606 and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Amended: Filed June 27, 2018.*

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 5—Heat Pump Construction Code

PROPOSED AMENDMENT

10 CSR 23-5.050 Construction Standards for Closed-Loop Heat Pump Wells. The board is amending the division name, sections (1), (2), (3), (4), (6), (7), (8), (9), (10), (11), and (12), and renumbering as needed.

PURPOSE: This rule is being amended to remove non-substantive regulatory burdens, allow jetted heat pump wells in Drilling Area 5 to be deeper than seventy-five feet (75'), and to improve readability by removing unnecessary language.

(1) Casing *[Material. If permanent casing is needed in a heat pump well, it must meet standards set in 10 CSR 23-3.030 for steel and 10 CSR 23-3.070 for plastic and must be]***, when used, shall follow the minimum standards pursuant to 10 CSR 23-3.030(1)(A) and be** grouted full-length.

(2) Heat Pump Loop Material. In a closed-loop heat pump well, the material used to make up the heat-exchange loop that is placed in the borehole or trench must be composed of high density polyethylene or polybutylene pipe and must be installed and grouted without delay upon completion of drilling each well.

(B) Polybutylene Pipe. This pipe must be manufactured in accordance with ASTM D-2581. The pipe material must be—

1. Either Class B (general purpose and dielectric, in colors) or Class C (weather resistant, black in color containing not less than two percent (2%) carbon black);
2. Type II (density, ninety-one thousandths to ninety-two thousandths (**0**.0*[0]*91–**0**.0*[0]*92) grams per centimeter (g/cm));
3. Grade 1 (flow rate twenty-five thousandths to seventy-five thousandths (**0**.0*[0]*25–**0**.0*[0]*75) gallons per ten (10) minutes (g/10 min)).

(C) Other pipe may be used *[if approval is granted in advance by the division]* **upon advanced written approval by the department**.

(3) Connecting Closed-Loop Pipe. Polyethylene and polybutylene pipe must be thermally fused according to the pipe manufacturer's specifications and must not leak after assembly.

(A) Other connection methods may be used *[if approval is granted in advance by the division]* **upon advanced written approval by the department**.

(4) Heat Transfer Fluid. The fluid used inside the closed-loop assembly must *[be approved by the board and]* meet the following standards:

(A) Heat transfer fluids must be composed of—

1. Inhibited glycol;
2. Methanol;
3. Water;
4. Ethanol; or
5. Other fluids may be used *[if approval by the division is received in advance]* **upon advanced written approval by the department**.

(6) Borehole Depth. Closed-loop heat pump wells must not be deeper than five hundred feet (500'). *[A variance must be obtained in advance, from the division, to drill a heat pump well deeper than five hundred feet (500').]* Total depth of a new heat pump well in **Drilling Area 12 (formerly** Special Area 3**)** and **Drilling Area 13 (formerly** Special Area 4**)** shall be determined in advance of drilling by the *[division]* **department**.

(7) Grouting Depth of Vertical Heat Pump Wells. Grouting the annulus of a heat pump well must be completed immediately after the well is drilled due to cave-in potential in the uncased hole.

(B) Vertical heat pump wells drilled two hundred feet (200') or less that are not grouted full-length*[,]* must follow the hole size requirements stated in section (5) and nonslurry bentonite plugs must be placed in the borehole. A plug (first plug) must be placed forty feet (40') above the total depth of the borehole. This plug must be

composed of bentonite chips or pellets utilizing at least one (1) bag of bentonite resulting in at least a five foot (5') plug. Every forty feet (40') of borehole that exists above the first plug must have a plug set as described in this section. A near surface plug, consisting of bentonite granules or powder, must be set from a point ten feet (10') below the bottom of the trench that connects the closed-loop to the heat pump machine to the base of the trench. All bentonite plugs must be hydrated immediately with six to eight (6–8) gallons of potable water for each bag of bentonite after emplacement if they are in the unsaturated zone. All clean fill material placed between the bentonite plugs must be chlorinated. Clean fill is defined as sand, local drill cuttings, pea gravel, varied sized agricultural lime, or clean aggregate free from contamination. Contractors utilizing this type of grouting method must notify the *[division]* **department** at least forty-eight (48) hours prior to beginning any construction on the system. The *[division]* **department** will maintain a list of current notification methods (includes, but is not limited to, telephone, fax, email, voice mail, and the department's online notification system) and contact information available online or upon request. Notification information must include: owner name, owner address, GPS location, date work is to begin, primary contractor name, primary contractor permit number, drilling contractor name, and drilling contractor permit number.

(8) Approved Grout Materials. The following four (4) grout types are permitted for use in heat pump wells:

(A) Bentonite Slurry. High solids sodium bentonite slurry must be at least twenty percent to thirty percent (20%–30%) by weight solids to be used as grout. Thickened drilling mud or thinner bentonite slurry is strictly prohibited. *[Specialized pumps are required to pump a high solids bentonite slurry.]* When bentonite slurry is used, it must be applied in one (1) continual motion, through a tremie lowered to the grouting point*[. It is recommended that full-length grout be used in all vertical closed-loop heat pump wells. The tremie pipe may be removed while the borehole is filled or removed afterward]*;

(B) Nonslurry Bentonite. **Only** *[C]***c**hipped or pelletized bentonite *[varieties that are designed to fall through standing water]* may *[only]* be used when sealing the annulus of a well that is below the water level in the saturated zone. *[Complete hydration is difficult to achieve when using dry nonslurry bentonite in the unsaturated zone.]* All nonslurry sodium bentonite varieties may be used in the unsaturated zone if the hole is dry and no bridging occurs. The dry bentonite must be hydrated after emplacement. *[The effective use of nonslurry bentonite as a sealing agent depends on the efficient hydration of the product]*;

(D) Other Grout. Other types of grout may be used if **advanced written** approval is *[granted in advance by the division]* **obtained by the department**.

(9) Wells that Encounter Karst Conditions. When a borehole encounters caves or larger fractures, *[grouting may become difficult.C]***c**hlorinated clean fill, such as gravel or sand, may be used to fill these intervals. Small fractures are effectively sealed by using chipped, hydrated bentonite. If the borehole cannot be grouted as specified, it must be plugged.

(10) Jetted Heat Pump Wells. Closed-loop heat pump wells that are jetted in **Drilling** Area 5 (see Figure 5) must *[not be deeper that seventy-five feet (75') and at least the upper]* **have a minimum top grout plug of** ten feet (10') *[of borehole must be grouted]*.

(11) Heat Pump Wells in **Drilling Area 12 (formerly** Special Area 3**)***[. Portions of Franklin County within and south of the city of New Haven are listed as Special Area 3 (Figures 7B and 7C, 10 CSR 23-3.100(7)) due to the contamination of portions of the aquifer by one (1) or more of the following chemicals of concern: tetrachloroethylene (PCE), trichloroethylene (TCE), PCE degradation products and TCE degradation products or other contaminants of the National Public Drinking Water Regulations (NPDWR). In this area it is necessary to utilize more stringent construction standards for new heat pump wells that are drilled into the aquifer. In Special Area 3 a qualified and properly trained individual shall collect all groundwater samples for analysis of chemicals of concern.]* **may be constructed provided advanced written approval is obtained from the department pursuant to 10 CSR 23-3.090(12).**

[(A) The division shall be consulted before constructing a new heat pump well in Special Area 3. The division will provide specific guidance on heat pump well drilling protocol and construction specifications on a case-by-case basis. The division must provide written approval for all new heat pump wells in Special Area 3 prior to construction.

(B) All drilling-derived fluids and solid materials from heat pump wells drilled in Special Area 3 shall be containerized, sampled, and managed pursuant to Missouri hazardous waste management regulations.

(C) Any heat pump well drilling operation, in which PCE and/or TCE is encountered in a pure-product phase (also known as dense non-aqueous phase liquid or DNAPL), drilling shall cease and the division shall be notified immediately. The division will determine further action.]

(12) Heat Pump Wells in **Drilling Area 13 (formerly** Special Area 4**)***[. Portions of St. Charles County west of the city of Weldon Spring are listed as Special Area 4 (Figure 7D, 10 CSR 23-3.100(8)) due to the contamination of portions of the aquifer by one (1) or more of the following chemicals of concern: trinitrotoluene (TNT) and dinitrotoluene (DNT) at the Army Corps of Engineers (COE) site, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, dinitrobenzene (1,3-DB), nitrobenzene (NB), nitrate, uranium, and trichloroethylene (TCE) at the Department of Energy (DOE) main site, uranium and 2,4-DNT at the DOE Quarry, or other contaminants of the National Public Drinking Water Regulations (NPDWR). In this area it is necessary to utilize more stringent construction standards for new heat pump wells that are drilled into or through the shallow aquifer defined as the Burlington Keokuk/Fern Glen formation(s) at the main site and the Kimmswick limestone at the DOE Quarry. In Special Area 4 a qualified and properly trained individual shall collect all groundwater samples for analysis of chemicals of concern. Sampling qualifications and training requirements will be determined in advance of sampling by the division and approval will be issued in written format.]* **may be constructed provided advanced written approval is obtained from the department pursuant to 10 CSR 23-3.090(13).**

[(A) The division shall be consulted before constructing a new heat pump well in Special Area 4. The division will provide specific guidance on heat pump well drilling protocol and construction specifications on a case-by-case basis. The division must provide written approval for all new heat pump wells prior to construction.

