

# **SB 4 WELL STIMULATION TREATMENT REGULATIONS**

## **INITIAL STATEMENT OF REASONS**

The Department of Conservation (Department) proposes to add sections 1751, 1761, 1780, 1781, 1782, 1783, 1783.1, 1783.2, 1783.3, 1784, 1784.1, 1785, 1786, 1787, 1788, and 1789 to California Code of Regulations, title 14, division 2, chapter 4, subchapter 2. These changes to the regulations are each necessary to implement the provisions of Senate Bill 4 (Pavley, Chapter 313, Statutes of 2013) (SB 4), and Public Resources Code section 3106.

### **INTRODUCTION**

On September 20, 2013, Governor Brown signed into law SB 4. SB 4 complements existing rules that require some of the strongest well construction and operation standards in the nation by enacting further safeguards to public health and safety and the environment regarding the practices known as well stimulation.

SB 4 requires a permit from the Division of Oil, Gas and Geothermal Resources to conduct well stimulation. The permit application must include detailed information about the fluids to be used, a ground water monitoring plan, and a water management plan. Copies of an approved permit must be sent to neighboring property owners and tenants, and water well testing must be provided upon request. SB 4 requires the Division to prepare regulations to ensure that well stimulation is done safely and to require detailed public disclosure about the well stimulation. The Division must develop an internet website to facilitate public disclosure of well stimulation information, and the website must allow the public to easily search and aggregate the information.

SB 4 requires the Division to prepare an environmental impact report, consistent with the California Environmental Quality Act, addressing the practice of well stimulation in California. Additionally, the Act requires the Natural Resources Agency to complete an independent scientific study on well stimulation treatments, and the State Water Resources Control Board to develop groundwater modeling criteria and implement ground water monitor programs.

The proposed regulations are intended to supplement the Division's current oil and gas regulatory framework with regulations specific to well stimulation to meet the mandates of SB 4. The proposed regulations satisfy the goals and requirements of SB 4 by setting requirements to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments; and by requiring full disclosure of the composition and disposition of well stimulation fluids, including hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids. The proposed regulations satisfy the goals and requirements of SB 4 by implementing express statutory requirements regarding well stimulation permits, public disclosure, neighbor notification, and water well testing. The proposed regulations address the distinction between well stimulation treatment and other routine operations; the distinction between well stimulation and underground injection projects;

and the acid concentration threshold at which an acid matrix stimulation treatment is subject to the requirements of SB 4.

## **DETAILED STATEMENT OF SPECIFIC PURPOSE AND RATIONALE**

### **1751. Single-Project Authorization.**

Public Resources Code section 3160, subdivision (d), requires operators to obtain a permit from the Division before performing a well stimulation treatment. Public Resources Code section 3203 requires operators to submit a notice of intention and obtain approval from the Division before drilling or reworking a well. Public Resources Code section 3160, subdivision (d)(2), provides that well stimulation permits and approvals of notices of intention to drill or rework wells may be approved under a single authorization if they are applied for concurrently.

The purpose of Section 1751 is to establish a procedure for requesting a single-project review and authorization for multiple well stimulation treatment permit applications or notices of intent to drill or rework a well. Operators commonly plan to conduct multiple drilling and well stimulation operations in short period of time. In those instances, consideration of each permit on an individual basis can be much less efficient than considering the group of operations as a single project.

When the Division issues a single-project authorization, it will specify what operations have been approved. If operations approved under a single-project authorization are not commenced within one year of approval then the operator must obtain a new approval for those operations. It is necessary to include this time limit because by statute both a well stimulation treatment permit and an approval of a notice of intention to drill or rework a well expire after one year.

It is necessary to establish a procedure for single-project authorization because the Division has a high volume of permits and notice of intention to evaluate. In some instances, permit evaluation will be repetitive from one operation to the next. Grouping approvals with commonalities will create efficiency for the Division, the operator, and for interested members of the public. The efficiency achieved by establishing a procedure for single-project authorization will facilitate the Division's statutory mandates under Public Resources Code section 3160, subdivision (d), and 3203 to evaluate proposals to conduct well stimulation treatments and drill or rework wells. Section 1751 will also increase openness and transparency in business and government because it will allow for a more orderly and efficient review process. All of the public notification and other requirements of SB 4 will be required as part of these approvals.

### **1761. Well Stimulation and Underground Injection Projects.**

Public Resources Code section 3160 requires the Division to establish regulations regarding well stimulation treatments and it requires a permitting process for well stimulation treatments. Public Resources Code section 3157 defines the term "well stimulation treatment," but further elaboration is necessary to make it clear whether specific types of operations do or do not meet the definition. Public Resources Code section 3157 distinguishes well stimulation treatment from routine well cleanout, well maintenance, removal of formation damage from drilling, bottom hole pressure surveys,

and other routine operations that do not affect the integrity of the well or the formation. In order to clarify this distinction, Section 1761, subdivision (a)(1), provides that a treatment that does not go more than 36 inches into the formation is not a well stimulation treatment. Thirty-six inches is typically the limit of penetration distance associated with drilling or operational damage, and it is also the limit of what the Division would consider to be routine. At the same time, for a treatment to increase the permeability of the formation, it must extend more than 36 inches into the formation. This specification is necessary to provide an unambiguous distinction between well stimulation treatment and other routine operations.

