Department of Conservation

REQUIREMENTS FOR IDLE WELL TESTING AND MANAGEMENT

Standardized Regulatory Impact Assessment (SRIA)

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Executive Summary

The proposed idle well testing and management regulations proposed by the Department of Conservation (Department), Division of Oil, Gas, and Geothermal Resources (Division) are intended to reduce the risks that are associated with idle wells in the State of California. Proactive testing and monitoring of idle wells will help both operators and the Division identify problems early and limit the risks that an idle well may pose to the environment. Idle wells can develop a number of issues over time due to aging or changes in the natural environment, such as corrosion or subsidence-induced cracking or shearing. Current regulations only require a fluid level test once every five years.[1] No mechanical integrity testing is required unless specifically ordered by the Division to prevent damage to life, health, property, and natural resources.[2] Long-term wells have a particularly high risk profile because they have not been used or evaluated, in many cases, for well over a decade or more.

The proposed regulations also provide incentives for operators to plug and abandon idle wells that have been idle for 15 or more years or are not viable to return to use. Every year since 2000, the number of idle wells in the State has remained steady, oscillating between 19,000 to 23,000 idle wells even as oil prices fluctuated. In addition to being potential conduits for contamination, idle wells are a potentially significant liability to the State[3]. As wells are deserted by insolvent operators over time, the State may need to properly plug and abandon those wells that become hazards to life, health, safety, natural resources and water quality. Addressing the liability associated with deserted oil and gas infrastructure is a problem faced by many oil and gas producing states and provinces.[4]

The proposed regulation also addresses the State's observation wells by requiring testing for these wells.

Using estimated costs provided by the oil and gas industry in response to a survey conducted by the Department, the proposed regulations are conservatively estimated to increase annual industry costs in the first four years, anywhere from $195-270 million, before dropping to $148 million in Year 5 and $162 million in Year 6 (see Table 1).

Table 1. Estimated Direct Costs of Proposed Regulations

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total	**$249,112,027**	**$269,616,330**	**$261,634,839**	**$195,376,319**	**$148,473,444**	**$162,130,192**

[1] California Code of Regulations, Title 14, Section 1723.9.
[2] Public Resources Code section 3224.
[3] Dan Frosch and Russell Gold, *How 'Orphan' Wells Leave States Holding the Cleanup Bag*, Wall Street Journal, Feb. 25, 2015. <https://www.wsj.com/articles/how-orphan-wells-leave-states-holding-the-cleanup-bag-1424921403>
[4] Ho, Jacqueline, Alan Krupnick, Katrina McLaughlin, Clayton Munnings, and Jhih-Shyang Shih, *Resources for the Future, Plugging the Gaps in Inactive Well Policy: Summary of Key Findings,* 2016. <http://www.rff.org/files/document/file/RFF-Rpt-PluggingInactiveWells_ExecutiveSummary_1.pdf>

Most of the State's idle wells are owned by large operators (12 operators own 72 percent of the State's idle wells). The proposed regulations will require operators to divert spending from other priorities such as profits and dividends, research, and project development to cover the additional costs imposed by new testing, plugging and abandonment, and other elements of the regulations. Not only are the proposed regulations likely to reduce operators' profit margins in the short-term, they may delay investments in new production to some extent. Despite these new compliance costs, the Division expects these operators with the largest inventories of idle well and thus the largest cost exposure to the new regulatory requirements to be able to absorb the costs.

Oil and gas operators have shown profitability even when crude oil prices and natural gas prices are low, demonstrating resilience in this volatile marketplace. In 2018 alone, prices for California crude have oscillated from just over $30 per barrel to over $70 dollar per barrel. This kind of price swing represents changes in potential gross revenue in the tens of billions of dollars on a statewide basis. On the other hand, small operators, or operators that generate less than $15 million each in estimated gross revenue in 2017, could experience financial difficulty in complying with the proposed regulations, particularly if oil prices decline significantly while the oil and gas industry adapts to proposed underground injection control regulations, which are the subject of a separate regulatory package. For those operators who would already be experiencing financial hardship resulting from low oil prices, additional regulatory costs may, in some cases, drive them out of the business. With the combination of lower profit margins and the possible exit of some small operators from the industry, California could experience a slight reduction in oil and gas production. However, given that California's oil production has been on the decline since 1985 and experienced one of the largest year-to-year drops in oil production in 2017, it would be difficult to say with certainty what, if any, fraction of the decline in production would be attributable to compliance costs associated with this regulation.

Because oil and natural gas prices are largely based on variables dictated on the global market, individual operators cannot pass the costs of compliance on to the refineries.[5] [6] According to the California Energy Commission, California refineries already import nearly 70 percent of crude oil from out-of-state sources. Refineries will continue to purchase oil from outside of the State if in-state production is not adequate, a trend that has been increasing since 1999 (see Direct Cost Impact sections of this report on Typical Businesses, Small Businesses, and Individuals). The public at-large will not experience higher prices for petroleum products because of regulations affecting oil and gas producers. However, if the stock prices of publicly traded oil and gas companies are negatively impacted by the proposed regulations, then these operators could experience difficulty raising capital and individuals may see lower dividends and lower capital gains.

The direct spending is anticipated to amplify the economic impacts in the State of California with an increase in gross output, employment, earnings, and value added (see Table 2). Most of the positive economic impacts will affect the service contractors that provide the required testing and plugging and

[5] US Energy Information Administration, *What Drives Crude Oil Prices*, 2018. <https://www.eia.gov/finance/markets/crudeoil/>

[6] GAO, Crude Oil: *California Crude Oil Price Fluctuations Are Consistent with Broader Market Trends*, Feb. 20, 2007. < https://www.gao.gov/products/GAO-07-315>

abandonment work described in the proposed regulation. Some of these impacts will be offset by operators that could reduce in-house jobs or exit the industry altogether if they cannot meet the regulatory cost burdens.

Table 2. Annual Indirect Economic Impacts from Regulatory Spending

Economic Impact	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Gross Output	$330,226,930	$357,300,169	$346,740,329	$259,025,123	$196,706,181	$214,808,133
Earnings	$97,387,230	$105,427,010	$102,321,381	$76,491,298	$57,989,770	$63,334,647
Jobs	1,430	1,548	1,502	1,123	851	930
Value Added (GSP)	$215,416,613	$233,153,662	$226,249,995	$168,942,692	$128,405,428	$140,215,640

Data Source: Estimated using RIMS II Type I Final Demand Multipliers (2015). BEA, California RIMS II data (Type I). 2007/2015.

However, the resultant environmental and public health benefits and the increased safety to communities that contain a substantial number of idle wells should also induce an economic impact, as should the reduced liability to the State. Moreover, the proposed regulations should reduce the operator's liability resulting from a leak or contamination that could lead to both a stop in production and costly remediation efforts. One of the intended benefits resulting from the proposed regulations is the protection of groundwater. The prevention of groundwater contamination is much less resource-intensive than remediation efforts once groundwater has been contaminated. A US EPA study of costs associated with groundwater contamination remediation at Superfund and RCRA sites estimates that the costs could rise to over $5 million per site. The proposed regulations should reduce the risk of contamination by helping to identify idle wells that could act as conduits for fluid migration (see the Benefits section of this report).

Another intended benefit is the reduction in methane emissions from idle wells. Using the estimated social costs for methane reduction developed by the Interagency Working Group on Social Cost of Greenhouse Gases, the total expected benefits from the social cost of methane reductions will range from $353,552 to $1,019,250, in total, over the first six years of this analysis.

In developing the regulations, the Division issued a "discussion draft" and received substantial feedback from the regulated community and nongovernmental organizations. When evaluating the effect of the feedback on the regulations, the Division balanced the benefits to the public and environment with the economic impact on the industry and the State.

Introduction

The Standardized Regulatory Impact Analysis (SRIA) estimates the direct and indirect economic impacts of the proposed regulations regarding requirements for idle well testing and management. All state agencies that propose major regulations[7] must complete a SRIA as described in Government Code section 11346.36 and California Code of Regulations, title 1, sections 2000 through 2004.

This analysis addresses the direct costs and economic impacts of the proposed Idle Well Testing and Management regulations. The SRIA specifically discusses the following topics: the need for the proposed regulation and its intended goals, the baseline requirements of idle well testing and management, an estimate for the number of affected wells over a six-year period, the direct cost estimate to operators for each new requirement, the indirect economic impacts from regulatory spending, the benefits to various stakeholders, and the fiscal impacts to state and local agencies.

Background

The Division was created in 1915 to supervise the drilling, operation, maintenance, and plugging and abandonment of onshore and offshore oil, gas, and geothermal wells. The Division carries out its regulatory authority under a dual legislative mandate to encourage the wise development of oil and gas resources, while preventing damage to life, health, property, and natural resources, including underground and surface waters suitable for domestic or irrigation purposes.[8]

The Division recognizes the need to strengthen its commitment to the protection of environment, occupational safety, and public health. A 2011 United States Environmental Protection Agency (EPA) audit of California's Underground Injection Control (UIC) program concluded that idle wells rules needed to be strengthened and bonding requirements were inadequate.[9] And in 2015, the Division discussed the need to reduce the State's large inventory of idle wells and revise idle well testing requirements in its "Renewal Plan for Oil and Gas Regulation," an ongoing, four-year framework to correct past problems and to create a regulatory program for oil and gas production that ensures the environment and public health are protected.[10]

On September 9, 2016 Governor Brown signed the Department-sponsored Assembly Bill 2729 (AB 2729).[11] Among other things, this bill redefined an "idle well" as a well that has had 24 consecutive months of inactivity.[12] Prior to the bill becoming law, an "idle well" was defined as "any well that has not produced oil or natural gas or had not been used for injection for six consecutive months of

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[7] A major regulation is a regulation that will result in either total costs or benefits exceeding $50 million in any given 12-month period through 12 months after full implementation.
[8] Public Resources Code section 3106.
[9] James D. Walker, Horsley Witten Group, *California Class II Underground Injection Control Program Review*, June 2011.
<http://www.conservation.ca.gov/dog/Documents/DOGGR%20USEPA%20consultant%27s%20report%20on%20CA%20underground%20injection%20program.pdf>
[10] DOGGR, CA Department of Conservation, *Renewal Plan*, Oct. 2015.
<http://www.conservation.ca.gov/dog/Documents/renewal-plan2017-lrg.pdf>
[11] Assembly Bill No. 2729 (2015-2016 Reg. Session) § 11.
[12] Public Resources Code section 3008, subdivision (d).

continuous operation during the last five or more years."[13] The bill also defined a "long-term idle well" as any well that has been an idle well for eight or more years.[14]

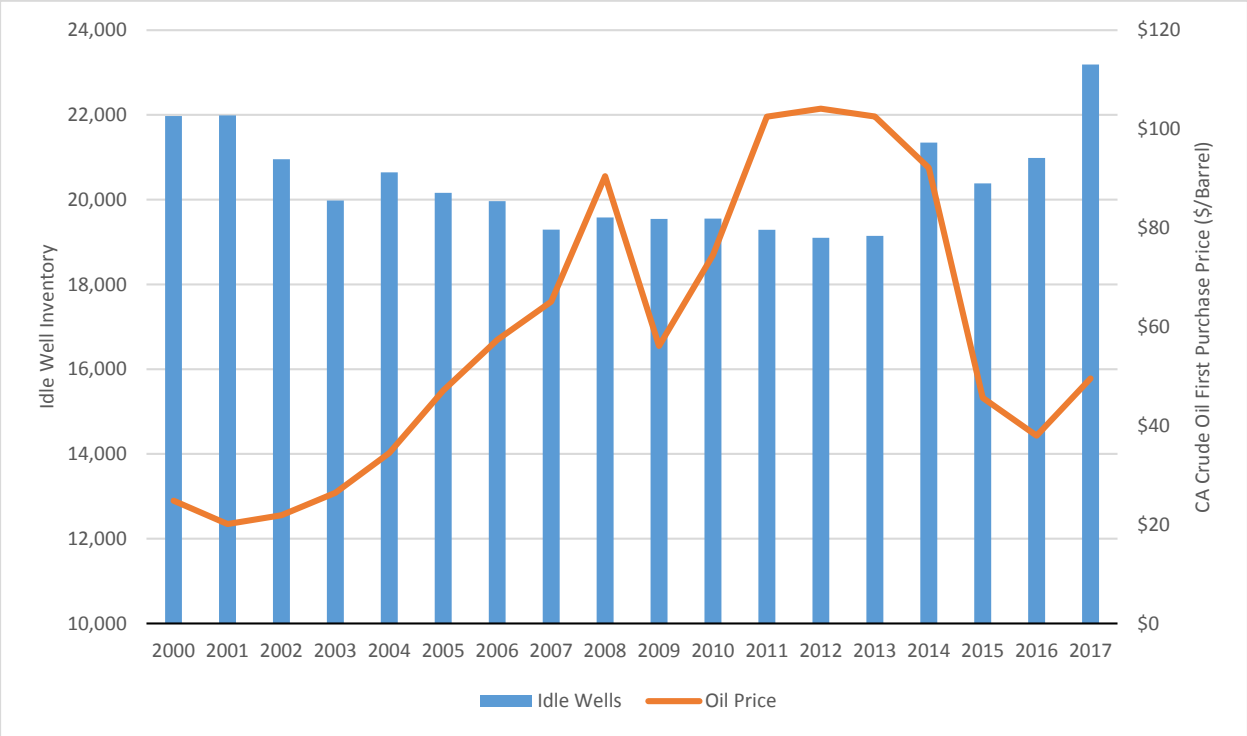
AB 2729 also increased operator fees for each idle well; increased bonding requirements for oil and gas wells; and required operators to either pay fees or submit an Idle Well Management Plan (IWMP) to reduce the inventory of idle wells by a specified amount.

Finally, AB 2729 requires the Division to review, evaluate, and update as appropriate, its regulations pertaining to idle wells. The update includes idle well testing requirements and provides an option for temporary or partial well abandonment in lieu of testing at the discretion of the Supervisor.