(B) All drilling-derived fluids and solid materials shall be containerized, sampled, and managed pursuant to Missouri hazardous waste management regulations.]

*AUTHORITY: sections 256.606 and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500)

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 5—Heat Pump Construction Code

PROPOSED AMENDMENT

10 CSR 23-5.060 Construction Standards for Open-Loop Heat Pump Systems *[That Use Groundwater]*. The board is amending the division name, rule title, sections (2), (3), and (4), removing sections (1), (5), and (6), and renumbering as needed.

PURPOSE: The title of this rule is being amended because Closed-Loop Heat Pump Systems That Use Refrigerants as the Heat Transfer Fluid are no longer allowed and to improve readability by removing unnecessary language.

[(1) Open-loop heat pump systems and their installers that utilize existing surface water supply which is plumbed through the heat pump machine and returned to the same surface water supply are exempt from these rules.]

*[(2)]***(1)** Open-*[L]***l**oop *[Heat Pump Systems and G]***g**roundwater *[S]***s**upply *[W]***w**ells*[. An open-loop heat pump uses groundwater produced from wells which are plumbed through the heat pump machine where the heat transfer of the groundwater is accomplished. The groundwater is then utilized at the surface or returned to the ground via a return well. Any newly drilled or reconstructed well utilized for supply or return water must meet the construction standards set out in 10 CSR 23-3.]* **shall be constructed to domestic/multifamily well standards pursuant to 10 CSR 23-3.030(1) if it produces less than seventy (70) gallons per minute and to high yield well standards pursuant to 10 CSR 23-3.030(3) if it produces more than seventy (70) gallons of water per minute.** Any well that was constructed before October 1987 that is utilized as the water supply or return for an open-loop heat pump system is exempt from these rules, except that the surface disposal of the water may *[fall under the Division of Environmental Quality rules and the return of the produced water via a well must meet rules set out in this section]* **be subject to other regulations**.

*[(3)]***(2) Heat pump systems and** *[S]***s**urface *[D]***d**isposal of *[U]***u**sed *[W]***w**ater*[. After the water passes through the heat pump machine, it may be disposed of to the surface only if the water remains on the landowner's property. It may not be run to drainage that leaves the property unless applicable permits are secured through the Water Protection Program, Division of Environmental Quality. If the heat pump utilizes more than twenty-five (25) gallons of water per minute when it is in operation, surface disposal of the used water is prohibited.]* **may require a permit pursuant to 10 CSR 20-6.**

*[(4)]***(3) Open loop** *[W]***w**ater *[R]***r**eturn *[and Supply W]***w**ells *[for Domestic Heat Pump Applications. Water return wells]* shall *[meet the requirements set out in 10 CSR 23 Chapters 1, 2, and 3 concerning casing, casing depth, well seal, borehole, grouting, and reporting.]* **be constructed to domestic/multifamily well standards pursuant to 10 CSR 23-3.030(1) if it produces less than seventy (70) gallons per minute and to high yield well standards pursuant to 10 CSR 23-3.030(3) if it produces more than seventy (70) gallons of water per minute.** The depth of the *[water]* return well *[must not exceed the depth of the water supply well.]* **shall be a similar depth as the supply well and the** *[W]***w**ater must be returned to the same aquifer*[, at a similar depth that it was taken from in the water supply well. A sanitary well seal or a pitless adapter may be used, and]*. *[t]***T**he water return pipe must extend at least twenty feet (20') below the static water level.

[(5) Water Return Wells for Nondomestic Heat Pump Applications. Specifications for water return wells in other than domestic applications will be determined on a case-by-case basis by the division, taking into account the water quality and quantity, geology, hydrology and water usage in the area.

(6) To drill and construct an open-loop heat pump well or a water return well, the driller must have a nonrestricted water well installation permit.]

AUTHORITY: sections 256.606 and 256.626, RSMo [2000] ***2016****. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Amended: Filed June 27, 2018.*

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 5—Heat Pump Construction Code

PROPOSED AMENDMENT

10 CSR 23-5.080 Plugging of Heat Pump Wells. The board is amending the division name, sections (1) and (2), and removing section (3).

PURPOSE: This rule is being amended to remove unnecessary language and to move substantive certification and registration requirements to the proposed rule 10 CSR 23-2.020 Certification and

Registration.

(1) Vertical Closed-Loop Heat Pump Wells. To plug a properly constructed vertical closed-loop heat pump well the following specifications must be met:

(A) Remove all heat transfer fluid from the closed-loop and take necessary precautions to ensure groundwater protection; **and**

(B) Dig down to the top of borehole and cut off the loop pipe*[. This must be]* at least three feet (3') below the surface. Pump the remaining loop full of bentonite or cement slurry. Allow the grout to fill the upper one foot (1') of borehole. Fill remaining hole with compacted earth or pavement*[; and]***.**

[(C) Submit registration report form and fee to the division within sixty (60) days which documents the proper plugging of the heat pump well. Upon review and approval of the registration report form, a registration number will be sent to the landowner which designates that the well was plugged according to the minimum standards.]

(2) Open-Loop Heat Pump Wells. Wells used to supply water for *[the]* heat pump and water return wells must be plugged *[as set out in]* **pursuant to** 10 CSR 23-3.110 *[Plugging of Wells. A registration report form and fee must be submitted]*.

[(3) Plugging Improperly Constructed Heat Pump Wells. When it is determined by the division that a heat pump well is constructed improperly, it must be brought into compliance with the rules or plugged. To plug an improperly constructed heat pump well, the following specifications must be met:

(A) Remove all pipes from hole;

(B) Clean out well bore of loose material;

(C) Plug well full-length with approved grout; and

(D) Submit registration report form and fee.]

*AUTHORITY: sections 256.606, 256.623, and 256.626, RSMo [2000] **2016**. Emergency rule filed Nov. 16, 1993, effective Dec. 11, 1993, expired April 9, 1994. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed May 17, 2013, effective Dec. 30, 2013. Amended: Filed June 27, 2018.*

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 6—Test Hole Construction and Plugging Code

PROPOSED RESCISSION

10 CSR 23-6.010 Definitions. This rule specifically defined words used in Chapter 6 concerning test wells, otherwise the definitions contained in 10 CSR 23-1.010 applied.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into 10 CSR 23-1.010 Definitions.

AUTHORITY: sections 256.606 and 256.626, RSMo Supp. 1991. Original rule filed Aug. 17, 1993, effective March 10, 1994. Rescinded: Filed June 27, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* ***Well Installation***
Chapter 6—Test Hole Construction *[and Plugging]* Code

PROPOSED AMENDMENT

10 CSR 23-6.020 General Protection of Groundwater Quality and Resources. The board is amending the division name, chapter name, and sections (1) and (2).

PURPOSE: This rule is being amended to improve readability by removing unnecessary and redundant lagrange and moving substantive requirements from 10 CSR 23-6.040 that relate to groundwater protection to this rule.

(1) *[Differences Between Wells. The rules contained in 10 CSR 23-6 cover test holes drilled for obtaining geologic data or mineral exploration data. Test holes differ from water wells, monitoring wells and heat pump wells in that the information obtained from test holes and their locations are often proprietary information. Test holes, in many cases, are smaller in diameter than water wells. In addition, test holes are drilled and are then quickly plugged.]* **All test holes shall be constructed in a manner that will conserve and protect the groundwater resources and not be a source or channel of contamination or pollution to any aquifer.**

(2) Test holes *[that are to be converted into other types of wells. Test holes may be converted into a well at the request of the landowner. All requests must be made in writing to the division, by the landowner. The well must meet the applicable standards contained in 10 CSR 23-1–10 CSR 23-6.]* **may be converted into other types of wells provided advanced written approval is obtained from the department and the well is constructed to the minimum standards provided in 10 CSR 23.**

*AUTHORITY: sections 256.606, 256.615, and 256.626, RSMo [1994] **2016**. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 6—Test Hole Construction *[and Plugging]* Code

PROPOSED AMENDMENT

10 CSR 23-6.030 Location of Test Holes. The board is amending the division name, chapter name, and section (1).

PURPOSE: This rule is being amended to more clearly state that the setback distances given in 10 CSR 23-3.010 Location of Wells also apply to test holes.

(1) *[The need to obtain site-specific data dictates the location of test holes. If the hole needs to be located closer than distance requirements stated in 10 CSR 23-3.010, a variance must be obtained before the hole is drilled (see 10 CSR 23-1.040 for details on variance issuance).]* **Setback distances shall be followed pursuant to 10 CSR 23-3.010(1) Table 3.1.**

*AUTHORITY: sections 256.606 and 256.626, RSMo [Supp. 1991] **2016**. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 6—Test Hole Construction *[and Plugging]* Code

PROPOSED AMENDMENT

10 CSR 23-6.040 Construction Standards for Test Holes. The board is amending the division name, chapter name, sections (2), (3), (4), and (6), removing sections (1) and (5), and renumbering as needed.