There is a further need for clear definition of the term “well stimulation treatment” because there has been confusion about the distinction between underground injection projects and well stimulation treatments. Injection projects for enhanced oil recovery, injection disposal, and underground gas storage are covered by extensive, existing regulations, found in sections 1724.6 through 1724.10. These requirements for a “subsurface injection or disposal project” do not apply to well stimulation treatments. The scope, duration, and purpose of injection projects and well stimulation treatments are substantially different, and therefore the regulatory approach to each practice is different. However, because both practices involve putting fluids into an oil or gas well, some have advocated that the Division should apply the underground injection project regulations to well stimulation treatments. Disagreement about the distinction between these two categories of operations has been the subject of litigation in state and federal courts.

The purpose of Section 1761 is to build upon the statutory definition of “well stimulation treatment” to make it as clear as possible what operations are subject to the proposed regulations and to the permitting requirements of Public Resources Code section 3160, subdivision (d). Section 1761 clearly defines the term “underground injection project” and is intended to resolve any confusion about the Division’s intention to regulate well stimulation treatments in a manner that is distinct from the way that underground injection projects are regulated.

Section 1761 is necessary to prevent confusion about which regulations apply to any given oil and gas operation. A clear definition of the term “well stimulation treatment” will facilitate the Division accomplishing its statutory mandate under Public Resources Code sections 3106 and 3160 to regulate those operations.

## **Proposed Article 4. Well Stimulation Treatments.**

### **1780. Purpose, Scope, and Applicability.**

The purpose of Section 1780 is to address various issues regarding the purpose, scope, and applicability of requirements for well stimulation treatments. The issues addressed include the acid concentration threshold at which the regulations are applicable; the points at which well stimulation treatment is considered to begin and end; and the distinction between well stimulation treatment requirements and underground injection project requirements.

Public Resource Code section 3160, subdivision (b)(1)(C), instructs the Division to establish a threshold of acid concentration below which acid matrix stimulation

treatments are not subject to the requirements for well stimulation treatments. Section 1780 specifies a concentration threshold of 7%, and acid matrix stimulation treatments at or below the concentration threshold are not subject to the requirements for well stimulation treatments.

Based on the Division's evaluation of the available information, the Division has determined that the risks posed by routine acid matrix stimulation at or below a 7% concentration are extremely low. Although these treatments may extend 30 to 50 inches out away from the wellbore and are designed to increase the permeability of the formation adjacent to the well, this process does not inject large volumes of fluid or inject fluid above the fracture gradient, and there is little risk of fluid at a concentration of less than 7% acid would migrate out of the production zone. Based upon the volume needed to treat the formation within a 50 inch radius, an acid matrix stimulation treatment at a concentration of 7% or less acid does not pose a threat to the integrity of the well. However, a higher concentration of acid increases the risk of damage to the well integrity and should be evaluated under the processes established under Public Resources Code section 3160.

While routine acid matrix stimulation treatments greater than 7% by volume occur elsewhere, literature treating the subject of risks posed by this activity may not be applicable to California's varied geologic settings, and the Division has limited data about the specifics of acid matrix stimulation in the state. Because of the lack of available data, the Division is establishing a protective concentration threshold that favors regulation of acid matrix stimulation treatments in order to fully evaluate the regulations' ability to prevent damage to life, health, property, and natural resources.

Public Resources Code section 3160, subdivision (b)(1)(C), requires the Division to evaluate the acid concentration threshold and, if needed, amend it on or before January 1, 2020. In the near future, the Division will have the benefit of a great deal of new information about well stimulation treatment in the state. This new information will be by virtue of an independent study that will be performed of risks associated with well stimulation treatments, the Division's own environmental impact report regarding potential impacts from well stimulation treatments statewide, and the Division's implementation of these proposed regulations. If this new information indicates that the 7% acid concentration threshold is inappropriate, then the Division will revise the regulation accordingly.

Section 1780 further defines the scope of the proposed regulations by establishing that the point at which a well stimulation treatment is considered to begin is when fluid is first pumped into the well, and that the treatment is assumed to end when the equipment is disconnected from the well. These points of clarification are necessary because the timeframes for certain requirements are triggered at the commencement or end of a well stimulation treatment.

Section 1780 explains that well stimulation treatments are to be governed by Article 4, and not by the requirements of existing Sections 1724.6 through 1724.10. Likewise, Section 1780 explains that Article 4 does not apply to underground injection projects. Because of the commonalities between well stimulation treatments and underground injection projects, it is necessary to be as clear as possible in distinguishing the two types of operations.

Each of the provisions of Section 1780 establish necessary parameters for the requirements of the proposed regulations, and these parameters facilitate the Division accomplishing its statutory mandate under Public Resources Code sections 3106 and 3160 to regulate well stimulation treatments. Section 1780, together with proposed Section 1761, will provide clarity as to what operations are or are not subject to the requirements of Article 4.

#### **1781. Definitions.**

A number of the key terms found in Article 4 require definition because they are used to convey a specific meaning, are subject to more than one interpretation, or are technical terms that are not commonly known. The purpose of Section 1781 is to define each of these key terms, which are usually included without modification to support consistent interpretation of the regulations.

The terms “acid well stimulation treatment,” “acid matrix stimulation treatment,” “additive,” “base fluid,” “flowback fluid,” “hydraulic fracturing,” “proppants,” “surface property owner,” and “well stimulation treatment fluid” are each defined by statute in Public Resources Code section 3150 through 3159. The definitions provided for these terms in proposed Section 1781 are essentially identical to the statutory definitions. It is necessary to add these definitions to make it clear that the statutory definitions are operative in Article 4.