Statement of Need

The Division maintains an annual idle well inventory at the beginning of each year based on well information during the prior year. From 2000-2017, under the pre-AB 2729 definition of an idle well, the statewide idle well inventory stayed relatively steady, ranging from 19,000 to 23,000 wells. Although the inventory does seem to change slightly with yearly fluctuations in crude oil prices, i.e., more idle wells when the price is low and fewer idle wells when the price is high, the count of idle wells generally remains in the same narrow range (see Figure 1).

Figure 1. Yearly Statewide Idle Wells Inventory Compared to Annual CA Crude Oil First Purchase Price



Data Source: (1) DOGGR, *FTP site IW Inventory*, 2000-2017. (2) US EIA, *CA Crude Oil First Purchase Price*, April 2, 2018.

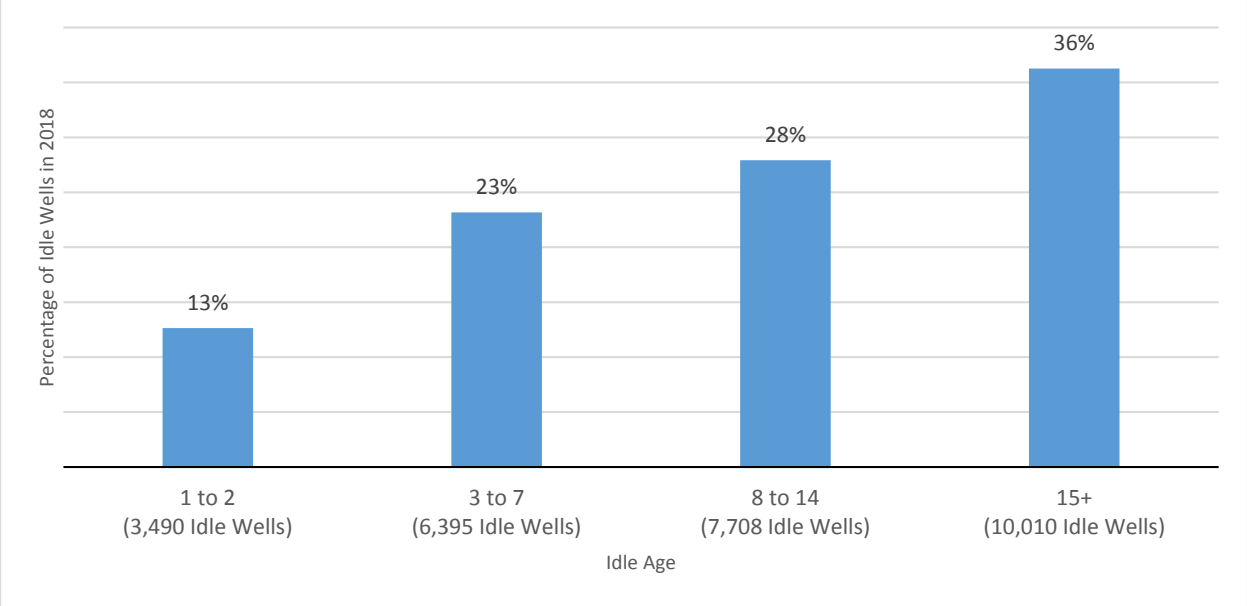
[13] Public Resources Code section 3008, subdivision (d) (Prior to January 1, 2017).
[14] Public Resources Code section 3008, subdivision (e).

In 2018, under the new definition of an idle well effective January 1, 2017, the Division identified even more idle wells in its start-of-year inventory with 27,603 idle oil and gas wells.[15] In the absence of the proposed regulations, the Division expects the statewide idle well inventory to generally remain as high, if not higher, than the 2018 count of idle wells.

Idle wells pose a potential risk to the environment and public health. Improperly maintained idle well casings can rust or crack when dormant, contaminating surroundings, including groundwater and air, and affecting the public health and quality of life for nearby residents. Other idle wells could be located in fields that are susceptible to subsidence, resulting in the shearing of these wells. Leaks or damage to idle wells could go unnoticed for long periods of time in the absence of the proposed regulations.

In addition, the longer a well remains idle, the more likely it is to be deserted by the operator. Figure 2 presents a breakdown of idle wells in 2018 by their idle age, or the number of years since a well has met the current definition of "idle well." About 54 percent of the idle wells, or 17,718, in the 2018 inventory are long-term idle wells, or wells that have been idle for eight or more years. And 36 percent of the idle wells, or 10,010, in the 2018 inventory are fifteen years or older. The likelihood of these idle wells being returned to production or injection is very low.

Figure 2. Number and Percentage Breakdown of Idle Age of 2018 Idle Well Inventory



Data Source: DOGGR, *Idle Wells Inventory*, 2018.

If the Division either cannot find the last known operator or enforce action against the last known operator, the idle wells are considered deserted and the State may need to properly plug and abandon any well that is hazardous or potentially hazardous. Ultimately, long-term idle wells could end up being

[15] The number is subject to change as the Division was still reviewing the idle wells inventory for accuracy at the time of this report.

a significant liability to the State. According to the Department, the Division has plugged and abandoned more than 1,350 orphan wells at a cost of more than $27 million since 1977.[16]

Because of the potential health and environmental dangers posed by the large inventory of idle wells, the proposed regulations introduce additional tests and greater testing frequency of the idle well population in order to ensure proactive monitoring by both the Division and the operator.

The proposed regulations also address the testing and management of observation wells. Idle wells have previously been repurposed, or intentionally mislabeled, as observation wells. The potential risks from well failure or degradation apply to observation wells as well, resulting in risks to the environment and the public. A proactive testing regiment will also identify mechanical integrity issues for these wells.

Major Regulation Determination

The proposed Idle Well Testing and Management regulations are estimated to have a combined direct and indirect cost exceeding $50 million within a 12-month period after full implementation. A specific discussion of costs appears in the Estimating Direct Cost and Economic Impact sections of this document.

Public Outreach and Input

The Division reached out to stakeholders in the lead-up to the formal rulemaking process in order to collect feedback on the ongoing development of idle well testing and management requirements. The stakeholders included oil and gas operators, industry representatives such as the Western States Petroleum Association (WSPA) and the California Independent Petroleum Association (CIPA), environmental groups, and members of the general public. The Division publicly released its pre-rulemaking draft regulation (discussion draft) on June 14, 2017, ahead of a July 14, 2017 workshop in Bakersfield, CA where the public was invited to provide oral and written comments. The comment period remained open for feedback from June 14, 2017 through August 21, 2017, due to public interest, mostly from industry. Additional in-person updates and discussions with WSPA, CIPA, and environmental groups, including the Natural Resources Defense Council, Environmental Defense Fund, Clean Water Action, and Environmental Working Group, about the requirements of the proposed regulation continued beyond the close of the initial public comment period. All comment submissions and in-person feedback were reviewed and carefully considered by the Division throughout the pre-rulemaking process.

The Division also distributed an idle well cost survey associated with the discussion draft in August 2018 to gather cost estimates associated with the proposed regulations (see Appendix C). The survey was delivered electronically to WSPA, CIPA, IOPA, the Conservation Committee of California Oil and Gas Producers (CCCOGP), and over 160 individual oil and gas operators.

[16] http://www.conservation.ca.gov/dog/FirminStreetProject/Pages/Firmin-Street-Project.aspx

Baseline

Prior to the passage of AB 2729, operators had several options for the management of idle wells. Public Resources Code section 3206 previously allowed operators to pay idle well fees, provide an escrow account for the benefit of the Supervisor and deposit $5,000 for each idle well, file an indemnity bond that provided the sum of $5,000 for each idle well, or file an IWMP for the elimination of idle wells. In addition, Public Resources Code section 3205, subdivision (a)(3), allowed operators to obtain a bond of $2 million (commonly known as a "super bond"), which exempted the operators from any obligations under Section 3206 above. Observation wells were exempt from annual assessments, and no specific demonstration was required to prove that a well was an observation well.

Existing regulations section 1723.9 requires the operator to test the fluid level in an idle well at least once every five years. Any subsequent testing is to be based on the fluid level in the well, the well's location in relation to freshwater zones, mitigation measures taken by the operator to prevent fluid migration, or other factors upon a showing of good cause by the district deputy.[17] Operators are required to notify the appropriate Division district office to provide an opportunity for district staff to witness the fluid level test.[18] No mechanical integrity testing is required, unless specifically ordered by the Supervisor.[19]

In general terms, the plugging and abandonment of idle wells has not historically been required. The Supervisor may order remedial work, including plugging and abandonment, to prevent damage to life, health, property or natural resources pursuant to Public Resources Code section 3224. The Supervisor may also order an operator to plug and abandon a well that is deemed deserted, hazardous, or idle-deserted.[20]

Due to the lack of a statutory or regulatory idle well testing and maintenance scheme, districts have developed different methods for managing idle wells. Some districts have detailed testing and maintenance protocols while other districts only require fluid level tests. However, due to the passage of AB 2729 and the development of the Division's Renewal Plan, the Division formed a focused idle well program tasked with uniformly enforcing current statutes and regulations and developing the proposed regulations.

AB 2729 amended much of the existing statutes pertaining to idle wells. Operators can no longer avoid paying idle well fees or eliminating long-term idle wells through bonds or escrow accounts.[21] Idle well fees have increased, and operators electing to submit an IWMP must either properly plug and abandon a percentage of long-term idle wells or return them to use.[22] Further, Public Resources Code section 3206.1, subdivision (d) requires an operator to plug and abandon an idle well if the operator cannot

[17] *Id*.
[18] *Id*.
[19] Public Resources Code section 3224.
[20] Public Resources Code sections 3237 and 3255.
[21] Public Resources Code sections 3205 and 3206.
[22] Public Resources Code section 3206.

demonstrate that an idle well is economically viable or if the operator fails to remediate an idle well as required by these proposed regulations.

These incentives to plug and abandon idle wells will carry forward as operators implement their IWMPs for the next several years; thus, although "elimination" of idle wells under a plan could include bringing those wells back into service, it is likely that most long-term wells will be plugged and abandoned per the plan schedule. An exception to this may be long-term idle wells located within the coastal zone where new drilling requires approval from the Coastal Commission in addition to the Division. These wells would be more likely be returned to use or maintained as idle, with operators choosing to pay idle well fees rather than lose a permit by plugging and abandoning the well.

A Notice to Operators (NTO), dated March 3, 2017 provided operators with a summary of the new provisions under the law, including the changes to fees and bonds, and the detailed requirements for a compliant IWMP. Operators were encouraged to begin working to update their IWMPs to meet the new requirements immediately, with updated plans due by January 1, 2018 to avoid idle well fees for the previous year. The NTO also reminded them of the need to demonstrate the actual use of an observation well by submitting a summary report of the types of data collected, and provided notice that these updated regulations were in process. A subsequent NTO, dated September 28, 2017, reminded operators of the upcoming increase in fees and bond amounts, as well as the existing testing requirement under section 1723.9.

Therefore, the baseline for this analysis assumes that operators will be in full compliance with the provisions of AB 2729 effective January 1, 2018, which includes updated requirements for either submitting idle well fees for each idle well or filing an IWMP with the Supervisor.

Wells returned to use would be required to meet minimum mechanical integrity standards and would become subject to testing and maintenance requirements under other regulations. Wells that remain idle are subject to the fluid level test required under section 1723.9, and the local districts, as part of the Renewal Plan, will enforce the requirement for subsequent testing uniformly as needed to mitigate issues identified by the fluid test.

Proposed Regulation Summary

The current testing requirements for idle wells fall short of the testing standards for other types of wells. The proposed regulations close that gap and minimize the risk that idle wells may pose to the public, natural resources, and underground sources of drinking water, while reducing the risk of liability to the State. The proposed regulations will require a more comprehensive regiment that will include not only regular fluid level testing for idle wells, but also regular casing pressure testing and clean out tags with the possibility of additional testing such as mechanical integrity test surveying. The proposed regulations also require greater data submission and specific standards for the proper partial plugging and plugging and abandonment of idle wells.

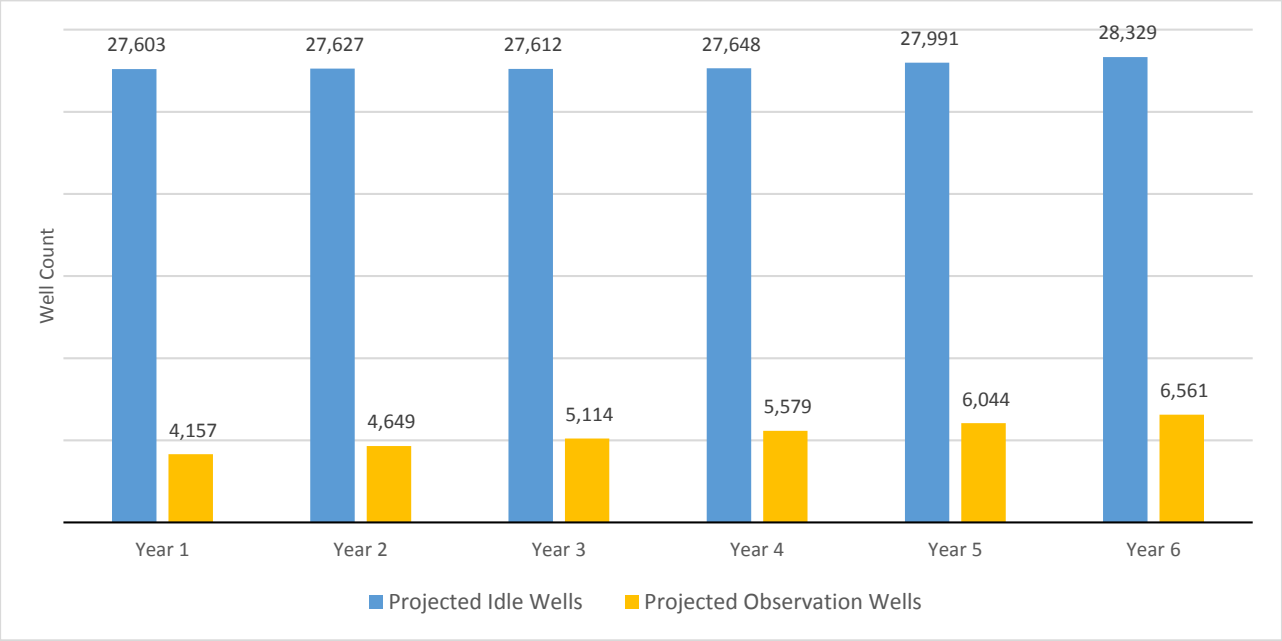
The Division attempts to measure the effect of the proposed regulations on the statewide inventory of idle wells and individual operators. The following two sections – Estimating the Population and Estimating the Direct Costs – examine the affected population and the resulting direct costs to the idle well owners in the State.