PURPOSE: This rule is being amended to remove unnecessary restrictions regarding the amount of permanent casing that must be set into bedrock and to move requirements that relate to groundwater protection to 10 CSR 23-6.020 General Protection of Groundwater Quality and Resources.

[(1) Standards for Construction of Test Holes. All test holes shall be constructed in a manner that will conserve and protect the groundwater resources and not be a source or channel of contamination or pollution to any aquifer.]

*[(2)]***(1)** Casing *[Material. All casing used in the construction of a test well must meet or exceed]* **when used shall follow the minimum** standards *[set out in]* **pursuant to** 10 CSR 23-3.030**(1)(A)**.

*[(3)]***(2)** Casing Depth. If permanent surface casing is set, it must be set at least *[fifty feet (50')]* **thirty feet (30')** into bedrock. *[Temporary surface casing lengths may be determined by the permitted contractor.]*

*[(4)]***(3)** Temporary Cap. All holes must be capped during the period they remain unplugged **pursuant to 10 CSR 23-3.030(1)(E)**.

[(5) Hole Size. Test hole size will be determined by the person owning the mineral rights or designing the hole.]

*[(6)]***(4)** *[Approved]* Grout*[. When a hole is grouted, procedures and materials set out in 10 CSR 23-3.030(3) and (4) must be followed]* **when used to seal casing annulus shall follow materials and methods pursuant to 10 CSR 23-3.030(1)(C)**.

*AUTHORITY: sections 256.606 and 256.626, RSMo [1994] **2016**. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—*[Division of Geology and Land Survey]* *Well Installation*
Chapter 6—Test Hole Construction *[and Plugging]* Code

PROPOSED AMENDMENT

10 CSR 23-6.050 Plugging of Test Holes. The board is amending the division name, chapter name, sections (1), (2), and (3), and adding a new section (4).

PURPOSE: This amendment improves readability by removing unnecessary language and clarifies the type and amount of grout plug required for these types of wells to bring them in line with industry standards.

(1) All test holes, except those that are converted to other types of wells are to be plugged in accordance with this chapter within sixty (60) days from the date that the well was drilled. *[Extensions of this time limit are available on a case-by-case basis from the division.]* **Submit plugging registration records pursuant to section 256.614.1, RSMo. Test holes are exempt from submitting construction certification records.**

(A) Plugging the Test Hole.

1. Test holes with no surface casing.

[A. Test holes must be filled with grout via tremie to within two feet (2') of the ground surface. If the Davis Formation is penetrated, an expanding packer must be placed in the bottom portion of the formation and grouted to within two feet (2') of the surface.

B. The top two feet (2') of hole must be filled with soil.

C. A registration report form must be submitted to the division which documents the method of plugging the test hole.]

A. Fill the test hole from total depth to within two feet (2') of ground surface with grout.

B. If the Davis Formation is penetrated, a grout plug shall extend from the bottom of the formation to within two feet (2') of ground surface.

C. A mechanical packer may be installed at the bottom of the Davis Formation or emplace clean fill from total depth to the bottom of the Davis Formation to hold the grout plug in place.

D. Fill the top two feet (2') of hole with soil.

2. Test holes with removable surface casing pipe.

[A. If the Davis Formation is penetrated, an expanding packer must be set in the bottom portion of the formation.

B. The hole must be filled with grout from the packer to the bottom of the interior casing pipe via tremie pipe. This grout plug must extend from near the bottom of the Davis Formation to at least fifty feet (50') above the top of the Davis Formation.

C. The hole must be backfilled with chlorinated clean fill such as varied sized agricultural lime, gravel or sand to the base of the surface casing pipe, while the interior casing is being pulled.

D. A fifty-foot (50')-grout plug must be pumped through the surface casing pipe as it is being removed, filling the hole to the top of bedrock.

E. Chlorinated clean fill must be used to backfill the hole above the upper plug while the surface casing pipe is being removed. The clean fill must extend from the top of the grout plug to within two feet (2') of the surface.

F. The top two feet (2') of the hole must be filled with on-site soil.

G. A registration report form must be submitted to the division which documents the method of plugging.

H. The test hole may be filled from total depth to surface with grout.]

A. Remove the surface casing and any interior casing if used.

B. Fill the test hole from total depth to within two feet (2') of ground surface with grout.

C. If the borehole has collapse potential, add grout as casing is withdrawn.

D. If the Davis Formation is penetrated, a grout plug shall extend from the bottom of the formation to within two feet (2') of ground surface.

E. A mechanical packer may be installed at the bottom of the Davis Formation or emplace clean fill from total depth to the bottom of the Davis Formation to hold the grout plug in place.

F. Fill the top two feet (2') of hole with soil.

3. Test holes with grouted nonremovable surface casing.

[A. Cut off casing three feet (3') below ground surface making a hole at least two feet (2') in diameter larger than the surface casing.

B. Fill the hole from total depth to within two feet (2') of the surface with grout.

C. Fill remaining hole with soil.

D. Submit a registration report form to the division.]

A. Cut the casing off two feet (2') below ground surface or three feet in an agricultural area. If bedrock is encountered, cut the casing flush with the top of bedrock.

B. Fill the test hole from total depth to within two feet (2') of ground surface with grout.

C. If the Davis Formation is penetrated, a grout plug shall extend from the bottom of the formation to within two feet (2') of ground surface.

D. A mechanical packer may be installed at the bottom of the Davis Formation or emplace clean fill from total depth to the bottom of the Davis Formation to hold the grout plug in place.

E. Fill the top two feet (2') of hole with soil.

[(2) Test Holes Drilled to Expand Quarrying and Surface Mining Operations. When test holes are drilled in the process of expanding quarrying and surface mining operations and are destroyed within one (1) year by the advance of the mine or quarry, they are required to be plugged by only inserting a temporary surface plug into the hole which will prevent surface water from entering the hole. Reporting requirements are not required for these temporary holes. If these test holes are drilled deeper than the quarry or mine floor, they must be plugged from the mine floor to the total depth of the hole with approved grout. If these holes are not destroyed by the mining process within one (1) year then the requirements of subsection (1)(A) must be met. Extensions of this time limit will be considered on a case-by-case basis by the division.

(3) Test Holes Drilled in Association with Clay Mining Operations , Shallow Industrial Minerals Exploration and Miscellaneous Geologic Data Holes.

(A) When the test hole is drilled that bottoms in an impermeable fire clay deposit a temporary surface plug must be inserted which prevents surface water from entering the hole. This type of well is exempted from reporting requirements.

(B) When a test hole is drilled that bottoms at the bedrock-unconsolidated material contact or above, it must be plugged when no longer needed for exploratory purposes. If the test hole is less than one hundred feet (100') in depth and does not encounter a potable water horizon, the test hole must be plugged by filling the hole from bottom to top with the type of uncontaminated material removed from the hole or other approved grout. A registration report is required per site for holes drilled and plugged that are greater than twenty feet (20') in depth. One (1) registration fee is required per report form for this type of hole. If a test hole is less than twenty feet (20') in depth, it must be filled with the material removed from the hole as soon as it is no longer needed for exploratory purposes. Test holes less than twenty feet (20') in depth are exempted from the rules. These wells can not be used in any way relative to monitoring well sites.

(C) If a test hole is greater than one hundred feet (> 100') in depth, it must be plugged as stated in 10 CSR 23-6.050(1).]

(2) Test holes drilled to expand quarrying and surface mining operations.

(A) Test holes completely destroyed within one (1) year of the advance of the mine or quarry shall have a ten foot (10') surface grout plug and are exempt from plugging registration requirements.

(B) Test holes that are not destroyed within one (1) year of the advance of the mine or quarry are subject to plugging requirements pursuant to 10 CSR 23-6.050(1).

(C) Test holes that penetrate the quarry or mine floor which are not completely destroyed by the quarry or mine operation shall be plugged with grout from total depth to the bottom of the quarry or mine and are subject to plugging registration requirements.

(3) Clay mining operations. Test holes that do not penetrate beneath an impermeable fire clay deposit shall have a ten foot (10') surface grout plug and are exempt from plugging registration requirements.

(4) Unconsolidated material test holes less than one hundred feet (<100') deep.

(A) Test holes less than twenty feet (<20') in depth may be plugged using clean fill or uncontaminated native material and are exempt from plugging registration requirements.

(B) One (1) registration report and fee is required per site for test holes that are twenty feet (20') in depth or greater. All test holes plugged may be reported on one (1) form.

(C) Test holes where no ground water is encountered, may be plugged using clean fill or uncontaminated native material.

(D) Test holes may not be used for monitoring.