The terms “acid stimulation treatment fluid” and “hydraulic fracturing fluid” are both used in the statutory definition of “well stimulation treatment fluid.” Although the two terms are not themselves used in Article 4, it is necessary to define them to make clear the meaning of “well stimulation treatment fluid.”

The term “Chemical Disclosure Registry” is defined to be short-hand reference to the internet website to be used for public disclosure of information relating to well stimulation treatments. Until the Division has completed its own website, the site to be used for public disclosure is FracFocus.org. This short-hand term is necessary because restating this explanation in each relevant part of the regulations would be confusing and inefficient.

The term “Regional Water Board” is defined to be a short-hand reference to the Regional Water Quality Control Board with jurisdiction over the location of a well that will have or has had a well stimulation treatment.

The term “protected water” is used in Article 4 to reference groundwater of particular concern in the context of the regulation of well stimulation treatments. In order to be consistent with the definition of an “underground source of drinking water” under the U.S. Safe Drinking Water Act, the term “protected water” is defined as water outside of a hydrocarbon zone that contains no more than 10,000 mg/l total dissolved solids.

Section 1781 is necessary to avoid ambiguity and ensure that those who are subject to the requirements of Article 4 are able to understand and interpret the regulation correctly.

### **1782. General Well Stimulation Treatment Requirements.**

The purpose of Section 1782 is to establish a set of governing principles under which all well stimulation treatments must be conducted. The stated principles are as follows:

- Casing is sufficiently cemented or otherwise anchored in the hole in order to effectively control the well at all times;
- Geologic and hydrologic isolation of the oil and gas formation are maintained during and following the well stimulation treatment;
- All potentially productive zones, zones capable of over pressurizing the surface casing annulus, or corrosive zones be isolated and sealed off to the extent that such isolation is necessary to prevent vertical migration of fluids or gases behind the casing;
- All well stimulation treatment fluids are directed into the zone(s) of interest;
- The wellbore's mechanical integrity is tested and maintained;
- The well stimulation treat fluids used are of known quantity and description for reporting and disclosure as required pursuant to this Article;
- The well stimulation treatment fluid is not of a concentration level that will damage the well casing, tubing, cement, or other well equipment, or would otherwise cause degradation of the well's mechanical integrity during the treatment process; and
- The operator shall follow the intent of all applicable well construction requirements, use good engineering practices, and employ best industry standards.

Each of the principles stated in Section 1782 are in furtherance of the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. Each of the principles stated in Section 1782 are also in furtherance of the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), to establish regulations ensuring integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments.

### **1783. Application for Permit to Perform Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (d), requires operators to obtain a permit from the Division before performing a well stimulation treatment. The purpose of Section 1783 is to reiterate the statutory permit requirement and affirm that well stimulation treatments must be performed in accordance with the conditions of the permit.. In addition, Section 1783 establishes certain procedures to facilitate the implementation of the statutory permitting requirement.

One of the procedures is that operators will submit the information supporting a permit application to the Division in a digital format. The Division will develop an interactive electronic form for submitting all of the permit application information to the Division by email. Eventually, the Division will streamline this process by developing an

interactive website for submission of the information. Processing the applications for well stimulation treatment permits represents a significant workload for the Division and electronic submission are necessary to mitigate the fiscal impact of the statutory permitting requirement. Requiring submission in an electronic format will result in an increase in openness and transparency in business and government because it will be easier for the Division to make the submissions available to the public.

The other procedure established in Section 1783 addresses the operator's notice to the Division immediately before performing a well stimulation treatment. Public Resources Code section 3160, subdivision (d)(9), requires operators to notify the Division at least 72 hours prior to the actual start of the well stimulation treatment so that Division staff can witness the treatment. In addition to this, Section 1783 requires operators to confirm with the Division three hours before it is to be done. This requirement is necessary to avoid Division staff driving to a well site to witness an operation that does not occur as scheduled.

#### **1783.1. Contents of Application for Permit to Perform Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (d), requires operators to obtain a permit from the Division in advance of performing a well stimulation treatment. The statute also specifies minimum contents of an application for a well stimulation treatment permit, which include:

- Identification and location of the well;
- The time period during which the well stimulation treatment is planned to occur;
- A water management plan;
- A list of the anticipated identity and concentration of the chemical constituents of the well stimulation treatment fluids the operator plans to use;
- Modeling of the well stimulation treatment and identification of plugged and abandoned wells within the modeled treatment area;
- A groundwater monitoring plan meeting the criteria of the Regional Water Quality Control Board; and
- An estimate of treatment-generated waste materials that are not addressed in the water management plan.

The purpose of Section 1783.1 is to implement the statutory permitting requirement of Public Resources Code section 3160, subdivision (d). Section 1783.1 reiterates the statutory requirements for a well stimulation treatment permit application, with some non-substantive revisions for the sake of clarity. In addition to the permit application requirements specified in Public Resources Code section 3160, subdivision (d), Section 1783.1 requires that the well stimulation treatment permit application includes:

- Identification and contact information of the operator;
- Depth of the base of fresh water; and
- The results of the evaluation and modeling required under Section 1784.

Section 1783.1 is necessary to clarify the statutory permitting requirements of Public Resources Code section 3160, subdivision (d) and to ensure that the Division all has the information that it needs to evaluate the well stimulation treatment permit application, including the quantifiable risk of the well stimulation treatment.