Estimating the Population

The proposed regulations include requirements that target two distinct populations: the statewide idle wells and the statewide observation wells. The Division's 2018 idle wells inventory (January 2018) serves as the basis for the Year 1 population of idle wells, while the 2018 query of observation wells (January 2018) serves as the basis for the Year 1 population of observation wells.

Figure 3 presents the expected changes to the total idle wells inventory and the observation wells over the six years of analysis.

Figure 3. Projected Idle Wells and Observation Wells Population, Six Years



The population projections in Figure 3 assume the current economic environment remains static for the six years of the analysis. Each year, the two populations experience a fairly steady increase in the population. In reality, the number of idle wells could fluctuate from year-to-year depending on the rise or fall of the price of crude oil. For example, the annual net changes in statewide idle wells ranged from -1,034 to 2,203 since calendar year 2000.

In this SRIA, annual inventory changes are solely dependent upon the elimination of wells and the addition of wells. Elimination of idle wells is affected by the following: (1) the planned plugging and abandoning of idle wells on the Waiver Plan; (2) the planned plugging and abandoning or return to use of long-term idle wells on the IWMP; and (3) the plugging and abandonment of idle wells due to testing and compliance failures. Meanwhile, the addition of idle wells is dependent on wells that become idle after the effective date of the regulation (new idle wells).

Idle Wells

The 2018 idle wells inventory represents the Year 1 population in the SRIA. The Division estimates that the inventory includes 27,603 total idle wells, of which 17,718 are long-term (i.e., an idle age of 8 years or more).

The idle wells inventory includes a subset of 1,763 inaccessible or buried idle wells. These wells are typically inaccessible due to natural disasters, such as landslides, or urban development. An idle well that is proven to be inaccessible does not require testing, though it is subject to verification of inaccessibility and monitoring requirements. This analysis assumes that the number is fixed in the short-term. Inaccessible idle wells remain in the idle wells inventory each year but do not require additional testing.

The idle wells inventory also includes a subset of partially plugged idle wells. Partial plugging is similar to a permanently plugged and abandoned idle well, except that the operator can maintain the well in its inventory and potentially re-enter it in the future. Being able to re-enter a partially plugged idle well is particularly important to operators in the Coastal and Southern Districts because it is more difficult to obtain permits for new wells in these areas due to local laws and ordinances. The Division estimates that up to 10 percent of the 1,072 idle wells in the Coastal Zone could already be partially plugged, or 107 wells.[23] The Division expects the number of partially plugged idle wells to increase at a constant rate of 54 per year (including 54 in Year 1 after the effective date of the regulation). These wells are subject to testing, but not at the same frequency as other idle wells.

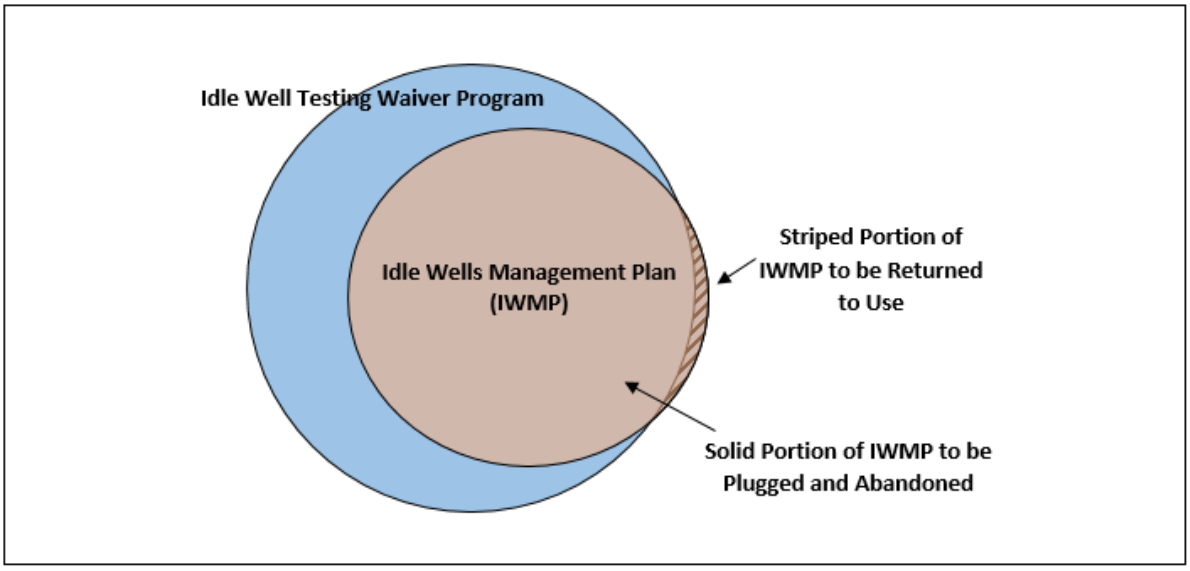
Plugged and Abandoned Wells on the Waiver Plan

Based on the total inventory, the Division can estimate the number of wells on both the IWMP and the Waiver Plan. The proposed regulations include an Idle Well Testing Waiver Program (Waiver Plan) that allows an operator to submit a plan to plug and abandon up to five percent of its idle wells per year for up to five years. Once the Waiver Plan is submitted and approved, an operator can waive testing in order to plug and abandon an even higher percentage of idle wells. The Waiver Plan saves the operators from having to test idle wells that are never intended to be returned to production or injection. Unlike the IWMP, the Waiver Plan inventory is not restricted to long-term idle wells.

At a minimum, the Division assumes that all operators participating in the IWMP will also participate in the Waiver Plan. Therefore, the long-term idle wells of the IWMP are a subset of an operator's Waiver Plan (see Figure 4).

[23] California Coastal Zone refers to the land and water area of the State of California from the Oregon border to the border of the Republic of Mexico, extending seaward to the State's outer limit of jurisdiction, including all offshore islands, and extending inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or five miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards. The coastal zone does not include the area of jurisdiction of the San Francisco Bay Conservation and Development Commission, nor any area contiguous thereto, including any river, stream, tributary, creek, or flood control or drainage channel flowing into such area.

Figure 4. Relationship of IWMP long-term idle wells and the Waiver Plan



In addition, the likeliest candidates for plugging and abandonment are the wells with the highest idle age. Therefore, all Waiver Plan wells are selected from long-term idle wells in this analysis.

Tables 3a displays the number of statewide operators with idle wells and their total idle wells inventory in 2018, by inventory range. The range is established by AB 2729 and serves as the basis by which the Division determines the percentage of long-term idle wells that must be eliminated by a participating operator. Based on actual and expected IWMP submissions as of March 9, 2018, Table 3b presents the estimated participation rate of operators in both the IWMP and the Waiver Plan in 2018 and the resulting number of idle wells that are expected to be eliminated by both the Waiver Plan and the IWMP.

Table 3a. Statewide Operator and Idle Wells Inventory in 2018, by IW Inventory Range

Idle Wells Inventory Range	Operators, Count	Operators, Percentage	Idle Wells, Count	Idle Wells, Percentage	LTIW, Count	LTIW, Percentage	LTIW/IW, Percentage
More than 1,250	4	0.3%	16,341	59%	10,354	58%	63%
251 to 1,250	10	1%	4,819	17%	3,015	17%	63%
51 to 250	27	2%	2,779	10%	1,596	9%	57%
21-50	36	3%	1,064	4%	705	4%	66%
20 or fewer	1,093	93%	2,600	9%	2,048	12%	79%
Total	**1,170**	**100%**	**27,603**	**100%**	**17,718**	**100%**	**64%**

Data Source: DOGGR, *2018 Idle Wells Inventory*, January 17, 2018.

Table 3b. Expected Waiver Plan and IWMP Participation, by IW Inventory Range

Idle Wells Inventory Range	Max. IWMP Reduction	Max. Waiver Plan Reduction	Expected Participation Rate	Waiver P&A, Count	IWMP Wells, Count	IWMP P&A, Count	IWMP RTU, Count
More than 1,250	6%	5%	50%	409	311	295	16
251 to 1,250	5%	5%	50%	120	75	71	4
51 to 250	4%	5%	50%	69	32	30	2
21-50	4%	5%	33%	18	9	9	0
20 or fewer	4%	5%	5%	7	4	4	0
Total	-	-	-	**623**	**431**	**388**	**43**

Data Source: (1) DOGGR, *2018 Idle Wells Inventory*, January 17, 2018. (2) DOGGR, *2018 IWMP Submissions*, March 9, 2018.

Based on the single-year results shown in Tables 1a and 1b, the Division makes the following assumptions about annual participation in both the Waiver Program and the IWMP:

- 2.26 percent of *all idle wells* will be listed on the Waiver for plugging and abandonment;
- 2.43 percent of the State's *long-term idle wells* will be listed on the IWMP; and
- 90 percent of IWMP idle wells are intended for plugging and abandonment.

Any cost associated with the IWMP idle wells are not attributed to the proposed regulation. The cost of all other Waiver Plan wells, however, are attributed to the proposed regulation.

Returned to Use Wells on the IWMP

Ten percent of the IWMP long-term idle wells are expected to be returned to use each year. The Division made this determination by reviewing the previous year's idle wells data, and noting that 43 idle wells were returned to use. According to Division experts, the return to use rate for long-term idle wells is typically low, even when oil prices are high. The cost of returning an idle well to production based on the IWMP is not a cost attributable to the proposed regulation.

The wells that are returned to use are removed from the inventory in the following year. This potentially low estimate of idle wells that are returned to use means that the number of idle wells in the following year may be higher in this analysis than might be expected in reality. As a result, the estimated regulatory costs would be applied to more idle wells. The low estimate of idle wells that are returned to use is consistent with the Division's attempt to create a conservative estimate of compliance costs, i.e., a cost ceiling. However, in reality, the Division expects that there may be a spike in the number of long-term wells being returned to use when the proposed regulations take effect as a way for operators to avoid the costs of testing or plugging and abandonment of idle wells. Those idle wells that are returned to use are then subject to the regulations affecting active wells.

Subject to Testing

The proposed regulation creates a distinction between the idle wells that were already "idle" at the effective date of the regulation (the baseline cohort) and wells that become "idle" after the effective date of the regulation (new idle wells). Using the information above regarding the Waiver Plan, IWMP,

and the various population subgroups, the Division can estimate the number of idle wells subject to testing in a given year.

Baseline Cohort

The baseline cohort is a subset of the idle wells inventory that is already idle at the effective date of the regulation. Because the entire Year 1 inventory is idle when the proposed regulation takes effect, the baseline cohort is made up of the Year 1 inventory. Section 1772.1, subdivision (g), of the proposed regulations allows operators to satisfy requirements for the baseline cohort over the initial 48 months (and half of the baseline idle wells within 24 months).

The number of wells in the baseline cohort subject to testing does not include the following subset of idle wells: inaccessible idle wells, partially plugged idle wells, and Waiver Plan wells that are expected to be plugged and abandoned, and IWMP wells that are expected to be returned to use.

The remaining idle wells in the baseline cohort represent the portion of the cohort's wells that are subject to testing. Because the baseline cohort wells are allowed a four-year period to comply with the testing requirements, the Division assumes only a quarter of the cohort's wells in a given year will be tested. In the fourth year, only a small remaining portion of the cohort's wells will need testing (less than a quarter). Table 4 displays the baseline cohort wells that are subject to testing in the first four years.

Table 4. Baseline Cohort Subject to Testing

Baseline Testing Worksheet	Year 1	Year 2	Year 3	Year 4
Baseline Cohort Subject to Testing	25,013	23,881	22,683	21,536
Portion to be Tested (1/4)	6,253	5,970	5,671	3,642

Note: Year 4 portion to be tested is less than a quarter of the baseline cohort subject to testing because it is the remaining portion of the remaining cohort left to be tested.

Testing and compliance failures will lead to a portion of wells being plugged abandoned. These wells will be removed from the total inventory and the baseline cohort starting in Year 2.

New Idle Wells

New idle wells are wells that become idle after the effective date of the proposed regulation. All new idle wells in this SRIA are subject to testing requirements until they are either plugged and abandoned or returned to use. New idle wells contribute to the growth of the overall idle wells inventory at a constant rate of 1,303 first year idle wells per year. The Division derived this number from the median value of the age groups under eight, or short-term idle wells (see Appendix B). The short-term idle wells are less likely than the long-term idle wells to leave the inventory through plugging and abandonment, thereby leaving each age cohort relatively intact.

Testing and compliance failures will lead to a portion of new wells being plugged abandoned. These wells will be removed from the total inventory starting in Year 3.

Observation Wells

The Division estimates that there are currently 4,157 observation wells statewide in Year 1 of the analysis based on the latest 2018 numbers. All of these wells are observation wells prior to the effective

date of the proposed regulation. Section 1772.3, subdivision (c), of the proposed regulations allows operators to satisfy requirements for these wells over the initial 48 months (and half of the baseline idle wells within 24 months). This analysis assumes the addition of 544 new observation wells per year, based on a single-year review of "new" observation wells in 2018, though the Division believes that this count is an overestimate because many of the wells in the statewide count are not being used as observation wells.

The Division estimates that no more than 85 percent of observation wells penetrate a USDW.

Population Summary

Table 5 displays six years of estimated population for each of the direct inputs as of the effective date of the proposed regulation.