*AUTHORITY: sections 256.606, 256.614, 256.615, and 256.626, RSMo [1994] **2016**. Original rule filed Aug. 17, 1993, effective March 10, 1994. Amended: Filed July 13, 1994, effective Jan. 29, 1995. Amended: Filed Nov. 1, 1995, effective June 30, 1996. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 23—Division of Geology and Land Survey
Chapter 6—Test Hole Construction and Plugging Code

PROPOSED RESCISSION

10 CSR 23-6.060 Confidentiality of Registration Report Form. This rule set standards to ensure that registration report forms are held confidential for at least ten years as required in section 256.615, RSMo.

PURPOSE: This rule is being rescinded and substantive information is being incorporated into a single new proposed rule 10 CSR 23-2.020 Certification and Registration.

AUTHORITY: sections 256.606, 256.614, 256.615 and 256.626, RSMo Supp. 1991. Original rule filed Aug. 17, 1993, effective March 10, 1994. Rescinded: Filed June 27, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: The proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with Department of Natural Resources' Geological Survey Program attention to Amber Steele at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to amber.steele@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 14, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 7, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 26—Petroleum and Hazardous Substance Storage Tanks
Chapter 2—Underground Storage Tanks—Technical Regulations

PROPOSED AMENDMENT

10 CSR 26-2.080 *[Risk-Based Target Levels]* ***No Further Action***. The department is deleting sections (2) and sections (4) through (8), amending the title, purpose statement, and section (3) of the rule, and renumbering as needed.

PURPOSE: This rule is being amended to eliminate portions of the rule that are outdated and duplicative of other regulatory and statutory requirements. Removing the outdated portions of the rule will eliminate confusion about the applicability of these requirements and support the department's efforts to get rid of unnecessary and outdated rule language.

PURPOSE: This rule [sets clean-up levels for underground storage tank corrective actions and for site assessment, site characterization, and workplan development, which are all stages in developing clean-up levels. The rule also sets deed notice language to assure that the site is not used in a manner which would pose unacceptable risk or exposure. The rule requires that sites be ranked and that the ranking be used to allocate staff and funds.] ***describes the conditions under which a "No Further Action" status may be assigned to sites that have had a release from an underground storage tank.***

[(2) Upon being so directed by the department, the UST remediator shall conduct a preliminary assessment of the site.

(A) The requirement for a preliminary assessment is waived if permanent closure is being conducted, or significant contamination is known to exist at the site, and the department has been notified of a release as required in 10 CSR 24-3.010(1).

(B) The preliminary assessment shall be conducted according to department guidance.]

*[(3)]***(2)** The department will evaluate the results of the *[preliminary]* **risk** assessment *[to rank the site relative to other sites]* for further characterization and/or corrective action.

(A) If the *[preliminary]* **risk** assessment shows**, to the department's satisfaction, that maximum** contamination levels **are** below the *[action]* **default target** levels outlined in the *[department's underground storage tank closure guidance document,]* **document referenced at paragraph (3)(C)1. or (3)(C)2. of 10 CSR 26-2.078, and the site poses no risk to ecological receptors,** the department will require no further action at the site.

(B) If the risk assessment shows, to the department's satisfaction, that all current and potential exposure pathways are incomplete (both on and off-site) or that no unacceptable risk from complete exposure pathways exists, and provided the conditions of sections 7.6, 8.4, or 9.5 of the document referenced at paragraph (3)(C)1. or (3)(C)2. of 10 CSR 26-2.078 are met, the department will require no further action at the site.

*[(B)]***(C)** If, in accordance with subsection *[(3)]***(2)**(A) **or (2)(B)** of this rule, the department determines that no further action is required at a site, and if subsequent information becomes available to indicate that contamination may be present at the site at levels which may threaten human health or the environment, the department may require additional investigation or site characterization and/or corrective action.

[(4) If full site characterization is required by the department, due to known contamination or in accordance with subsection (3)(B) of this rule, the UST remediator shall conduct the site characterization according to department guidance.

(5) The department will review the site characterization and rank the site relative to other sites based on site conditions as reflected in the site characterization and the potential risk to human health and/or the environment.

(A) The rank assigned to the site will be used to prioritize department actions including, but not limited to review of documents, pre-approval of costs and reinbursement of costs, in regard to the site.

(B) The department will not require further action at sites that the department deems not to pose a risk to human health and/or the environment, unless there is a change in known conditions at the site that would upgrade its priority, as determined by the department.

(6) Except as provided in section (8) of this rule, site clean-up objectives will be set as follows:

(A) Site clean-up objectives for the cleanup of petroleum released from underground storage tanks will be set by using the scoring matrix and the groundwater clean-up standards as outlined in the department's underground storage tank closure guidance document.

(B) (Reserved) (Note: The soil scoring matrix is a site-specific risk-based method which accounts for future land use and other considerations. Upon further development and review, this method or another which also meets statutory requirements, will be set forth in this section.)

(7) Site clean-up objectives and workplans are subject to approval by the department. Such approval must be granted in writing prior to implementation of the workplan.

(8) For all sites which are cleaned up to meet levels less stringent than (higher than) those set according to section (6) of this rule, the UST remediator shall file a document in the chain of title of the property. The document shall state that the contaminant levels were deemed acceptable by the department, based on the land use and other considerations, at the time of cleanup.

(A) If the UST remediator is a person other than the landowner, the UST remediator shall provide a copy of the document which is to be filed in the chain of title for the property, by certified mail to the landowner.

(B) The language of the document to be filed in the chain of title shall include the following:

NOTICE OF ACCEPTABLE LAND USE(S) OF UNDERGROUND STORAGE TANK SITE

Owner of Record: (Landowner's Name)

Site Description: (Site Name and Legal Description)

The above-described real property, owned by (Landowner's Name) and located in the County of (County Name) and State of Missouri, is the site of an underground storage tank which was (Removed/Closed) on (Date). The site cleanup was accepted as complete by the Missouri Department of Natural Resources on (Date), in accordance with the applicable requirements of Title 10, Division 25, Chapters 10 through 12 of the Code of State Regulations which were in effect at the time of cleanup. The contaminant levels remaining on the site are suitable for (Commercial/Light Industrial/Heavy Industrial/ Other Specified) use.

In witness whereof I hereunto set my hand this _____ day of ___, 19___.

_____
(Office)

_____
(Name)

_____
(Title)

(C) No person may substantially change the manner in which a site with a document filed in the chain of title under this section is used without the prior written approval of the director or the director's designee.

1. Requests for approval of change in use of real property must be submitted in writing to the director's office no less than sixty (60) days prior to the planned change in use of real property. In the event the director does not respond within sixty (60) days after the request is received, the request will be considered to be approved as submitted.

2. The director will evaluate the request to determine whether the change in use of real property is likely to result in increased exposure of persons or the environment or spread of contamination.

3. If the change in use of real property is not likely to result in increased exposure of persons or the environment or spread of contamination, the director shall provide written approval.

(D) When the director finds that a site which has had a document filed in the chain of title under this section has been further cleaned up to meet or exceed (lower levels than) the standards described in section (6) of this rule, the director shall direct the UST remediator to file a second document in the chain of title. The document shall include the language in subsection (8)(B) of this rule, and shall describe the land uses for which the new contaminant levels are suitable.]

AUTHORITY: [section 319.111, RSMo 2000, and] sections 319.109, ***319.111,*** *and 319.137, RSMo [Supp. 2010]* ***2016****. This*

rule originally filed as 10 CSR 20-10.068. Original rule filed Jan. 2, 1996, effective Aug. 30, 1996. Amended: Filed Jan. 14, 1997, effective Sept. 30, 1997. Moved and amended: Filed April 15, 2011, effective Dec. 30, 2011. Amended: Filed June 29, 2018.

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: The Missouri Hazardous Waste Management Commission will hold a public hearing on this rule action and others beginning at 10:00 a.m. on September 13, 2018, at the Elm Street Conference Center, 1730 East Elm Street, Jefferson City, Missouri. Any interested person will have the opportunity to testify. Advance notice is not required. However, anyone who wants to make arrangements to testify may do so prior to the hearing by contacting the secretary of the Hazardous Waste Management Commission at (573) 751-2747.

Any person may submit written comments on this rule action. Interested persons, whether or not heard, may submit a written or email statement of their views until midnight on September 20, 2018. Written comments shall be sent to the director of the Hazardous Waste Program at PO Box 176, Jefferson City, MO 65102-0176. To be accepted, written comments must be postmarked by midnight on September 20, 2018. Email comments shall be sent to tim.eiken@dnr.mo.gov. Please direct all inquiries to the Rules Coordinator of the Hazardous Waste Program, at 1730 E. Elm, Jefferson City, MO 65102, telephone (573) 751-3176.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 50—Oil and Gas Council
Chapter 1—*[Organization, Purpose,]* *General Procedures* and Definitions

PROPOSED AMENDMENT

10 CSR 50-1.020 General Procedures. The council is amending the chapter title, sections (1), (2), (5), and (7), deleting sections (3) and (4), and renumbering as needed.

PURPOSE: This amendment removes duplication with sections 259.070, 259.140, 259.190, and 259.200, RSMo, improves readability, and removes unnecessary language pursuant to Executive Order 17-03 and the Red Tape Reduction Initiative.