Because the evaluations required under Section 1784 are included in the permit application requirements, Section 1783.1 furthers the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), of ensuring integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. Effective implementation of the statutory permitting requirement will further the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources because it will ensure that the Division has an opportunity to evaluate whether there are risks associated with a well stimulation treatment before it occurs.

**1783.2. Copy of Well Stimulation Permit; Notice of Availability for Water Testing, Sampling.**

**1783.3. Duty to Hire Independent Third Party to Provide Copy of Permit, Notice of Water Testing, Sampling.**

Public Resources Code section 3160, subdivision (d), requires operators to hire an independent entity to provide notification to every tenant and owner of neighboring property within 1500 feet of the wellhead or 500 feet of the surface representation of a well that will have a well stimulation treatment performed on it. The statute requires operators to provide neighbor notification at least 30 days prior to commencing the well stimulation treatment and notified property owners may request water quality testing at the operator's expense. Public Resources Code section 3160, subdivision (b)(1)(B) expressly requires the Division to adopt regulations implementing the statutory neighbor notification requirement.

The purpose of Sections 1783.2 and 1783.3 is to establish clear procedures to implement the neighbor notification requirement of Public Resources Code section 3160, subdivision (d). Section 1783.2 reiterates the statutory neighbor notification requirement, specifies the required content of the notice, and defines the key terms "tenant" and "horizontal projection." Section 1783.3 clarifies the respective responsibilities of the operator and the independent entity hired to provide the neighbor notification, and lists the information the independent entity must provide to the Division about the notifications performed. Section 1783.3 provides that information about the availability of water quality testing may be included in the notification or the notification may reference a website with further information about testing options.

The provisions of Sections 1783.2 and 1783.3 are each necessary to avoid confusion on the part of operators or the independent entities hired about how to comply with the neighbor notification requirements of Public Resources Code section 3160, subdivision (d). The statutory neighbor notification requirement will ensure that people living in the vicinity have an opportunity to raise questions and concerns with the Division and the operator before a well stimulation treatment occurs, and Sections



1783.2 and 1783.3 will accomplish the Division's goal under Public Resources Code section 3160, subdivision (b) to implement the requirement.

#### **1784. Evaluation Prior to Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (b), requires the Division to adopt regulations to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. The purpose of Section 1784 is to specify the evaluation that an operator must do prior to performing a well stimulation treatment in order to demonstrate that the well is competent to withstand the well stimulation treatment well. The evaluation and planning required by Section 1784 includes evaluation of the cement in the well, a well stimulation treatment radius analysis to determine if there are potential conduits for fluids to escape from the hydrocarbon zone, and a treatment design that ensures that geologic and hydrologic isolation will be maintained.

The required cement evaluation must demonstrate that the cement outside of the production casing is competent to ensure geologic and hydrologic isolation during and following well stimulation treatment. Although the default cement evaluation method is a cement evaluation log, Section 1784(a)(1) is intended to be a performance-based requirement. Another cement evaluation method may be used if it is capable of demonstrating the adequacy of the cement. If adequate cement cannot be demonstrated, then the operator must develop a plan for remediating the cement before a well stimulation treatment is performed. Cement evaluation cannot be done within 48 hours of placing cement because cement must be allowed to dry before it can be effectively evaluated.

If the well has cement in place beyond what is required under the applicable well construction regulation, then the operator is not required to evaluate the additional cement. The cement evaluation may be waived entirely if the Division is satisfied that past experience with drilling and production in the area has proven that the method of well construction and cementing employed will ensure that there will be no voids in the annular space of the well.

The well stimulation treatment radius analysis must demonstrate that there is no potential conduit for fluid to migrate out of the hydrocarbon zone where the well stimulation treatment will occur. Based on modeling approved by the Division, the operator is required to review the area of twice the anticipated well treatment length to verify that there is no well or fault in that area that could act as a conduit for fluid to contaminate protected water. If the area of five times the anticipated well treatment length extends beyond the hydrocarbon zone where the well stimulation treatment will occur, then the operator must also demonstrate that the adjacent geological formations will contain the well stimulation treatment. A safety factor of two is used for the analysis of potential conduits within the treatment area because it provides an ample margin of error without requiring a review that extends well beyond the area influenced by the well stimulation treatment. A safety factor of five that is used for determining whether adjacent formations must be evaluated because it will ensure that adjacent formations are evaluated for all but the most contained well stimulation treatments, effectively ensuring geologic and hydrologic isolation.

In addition to the cement evaluation and well stimulation treatment radius analysis, Section 1784(a)(3) requires that the operator prepare a well stimulation treatment design demonstrating the evaluations required by Section 1784 have been completed and that the findings have been synthesized and employed.

Section 1784 is necessary to ensure that due precautions are taken to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. It is standard practice to thoroughly evaluate a well and to design well stimulation treatments so as to prevent damage to the well or escape of fluids from the hydrocarbon zone. However, these best practices are not specified in regulation.

The requirements of Section 1784 further the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), of ensuring integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. They also further the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. Performing a well stimulation treatment on a well without verifying adequate cement and the absence of potential conduit would present risks of contamination of groundwater and loss of hydrocarbon resources. Section 1784 will have the additional benefit of increasing openness and transparency in business and government because it will result in a record of pre-well stimulation treatment evaluations that can be reviewed by other public agencies and by interested members of the public.