Table 5. Population of Wells Subject to Regulation

Direct Cost Category	Y1 Count	Y2 Count	Y3 Count	Y4 Count	Y5 Count	Y6 Count
1. Reporting Requirements	7,177	1,579	1,579	1,579	1,583	1,586
Baseline Idle Wells	*7,177*	*276*	*276*	*276*	*280*	*283*
New Idle Wells	*0*	*1,303*	*1,303*	*1,303*	*1,303*	*1,303*
2. Fluid Level Test	7,136	8,618	12,305	11,129	10,398	11,493
Baseline Idle Wells	*6,253*	*5,970*	*9,657*	*7,448*	*7,600*	*6,832*
New Idle Wells	*0*	*1,303*	*1,303*	*2,335*	*2,335*	*3,368*
Observation Wells	*883*	*1,345*	*1,345*	*1,345*	*462*	*1,293*
3. Casing Pressure Test	7,399	8,856	8,557	6,528	2,935	3,880
Baseline Idle Wells	*6,253*	*5,970*	*5,671*	*3,642*	*1,034*	*992*
New Idle Wells	*0*	*1,303*	*1,303*	*1,303*	*1,303*	*1,303*
Partially Plugged Idle Wells	*107*	-	-	-	*54*	*54*
Observation Wells	*1,039*	*1,583*	*1,583*	*1,583*	*544*	*1,531*
4. Clean Out Tag	6,253	5,970	5,671	3,642	5,172	4,958
5. Mechanical Integrity Test Survey	12	12	12	12	12	12
6. Monitoring of Inaccessible Idle Wells	441	441	441	441	-	-
7. Engineering Analysis for 15-Year Idle Wells	2,062	2,859	2,927	2,971	981	1,196
8. Plugging and Abandoning	913	971	944	745	556	595
Waiver – IWMP	*235*	*220*	*222*	*227*	*227*	*224*
Baseline IW Failed Casing Pressure Test - P&A	*438*	*418*	*397*	*255*	*103*	*99*
New IW Failed Casing Pressure Test - P&A	*0*	*65*	*65*	*65*	*65*	*65*
Baseline IW Failed Clean out Tag - P&A	*141*	*134*	*128*	*82*	*116*	*112*
New IW Failed Clean out Tag - P&A	*0*	*0*	*0*	*0*	*0*	*0*
Baseline IW Failure to Comply - P&A	*47*	*45*	*43*	*27*	*8*	*7*
New IW Failure to Comply - P&A	*0*	*10*	*10*	*10*	*10*	*10*
Obs. Wells Failed Casing Pressure Test - P&A	*52*	*79*	*79*	*79*	*27*	*77*
9. Partial Plugging	70	54	54	54	54	54
Partially Plugged Idle Wells	*54*	*54*	*54*	*54*	*54*	*54*
Failed Casing Pressure Test - P&A	*16*	-	-	-	-	-
10. Remediation	63	63	60	39	45	42
Baseline Idle Wells Failed Clean out Tag	*47*	*45*	*43*	*27*	*39*	*37*
New Idle Wells Failed Clean out Tag	*0*	*0*	*0*	*0*	*0*	*0*
Baseline Idle Wells Failure to Comply	*16*	*15*	*14*	*9*	*3*	*2*
New Idle Wells Failure to Comply	*0*	*3*	*3*	*3*	*3*	*3*
Total	**31,526**	**29,424**	**32,550**	**27,140**	**21,735**	**23,816**

Data Source: DOGGR, *2018 Idle Wells Inventory*, Jan. 17, 2018.
Note: Rows in grey are subsets of the rows in white.

Estimating the Direct Costs

The analysis of direct costs uses estimates provided directly from oil and gas operators but, when necessary, makes assumptions to ensure that economic costs and benefits are captured to the maximum extent possible. In order to avoid underestimating potential economic impacts, the Division used a conservative cost estimate. Where there was any question as to whether or not costs incurred by operators could be attributed to the proposed regulations, for the purposes of this assessment, the Division opted to attribute them to the regulations.

Direct Cost Sources

The Division distributed an anonymous cost survey in August 2017 based on the discussion draft of the proposed idle well regulation published in July 2017.[24] The survey specifically asks respondents to answer questions about the per unit costs of the following work: a fluid level test, a casing pressure test, a clean out tag, a mechanical integrity test, an engineering analysis, the remediation of a well, the partial plugging of a well, and the plugging and abandonment of a well.[25]

We received 29 responses from operators with idle wells. Table 6 displays the breakdown of the survey respondents and compares it to the 2018 population of operators with idle wells. The survey respondents are overrepresented by the largest idle well owners and underrepresented by the smallest idle well owners.

Table 6. Profile of Idle Wells Survey Respondents

Operators	Sample		Population	
	Count	Percent	Count	Percent
1 to 100	20	69%	1,146	98%
101 to 250	3	10%	10	1%
251 or more	6	21%	14	1%
Total	**29**	**100%**	**1,170**	**100%**

Data Source: DOGGR, *Industry Costs for Idle Wells Testing Survey*, August 2017.

Even though the responses from large operators seem to skew the responses in their favor despite their limited representation as operators, the top one percent of idle wells operators own about 75 percent of the statewide idle wells. Therefore, the Division considers the large operators as "typical" and not the small operators.

For additional verification, the Division applied post-stratification weights to the responses and compared the weighted average costs to not only the unweighted average costs, but also costs submitted by the Conservation Committee of California Oil and Gas Producers (CCCOGP). Division experts reviewed each set of responses and determined that the average costs from the unweighted survey responses likely best reflect the actual per unit costs.

The proposed regulation has been modified since August based on feedback from various stakeholders. Most of the changes reflect changes in frequency of the requirements and allow for a four-year

[24] http://www.conservation.ca.gov/dog/Documents/AB-2729-Discussion-Draft.pdf

[25] The survey can be found in Appendix C.

compliance schedule. For those few requirements not reflected in the survey, rather than issue another cost survey, the Division depended upon its own internal experts – many of whom have recently left the oil and gas industry – to provide cost estimates and verify assumptions used in this analysis.

Direct Cost Inputs

There are 10 categories of new requirements that serve as the direct cost inputs, some of which have been combined into a more general category.

1. Reporting Requirements

Section 1772 of the proposed regulations requires operators to submit an Idle Well Inventory and Evaluation to the Division that codifies the information needed for Division staff to review, evaluate, and update its regulations pertaining to idle wells. The information helps both the Division and operator prioritize certain wells for plugging and abandonment.

Operators are required to submit inventory data in a digital format within six months of the effective date of this regulation. Operators are required to submit evaluation data in a digital format within one year of the effective date of this regulation. Further, operators may be given an extension on the evaluation data based on the total number of idle wells. The operators are expected to update any changes to the required information by January 31 of each year as needed. For any sale or transfer of assets that include 50 or more idle wells, the operator must submit the Idle Well Inventory and Evaluation for those idle wells within one year of the date of sale or transfer becomes final.

If the information has already been submitted to the Division, even in a non-digital format, then the operator is not required to resubmit the information unless the Division specifically requests it.

The Division expects that large operators have either already submitted or can readily submit the required data while smaller operators will have a more difficult task. Because large operators own about 75 percent of all idle wells, that leaves roughly 25 percent of wells belonging to smaller operators. Therefore, the Division assumes that 25 percent of all idle wells would be affected by this Idle Well Inventory and Evaluation requirement in Year 1 of the analysis. For Year 2 through 6 of the analysis, all new idle wells (1,303) will have a cost requirement. The cost is estimated to be $100 per idle well, which represents three hours of a technician's time at $33 per hour.

Section 1772.4 of the proposed regulations also contains a reporting requirement to verify a well's production or injection when requested by the Division. In this case, the operator is required to demonstrate that a well is capable of producing or injection and did in fact produce or inject as reported. The Division *may* require an equipment check, well test, or verifying documentation. The requirement is intended to prevent operators from intentionally misidentifying an idle well as an active well in order to avoid idle well testing and management requirements.

The Division has very rarely asked for verification in the past and does not expect to use it often going forward. This economic analysis conservatively estimates that one percent of the total inventory may have to submit to additional injection verification each year. The bulk of the costs will likely come from report preparation and submission. Therefore, the cost is estimated to be $100 per well, which represents three hours of a technician's time at $33 per hour.

2. Fluid Level Test

Section 1772.1, subdivision (a)(1), of the proposed regulations requires operators to conduct a fluid level test to demonstrate whether the fluid is above the base of a known USDW. A fluid level above the base of a USDW indicates that there is potential risk of a migration of fluids from the hydrocarbon zone into the USDW and vice versa. In the event that a fluid level is above the base of a known USDW, further testing of the well is required to demonstrate mechanical integrity of the well bore. While the test is intended to protect the quality of both USDWs as well as hydrocarbon reserves, the Division prioritizes the contamination risk to USDWs because, although oil separated from water is still usable (though less economical), water separated from oil is less likely to be used for other purposes without significant treatment. As such, the Division proposed more frequent fluid level testing for the estimated 85 percent of idle wells within 0.5 mile of a USDW. The idle wells that are near a USDW are required to repeat the test every 24 months, while the 15 percent of idle wells beyond 0.5 mile of a USDW are required to repeat the testing every 60 months.

In this analysis, one-quarter of the remaining idle wells in the baseline cohort are tested in each of the first four years of the regulation as part of the Division's compliance schedule. New idle wells, however, are required to be tested within 24 months of becoming an idle well.

Section 1772.3, subdivision (a), of the proposed regulations also requires observation wells with a well bore that penetrates a USDW to undergo fluid testing every 60 months. Observation wells are required to be tested within six months of the effective date of these regulations. Although the results from a fluid level test conducted within 60 months prior to the effective date of this section will be accepted for initial compliance, this analysis assumes new costs for the observation wells.

Based on the survey responses, the average cost to conduct a fluid level test is about $413 per well.[26] While nearly 84 percent of the survey respondents said that they planned to use an acoustical test, operators can use a variety of Division-approved methods, including mechanical tests.

3. Casing Pressure Test

Section 1771.1.1 of the proposed regulations specifies the standards by which operators are to conduct a casing pressure test and section 1772.1, subdivision (a)(2), of the proposed regulations specifies the frequency of casing pressure tests based on the pressure to which the well casings are subjected to during such testing. The combined effect of these requirements is intended to ensure the mechanical integrity of idle wells and prevent contamination of the surrounding environment.

An idle well operator must decide the maximum pressure by which to test each idle well, based on the known or suspected characteristics of the well, namely mechanical integrity. Operators are required to conduct casing pressure tests every 48 months for idle wells tested at 200 psi above surface pressure; every 72 months for idle wells tested at 500 psi; and every 96 months for idle wells tested at 1,000 psi.

[26] The cost represented in the survey may be an overestimate. According to one contractor that performs acoustical idle well fluid level tests, the cost per well is $20-25 with a minimum charge of $150 for operators with a small number of wells needing testing. There is also a $50 charge on the rare occasion that the gun fills with oil and has to be cleaned. Thus, the actual cost to perform a fluid level test could be half the cost reported in the survey.

The varying testing periods are proportional to the risk exhibited by the well. An idle well that can be successfully tested to 1,000 psi presents less risk to the public and environment than an idle well that can only safely be tested to 200 psi.

In this analysis, the idle age of a well is associated with potential vulnerability. Wells with an idle age of 21 or older make up approximately 20 percent of the inventory; wells with an idle age of 11-20 make up approximately 30 percent of the inventory; and the remaining wells with an idle age of 10 and under, make up approximately 50 percent of the inventory. Therefore, the Division expects 20 percent of idle wells in the baseline cohort to be pressure tested at 200 psi; 30 percent to be pressure tested at 500 psi; and 50 percent to be pressure tested at 1,000 psi. Moreover, new idle wells have an idle age of under 11 and most likely will be tested at 1,000 psi.

Section 1752, subdivision (c), of the proposed regulations requires that all partially plugged idle wells undergo casing pressure test at 200 psi about surface pressure. This analysis assumes that all wells that are already partially plugged at the effective date of the regulation will undergo a casing pressure test in Year 1. Idle wells that are partially plugged after the effective date of the regulation will not undergo a casing pressure test until Years 5 and 6 of this analysis.

Section 1772.3, subdivision (b), of the proposed regulations also requires that all observation wells undergo casing pressure tests at 200 psi above surface pressure within six months of becoming an observation well and pressure tested again every 60 months.

Based on the survey responses, the average cost to conduct a casing pressure test is about $13,475 per well.[27] The figure quoted in the survey most likely includes the cost of moving in a rig and rig pump and renting a packer to isolate the well. In reality, the per well cost to perform a casing pressure test will be less than the figure used in this analysis because multiple wells can be tested in the same day.

4. Clean Out Tag

Section 1772.1, subdivision (a)(3), of the proposed regulations requires all idle wells to perform a clean out tag within eight years of becoming an idle well and repeated once every 48 months. The clean out tag has several purposes in ensuring the integrity of an idle well: it verifies the total depth of the well; identifies the existence of any possible obstruction; and cleans out the obstruction. A successful clean out tag essentially means the operators can demonstrate that the well is free of obstructions all the way down to the permitted depth.

This analysis assumes that there are three basic categories of difficulty in performing a clean out tag: a best case scenario that only requires the use of a slickline; a middle case scenario that may require more than a slickline, such as coiled tubing and a washout; and a worst case scenario that requires a workover rig, a rig pump, and a crew to remove the tubing and run wireline to total depth. Any fill located in the well may require circulating out the fill and/or running cleaning and repair equipment into the well.

[27] According to one contractor, a pressure test truck going between close locations charges $400 per well and averages four wells a day. In steep terrain and with some travel charges to the site, the cost is $600 per well. For one-off jobs, the cost is $1,200 per well. And testing the well using nitrogen could also bring down costs.

There are varying degrees of difficulty in performing a clean out tag based on unknown circumstances. Based on an average of survey responses, a best case scenario could account for 45 percent of an operator's idle wells at an average cost of $2,371 per idle well; a medium case scenario could account for 12 percent of an operator's idle wells at an average cost of $10,000 per idle well; and a worst case scenario could account for 43 percent of an operator's idle wells at an average cost of $20,000 per idle well.