(1) All rules promulgated *[shall be]* **apply** statewide *[in application]* unless otherwise specifically excepted by a written order of the council.

(2) *[No order or amendment, except in an emergency, shall be made by the council without a public hearing upon at least ten (10) days' notice. The public hearing shall be held at a time and place as may be prescribed by the council and any interested person shall be entitled to be heard.]* The notice requirements in *[this regulation]* **section 259.140, RSMo,** apply to each hearing arising under Chapter 259, RSMo, and implementing regulations heard by the council or any agent appointed by the council.

[(A) Notice of the hearing shall be published by the council in a newspaper of general circulation in the county where the land affected, or some part thereof, is situated. If the notice is applicable throughout the state, then it shall be published in a newspaper of general circulation which is published in Jefferson City.]

*[(B)]***(A)** A copy of the notice of the hearing *[shall]* **will** be mailed by the council to each person who has filed for the purpose of receiving notice. The notice *[shall]* **will** be mailed not less than ten (10) business days prior to the hearing date.

*[(C)]***(B)** *[In addition to notice required in subsection (2)(A), t]***T**he council also *[shall]* **will** provide notice to any person whose property interests may be affected by the outcome of the hearing.

[(3) When the council determines an emergency requiring immediate action exists, the council is authorized to issue an emergency order without notice of hearing, which shall be effective when issued. No emergency order shall remain effective for more than fifteen (15) calendar days.

(4) The department or its authorized representatives shall have the authority to enter property, with the consent of the owner or operator, to conduct investigations or inspections as are consistent with the intent of Chapter 259, RSMo.]

*[(5)]***(3)** The council, after a hearing as provided by law, may order an operation to cease or wells to be plugged upon a finding that any provisions of the laws, rules, or conditions of the council **or state geologist** have been violated or that any fraud, deceit, or misrepresentation was made to obtain the approval of a permit. Appeals of any decision of the council may be made as provided by law.

*[(6)]***(4)** Information submitted pursuant to Chapter 259, RSMo, and implementing regulations shall use Missouri nomenclature.

*[(7)]***(5)** Confidentiality. Information gathered pursuant to Chapter 259, RSMo, and implementing regulations is public record pursuant to the Missouri Sunshine law, Chapter 610, RSMo. Confidentiality may be granted upon request, in accordance with section 640.155.1, RSMo. Cancelled permits are not considered confidential.

(A) If a written request for confidentiality is made to the state geologist within one hundred twenty (120) days of the spud date or the date of commencement of recompletion of the well, all information, samples, or cores filed *[as required in]* **per** 10 CSR 50-2.050 *[shall]* **will** be held in confidential custody for an initial period of one (1) year from the written request.

(B) All rights to confidentiality shall be lost if the filings are not timely, as provided in 10 CSR 50-2.050, or if the request for confidentiality is not timely, as provided in subsection *[(7)]***(5)**(A).

(C) Samples, cores, or information may be released before the expiration of the one- (1-) year period only upon written approval of the operator.

(D) If a request for an extension is made at least thirty (30) days before the expiration of the initial one- (1-) year period, the period of confidentiality may be extended for one (1) additional year.

*AUTHORITY: sections 259.070**,** [and] **259.140,** 259.190, **and 259.200,** [RSMo Supp. 2015, and sections 259.140 and 259.200,] RSMo [2000] **2016**. Original rule filed Oct. 11, 1966, effective Oct. 21, 1966. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Kimberly Ward at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to kimberly.ward@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 13, 2018 at

5:00 p.m. A public hearing is scheduled for 10 a.m., September 6, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 50—Oil and Gas Council
Chapter 1—*[Organization, Purpose,]* *General Procedures* and Definitions

PROPOSED AMENDMENT

10 CSR 50-1.030 Definitions. The council is amending the chapter title, the rule purpose, sections (1) and (2), and renumbering as needed.

PURPOSE: This amendment removes duplication with section 259.050, RSMo, adds definitions for observation wells and private domestic consumption, improves readability, and removes unnecessary language pursuant to Executive Order 17-03 and the Red Tape Reduction Initiative.

PURPOSE: This rule provides the definitions for terms used in 10 CSR 50 ***that are not defined in section 259.050, RSMo****.*

(1) The terms used in 10 CSR 50 *[shall]* have the meanings set forth in section 259.050, RSMo, or this rule, unless the context of the term clearly indicates otherwise.

(C) Terms beginning with the letter C.

1. Casing, the impervious, durable, tubular materials used to line a wellbore.

2. Casinghead gas, gas produced that was in solution with oil in its original state in the reservoir.

3. Cement, portland cement or a blend of portland cement.

4. Coalbed natural gas, natural gas produced from either coal seams or associated shale.

5. Commercial well, a well from which oil or gas is recovered and sold, traded**,** or otherwise used for profit.

6. Common source of supply, synonymous with "pool" as defined in *[this rule]* **Chapter 259, RSMo**.

7. Confining strata, geologic stratum or strata that serve as a barrier between water-, oil-, or gas-bearing strata.

8. Core, a continuous section of geologic materials recovered during drilling.

9. Corrective action, remedial action on any well to prevent the migration of fluids from the surface or from one (1) stratum to another.

10. Correlative rights, the right of each owner or operator in a pool to obtain that owner's or operator's just and equitable share of the oil or gas resource, or an economic equivalent of that share of the resource, produced in a manner or amount that will not have any of the following effects:

A. Damage the reservoir;

B. Take an undue proportion of the obtainable oil or gas; or

C. Cause undue drainage between developed leases.

11. Council, the State Oil and Gas Council established by section 259.010, RSMo.

(D) Terms beginning with the letter D.

[1. Department, the Department of Natural Resources.]

*[2.]***1.** *[Disposal well, an injection well used to place produced water, non-usable gas or other liquid or gaseous waste associated with the production of oil or gas or both into an injection zone and is not used for enhanced recovery.]* ***(Reserved)***

(F) Terms beginning with the letter F.

[1. Field, the general area underlain by one (1) or more pools.]

*[2.]***1.** Fluid, any material or substance which flows or moves whether in a semi-solid, liquid, sludge, or gaseous state.

*[3.]***2.** Formation water, water that occurs naturally within the pores of a geologic formation or stratum.

(G) Terms beginning with the letter G.

1. *[Gas, all natural gas and all other fluid hydrocarbons which are produced at the wellhead and not herein below defined as oil.]* ***(Reserved)***

(M) Terms beginning with the letter M.

1. Mechanical integrity, a well *[shall be considered to have]* **has** mechanical integrity if there is no significant leakage in the casing, tubing, or packer; and there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the wellbore.

2. Missouri nomenclature, Missouri-specific geologic terminology as provided by the state geologist including, but not limited to, names of geologic strata, pools, and geologic features.

3. Multiple completion, the completion of any well that permits production from two (2) or more pools that are completely segregated by confining strata.

(N) Terms beginning with the letter N.

1. *[Non-commercial gas well, a gas well drilled for the sole purpose of providing gas for private domestic consumption by the owner and not for resale or trade.]* ***(Reserved)***

(O) Terms beginning with the letter O.

1. *[Oil, crude petroleum oil and other hydrocarbons regardless of gravity which are produced at the wellhead in liquid form and the liquid hydrocarbons known as distillate or condensate recovered or extracted from gas, other than gas produced in association with oil and commonly known as casinghead gas. The term shall also include hydrocarbons that do not flow to a wellhead but are produced by other means, including those contained in oil-shale and oil-sand.]* **Observation well, a well that is used to monitor the operational integrity and conditions of oil, gas, and storage operations, including physical or chemical parameters of a reservoir or geologic formation or strata, and is not used currently as a production, injection, disposal, or water well.**

2. Oil and Gas Remedial Fund, the fund established by section 259.190.5, RSMo into which forfeited bond monies and proceeds from the sale of illegal oil, illegal gas, and illegal product are deposited, which is to be used for plugging abandoned wells as provided for in 10 CSR 50-2.060(3)(F).

3. Oil and Gas Resources Fund, the fund established by section 259.052, RSMo, into which all gifts, donations, transfers, moneys appropriated by the General Assembly, permit application fees, operating fees, closure fees, late fees, severance fees, and bequests are deposited, which is to be used to administer the provisions of Chapter 259, RSMo, and implementing regulations, and to collect, process, manage, interpret, and distribute geologic and hydrologic resource information pertaining to oil and gas potential.

4. Open well, a well that has not been plugged including, but not limited to, abandoned, operating, or shut-in wells.

5. Operator, a person who drills, maintains, operates, or controls wells associated with oil or gas production, storage, or injection projects.

[6. Owner, the person who has the right to drill into and produce from a pool and to appropriate the oil or gas he produced therefrom either for himself or others or for himself and others.]

(P) Terms beginning with the letter P.

1. Person, any individual, partnership, co-partnership, firm, company, public or private corporation, association, joint stock company, trust, estate, governmental or political subdivision, or any other legal entity.

2. Plugged well, a well that has been filled or partially filled with cement or other materials to prevent the migration of fluids within the well.