#### **1784.1. Pressure Testing Prior to Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (b), requires the Division to adopt regulations to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. The purpose of Section 1784.1 is to require operators to pressure test the well, and the equipment to be used for hydraulic fracturing, prior to commencing a well stimulation treatment. Pressure testing must be performed to a pressure equal to 125% of the pressure anticipated during the well stimulation treatment. If there is a pressure drop of 10% or more then the casing or tubing cannot be used unless the problem is corrected and there has been a successful pressure test. Pressure testing must be done no more than 24 hours prior to well stimulation so as to ensure that the well is in the same condition during well stimulation treatment as it was when it was tested. The operator must give the Division at least 24-hours notice before pressure testing so that the Division will have an opportunity to witness the testing.

Pressure testing is a basic and essential precaution to determine the integrity of a well or equipment during hydraulic fracturing. It is necessary to require pressure testing of the well because pressure testing is an effective way to establish that a well is competent to withstand the pressure used during the well stimulation treatment. Likewise, pressure testing of the surface equipment is an effective way to establish that the equipment will not fail under the pressures used in the well stimulation treatment. Pressure testing to 125% of the anticipated pressure during the treatment provides an

appropriate safety margin and is consistent with the established best practices within the industry.

Although the Division believes that pressure testing in advance of hydraulic fracturing is a best practice that is universally employed, it is necessary to expressly require pressure testing so that the Division can verify and enforce the practice. It is necessary that the Division is provided an opportunity to witness pressure testing because first-hand observation is the only way to verify that pressure testing is done properly.

The pressure testing requirements of Section 1784.1 further the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. They also further the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. Performing a well stimulation treatment on a well that is not competent to withstand the pressure involved could cause a breach in the well that could result in contamination of groundwater, health and safety risks for workers, or loss of hydrocarbon resources.

#### **1785. Monitoring During Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (b), requires the Division to adopt regulations to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. The purpose of Section 1785 is to require the operator to monitor during well stimulation treatment for indications that a well breach may have occurred or that fluid is not confined to the intended zone, and to require appropriate diagnostics and response if there is such an indicator. The further purpose of Section 1785 is to specify the information that must be provided to the Division, and to the local Regional Water Quality Control Board, if diagnostics indicate that a well breach has occurred during a well stimulation treatment.

Section 1785 requires the operator to monitor the surface injection pressure, the slurry rate, the proppant concentration, the fluid rate, and the pressure of each annuli of the well. Section 1785(b) specifies two thresholds at which the operator must terminate the well stimulation treatment, report the incident to the Division, and conduct diagnostics. The two specific thresholds are an unexpected pressure change of 20% or greater and the occurrence of a pressure in excess of 90% of the API rated minimum internal yield of a casing string in communication with the hydraulic fracture treatment. For wells that do not have the surface casing annulus open to atmospheric pressure, Section 1785 requires a gauge and pressure relief device, and specifies maximum pressure relief settings. Each of the thresholds specified in Section 1785 is based upon established best practices and precautionary principles of the industry.

Regardless of whether one of the specified monitoring thresholds is surpassed, if the operator has any indication of well breach or a breach of isolation of protected water, then the operator must terminate the well stimulation treatment, report the incident to the Division, and conduct diagnostics. Although circumstances with the well

may prevent the operator from conducting diagnostics immediately, the diagnostics must be done as soon as possible. The Division must be notified when diagnostics are conducted so that Division staff has an opportunity to witness the diagnostics. If diagnostics indicate that a well breach did occur during well stimulation treatment, then the operator must immediately shut-in the well and isolate the perforated interval. In addition, the operator must provide essential information about the event to the Division and the local Regional Water Quality Control Board to facilitate incident response. The information that the operator must provide includes a description of events leading up to the well breach, an exact description of the chemical composition of the fluids in the well at the time of the well breach, an estimate of the volume of fluid lost during the well breach, and available data about the protected water closest to the well breach.

Section 1785 is necessary to ensure that due precautions are taken to protect groundwater. It is standard practice to carefully monitor the pressures, rates, and concentrations occurring during a well stimulation treatment, but these best practices are not specified in regulation and therefore are not expressly required. If a well breach does occur during hydraulic fracturing, then it is necessary for the Division and the Regional Water Quality Control Board to be involved and well-apprised of the situation so that so as to ensure that the situation is effectively addressed to prevent and mitigate any contamination of groundwater or loss of hydrocarbon resources. The information required under Section 1785 is crucial to determining the most effective approach to evaluating, monitoring, and arresting the risk of contamination of groundwater when responding to a well breach during a well stimulation treatment.

Section 1785 furthers the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. It also furthers the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. The requirements of Section 1785 will standardize diagnostic testing and reporting on a well that has been breached during well stimulation treatment, and ensure that the Division and the Regional Water Quality Control Board have an opportunity to verify and direct response to well breach situations. The information that an operator is required to report under Section 1785 will increase openness and transparency in business and government because it will result in a detailed public record of each incident.

#### **1786. Storage and Handling of Well Stimulation Treatment Fluids.**

The purpose of Section 1786 is to ensure proper storage and handling, including appropriate spill response, for fluids associated with well stimulation treatment. Section 1786 clarifies that for facilities associated with well stimulation treatment operators must adhere to existing production facilities maintenance requirements and that well stimulation treatment fluids must be accounted for in an operator's Spill Contingency Plan. The applicability of existing secondary containment requirements to well stimulation treatment facilities is clarified, with the provision that secondary containment is not required for portable or temporary production facilities. The operator must also comply with all applicable requirements of other state agencies, including evaluation of

wastes fluids to determine if they meet the Department of Toxic Substance Control's definition of hazardous waste. In addition, Section 1786 expressly requires fluids associated with well stimulation treatment to be stored in containers and not in sumps or pits.