Nearly all of the idle wells in the baseline cohort have an idle age of eight or more or will reach long-term idle status by the end of Year 4. For the sake of simplicity, this analysis assumes that all idle wells in the baseline cohort that are subject to testing will require a clean out tag within the first four years of the compliance period. Therefore, the costs in the SRIA reflect an overestimate of baseline cohort wells that are subject to this requirement – the actual total costs attributed to a clean out tag in the first four years should be less. The remaining idle wells in this group that are tested in Year 1 will repeat testing in Year 5 of this analysis. The remaining idle wells in this group that are tested in Year 2 will repeat testing in Year 6 of this analysis.

New idle wells will not require a cleanout tag in this analysis because they are not required to do so until closer to Year 8.

Based on the weighted average of the survey responses, the cost to conduct a cleanout tag is approximately $10,867 per well.

5. Corrosion Survey

Section 1772.1, subdivision (a)(4), of the proposed regulation allows the Division to require the operator to conduct an ultrasonic or magnetic flux survey, or equivalent survey, to measure casing thickness and look for anomalies in the casing. This requirement is only necessary if there is any indication that an idle well exhibits a high risk of corrosion or other mechanical integrity issues. The Division already has a good sense of which oil and gas producing fields may have high corrosion rates, but will need to determine the corrosion rate for problematic fields by sampling a group of idle wells.

There are 330 fields in the 2018 inventory. The fields that are most susceptible to corrosion or subsidence are the 24 cyclic steam fields. This analysis assumes a possible testing sample of three idle wells from each of the 24 fields over the six-year period of the SRIA, or 12 mechanical integrity tests per year.

Based on the survey responses, the average cost to conduct a corrosion survey is approximately $12,000 per well.

6. Monitoring of Inaccessible Idle Wells

Proposed section 1772.1, subdivision (e), would require operators with inaccessible idle wells to demonstrate that the wells are inaccessible to the Division's satisfaction and propose a mitigation plan for the ongoing monitoring of these wells. Not only is this requirement an important measure in protecting the public, it also ensures that operators are not labeling idle wells as inaccessible to avoid idle well testing.

Based on the survey responses, the labor to collect the necessary information about the inaccessible idle well and submit a mitigation plan is about $100 (or approximately $33 per hour for 3 hours of work). This analysis also assumes a cost of $100 per well for two gas sensors, $80 per well for an infrared gun, and $100 for remote gas sensing. The total cost attributed to the monitoring of inaccessible wells are evenly distributed across the first four years of this analysis.

7. Engineering Analysis for 15-Year Idle Wells

Proposed section 1772.1.2 would require operators to submit an engineering analysis for idle wells that have been idle for 15 years or more. The engineering analysis must demonstrate to the Division's satisfaction that the idle well is viable to return operation in the future.

There are 8,247 idle wells in 2018 with an idle age of 15 years or more. The cost imposed on these wells will be divided equally over the four-year compliance period. Any idle wells that reach the idle age of 15 years are subject to the engineering analysis from Years 2-6 in this analysis. For the purposes of the SRIA, we account for all of the 15-year idle wells in the inventory in 2018 without making any assumptions about their elimination from the inventory.

The cost estimate the Division uses in this analysis is $440 per well. The engineering analysis would require a geologist or engineer to review the test results and the mechanical configuration of the well and determine if the well is capable of accessing potential oil or gas reserves per field or group of wells at a cost of about $70-$150 per hour over about half-a-day of work, or four hours.[28] The cost range is from $280-600 per field or batch of wells, or an average of $440. This analysis sets the $440 cost per well rather than per field or batch of wells. In reality, the cost will be less than the projected amount.

8. Plugging and Abandonment

There are several requirements within the proposed regulation that would lead to an order to plug and abandon a well. All of the plugged and abandoned outcomes, regardless of the reason and regardless of the specific population (i.e., idle well or observation well), are combined in the total cost summary.

Waiver Plan

The proposed Waiver Plan allows an operator to avoid spending resources testing an idle well that has no realistic expectation of producing or injecting again. This analysis does not consider an idle well that is on both the IWMP and the Waiver Plan as a cost of regulation because the idle well would be planned for elimination under the provisions of AB 2729. Details about the population estimates can be found in Tables 1a and 1b.

P&A from Testing Failure

Failed casing pressure tests and cleanout tags could also lead to a required plug and abandonment. Regarding casing pressure tests, the Division assumes that 15 percent of the 200 psi wells will fail; five percent at 500 psi; and five percent at 1,000 psi. We expect that a fairly large number of idle wells might fail at the 200 psi level in particular because the operator specifically chose the lowest pressure

[28] Salary is established from Bureau of Labor Statistics, *Oil & Gas Extraction: NAICS 211 Workforce Statistic*s, 4th quarter 2017. <https://www.bls.gov/iag/tgs/iag211.htm>

testing option knowing that the well may not be able to withstand the higher pressures. This analysis assumes a test failure rate for an observation well of five percent.

Regarding clean out tags, the Division assumes that three percent of idle wells subject to testing in a given year could fail. An idle well can fail a clean out tag for a number of reasons, due to issues such as junk in the hole, irretrievable fish and other tools, or a collapsed wellbore. Shifting geology can also create clean out tag failures. For example, idle wells in fields with cyclic steam operations are at a particularly high risk of failure due to subsidence and shearing. According to the 2018 idle wells inventory, about 59 percent of idle wells are located in fields with cyclic steam operations.

The Division assumes that 75 percent of these failed idle wells will undergo plugging and abandonment (the other 25 percent assumed to undergo remediation).

P&A from Compliance Failure

If an operator fails to comply with any of the testing requirements, Section 1772.1, subdivision (b), of the proposed regulations requires the operator to do one of the following: bring the well into compliance, partially plug and abandon the well, or plug and abandon the well.[29]

When an operator fails to comply with the testing requirements, the Division will submit a Notice of Violation requiring the operator to bring the well into compliance. In the baseline cohort, as much as ten percent of idle wells could fail to comply with the testing requirements, mostly because of operators that are no longer active.[30] However, the Division assumes that one percent of idle wells in the baseline cohort that fail to comply will have active operators that will appropriately address the Notice of Violation. And of the one percent of non-compliant wells, this analysis assumes that 75 percent will be plugged and abandoned either as a result of testing or as a financial preference.

This analysis also assumes that new idle wells will have a failure to comply rate of one percent, with 75 percent of these idle wells assumed to be plugged and abandoned.

Based on the survey responses, the average cost to plug and abandon an idle well is approximately $75,000 per well.

9. Partial Plugging

Section 1752 of the proposed regulations requires that wells must be partially plugged according to a set of strict standards that should reduce the possibility of inadequate partial plug work going forward. The added incentive for an operator, aside from being able to re-enter the well without a new permit, is that it can delay testing for five to eight years.

The standards set forth in the proposed regulation for partial plugging are essentially the same as those for proper plugging and abandonment, except a surface plug is not required. On average, the work will be cheaper than a full plug and abandonment and wells in the Coastal Zone have the largest incentive due to their difficulty or inability to acquire new drilling permits in the future.

[29] Partial plugging as an outcome of a failure to comply is expected to be rare.
[30] See section on "Direct Costs on Small Businesses" for more information about inactive operators.

This analysis estimates that there are 107 idle wells that were partially plugged prior to the effective date of the proposed regulations. The quality of prior partial plugging is likely to be less reliable than the those that occur after the effective date of the proposed regulation. The Division believes that 15 percent, or 16 wells, could fail a casing pressure test in the first year of the enacted regulations. Those 16 wells would have to be partially plugged again to the standard set forth in the regulations.

The Division also expects 54 new partial pluggings per year.

Based on the survey responses, the average cost to partially plug a well is about $53,400 per well.

10. Remediation

There are several requirements within the proposed regulation that would lead to required remediation of an idle well. All of the remediation outcomes, regardless of the reason, are combined in the total cost summary (see Table 7).

Remediation from Testing Failure

If an idle well fails a casing pressure test or cleanout tag, the operator may opt to remediate the well rather than plug and abandon it. Regarding casing pressure tests, the Division assumes that 15 percent of the 200 psi wells will fail; five percent at 500 psi; and five percent at 1,000 psi. We expect that a fairly large number of idle wells might fail at the 200 psi level in particular because the operator specifically chose the lowest pressure testing option knowing that the well may not be able to withstand the higher psi tests. The casing pressure test failure rate for an observation well assumes a five percent failure rate since all observation wells will test at 200 psi rather than the most vulnerable.

Regarding clean out tags, the Division assumes that three percent of idle wells subject to testing in a given year could fail. An idle well can fail a clean out tag for a number of reasons, due to issues such as junk in the hole, irretrievable fish and other tools, or a collapsed wellbore. Shifting geology can also create clean out tag failures. For example, idle wells in fields with cyclic steam operations are at a particularly high risk of failure due to subsidence and shearing. According to the 2018 idle wells inventory, about 59 percent of idle wells are located in fields with cyclic steam operations.

The Division assumes that 25 percent of these failed idle wells will undergo remediation (the other 75 percent assumed to undergo plugging and abandonment).

Remediation from Compliance Failure

If an operator fails to comply with any of the testing requirements, Section 1772.1, subdivision (b), of the proposed regulations requires the operator to do one of the following: bring the well into compliance, partially plug and abandon the well, or plug and abandon the well.[31]

When an operator fails to comply with the testing requirements, the Division will submit a Notice of Violation requiring the operator to bring the well into compliance. In the baseline cohort, as much as ten percent of idle wells could fail to comply with the testing requirements, mostly because of operators that are no longer active.[32] However, the Division assumes that one percent of idle wells in the baseline

[31] Partial plugging as an outcome of a failure to comply is expected to be rare.
[32] See section on “Direct Costs on Small Businesses” for more information about inactive operators.

cohort that fail to comply will have active operators that will appropriately address the Notice of Violation. And of the one percent of non-compliant wells, this analysis assumes that 25 percent will be remediated as a result of testing.

This analysis also assumes that new idle wells will have a failure to comply rate of one percent, with 25 percent of these idle wells assumed to be remediated.

Based on the survey responses, the average cost to remediate an idle well is approximately $69,500 per well.

Total Cost Summary

Table 7 displays six years of estimated costs for each of the direct inputs as of the effective date of the proposed regulation. The estimated range of the costs is $148-$270 million dollars, with all costs calculated in 2018 dollars.

The Division believes that the total direct costs in Table 7 are conservative and likely overestimate costs for mainly three reasons. One, the Division selected both conservative unit costs and conservative population counts to intentionally present a conservative estimate of direct costs. Two, the total direct costs include approximately 10 percent of the idle wells from the 2018 inventory that are no longer active (i.e., no longer producing oil or gas). These idle wells account for a cost that is not relevant to active operators. Three, the total estimated costs reflect a large inventory of idle wells that may be attributable to several years of low crude oil prices. Nonetheless, the Department, in order for the SRIA to reflect a full consideration of possible costs, opted to risk erring on the side of overestimating the costs rather than underestimating the costs imposed by the proposed regulation.

Table 7. Estimated Direct Costs of Proposed Regulations

Direct Cost Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1. Reporting Requirements	$717,703	$157,927	$157,912	$157,948	$158,291	$158,629
Baseline Idle Wells	*$717,703*	*$27,627*	*$27,612*	*$27,648*	*$27,991*	*$28,329*
New Idle Wells	-	*$130,300*	*$130,300*	*$130,300*	*$130,300*	*$130,300*
2. Fluid Level Test	$2,947,168	$3,559,234	$5,081,908	$4,596,188	$4,294,170	$4,746,550
Baseline Idle Wells	*$2,582,489*	*$2,465,610*	*$3,988,284*	*$3,076,183*	*$3,138,843*	*$2,821,640*
New Idle Wells	-	*$538,139*	*$538,139*	*$964,520*	*$964,520*	*$1,390,901*
Observation Wells	*$364,679*	*$555,485*	*$555,485*	*$555,485*	*$190,806*	*$534,009*
3. Casing Pressure Test	$99,701,525	$119,334,600	$115,305,575	$87,964,800	$39,553,442	$52,278,394
Baseline Idle Wells	*$84,259,175*	*$80,445,750*	*$76,416,725*	*$49,075,950*	*$13,937,467*	*$13,362,594*
New Idle Wells	-	*$17,557,925*	*$17,557,925*	*$17,557,925*	*$17,557,925*	*$17,557,925*
Partially Plugged Idle Wells	*$1,441,825*	-	-	-	*$727,650*	*$727,650*
Observation Wells	*$14,000,525*	*$21,330,925*	*$21,330,925*	*$21,330,925*	*$7,330,400*	*$20,630,225*
4. Clean Out Tag	$67,951,351	$64,875,990	$61,626,757	$39,577,614	$56,199,798	$53,881,746
5. Mechanical Integrity Test Survey	$144,000	$144,000	$144,000	$144,000	$144,000	$144,000
6. Monitoring of Inaccessible IW	$167,580	$167,580	$167,580	$167,580	-	-
7. Engineering Analysis for 15-Year IW	$907,280	$1,257,960	$1,287,880	$1,307,240	$431,640	$526,240
8. Plugging and Abandoning	$68,456,250	$72,856,939	$70,809,627	$55,866,849	$41,681,003	$44,592,032
Waiver - IWMP	*$17,625,000*	*$16,528,189*	*$16,652,127*	*$17,013,099*	*$16,994,753*	*$16,818,346*
Baseline IW Failed CPT	*$32,831,250*	*$31,342,500*	*$29,771,250*	*$19,117,500*	*$7,725,000*	*$7,437,436*
New IW Failed CPT	-	*$4,886,250*	*$4,886,250*	*$4,886,250*	*$4,886,250*	*$4,886,250*
Baseline IW Failed Clean out Tag	*$10,575,000*	*$10,050,000*	*$9,600,000*	*$6,150,000*	*$8,700,000*	*$8,400,000*
New IW Failed Clean out Tag	-	-	-	-	-	-
Baseline IW Failure to Comply	*$3,525,000*	*$3,375,000*	*$3,225,000*	*$2,025,000*	*$600,000*	*$525,000*
New IW Failure to Comply	*$0*	*$750,000*	*$750,000*	*$750,000*	*$750,000*	*$750,000*
Obs. Wells Failed CPT	*$3,900,000*	*$5,925,000*	*$5,925,000*	*$5,925,000*	*$2,025,000*	*$5,775,000*
9. Partial Plugging	$3,740,670	$2,883,600	$2,883,600	$2,883,600	$2,883,600	$2,883,600
Partially Plugged Idle Wells	*$2,883,600*	*$2,883,600*	*$2,883,600*	*$2,883,600*	*$2,883,600*	*$2,883,600*
Failed Casing Pressure Test – PP IW	*$857,070*	-	-	-	-	-
10. Remediation	$4,378,500	$4,378,500	$4,170,000	$2,710,500	3,127,500	2,919,000
Baseline IW Failed Clean out Tag	*$3,266,500*	*$3,127,500*	*$2,988,500*	*$1,876,500*	*$2,710,500*	*$2,571,500*
New IW Failed Clean out Tag	-	-	-	-	-	-
Baseline IW Failure to Comply	*$1,112,000*	*$1,042,500*	*$973,000*	*$625,500*	*$208,500*	*$139,000*
New IW Failure to Comply	-	*$208,500*	*$208,500*	*$208,500*	*$208,500*	*$208,500*
Total	**$249,112,027**	**$269,616,330**	**$261,634,839**	**$195,376,319**	**$148,473,444**	**$162,130,192**

DOGGR "2018 Idle Wells Inventory" (January 17, 2018).