[3. Pool, an underground reservoir containing a common

accumulation of oil or gas or both; each zone of a structure which is completely separated from any other zone in the same structure is a "pool," as that term is used in Chapter 259, RSMo, and in these regulations.]

*[4.]***3.** Pooling, the contractual agreement of those holding the rights to mineral interests within a single spacing unit for primary production, whether that agreement is voluntary or by order of the council, to produce oil or gas or both from that unit.

*[5.]***4.** Primary production, the process of recovery of oil or gas from a pool in which one (1) well is capable of efficiently draining the pool or portion thereof that resides within the confines of the spacing unit and the drainage of oil, gas, or formation water into the well occurs naturally.

5. Private domestic consumption, gas used from an on-site well(s) for the sole purpose of providing gas for a private dwelling or business and not for resale or trade.

6. Produced water, formation water that is associated with the production of oil or gas and either requires disposal or is used as part of an enhanced recovery project.

[7. Product, any commodity made from oil or gas and includes refined crude oil, crude tops, topped crude, processed crude, processed crude petroleum, residue from crude petroleum, cracking stock, uncracked fuel oil, fuel oil, treated crude oil, residuum, gas oil, casinghead gasoline, natural gas gasoline, kerosene, benzene, wash oil, waste oil, blended gasoline, lubricating oil, blends or mixtures of oil with one (1) or more liquid products or by-products derived from oil or gas, and blends or mixtures of two (2) or more liquid products or by-products, derived from oil or gas whether herein enumerated or not.]

*[8.]***7.** Production unit, an uninterrupted block of acreage of any size and any shape that has a definite outer boundary and in which wells may be drilled for enhanced recovery. The acreage that composes a production unit may include default spacing units, acreage for which spacing units have or have not been explicit**l**y ordered by the state geologist or council, pooled or non-pooled mineral acreage, and all or parts of past and present production units.

*[9.]***8.** Production well, any well used for recovery of oil or gas or both.

(R) Terms beginning with the letter R.

[1. Reasonable market demand, the demand for oil or gas for reasonable current requirements for consumption and use within and without the state, together with such quantities as are reasonably necessary for building up or maintaining reasonable working stocks and reasonable reserves of oil or gas or product.]

*[2.]***1.** Recompletion, the process of reworking or repairing a well after its initial well completion.

*[3.]***2.** Reference well, a well used to collect data to establish a maximum injection pressure as approved by the state geologist.

(W) Terms beginning with the letter W.

[1. Waste, includes, but is not limited to:

A. Physical waste, as that term is generally understood in the oil and gas industry, but not including unavoidable or accidental waste;

B. The inefficient, excessive, or improper use of, or the unnecessary dissipation of, reservoir energy;

C. The location, spacing, drilling, equipping, operating, or producing of any oil or gas well or wells in a manner which causes, or tends to cause, reduction in the quantity of oil or gas ultimately recoverable from a pool under prudent and proper operations, or which causes or tends to cause unnecessary or excessive surface loss or destruction of oil or gas;

D. The inefficient storing of oil or gas;

E. The production of oil or gas in excess of transportation or marketing facilities or in excess of reasonable market demand; and

F. Through negligence, the unnecessary or excessive surface loss or destruction of oil or gas resulting from evaporation, seepage, leakage, or deliberate combustion.]

*[2.]***1.** Waters of the state, *[shall have]* **has** the same meaning as defined in the Missouri Clean Water Law, section 644.016, RSMo.

*[3.]***2.** Well, *[any hole drilled in the earth for, or in connection with, the exploration, discovery, or recovery of oil or gas, or for or in connection with the underground storage of gas in natural formation, or for or in connection with the disposal of salt water, nonusable gas, or other waste accompanying the production of oil or gas]* **has the meaning as defined in section 259.050(16)**. Wells drilled for the production of water are regulated by the Water Well Drillers' Act, Chapter 256, RSMo, and the implementing Missouri Well Construction rules, 10 CSR 23. A well includes, but is not limited to, the following:

A. Disposal well;
B. Enhanced recovery injection well;
C. Horizontal well;
D. Injection well;
E. Observation well;
*[E.]***F.** Production well;
*[F.]***G.** Seismic shot hole;
*[G.]***H.** Storage well; or
*[H.]***I.** Stratigraphic test well.

*[4.]***3.** Well stimulation treatment, a treatment of a well designed to enhance oil and gas production or recovery by increasing the secondary permeability of the geologic strata. Well stimulation is a short-term and non-continual process for the purposes of opening and stimulating channels for the flow of oil or gas or both. Examples of well stimulation treatments include hydraulic fracturing, acid fracturing, and acid matrix stimulation. Well stimulation treatment does not include routine well cleanout work; routine well maintenance; routine treatment for the purpose of removal of geologic strata damage due to drilling; bottom hole pressure surveys; routine activities that do not affect the integrity of the well or the geologic strata; the removal of scale or precipitate from the perforations, casing, or tubing; or a treatment that does not penetrate into the geologic strata more than thirty-six (36) inches from the wellbore.

*[5.]***4.** Whipstock, a long wedge-shaped steel device or casing that uses an inclined plane to cause the bit to deflect from the original borehole at a slight angle, sometimes used in an oil or gas well to control directional drilling, to straighten crooked boreholes, or to sidetrack to avoid unretrieved items left in a well.

(2) All other words used in this rule *[shall be given]* **have** their usual customary and accepted meaning, and all words of a technical nature, or specific to the oil and gas industry, *[shall]* **will** be given that meaning which is generally accepted in the oil and gas industry.

AUTHORITY: sections 259.050, 259.070, ***259.140,*** *and 259.190, [RSMo Supp. 2015, and section 259.140,] RSMo [2000]* ***2016****. Original rule filed Oct. 11, 1966, effective Oct. 22, 1966. For intervening history, please consult the* ***Code of State Regulations****. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Kimberly Ward at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to kimberly.ward@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 13, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 6,

2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 50—Oil and Gas Council
Chapter 1—*[Organization, Purpose,]* General Procedures and Definitions

PROPOSED AMENDMENT

10 CSR 50-1.050 Assessment of Costs. The council is amending the chapter title and sections (1) and (2).

PURPOSE: This amendment improves readability, clarifies requirements, and removes unnecessary language pursuant to Executive Order 17-03 and the Red Tape Reduction Initiative.

(1) Beginning January 1, 2017, the following fees shall be assessed and deposited in the Oil and Gas Resources Fund:

(A) A fee of two hundred fifty dollars ($250) *[shall be]* paid upon the submittal of an **initial or renewal** application for an operator license; except *[that an applicant for a license who solely operates a non-commercial gas well shall pay a fee of fifty dollars ($50)]* **as provided in subsection (B)**;

(B) A fee of *[two hundred]* fifty dollars ($*[2]*50) *[shall be]* paid **upon submittal of an initial or renewal application for an operator license** by *[each operator upon submittal of an operator license renewal form; except that an operator]* **an applicant** who solely operates a non-commercial gas well *[shall pay a fee of fifty dollars ($50)]*;

(C) A fee of one hundred dollars ($100) *[shall be]* paid upon submittal of an application for a permit to drill, deepen, plug-back, or recomplete as follows:

1. Any new application for permit to drill, deepen, plug-back, or recomplete any well;

2. Any application for modification to the permit to drill, deepen, plug-back, or recomplete; or

3. Blanket requests to drill, deepen, plug-back, or recomplete wells proposed to depths no greater than one thousand five hundred feet (1500');

(D) A fee of one hundred dollars ($100) *[shall be]* paid upon submittal of an application for a permit to inject as follows:

1. Any new application for a permit to inject in any well; or

2. Any application for modification to the initial injection well permit including, but not limited to, an increase in the maximum injection pressure and/or the maximum injection rate;

3. No fee *[shall]* **will** be assessed for a *[notice of permit]* modification **to an injection permit** as specified in 10 CSR 50-2.055(5)(B);

(E) A fee of twenty-five dollars ($25) *[shall be]* paid upon submittal of an application for extension of the shut-in status of a well;

(F) A fee of fifty dollars ($50) *[shall be]* paid upon submittal of a plugging record for each well plugged;

(G) A fee of sixty cents ($0.60) on each barrel of oil sold or marketed each month *[shall be]* assessed to each operator. The fee and assessment *[shall]* apply only to the first purchase of oil from the operator and *[shall]* **will** be collected and submitted by the first purchaser of oil;

(H) A fee of seven and one-tenth cents ($0.071) on each one thousand (1,000) cubic feet of gas sold or marketed each month *[shall be]* assessed to each operator. The charge and assessment *[shall]* apply only to the first purchase of gas from the operator and *[shall]* **will** be collected and submitted by the first purchaser of gas;

(I) *[In the event any required form or report is not submitted per Chapter 259, RSMo, or implementing regulations, a]***A** late fee of no more than one hundred dollars ($100) per month *[shall be]* assessed against the responsible party*[, and shall be assessed]* each month until the form or report has been submitted. In no case, however, will a late fee exceed one thousand two hundred dollars ($1,200) per violation for each well.