Section 1786 clarifies that the operator must comply with all federal, state, and local requirements for spill reporting and remediation applicable to the fluids and chemicals associated with well stimulation treatment. In addition, if a spill occurs, subsection (b), item (6), requires the operator to submit a corrective action plan to the Division explaining what went wrong and what steps have been taken to ensure that it does not happen again.

Each of the provisions of Section 1786 is necessary to ensure proper storage and handling of fluids associated with well stimulation treatment. There is widespread public concern that environmental contamination and other health and safety impacts will result from improper handling of fluids associated with hydraulic fracturing. Expressly stating that existing laws and regulations regarding storage and handling of fluids apply in the context of well stimulation treatment in order will assure concerned members of the public of this fact and dispel any confusion that may exist for operators. Expressly requiring compliance with other federal, state, and local laws and regulations also allows the Division to intervene and take independent enforcement action should an operator disregard requirements administered by other regulatory agencies. It is necessary to require the use of containers for storage of fluids associated with well stimulation treatment because that is the most effective way to prevent the fluids from contaminating air, soil, or water, or otherwise posing a health and safety risk.

Section 1786 furthers the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources by ensuring that fluids are handled with all due care and that spills and incidents are responded to effectively and proactively. In doing so, these requirements will benefit public health and safety, worker safety, and the environment.

#### **1787. Well Monitoring After Well Stimulation Treatment.**

Public Resources Code section 3160, subdivision (b), requires the Division to adopt regulations to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. The purpose of Section 1787 is to require ongoing monitoring of a well that has had a well stimulation treatment and to specify minimum standards for that monitoring. Once a well has had a well stimulation treatment, the operator has an ongoing obligation to monitor the well for any indication of a well breach and, if there is such indication, immediately inform the Division and the local Regional Water Quality Control Board, conduct diagnostics, and take all appropriate measures to prevent contamination of protected water or loss of hydrocarbon resources.

Required monitoring for a well that has had a well stimulation treatment includes monitoring of production pressures and monitoring the oil, gas, and water produced from the well, including the readily identifiable volume of well stimulation treatment fluid flowback. This monitoring must occur at least once every two day for the first thirty days

and monthly after that, except that monitoring of the well output may be stopped once the operator has seen a 95% reduction in the amount of well stimulation treatment fluid in the produced fluid. This information is necessary because it provides possible indicators of a well failure, a lack of geologic confinement, or that the well stimulation treatment did not occur according to design, each of which could result in contamination of groundwater and loss of hydrocarbon resources.

Section 1787 establishes standards and thresholds for monitoring annular pressures of a well that has been hydraulically fractured. Operators must report annular pressures to the Division on an annual basis, but must immediately inform the Division if annular pressure exceeds 70% of the API rated minimum internal yield or collapse strength of casing, or if surface casing pressures exceed a pressure equal to: 0.70 times 0.433 times the true vertical depth of the surface casing shoe (expressed in feet). These thresholds are consistent with established industry norms and precautionary principles. For monitoring purposes, the annular valve must be kept accessible at the surface, unless the Division is satisfied that there are no voids in the annular space of the well. A pressure release device is required for the annulus and the maximum set pressure is specified. The Division may waive the requirement of a pressure release device if satisfied that the need for one is alleviated by other forms of technical analysis and or by operating experience in the area. Monitoring of annular pressures is necessary because breakdown of the annulus of a well is potentially an indication of a mechanical failure of the well, which could result in contamination of groundwater and loss of hydrocarbon resources.

Section 1787 furthers the Division's statutory mandate under Public Resources Code section 3160, subdivision (b), to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments. It also furthers the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. Careful monitoring of a well after a well stimulation treatment provides assurance that the well has not been compromised and that there is geologic and hydrologic isolation of the formation following the well stimulation.

#### **1788. Required Public Disclosures.**

Public Resources Code section 3160, subdivision (b), requires the Division to adopt regulations requiring full disclosure of the composition and disposition of well stimulation fluids, including, but not limited to, hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids. The statute provides detailed specification of the disclosure that the regulations must, at a minimum, require. Public Resources Code section 3160, subdivision (g), requires operators to publicly disclose this information on a website to be developed by the Division for the purpose. Until the Division's public disclosure website is complete, the Division may direct operators to disclose the information on a website that already serves that purpose.

The purpose of Section 1788 is to implement the public disclosure requirements mandated by Public Resources Code section 3160, subdivision (b). Section 1788 reiterates the disclosures specified in the statute, with some non-substantive revisions

for the sake of clarity. In addition to the information specified in Public Resources Code section 3160, subdivision (b), Section 1788 requires the public disclosure to include:

- The identity of the operator;
- The identity, location, and depth of the well;
- The description of the productive horizon where well stimulation treatment occurred; and
- An estimate of the well stimulation treatment fluid that has been recovered.

These additional disclosures are necessary to meaningful disclosure of the composition and disposition of well stimulation fluids. The Division has specified the website that operators must use to comply with Section 1788 in the definition of the term “Chemical Disclosure Registry.”