Direct Costs on Typical Businesses

The ownership of idle wells in California is heavily skewed towards a handful of large operators. Twelve operators collectively owned 72 percent of the idle wells inventory at the beginning of 2018 and generated more than $100 million each in estimated gross sales in 2017. In total, these 12 operators generated nearly $7.9 billion in 2017, or nearly 88 percent of the $8.9 billion gross revenue among all idle well owners. The Division considers these twelve operators as a "typical" business.

Because these twelve operators own 72 percent of the State's idle wells, the Division expects the operators to take on roughly 72 percent of the State's compliance cost burden (see "Expected Share of Costs" in Table 8). The expected share of costs divided by their estimated total revenue represents their compliance burden. On average, the direct costs make up 1.4 to 2.5 percent of the gross revenue for the typical operator.

Table 8. Direct Cost Impact on "Typical" Business

Year	Total Direct Cost	Expected Share of Costs (%)*	Expected Share of Costs ($)	Estimated Total Revenue	Compliance Burden
1	$249,112,027	72%	$179,360,659	$7,867,882,003	2.3%
2	$269,616,330	72%	$194,123,758	$7,867,882,003	2.5%
3	$261,634,839	72%	$188,377,084	$7,867,882,003	2.4%
4	$195,376,319	72%	$140,670,949	$7,867,882,003	1.8%
5	$148,473,444	72%	$106,900,879	$7,867,882,003	1.4%
6	$162,130,192	72%	$116,733,738	$7,867,882,003	1.5%

Data Source: (1) DOGGR, *2017 Production Access Database.zip*, Feb. 6, 2018. (2) DOGGR, *2018 Idle Wells Inventory*, Jan. 17, 2018.
* Based on percentage of idle wells owned.

The costs of compliance to a typical operator will likely reduce its profit margins and impact investment decisions in the short-term. The funds necessary to comply with the proposed regulations would likely be diverted from some other form of spending, such as dividends to shareholders, direct production activities, or research and development. In other words, additional compliance costs restrict an operator's ability to fully utilize its funds according to its own priorities. In the short-term, the costs of compliance may also divert time and resources away from production. While the costs associated with this regulation would represent a small portion of overall expenditures for typical operators, a reduction in profits due to regulations could conceivably have some effect on stock prices, which would make raising capital more challenging, reduce dividend payments, and reduce overall capital gains to current shareholders.

In addition to these proposed regulations, the Division has other pending rulemakings including one that would affect oil and gas producers with pipelines in sensitive areas and another that would affect operators with Class II underground injection control wells. The cumulative costs of the regulations could pose a financial burden on operators that are affected by more than one of the proposed regulations. While the economic impact of the regulations is relatively minor compared to changes in revenue swings associated with highly volatile oil and gas prices, these and other new regulations will result in marginally smaller profits. Statewide oil and gas production could experience some reduction

in production activity, however, as noted previously, it would be difficult to parse out what, if any lost production would be attributable to new regulatory costs or simply part of the continuing pattern of lower and lower production that has been occurring in California since 1985.

The typical operator's business practices have evolved to withstand the extreme volatility of crude oil and natural gas prices. In 2016, the US EIA commissioned IHS Global Inc. (IHS) to perform a study of upstream drilling and production costs associated with drilling, completing, and operating wells and facilities. Even in extended periods of a low commodity price environment, the study identified multiple ways in which operators were able to cut costs by a number of methods, including the cutting of operating costs, the prioritization of projects, the implementation of technological improvements and innovations, and the adoption of best practices and improvements related to well design.[33] As a result, the Division expects the direct costs to create a large, but absorbable burden on these typical operators.

[33] US Energy Information Administration, Trends in US Oil and Natural Gas Upstream Costs, March 23, 2016. <https://www.eia.gov/analysis/studies/drilling/pdf/upstream.pdf>

Direct Costs on Small Businesses

For purposes of this SRIA, the Department defines a small business as any operator with positive oil and gas production and less than $15 million each in estimated gross revenue in 2017.[34] One hundred and fifty-three (153) operators meet this standard, representing 13 percent of all operators with idle wells. The 153 operators collectively own 2,318 idle wells and generated over $222 million in 2017, or nearly 2.5 percent of the $8.9 billion gross revenue among all idle well owners.

Because they own 8.4 percent of the State's idle wells, the Division expects the small operators to take on roughly 8.4 percent of the State's compliance cost burden (see "Expected Share of Costs" in Table 9). The expected share of costs divided by their estimated total revenue represents their compliance burden.

Table 9. Direct Cost Impact on "Small" Business

Year	Total Direct Cost	Expected Share of Costs (%)*	Expected Share of Costs ($)	Estimated Total Revenue	Compliance Burden
1	$249,112,027	8.4%	$22,358,599	$222,380,434	9.4%
2	$269,616,330	8.4%	$23,375,463	$222,380,434	10.2%
3	$261,634,839	8.4%	$22,695,221	$222,380,434	9.9%
4	$195,376,319	8.4%	$16,980,368	$222,380,434	7.4%
5	$148,473,444	8.4%	$13,175,616	$222,380,434	5.6%
6	$162,130,192	8.4%	$14,368,986	$222,380,434	6.1%

Data Source: (1) DOGGR, *2017 Production Access Database.zip*, Feb. 6, 2018. (2) DOGGR, *2018 Idle Wells Inventory*, Jan. 17, 2018.
* Based on percentage of idle wells owned.

On average, the direct costs make up 5.6 to 10.2 percent of the gross revenue for the small operator. The direct costs could have a significant impact on these operators, particularly the ones that do not produce much oil or gas. A small operator is far more likely than a large operator to declare bankruptcy and desert its idle wells, which will then trigger enforcement actions by the Division.

The costs of compliance to a small operator will reduce its profit margins and negatively impact investment decisions in the short-term. The funds necessary to comply with the proposed regulations would likely be diverted from direct production activities in this case, which could restrict an operator's ability to produce to its full productive capacity. In the long-term, small operators may learn to adapt, large companies may buy projects and wells from small operators, and/or operators will become more efficient and productive to make up for any short-term production losses.

A separate population of idle well owners not included in the small operator discussion above are operators that generated zero oil and gas production in 2017. There are 985 such operators with 2,886 total idle wells, or 10 percent of all idle wells. According to the DOGGR database CalWIMS, nearly 90 percent of these operators are no longer active. While the idle wells could potentially be sold or

[34] According to the California Department of General Services (DGS), one of the eligibility requirements for "small" business is an average annual gross receipts of $15 million or less, over the last three tax years. <http://www.dgs.ca.gov/pd/Programs/OSDS/SBEligibilityBenefits.aspx>

transferred to new owners, the Division is aware that few of the 985 operators may ultimately comply with the regulations. The Division will likely exercise its enforcement authority to find the last known well owner or current land owner, issue violations, orders to comply, and, if necessary, levy the appropriate fines.

These inactive and non-producing operators ceased production in the absence of specific regulations targeting idle well testing and management. The proactive approach of the proposed regulations would compel small operators to make decisions about their idle wells while the operators are still financially solvent, leaving fewer deserted wells for the Division to address.

In this SRIA, the Division does not exclude these 985 non-producing operators and the associated 2,886 idle wells from the analysis. As a result, the actual overall direct cost to the active oil and gas operators will be less than the projected direct costs.

Direct Costs on Individuals

Crude Oil

The direct cost of the proposed regulation is not expected to result in a cost impact to individuals or final consumers of petroleum products. Although end products from the refinement of crude oil, such as diesel and gasoline, incorporate the cost of the crude oil purchased by refineries, the price of the crude oil itself is not determined by individual operators in California. Because crude oil is the world's most traded commodity, its price is primarily established by speculators and hedgers in the futures market who try to secure a price now in anticipation of or protection from price changes in the future.

The price of California crude oil is typically benchmarked against a grade of a light crude oil called West Texas Intermediate (WTI). The price can be higher or lower based on both its relative quality compared to the WTI and the cost of transportation to refineries. In general, the transportation cost is borne by the operator and not the refinery that purchased the crude oil.[35] This is due to pressure from the global market. California refineries imported approximately 70 percent of their crude oil from Alaska and foreign sources in 2017; a trend toward imports that has been increasing steadily since 1999.[36] Refineries could simply find an out-of-state alternative to domestic producers if domestic producers increased their prices. As a result, oil producers cannot pass the costs of compliance on to refineries or end users.

Natural Gas

The direct cost of the proposed regulation is not expected to result in a cost impact to individuals or final consumers of natural gas. Global natural gas markets are becoming increasingly interconnected, creating a greater flexibility to respond to changes in supply and demand.[37] The U.S. shale boom has driven much of this globalization by providing a glut of gas for export. This shale gas is sourced from multiple locations throughout the continental U.S., providing for flexibility of product delivery with little to no price impact when a region or pipeline is disrupted.[38]

Nationally, California accounts for only one percent of total natural gas reserves and production; in-state output equals about one-tenth of state demand and is used exclusively in-state.[39] Thus, California production does not enter the global market and a loss in production would not affect global market

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[35] American Petroleum Institute (API). Understanding Crude Oil and Product Markets <http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Crude-Oil-Product-Markets/Crude-Oil-Primer/Understanding-Crude-Oil-and-Product-Markets-Primer-High.pdf > (as of March 22, 2018).

[36] California Energy Commission. Oil Supply Sources to California Refineries <http://www.energy.ca.gov/almanac/petroleum_data/statistics/crude_oil_receipts.html> (as of March 15, 2018).

[37] International Energy Agency. Global Gas Security Review: How is LNG Market Flexibility Evolving? <https://www.iea.org/publications/freepublications/publication/GlobalGasSecurityReview2017.pdf > p.3 (2017).

[38] Id. at 33.

[39] U.S. Energy Information Administration. California State Profile and Energy Estimate; Profile Analysis<https://www.eia.gov/state/analysis.php?sid=CA> (as of October 29, 2017).

prices. This has been demonstrated during recent supply disruptions, such as Hurricane Harvey in 2017, when prices remained stable in spite of a 26 percent peak loss in offshore gas production.[40]

With more than eight interstate pipelines connecting California to natural gas basins in the Southwest, Canada, and the Rocky Mountains[41], California is able to access the greater U.S. market for natural gas and can simply increase its import volume to cover any production loss caused by these regulations. Thus, the global price will not be affected by these regulations, and the local price should remain consistent with the global price.

Current and Prospective Shareholders

Although operators that produce crude oil and natural gas cannot pass costs onto refineries and individuals, a reduction in profits could negatively affect share prices of a publicly traded oil and gas companies with underground injection wells in California. If profitability of such a company is affected by the proposed regulations in any meaningful way, both current and prospective shareholders might not find the stock offerings to be attractive. In the end, both corporations and individuals could be affected by the regulatory environment if stock prices are negatively affected – capital gains to shareholders would be reduced, raising capital would become more challenging, and any dividend payments would be reduced. However, it should be noted that the compliance costs imposed by these regulations are substantially smaller than typical fluctuations in oil and gas prices in any given year. As such, they are not likely to be considered a significant variable for stock performance relative to other market forces such as oil price, assets, known reserves, and other factors.

[40] International Energy Agency at p. 33.
[41] California Public Utilities Commission. Natural Gas and California, Last accessed March 15, 2018. <http://www.cpuc.ca.gov/natural_gas/>

Economic Impacts

The Division can estimate the economic impact of every dollar spent from the cost of compliance by using an input-output (I-O) model to capture the secondary indirect effects of direct spending. Although there are a wide range of commercially available I-O models, this analysis uses the Regional Input-Output Modeling System (RIMS II) to estimate the regional economic impact.

RIMS II

RIMS II is produced by the U.S. Bureau of Economic Analysis (BEA) using their 2007 national I-O table, which shows the input and output structure of nearly 500 U.S. industries, and adjusted by their 2015 regional economic accounts to reflect California-specific industrial structure and trading patterns. Each industry is associated with a set of multipliers that represents final demand change in state output, earnings, employment, and value-added, for every dollar of direct spending.[42] In this analysis, direct spending is necessary to satisfy regulatory requirements, so spending is treated as an investment purchase rather than an intermediate input.

Assumptions and Limitations

The resultant economic impacts from the RIMS II analysis have several important assumptions that could limit or reduce the local economic impact. First, it assumes businesses in the affected industries have no supply constraints and can satisfy additional demand with an increase in inputs and labor from within the State. Second, it assumes businesses have fixed patterns of purchases, or increase in output requires the same proportionate increase in input. Third, the model assumes businesses use local inputs if they are available.