(2) Fee nonrefundable. Once paid, each fee *[shall be]* **is** nonrefundable.

*AUTHORITY: sections 259.052 and 259.080, RSMo [Supp. 2015] **2016**. Original rule filed Sept. 15, 2015, effective March 30, 2016. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 50—Oil and Gas Council
Chapter 2—Oil and Gas Drilling and Production

PROPOSED AMENDMENT

10 CSR 50-2.010 Operator License. The council is amending the rule purpose and sections (1), (2), (3), (4), and (6).

PURPOSE: This amendment removes tank signage requirements from paragraph (6)(A)7. and moves them into 10 CSR 50-2.065(1), improves readability, clarifies requirements, and removes unnecessary language pursuant to Executive Order 17-03 and the Red Tape Reduction Initiative.

*PURPOSE: This rule provides for the filing of information that identifies those responsible for oil and gas exploration, production, or related industry activities regulated by the council. The operator license is [required] **necessary** in order to properly process bonding, well permitting, producing, plugging, and other council regulated activities and to make sure that the person making application is, in fact, authorized to represent a person, firm, or corporation.*

(1) No person shall engage in oil or gas operations pursuant to Chapter 259, RSMo, and implementing regulations without first obtaining or renewing an operator license from the department*[. Each operator of a well or gas storage facility shall maintain a current operator license]***,** even if the well or storage facility is shut in or idle.

(2) Application for an operator license.

(A) An application for an operator license shall be **completed in full on a form provided by the department and** submitted**, along with the applicable fee pursuant to 10 CSR 50-1.050,** to the state geologist for approval. *[This application shall be submitted on a form provided by the department along with the fee required pursuant to 10 CSR 50-1.050 and shall be completed in full.]*

(B) The state geologist *[shall]* **will** review the application for operator license and, within fifteen (15) business days, determine if the application is in proper form and if the requirements of Chapter 259, RSMo, and implementing regulations are met. If the application is incomplete or lacking *[required]* information, forms, or fees, the state geologist *[shall]* **will** notify the applicant and suspend the application process. When the *[required]* **missing** form, information, or fee is submitted by the applicant and received by the state geologist, the fifteen (15) business day review period will begin anew. If the state geologist has not received the missing or incomplete *[required]* application information or fee within thirty (30) days after notification of the applicant, the application *[shall]* **will** be considered null and void and the applicant must reapply by submitting a new application for an operator license along with the *[required]* **associated** fee.

1. If the state geologist finds that the application is in good form, that all requirements of the application have been met, and that Chapter 259, RSMo, and implementing regulations are being met, the state geologist *[shall]* **will** issue the operator license.

2. If the state geologist determines either that the application is not in proper form, that the applicant failed to submit the applicable fees, or that Chapter 259, RSMo, and implementing regulations are not being met, *[the state geologist shall deny]* the application **will be denied**.

3. If the state geologist determines that the applicant is in violation of any provision of Chapter 259, RSMo, or implementing regulations, the state geologist may deny the application.

4. If the state geologist has not taken action by the prescribed fifteen (15) business day review period, the application shall be considered denied.

(3) License Renewal.

(A) An operator license issued pursuant to this section *[shall]* expire**s** on January 1 of the year immediately following issuance of the license. An operator may apply to renew the operator's license by submitting an application to the state geologist for approval. This application shall be **completed in full and** submitted on a form provided by the department, along with the fee *[required]* pursuant to 10 CSR 50-1.050, on or before January 1 each year *[and shall be completed in full]*.

(B) A late fee pursuant to 10 CSR 50-1.050 *[shall be paid]* **will be assessed** if the renewal is submitted *[within thirty (30) calendar days following the expiration date. If a license has been expired more than thirty (30) calendar days, the licensee must reapply by submitting a new application for an operator license along with the required fee]* **after the expiration date**.

(4) Suspension or revocation of operator license.

(B) The order of suspension or revocation shall state the reason(s) for suspension or revocation, the effective date of the suspension or revocation, and the conditions under which the suspension or revocation would be rescinded. The order *[shall]* **will** be sent registered or certified mail to the licensee's last known address. The licensee may appeal the suspension or revocation as provided in 10 CSR 50-1.040(3).

(6) *[The operator of any open well shall comply with Chapter 259, RSMo, and implementing regulations.]* Any open well shall not be transferred from one (1) operator to another operator without approval of the state geologist. **No less than thirty (30) calendar days prior to the planned transfer,** *[A]***a**n operator (transferor) shall submit to the state geologist**, on a form provided by the department**, a request to transfer any open well(s) *[to a new operator (transferee). The request shall be submitted on a form provided by the department no less than thirty (30) calendar days prior to the planned transfer]*. Any such request may be denied if the state geologist determines that the *[operator has not submitted all the required]* **submitted** information **is incomplete**.

(A) The state geologist *[shall]* **will** review the completed transfer request and, within fifteen (15) business days, approve or deny the request based upon the following *[conditions]* **requirements**:

1. The transfer of the well(s) *[must be]* **is** agreed upon by both the transferor and by the transferee;

2. The transferee *[must have]* **holds** a current operator license issued by the state geologist;

3. The transferee *[must have]* **has** bonding *[as required in]* **pursuant to** 10 CSR 50-2.020 in place *[prior to transfer]*;

4. *[The transferor shall provide a]***A** list of American Petroleum Institute (API) numbers for all open wells on the lease, spacing unit, production unit, or gas storage facility **submitted** with the *[notice of]* **request to** transfer; **and**

[5. Transfers shall not be made to any person who has not complied with the provisions of 10 CSR 50-2.010;]

*[6.]***5.** The transferor may be required by the state geologist to conduct a mechanical integrity test as a condition of the transfer*[; and]***.**

[7. Within ninety (90) days of any transfer, the transferee shall change the tank battery identification sign provided for in 10 CSR 50-2.065(1) to include the new operator information.]

(B) If the *[form]* **request to transfer** is incomplete *[or lacking required information]*, the state geologist *[shall]* **will** notify the operator and suspend the review process. When *[the completed form or required information]* **all necessary information** is *[submitted by the operator and]* received by the state geologist, the fifteen (15) business day review period will begin anew. If the state geologist has not received the *[missing or incomplete required]* **necessary** information within thirty (30) days after notification of the operator, the request *[shall]* **will** be considered null and void and the operator must submit a new transfer request.

*AUTHORITY: section 259.070, RSMo [Supp. 2015] **2016**. Original rule filed Oct. 11, 1966, effective Oct. 21, 1966. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 50—Oil and Gas Council
Chapter 2—Oil and Gas Drilling and Production

PROPOSED AMENDMENT

10 CSR 50-2.020 Bonds. The council is amending the rule purpose and sections (1), (2), (3), (5), and (6).

PURPOSE: This amendment clarifies the distinction between bonds and financial assurance instruments, removes duplication with chapter 259, RSMo, improves readability, consolidates duplicative language particularly for notification requirements, clarifies requirements

including those for bond release, and removes unnecessary language pursuant to Executive Order 17-03 and the Red Tape Reduction Initiative.

*PURPOSE: Bonding is [required of an operator] **necessary** before **an operator** commenc[ing]**es** oil or gas drilling or operations to insure compliance with the provisions of Chapter 259, RSMo, and the rules of the council, specifically with reference to the proper plugging for abandonment of a well(s).*

(1) Prior to commencement of drilling or other operations, the operator commencing such drilling or operations shall make, or cause to be made, **for each well** a good and sufficient bond *[for each well. The bond shall be]* **that—**

(A) Is secured by an approved financial assurance instrument payable to the state of Missouri, conditioned upon the performance of the duty to comply with all of the laws of the state and the rules and orders of the council*[.]***;**

(B) *[The bond shall be filed with]* **Is submitted on a form provided by the department and approved by** the state geologist*[.]***; and**

(C) *[This bond shall r]***R**emain**s** in full force and effect until a letter of release is issued by the state geologist or the bond is forfeited as provided in section (6) below. *[The state geologist shall issue the letter of release after plugging of the well, or after a new bond is filed by a successor and appropriate well transfer form submitted to the state geologist pursuant to 10 CSR 50-2.010(6).]*

(2) Bond Amounts. *[Required b]***B**ond amounts**,** *[shall be]* **as** determined by the council**,** *[and]* shall be no less than the following amounts:

MINIMUM SINGLE WELL BOND
Depth of Well

From	To	Amount
0'	500'	$1,100
501'	1000'	$2,200
1001'	2000'	$3,300
2001'	5000'	$4,400
5001'	_____	$5,500 plus $2/foot beyond 5001 feet

Bonds for horizontal wells shall be based on the total measured length of the wellbore from the surface to the depth of the deepest producing horizon.

MINIMUM BLANKET WELL BOND
Depth of Well

From	To	Amount	Number of Open Wells/bond
0'	800'	$22,000	40 wells
801'	1500'	$25,000	10 wells

Wells greater than one thousand five hundred feet (1500') in depth must be bonded individually by a single well bond.