If any of the information required under Section 1788 is subject to a claim of trade secret protection, then the person asserting trade secret protection must follow the procedure laid out in Public Resources Code section 3160, subdivision (j), for asserting and substantiating a claim of trade secret protection. With the exception of basic identifying information about the well, an operator is not required to publicly disclose information that is part of well records that have been found to be confidential under Public Resources Code section 3234. These provisions are necessary to ensure that the public disclosure requirements in regulation are not inconsistent with the statutory protections for confidential well records and trade secret information.

If the public disclosure website is for any reason unable to receive information required under Section 1788, then the operator shall provide the information directly to the Division. Groundwater quality data reported under Section 1788 must also be submitted to the Regional Water Quality Control Board in an electronic format that is compatible with its water quality database. These requirements are necessary to ensure that, regardless of the status of the functionality of the public disclosure website, all of the required disclosure information is readily available to the Division and the Regional Water Quality Control Board.

Section 1788 accomplishes the statutory goal of adopting regulations requiring full disclosure of the composition and disposition of well stimulation fluids, including, but not limited to, hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids. Section 1788 has the further benefit of increasing openness and transparency in business and government because the public will have easy access to comprehensive information regarding individual well stimulation treatments that have occurred statewide. The reporting required under Section 1788 is necessary for the health, safety, and welfare of the people of the state because the availability of complete information about well stimulation treatments will facilitate evaluation of the safety and efficacy of well stimulation treatment.

#### **1789. Post-Well Stimulation Treatment Report.**

The purpose of Section 1789 is to make sure that, in addition to the preliminary information required in other parts of the regulations, the Division also receives a report from the operator detailing what happened during the well stimulation treatment. Within sixty days after a well stimulation treatment, the operator is required to report to the

Division on what the results were, what pressures were encountered, and how the operations differed from what was anticipated in the treatment design. In addition, the operator is required to review data available from the U.S. Geological Survey and indicate to the Division if there have been any earthquakes of magnitude 2.0 or greater in the area of the well stimulation treatment. Consistently with the timeframe for compliance with the public disclosure requirements, the post-well stimulation treatment report must be submitted within 60 days after cessation of the well stimulation treatment.

The post-well stimulation treatment report required by Section 1789 is necessary to a complete record and understanding of well stimulation treatments. This report will assist the Division in verifying that operations were conducted in accordance with the laws and regulations governing the process and it will allow the Division to evaluate whether the approach to modeling and designing well stimulation treatment is proving accurate. The post-well stimulation treatment report will assist the Division in developing a basic dataset for identifying correlation between hydraulic fracturing and seismicity.

The post-well stimulation treatment report is necessary for the health, safety, and welfare of the people of the state because the Division must have complete information about the well stimulation treatments to effectively evaluate their safety and efficacy. For the same reason Section 1789 furthers the Division's statutory mandate under Public Resources Code section 3106 to supervise oil and gas production so as to prevent, as far as possible, damage to life, health, property, and natural resources. Because this information will also be available for public inspection, Section 1785 will increase openness and transparency in business and government by providing additional information about well stimulation treatment operations that have occurred.

## **ALTERNATIVES CONSIDERED**

During the summer of 2012 the Department conducted a statewide listening tour to better understand public concerns about hydraulic fracturing. In December 2012, the Department released an initial set of draft regulations for discussion purposes and, during spring of 2013, the Department conducted a statewide series of day-long public workshops to solicit input on the draft regulations. Throughout this process, the Department has been meeting and discussing this area of regulation with the regulated industry, other public agencies, environmental groups, concerned members of the public, and members of the Legislature.

With the passage of SB 4, the Department has built upon this work to ensure that the proposed regulations accomplish each of the express rulemaking mandates of the new legislation. In particular, the scope of the Department's regulations has been expanded so that they address not only hydraulic fracturing, but other forms of well stimulation treatment as well.

In the course of developing the proposed regulations, the Department considered and rejected various alternative approaches. No alternative considered by the Department would be more effective in carrying out the purposes of the proposed regulations or would be as effective but less burdensome to affected private persons than the proposed regulation.



- The Department considered but rejected requiring a radial cement evaluation log as part of the evaluation for every well stimulation treatment. The Department determined that the purposes of the regulation could be achieved without prescribing a specific technology. Although a radial cement evaluation log is an effective method for determining the adequacy of cement in the well, other equally effective technologies are available. In addition, where there is extensive geologic knowledge of area from past experience drilling and constructing wells, the adequacy of cement can be demonstrated through adherence to well construction techniques that have been proven to be successful in that area.

- The Department considered but rejected various alternative approaches to well monitoring after well stimulation treatment, some requiring less monitoring and some requiring more. Well monitoring after a well stimulation is the most effective way to verify continuing well integrity and geologic and hydrologic isolation. At the same time, such monitoring requires an investment by operators in new equipment and additional staff time. The proposed regulations require a minimum level of well monitoring that will effectively verify well integrity and geologic and hydrologic isolation. In addition to the well monitoring required under the proposed regulations, Public Resources Code section 3160, subdivision (d), requires operators to have a groundwater monitoring plan for a well subject to a well stimulation treatment.

- The Department considered but rejected requiring operators to employ micro-seismic monitoring equipment during hydraulic fracture treatments. Although micro-seismic monitoring equipment may be used in the course of doing the modeling required under the proposed regulations, prescribing the use of this technology is not necessary to achieve the purposes of these regulations. Especially in established fields where there is knowledge of the geology, micro-seismic monitoring equipment may have already been used, and other technologies and modeling techniques can be used instead of or in addition to micro-seismic monitoring to achieve the results.