Regarding the first and third assumptions, one particular concern by operators in the oil and gas industry is the availability of rigs to address all of the testing required by not just the proposed idle well regulation, but also testing for active production and injection wells. The Division believes that service contractors in or near California may not yet be operating at full capacity. In other words, enough well service rigs are likely available regionally or in-state to meet demand. According to a monthly survey of well service rigs by the Association of Energy Service Companies (AESC), the utilization rate of workover rigs for the geographic region that includes California, "West Coast/Alaska," was approximately 41 percent in February 2018.[43] Furthermore, none of the three closest regions – the Rocky Mountain area, the West Texas/Permian basin, and the Mid-Continent – show utilization rates for well service rigs greater than 51 percent.[44] If the required testing can be handled by the State's inventory of workover rigs, then there would not be a reduction in the estimated economic impacts from use of out-of-state rigs. Because they are known for their mobility, well service rigs can likely be brought in from outside of

[42] Multipliers that account for only the interindustry effects (direct and indirect) of a final-demand change. BEA RIMS II Guidelines, p. G-3.
[43] Association of Energy Service Companies, *Rig Count – Past Months Excel (Download)*, <http://www.aesc.net/AESC/Industry_Resources/Rig_Counts/AESC/Industry_Resources/Well_Service_Rig_Count.aspx?hkey=0f7d9987-7819-421e-9c4c-7e7d9323ab3c>
[44] Id.

the State if demand cannot be met in-state. However, if additional workover rigs are brought in from outside of the State, then the estimated economic effects in the model would not be fully realized.

Regarding the second assumption, the reality is that businesses – particularly in the oil and gas industry – become more efficient over time with changes in processes and technology that allow them to do more with less. This applies not only to the service contractors, but also to the operators who may find more cost-effective solutions to satisfy the requirements of the proposed regulation. Therefore, the results of the assessment represent the impact's upper bound.

Industry Code

One of the biggest advantages of using RIMS II is the level of industrial detail, which helps to avoid aggregation issues. Table 10 displays the relevant RIMS II industry code for each of the direct cost categories from the proposed regulation as well as the related North American Industry Classification System (NAICS) code.

The most common RIMS II industry code affected by the direct regulatory spending is 21311A, described as "other support activities for mining," with an associated NAICS code of 213112, described as all industries "primarily engaged in performing support activities on a contract or fee basis for oil and gas operations." Regulatory spending on fluid level tests, casing pressure tests, clean out tags, mechanical integrity test surveys, plugging and abandonment work, partial plugging work, and remediation work will affect this industry.

Table 10. RIMS II Industry Code and Related NAICS Code

Direct Cost Category	RIMS II Industry Code	Industry Description	Related NAICS Code
1. Reporting Requirements	518200	Data processing, hosting, and related services	518210
2. Fluid Level Test	21311A	Other support activities for mining	213112
3. Casing Pressure Test	21311A	Other support activities for mining	213112
4. Clean Out Tag	21311A	Other support activities for mining	213112
5. Mechanical Integrity Test Survey	21311A	Other support activities for mining	213112
6. Monitoring of Inaccessible Idle Wells	334513	Industrial process variable instruments manufacturing	334513
7. Engineering Analysis for 15-Year Idle Wells	541300	Architectural, engineering, and related services	541330
8. Plugging and Abandoning	21311A	Other support activities for mining	213112
9. Partial Plugging	21311A	Other support activities for mining	213112
10. Remediation	21311A	Other support activities for mining	213112

Data Source: BEA, *California RIMS II data (Type I), 2007/2015,* 2017.

Other industry codes used in this analysis of economic impacts are 518200 (data processing, hosting, and related services) for spending on reporting requirements; 334513 (industrial process variable instruments manufacturing) for monitoring of inaccessible idle wells; and 541300 (architectural, engineering, and related services) for the engineering analysis for 15-year idle wells.

Type I Multipliers

The Type I multipliers associated with affected industries are shown in Table 11. The value derived from the use of the multipliers represents final demand change in state output, earnings, employment, and value-added, for every dollar of direct spending.[45]

Table 11. Type I RIMS II Multipliers Associated with the Industry Affected by Regulatory Spending

Direct Cost Category	Type I RIMS II Multipliers			
	Gross Output (per dollar)	Earnings (per dollar)	Jobs (per million $)	GSP (aka Value Added)
1. Reporting Requirements	1.5969	0.4423	6.9752	0.8498
2. Fluid Level Test	1.3239	0.3899	5.7237	0.8649
3. Casing Pressure Test	1.3239	0.3899	5.7237	0.8649
4. Clean Out Tag	1.3239	0.3899	5.7237	0.8649
5. Mechanical Integrity Test Survey	1.3239	0.3899	5.7237	0.8649
6. Monitoring of Inaccessible Idle Wells	1.4644	0.5578	7.6475	0.7747
7. Engineering Analysis for 15-Year Idle Wells	1.5532	0.6023	9.0209	0.849
8. Plugging and Abandoning	1.3239	0.3899	5.7237	0.8649
9. Partial Plugging	1.3239	0.3899	5.7237	0.8649
10. Remediation	1.3239	0.3899	5.7237	0.8649

Data Source: BEA, *California RIMS II data (Type I), 2007/2015,* 2017.

[45] Multipliers that account for only the interindustry effects (direct and indirect) of a final-demand change. BEA RIMS II Guidelines, p. G-3.

Results of the Assessment

The resultant indirect economic impacts are shown in Table 12 for gross output, earnings, jobs, and value added. The breakdown of economic impacts by category of regulatory spending can be found in detail in Appendix D through G.

Table 12. Annual Indirect Economic Impacts from Regulatory Spending

Economic Impact	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Gross Output	$330,226,930	$357,300,169	$346,740,329	$259,025,123	$196,706,181	$214,808,133
Earnings	$97,387,230	$105,427,010	$102,321,381	$76,491,298	$57,989,770	$63,334,647
Jobs	1,430	1,548	1,502	1,123	851	930
Value Added (GSP)	$215,416,613	$233,153,662	$226,249,995	$168,942,692	$128,405,428	$140,215,640

Data Source: Estimated using RIMS II Type I Final Demand Multipliers (2015). Data Source: BEA, *California RIMS II data (Type I), 2007/2015,* 2017.

Because the cost of compliance is expected to be largest in the first four years of the proposed regulation's effective date, the indirect economic impact is largest in the first four years. As discussed in the Direct Cost Impact sections, despite the large positive economic impact derived from regulatory spending, the operators themselves are likely to experience negative impacts that are not captured in this input-output model, including lower profit margins, reduced production levels, diverted investments, and lower share prices, among other possibilities. The costs of compliance will ultimately mute the largely positive indirect economic impacts from the required regulatory spending.

Creation or Elimination of Jobs within California

The proposed regulations are expected to create a demand for services in the oil and gas industry that specifically address an increase in testing and the plugging and abandonment of idle wells. Table 12 displays the expected job growth from the final demand change, ranging from 1,123 to 1,548 jobs per year for the first four years, and 851 jobs in Year 5 and 903 jobs in Year 6, primarily for work related to casing pressure tests, clean out tags, and plugging and abandonment (see Appendix F for the industry breakdown). Employment will certainly consist of full- and part-time jobs, though the RIMS II data does not capture the difference. The calculated output per worker (earnings divided by jobs) is about $68,000 per year.

While the I-O model captures job growth in companies that perform support activities on a contract or fee basis for oil and gas operations, there is a possibility that operators themselves may downsize the number of in-house employees or, in the case of small operators, exit the industry altogether. Both examples would lead to job losses not captured by the RIMS II model.

Creation of New Businesses or the Elimination of Existing Businesses within California

The initial increase in spending on testing, plugging and abandonment, and other regulatory activities is expected to lead to gross output of anywhere from $259-337 million per year for the first four years of the proposed regulation, and about $197 million in Year 5 and about $215 million in Year 6 (see Table

12). The gross output will not only affect the industries that provide the contracted services, but also all of the related equipment manufacturers, maintenance operators, equipment suppliers, and other businesses that provide intermediate inputs to those oil and gas service contractors. Therefore, oil and gas service contractors and their various suppliers will likely see an increase in demand for their services as a result of the proposed regulations. However, barriers to entry, such as the cost of equipment needed to perform testing or plugging and abandonment work, could limit the number of new service contractor businesses.

For oil and gas operators, the cost of compliance could be a heavy financial burden on smaller businesses. These smaller operators could exit the industry leading to fewer operators in the State.

Competitive Advantages or Disadvantages for Businesses Currently Doing Business within California

Because they do not have control over the sale price of the extracted hydrocarbon, operators in California reduce risk and increase efficiency, revenue, and profit by constantly improving both their technological capabilities and their processes. The Division does not expect the proposed regulation to interfere with an operator's investment in efficiency, particularly for a mid- to large-sized operator that has the resources to invest in research and development and/or outsource work to service contractors. However, small operators do not have the same resources as the larger operators and are more likely to experience some hardship in complying with the costs of the proposed regulation. Smaller operators are more likely to exit the industry altogether due to these financial hardships, which could lead to a slight reduction in overall state oil and gas production as discussed in the Cost to Small Business section above. Since most of the State's idle well inventory is owned by the largest operators in the State, the Division does not anticipate any change in competitive advantages or disadvantages for California's oil and gas producers as a whole.

Most of the indirect economic benefits will be realized by service contractors in the oil and gas industry. The proposed regulations are likely to negatively affect statewide operators' competitive advantage in the short-term as profits will likely be affected by the costs of compliance. In the long-term, however, the Division expects the operators to make up for the reduced profit margin by developing and adopting technological and process efficiencies to meet the demand for their services created by the proposed regulation.

Increase or Decrease of Investment in California

The annual direct spending resulting from the regulations is an immediate investment spending. In this case, the investment spending mostly consists of purchases of contracted oil and gas services or equipment to meet the requirements of the proposed regulations. The indirect economic effect of that investment spending is expected to create $128-233 million per year over the first six years in value added (see Table 12). That value added represents the increase in Gross State Product (GSP) as a result of investment spending. However, the economic impact of the value added is relatively insignificant compared to California's roughly $2.6 trillion annual economy[46].[47]

[46] $2.6 trillion in 2016 California Department of Finance.
[47] Dpartment of Finance, *Gross State Product in California*, May 4, 2018.

Incentives for Innovation in Products, Materials, or Processes

Operators in California are constantly trying to reduce risk and increase efficiency, revenue, and profit by innovating. Operators have little to no control over the sales price of crude oil, so they must continually find ways to produce oil cheaply and efficiently if they want to raise the profit margins, particularly when the price of crude oil is relatively low. While the proposed regulation helps to reduce some of the long-term risk by mandating testing and incentivizing the elimination of idle wells, it also narrows the profit margins in the short-term. But large and mid-sized operators have historically found ways to increase efficiency along the production chain, particularly through better technologies and outsourcing.[48] Oil and gas producers and the service contractors will continue to find innovations in technology and processes to remain competitive in a world market.

<http://www.dof.ca.gov/Forecasting/Economics/Indicators/Gross_State_Product/>

[48] Abdel M. Zellou, "The Economic Benefits of Consolidation, Focus, and Partnership," *Innovations* Vol. VII, No. 4 (2015): 12-13.

Benefits

The proposed regulations effectively require regular idle well testing for the State's inventory of idle wells while incentivizing the elimination of those wells. While there are large direct costs, there are also important social benefits that are less tangible and not easily measurable. Although this SRIA does not provide a cost accounting of the social benefits, it does discuss their importance.

Benefits to the Environment and Public Health

The proactive approach to the testing and elimination of idle wells is a crucial component of the proposed regulations. Under the proposed regulation, both the operator and the Division have ways to identify problematic idle wells early enough to mitigate the risk of significant contamination to the environment and the public. Improperly maintained idle well casings can rust or crack as they lay dormant, contaminating their surroundings, affecting groundwater, air, and the public health of nearby residents. Leaks or damage to idle wells could go unnoticed for long periods of time in the absence of the proposed regulations. Under the proposed regulations, operators will identify problems in idle wells that may have otherwise gone unnoticed while the wells remained inactive and untested.

Air Quality

The environmental and public health risks of idle wells are fairly significant. One can consider the environmental and public health risks posed by abandoned idle wells to be a fairly good proxy for the environmental and public health risks posed by long term-idle wells if left unaddressed. A 2014 study by researchers at the Proceedings of the National Academy of Sciences (PNAS) found that abandoned oil and gas wells in Pennsylvania are a significant source of methane emissions.[49] The researchers found that the average methane flow rate for a sample of 19 abandoned oil and gas wells in Pennsylvania was 0.27 kg per day per well compared to an average methane flow rate of 4.5×10^{-6} kg per day per control location. And according to other research, methane emissions from the estimated three million abandoned wells in the US are assumed to be the second largest potential contributor to total US methane emissions.[50] The migration of oil and gas formations to the surface can create a serious risk of explosion, noxious odors, and potential emissions of carcinogenic chemicals.[51]

The benefit of the proposed regulations on methane reductions ($SC\text{-}CH_4$) can be estimated using social cost estimates developed by the Interagency Working Group on Social Cost of Greenhouse Gases (IWG), a 13-member committee of experts appointed by the National Academy of Sciences. In short, the model is based on a "set of three integrated assessment models (IAMs), five socioeconomic and emissions

[49] Mary Kang, et al, PNAS, *Direct measurements of methane emissions from abandoned oil and gas wells in Pennsylvania*, Vol. 111, No. 51, pp. 18173-18177, Dec. 2014.
[50] Brandt AR, et al, "Energy and environment. Methane leaks from North American natural gas systems." *Science* 343(6172):733–735
[51] Mary Kang, et al, PNAS, *Direct measurements of methane emissions from abandoned oil and gas wells in Pennsylvania*, Vol. 111, No. 51, pp. 18173-18177, Dec. 2014.

scenarios, equilibrium climate sensitivity distribution, three constanct discount rates, and the aggregation approach used by the IWG to develop the SC-CO_2 estimates."[52]

The social cost estimates are shown in Table 13. The IWG presents a range of discount rates to represent the value of current benefits against future benefits. A higher discount rate translates to a lower benefit in the future while a zero discount rate means that the benefit is worth the same at any point in the future as it is today. For example, a five percent discount rate implies that a benefit is worth five percent less each year into the future. In 2020, for example, if the proposed regulation reduces methane emissions by 1,000 metric tons, then the estimated value of reduced methane emissions is $1,200,000 at the three percent discount rate.