(3) *[Types of bonds]* **Financial assurance instruments**. The state geologist may accept **as financial assurance instruments** surety bonds, *[personal bonds secured by]* certificates of deposit, and *[personal bonds secured by]* irrevocable letters of credit. *[The bond shall be submitted on the appropriate form. When the bond is filed, the state geologist shall review the bond and if the bond is in proper form, the state geologist shall accept the bond with the conditions which may be required by the council or by rule. If the bond is determined to be insufficient or not in proper form, the state geologist shall notify the operator. No drilling or operation shall commence or continue unless there is a sufficient bond on file with the state geologist.]*

(A) Surety bonds shall be subject to the following conditions:

1. Only irrevocable surety bonds shall be accepted. No bond of a surety company shall be cancelled for any reason whatsoever, including, but not limited to, nonpayment of premium, bankruptcy, or insolvency of the operator or issuance of notices of violations or cessation orders and assessment of penalties with respect to the operations covered by the bond, except that surety bond coverage for wells not drilled may be cancelled if the surety provides written notification and the state geologist is in agreement. The state geologist shall advise the surety, within thirty (30) days after receipt of a notice to cancel bond, whether the bond may be cancelled;

2. The surety shall be licensed to conduct a surety business in Missouri; **and**

3. Both the surety and the operator shall be primarily liable for completion of any remedial actions, including, but not limited to, well plugging, with the surety's liability being limited to the amount of the bond*[;]***.**

[4. The bond shall provide that—

A. The surety will give prompt notice to the operator and the state geologist of any change in name or address of the surety company, or any notice received or action filed alleging the insolvency or bankruptcy of the surety or alleging any violations of regulatory requirements which could result in suspension or revocation of the surety's license to do business; and

B. In the event the surety becomes unable to fulfill its obligation under the bond for any reason, notice shall be given immediately to the operator and the state geologist; and

5. The bond shall provide a mechanism for a surety company to give prompt notice to the state geologist and the operator of any change in name or address of the surety company, or any action filed alleging the insolvency or bankruptcy of the surety company, or the operator, or alleging any violations which would result in suspension or revocation of the surety license to do business. Upon the incapacity of a surety by reason of bankruptcy or insolvency, or suspension or revocation of its license, the operator shall be deemed to be without bond coverage in violation of section (1) and shall promptly notify the state geologist. The state geologist, upon notification of the surety's bankruptcy or insolvency, or suspension or revocation of its license, shall issue a notice of violation against any operator who is without bond coverage. The notice shall specify a thirty- (30-) day period to replace bond coverage. If the bond is not replaced in thirty (30) days, an order shall be issued by the state geologist requiring immediate cessation of operations. Operations shall not resume until the state geologist has determined that an acceptable bond had been posted.]

(B) *[Personal bonds secured by c]***C**ertificates of deposit shall be subject to the following conditions:

1. The certificate(s) shall be in the amount of the bond or in an amount greater than the bond and shall be made payable to or assigned to the state of Missouri, both in writing and upon the records of the institution issuing the certificates, and shall be automatically renewable at the end of the term of the certificate. If assigned, institutions issuing the certificate(s) waive all rights of set off or liens against the certificate(s);

2. No single certificate of deposit shall exceed the sum of two hundred fifty thousand dollars ($250,000) nor shall any permittee submit certificates of deposit aggregating more than two hundred fifty thousand dollars ($250,000) or the maximum insurable amount as determined by the Federal Deposit Insurance Corporation from a single institution. The institution issuing the certificate of deposit

must be insured by the Federal Deposit Insurance Corporation (FDIC);

3. Any interest on the certificates of deposit shall be made payable to the operator; **and**

4. The certificate of deposit shall be kept until the bond is released by the state geologist*[;]***.**

[5. The institution issuing the certificate(s) of deposit for bonding purposes shall give prompt notice to the state geologist and the operator of any change in name or address of the institution, and any insolvency or bankruptcy of the institution; and

6. The bond shall provide a mechanism for an institution to give prompt notice to the state geologist and the operator of any change in name or address of the institution, any action filed alleging the insolvency or bankruptcy of the institution or the operator, or alleging any violations which would result in suspension or revocation of the institution charter or license to do business. Upon the incapacity of any institution by reason of insolvency or bankruptcy, or suspension or revocation of its charter or license, the operator shall be deemed to be without bond coverage in violation of section (1). The state geologist, upon notification of the institution's bankruptcy or insolvency, or suspension or revocation of its charter or license, shall issue a notice of violation against any operator who is without bond coverage. The notice shall specify a thirty- (30-) day period to replace bond coverage. If the bond is not replaced in thirty (30) days, an order shall be issued by the state geologist requiring immediate cessation of operations. Operations shall not resume until the state geologist has determined that an acceptable bond has been posted.]

(C) *[Personal bonds secured by l]***L**etters of credit shall be subject to the following conditions:

1. The letter of credit shall be no less than the face amount of the bond and shall be irrevocable. A letter of credit used as security shall be forfeited and *[shall be]* collected by the state geologist if not replaced by other suitable bond or letter of credit at least thirty (30) days before its expiration date;

2. The beneficiary of the letter of credit shall be the state of Missouri;

3. The letter of credit shall be issued by a bank authorized to do business in the United States. If the issuing bank is located in another state, a bank located in Missouri must confirm the letter of credit. Confirmations shall be irrevocable and on a form provided by the department;

4. The letter of credit shall be governed by Missouri law. The Uniform Customs and Practice for Documentary Credits, fixed by the International Chamber of Commerce, shall not apply;

5. The letter of credit shall provide that the state geologist may draw upon the credit by making a demand for payment, accompanied by his/her statement that the operator's bond has been declared forfeited; **and**

6. The issuer of a letter of credit or confirmation shall warrant that the issuance will not constitute a violation of any statute or regulation which limits the amount of loans or other credits which can be extended to any single borrower or customer or which limits the aggregate amount of liabilities which the issuer may incur at any one (1) time from issuance of letters of credit and acceptances*[;]***.**

(D) Notification Requirements.

1. In the event the surety company becomes unable to fulfill its obligation under the bond for any reason, notice shall be given immediately to the operator and the state geologist.

*[7.]***2.** The *[bank]* **surety company or financial institution** issuing the *[letter(s) of credit]* **financial assurance instrument** for bonding purposes shall give prompt notice to the state geologist and the operator of any change in name or address of the institution, or any insolvency or bankruptcy of the *[bank]* **institution or any notice received or action filed alleging the insolvency or bankruptcy of the institution or alleging any violations of regulatory requirements which could result in suspension or revocation of the institution's license to do business***[; and]***.**

*[8.]***3.** The *[bond]* **financial assurance instrument** shall provide a mechanism for a *[bank]* **surety company or financial institution** to give *[prompt]* notice *[to the state geologist and the operator of any change in name or address of the institution, any action filed alleging the insolvency or bankruptcy of the bank or the operator, or alleging any violations which would result in suspension or revocation of the bank's charter or license to do business.]* **per paragraph 2. above.**

4. Upon the incapacity of any *[bank]* **surety company or financial institution** by reason of insolvency or bankruptcy, or suspension or revocation of its charter or license, the operator shall be deemed to be without bond coverage in violation of section (1). The state geologist, upon notification of the *[bank]* **institution**'s bankruptcy or insolvency, or suspension or revocation of its charter or license, shall issue a notice of violation against any operator who is without bond coverage. The notice shall specify a thirty- (30-) day period to replace bond coverage. If the *[bond]* **financial assurance instrument** is not replaced in thirty (30) days, an order shall be issued by the state geologist requiring immediate cessation of operations. Operations shall not resume until the state geologist has determined that an acceptable bond **secured by an approved financial assurance instrument** has been posted.

(5) Bond Release. Application for release of a bond**, and any instruments securing the bond,** shall be made by written notice to the state geologist who *[shall]* **will issue the letter of** release *[the bond]* **after plugging of the well, or after a new bond, and any instruments securing the bond, is filed by a successor and an appropriate well transfer form is submitted pursuant to 10 CSR 50-2.010(6), and** if the requirements of Chapter 259, RSMo, and implementing regulations have been met.

(6) Bond Forfeiture.

(D) The entry of an order declaring a bond forfeited shall automatically authorize the state geologist, with the assistance of the attorney general, if necessary, to take whatever actions are necessary to collect the forfeited bond and any instruments securing the bond. *[The forfeited bond shall be deposited into the Oil and Gas Remedial Fund and utilized according to 10 CSR 50-2.060(3)(F).]*

*AUTHORITY: section 259.070, RSMo [Supp. 2015] **2016**. Original rule filed Oct. 11, 1966, effective Oct. 21, 1966. For intervening history, please consult the **Code of State Regulations**. Amended: Filed June 27, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with Department of Natural Resources' Geological Survey Program attention to Kimberly Ward at PO Box 250, 111 Fairgrounds Rd., Rolla, MO 65402 or via email to kimberly.ward@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on September 13, 2018 at 5:00 p.m. A public hearing is scheduled for 10 a.m., September 6, 2018, Mozarkite Conference Room, Missouri Geological Survey, 111 Fairgrounds Road, Rolla, MO 65401.