- The Department considered but rejected both lesser and greater safety factors for the well stimulation treatment radius analysis. A safety factor of two is used for the analysis of potential conduits within the treatment area. This provides an ample margin of error without requiring a review that extends well beyond the area influenced by the well stimulation treatment. A safety factor of five that is used for determining whether adjacent formations must be evaluated. This large safety factor will ensure that adjacent formations are evaluated for all but the most contained well stimulation treatments, effectively ensuring geologic and hydrologic isolation.

- The Department considered but rejected allowing fluids associated with well stimulation treatment to be stored in lined pits or sumps. This alternative would not have been as effective because it is difficult to verify the efficacy of the lining in a pit or sump, and because fluids stored in sumps or pits are more exposed to the environment.

## **ECONOMIC IMPACTS**

The Department has made an initial determination that the adoption of these regulations may have a significant, statewide adverse economic impact directly affecting business, including the ability of California business to compete with businesses in other states. The Department's Economic Impact Analysis for the proposed regulations

anticipates that there will be significant initial and ongoing costs associated with the requirements for cement evaluation; well stimulation treatment radius analysis; pressure testing prior to well stimulation treatment; storage and handling of well stimulation fluids, including storage of fluids in contained systems; and monitoring after well stimulation treatment. As discussed above, each of these requirements is necessary to accomplish the statutory goals of Public Resources Code sections 3106 and 3160. No alternative considered by the Department would be more effective in carrying out the purposes of the proposed regulations or would be as effective but less burdensome to affected private persons than the proposed regulation.

Given the economic context of well stimulation treatments, the added economic impacts associated with complying with the proposed regulations will not deter operators from performing future well stimulation treatments. For these reasons, the Department has made the following determinations:

- The proposed regulations will not affect the creation or elimination of jobs within the State of California.
- The proposed regulations will not affect the creation of new businesses or the elimination of existing businesses with the State of California.
- The proposed regulations will not affect the expansion of businesses currently doing business in the State of California.
- The proposed regulations will not affect the ability of businesses within California to compete with businesses in other States.

The proposed regulations satisfy the Division's statutory mandate to prevent damage to life, health, property, and natural resources by ensuring that wells are properly drilled, operated, repaired, and plugged and abandoned; and to allow, with Division approval and oversight, the oil and gas industry to utilize all methods and practices known to the oil industry for the purpose of increasing the ultimate recovery of underground hydrocarbons. Also, the proposed regulations satisfy the statutory goals of SB 4 by addressing the well stimulation permit application process, acid concentration thresholds, construction of wells and well casings to ensure integrity of wells, well casings, and the geologic and hydrologic isolation of the oil and gas formation during and following well stimulation treatments, and full disclosure of the composition and disposition of well stimulation fluids, including hydraulic fracturing fluids, acid well stimulation fluids, and flowback fluids, and the distinction between well stimulation and underground injection projects. Further, the Department has determined that the proposed regulations will result in nonmonetary benefits such as protection of public health and safety, worker safety, environmental safety, and transparency in business and government. Specifically, the benefits are as follows:

- Clarity for the Division, operators, and the public regarding which set of regulations oversee a specified oil and gas operation.
- A better informed public that will know when and where well stimulation is occurring, and be able to obtain information specific to a completed well stimulation treatment.

- The Division will receive comprehensive information regarding the integrity of a well, information regarding the integrity of wells near a well stimulation treatment, and geologic information regarding the area around the well prior to a well stimulation treatment, which will result in assurances that well stimulation will be completed safely.
- Operators will be provided with clear directives regarding when to terminate a well stimulation treatment, how to respond in the case of a well failure, and what information must be collected to ensure that future well failures are preventable.
- Assurances that all well stimulation fluids will be handled safely and that spills and incidents will be responded to effectively and proactively.

## DOCUMENTS RELIED UPON

The Department relied upon the following documents in proposing this rulemaking action:

- The Department's Economic Impact Analysis and STD 399 for the proposed regulations
- API Technical Report 10TR1, Cement Sheath Evaluation, Second Edition, September 2008.
- Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon Dioxide, API Recommended Practice 1110, 5th Ed., June 2007.
- Model Regulatory Framework for Hydraulic Fractured Hydrocarbon Production Wells, Environmental Defense Fund (EDF) and Southwestern Energy, Deliberative Draft of December 2, 2010.
- Economides, M.J., and K.G. Nolte, eds 2000. *Reservoir Stimulation*. 3<sup>rd</sup> ed. Houston: Schlumberger Educational Services.
- Grubb, W.E. and F.G. Martin, 1963. *A Guide to Chemical Well Treatments*. Petrol. Eng. Reprint Series.
- Guerard, B., 1984. *Evaluation and Surveillance of Water Injection Projects*. Pub. No. M13. California Department of Conservation Division of Oil and Gas.
- Harris, O.E., Hendrickson, A.R., and Coulter, A.W., 1966. *High-Concentration Hydrochloric Acid Aids Stimulation Results in Carbonate Formations*. J Petrol Technol, Vol. 18, No. 10. Pg 1291-1296.
- Kaabi, A.A., "Stimulate the Flow." 2003. *Middle East & Asia Review*, Vol. 4.
- King, G.E., 1986. *Acidizing Concepts – Matrix vs. Fracture Acidizing*. J Petrol Technol, Vol. 38, No. 5. Pg 507-508.