Table 13. Methane Reduction Cost Estimates (in 2007 dollars per metric ton)

Year	Cost at 5% Discount Rate	Cost at 3% Discount Rate	Cost at 2.5% Discount Rate
2018	$510	$1,100	$1,500
2019	$520	$1,200	$1,500
2020	$540	$1,200	$1,600
2021	$560	$1,200	$1,600
2022	$590	$1,300	$1,700
2023	$610	$1,300	$1,700

Source: Interagency Working Group on the Social Cost of Greenhouse, *Addendum to Technical Support Document* (2016).

In this analysis, the expected annual total of plugged and abandoned idle wells shown in Table 5 will be the main driver of methane emissions reductions. In the absence of the proposed regulations, the idle wells would not be comprehensively and proactively tested nor properly plugged and abandoned. Thus, the Division uses, as a proxy, the average methane flow rate of 0.27 kg per day per well cited in the 2014 PNAS study. This methane flow translates to 0.00027 metric ton per day per well, or 0.09855 metric ton per year per well, which is the expected reduction in methane emissions from the proposed regulations.

Depending on the discount rate, the expected total benefits from the social cost of methane reductions will range from $353,552 to $1,019,250 over the first six years that the regulations are in effect (see Table 14).

[52] Interagency Working Groupon on Social Cost of Greenhouse Gases, *Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*, August 2016.

Table 14. Methane Reduction Cost Estimates (in 2017 dollars per metric ton)

Year	Wells Expected to be Plugged and Abandoned	Cost at 5% Discount Rate	Cost at 3% Discount Rate	Cost at 2.5% Discount Rate
2018	913	$54,148	$116,789	$159,258
2019	971	$55,209	$127,406	$159,258
2020	944	$57,333	$127,406	$169,875
2021	745	$59,456	$127,406	$169,875
2022	556	$62,641	$138,023	$180,492
2023	595	$64,765	$138,023	$180,492
Total	**4,724**	**$353,552**	**$775,055**	**$1,019,250**

Note 1: The per well annual methane flow reduction is 0.09855 metric tons.
Note 2: The 2007 to 2017 CPI multiplier is 1.18
Data Sources: (1) Interagency Working Groupon on Social Cost of Greenhouse Gases, *Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*, August 2016. (2) US Bureau of Labor Statistics, *CPI-All Urban Consumers (Current Series)*, last accessed June 14, 2018.

Groundwater

Another of the intended benefits of the proposed regulation is to protect sources and potential sources of water that can be of beneficial use including residential, agricultural, and commercial purposes. Groundwater is one of California's greatest natural resources. It provides 39 percent of the water supply to meet the State's total agricultural uses, 41 percent of the supply to meet the total urban water uses, and approximately 18 percent of the supply to meet the total managed wetlands uses. In drought years, groundwater usage increases and has contributed up to 46 percent of water used by California's farms, residents, and businesses.[53] Groundwater serves as a buffer against the impacts of drought and climate change and is a vital resource that should be protected and remain sustainable.

Contamination of groundwater supplies can render a groundwater basin unusable as a drinking water source, as well as for agricultural, industrial and other uses. Preventing groundwater contamination is much easier and far less expensive than remediating it. Thoroughly cleaning an aquifer can require cleansing the soil, sand, or rock containing the water source. For this reason, remediating polluted groundwater is very costly, can take years, and in many cases, is not technically or economically feasible.

For example, the cost and effort involved in the groundwater remediation at Superfund sites and Resource Conservation and Recovery Act (RCRA) corrective action sites, while not a perfect analog for remediation of the type of groundwater contamination that could potentially occur from leaking idle

[53] Department of Water Resources, *California's Ground Water Update*, 2013. <https://www.water.ca.gov/LegacyFiles/waterplan/docs/groundwater/update2013/content/statewide/GWU2013_Combined_Statewide_Final.pdf>

wells, the comparison offers an idea of how resource-intensive and challenging groundwater remediation efforts can be. In 2001, the US EPA prepared a cost analysis for groundwater cleanup at 48 different Superfund sites and RCRA corrective action sites. The analysis focused on pump-and-treat (P&T) systems and permeable reactive barriers (PRBs). P&T involves extracting contaminated groundwater through recovery wells or trenches and treating the groundwater by aboveground processes, such as air stripping, carbon adsorption, biological reactors, or chemical precipitation. A PRB is a below-ground treatment zone of reactive material that degrades or immobilizes contaminants as groundwater flows through it. PRBs are installed as permanent, semi-permanent, or replaceable units across the flow path of a contaminated plume. The US EPA analysis considered six main factors that affect the cost of P&T and PRB technology applications: (1) characteristics or properties of contaminants present, (2) system design and operation, (3) source control, (4) hydrogeologic setting, (5) extent of contamination, and (6) remedial goals. The analysis found that the costs varied significantly between sites and that many of the factors that affect costs are site-specific. The analysis concluded that the average remedial costs associated with P&T sites (32 sites) included $4.9 million total capital costs, and $770,000 operating costs per year. The average remedial costs associated with PRB sites (16 sites) included $730,000 total capital costs, with the per year operating costs unavailable due to insufficient data.[54] The remediation effort undertaken by either system can take many years to complete.

Benefits to California Taxpayers and Residents

In the absence of the proposed regulation, idle wells could become deserted idle wells as oil and gas operators exit the industry without having properly plugged and abandoned their wells. If the Division either cannot find the last known operator or enforce action against the last known operator, the idle wells are considered deserted and the State may need to properly plug and abandon any well that is hazardous or potentially hazardous. Ultimately, long-term idle wells have the potential to be a significant liability to the State. According to the Department website, the Division has plugged and abandoned more than 1,350 orphan wells at a cost of more than $27 million since 1977.[55] The plugging and abandonment of idle wells can be particularly expensive in densely populated urban areas. In October 2016, the Division spent over $1 million in contractor costs to plug and abandon and two wells on Firmin Street in the Echo Park neighborhood in Los Angeles – much of the costs going to the restoration of the infrastructure surrounding the idle well. Moreover, the work involved in plugging and abandoning the Firmin Street wells resulted in inconveniences to the residents, such as the loss of power, phone, and cable services as well as increased noise pollution and loss of parking.

The proposed regulations attempt to reduce the liability to the State by encouraging and incentivizing the proper plugging and abandonment of the idle well inventory by active operators, thereby reducing the amount of state funds needed to address orphan wells.

In addition, the proper elimination of an idle well is an important practice in a state experiencing fast-paced urban growth and urban sprawl. For example, community activists and local leaders are

[54] US EPA, *Cost Analyses for Selected Groundwater Cleanup Projects: Pump and Treat Systems and Permeable Reactive Barriers, Feb. 2001.* <https://www.epa.gov/sites/production/files/2015-04/documents/cost_analysis_groundwater.pdf>

[55] http://www.conservation.ca.gov/dog/FirminStreetProject/Pages/Firmin-Street-Project.aspx

interested in re-purposing a drilling site in Arlington Heights in Los Angeles for affordable housing. However, the idle wells there have not been properly plugged and abandoned. And no development will move forward without the proper plugging and abandonment required to make the site safe for future residents.[56] The proposed regulations encourage the elimination of wells such as the ones in Arlington Heights, which would benefit California residents. And in general, the proper plugging and abandonment of idle wells increases public safety in communities that contain a substantial number of such wells.

Benefits to California Businesses and Consumers

The proposed regulations should also provide benefits to California businesses and consumers. For an operator with idle wells, a reduction in its idle well inventory reduces the risk to the operator. Risk reduction is an important component of reducing long-term liabilities and remaining solvent and profitable. Investing resources in the testing and elimination of idle wells reduces the risk that the well is leaking oil, natural gas, and/or other gases commonly found in hydrocarbon zones or providing a conduit for fluid migration. Aside from significant resource investment to address the incident, the Division could potentially order the operator to stop production until all well issues are remediated. Under these circumstances, the operators' revenues and profits would be greatly affected. The proposed regulation attempts prevent significant issues from arising.

There is also an induced effect of the spending from operators. Aside from the increase in jobs discussed earlier in this report, households will have more money to spend and introduce into the state economy. The induced spending by households will benefit local businesses beyond the oil and gas industry.

[56] http://www.latimes.com/local/lanow/la-me-ln-drilling-site-plan-20170407-story.html

Alternatives

The Division also considered alternatives to the casing pressure test requirements based on stakeholder comments and internal staff discussions. The two casing pressure test alternatives are evaluated relative to the proposed regulation – one that is more burdensome and one that is less burdensome to the State's idle well operators.

Alternative 1: Conducting Casing Pressure Tests for All Idle Wells at 500 psi

The Division considered a more stringent alternative to the casing pressure test than the requirements set forth in the proposed regulation. While the proposed regulations allow the operator to self-select the maximum pressure at which to pressure test each of its idle wells based on the risk of the well, this first alternative would require these idle wells to be tested at a maximum pressure of 500 psi. Moreover, all idle wells would have to repeat the casing pressure test every 72 months. In contrast, under the proposed regulation, all idle wells that test at 200 psi above surface pressure would repeat testing every 48 months; idle wells that test at 500 psi would repeat testing every 72 months; and idle wells that test at 1,000 psi would test every 96 months.

The first alternative yields several benefits. One, the pressure testing at 500 psi would identify a larger number of idle wells with mechanical integrity issues. Two, operators may decide to plug and abandon even more idle wells with increased participation in the Waiver Plan in order to avoid wasteful testing costs on idle wells that would likely fail at 500 psi. Three, idle wells that successfully pressure test at 500 psi instead of 200 psi under the proposed regulations would be able to delay repeat testing for 72 months instead of 48 months. And finally, a single pressure standard for the casing pressure test offers regulatory clarity, consistency, and efficiency. All tests would be held to the same standard, which would make enforcement potentially easier.

However, the first alternative would also result in increased costs relative to the proposed regulations. The first alternative would unnecessarily raise the cost of compliance to the industry. It could also create mechanical integrity issues in otherwise stable idle wells by forcing them to be tested at an unnecessarily high pressure requirement. Many of the idle wells that undergo a casing pressure test at 500 psi under this first alternative would only need to undergo a casing pressure test at 200 psi under the proposed regulations. As long as these wells can successfully pass a casing pressure test at 200 psi, the Division does not consider the idle wells to pose a serious threat to the public and the environment. The alternative casing pressure test at 500 psi could create an increased threat to the public and the environment by damaging the idle wells. As a result, the alternative could increase potential environmental and social costs as well as compliance costs.[57]

Table 15 displays the number of idle wells that are expected to be pressure tested at 200 psi over the six years of this analysis. Under the proposed regulations, 15 percent of these wells are expected to fail a casing pressure test at 200 psi, leading to plugging and abandonment. Under the first alternative, 25-50 percent of the idle wells that would test at 200 psi could fail at 500 psi. In the first year alone, the cost of compliance in the first alternative is about $23-47 million rather than approximately $14 million in the proposed regulations. Over the first four years of the analysis, the alternative could cost $5-33 million per year more than the casing pressure test requirements in the proposed regulations.

[57] Environmental and social costs are not quantified in this analysis.

Table 15. Alternative 1 Comparison of Costs

Scenario	Year 1		Year 2		Year 3		Year 4	
	Failed IW	P&A Cost	Failed IW	P&A Cost	Failed IW	P&A Cost	Failed IW	P&A Cost
Proposed Reg CPT 200 psi 15% Failure	188	$14,073,750	179	$13,432,500	170	$12,757,500	109	$8,190,000
Alternative 1: CPT 500 psi 25% Failure	313	$23,456,250	299	$22,387,500	284	$21,262,500	182	$13,650,000
Alternative 1: CPT 500 psi 50% Failure	626	$46,912,500	597	$44,775,000	567	$42,525,000	364	$27,300,000

Note: The affected population under the proposed regulation is the count of idle wells that are accessible and not partially plugged and pressure tested at a maximum pressure of 200 psi. Under the requirements of the first alternative, these idle wells would be pressure tested at a maximum pressure of 500 psi. All other idle wells under the proposed regulation would already be testing at 500 psi or higher and would not have a higher failure rate. Years 5 and 6 are excluded from this table because the Year 1 idle wells testing at 500 psi will not need to be tested again until Year 7.

Because the alternative scenario requires casing pressure tests to be repeated every 72 months, any cost savings for idle wells that would have been pressure tested at 200 psi and repeated every 48 months under the proposed regulation would be more than offset by cost expenditures for idle wells that would have been pressure tested at 1,000 psi and repeated every 96 months under the proposed regulation.

Ultimately, the Division rejects this first alternative because the high failure rates, the additional compliance costs, and the increased environmental and public risk created by conducting a casing pressure test at an unnecessary and unsafe maximum pressure do not outweigh the benefits of testing all idle wells at 500 psi. The Division considers this first alternative to be too burdensome to the industry, the State, and public and environmental safety and health.

Alternative 2: Casing Pressure Test Exemptions

The Division also considered a less burdensome casing pressure testing requirement. This second alternative would exempt a subset of idle wells from undergoing a casing pressure test if it meets the following criteria: (1) the well is located outside of a half-mile of a USDW, (2) the well passes a single required fluid test, and (3) the well is not a long-term idle well. This second alternative reduces the testing burden for idle wells considered to have a lower risk profile. Long-term idle wells and idle wells that penetrate a USDW have a higher risk profile and remain subject to the full requirements of the proposed regulation.

The primary benefit of the second alternative is the reduced cost of compliance to the operator for a portion of its idle wells. All new idle wells would be exempt from casing pressure testing assuming that there is no issue with the fluid level test. And approximately one-quarter of all idle wells in the baseline cohort would be exempt from testing. Table 16 displays the possible annual savings that might result from the testing exemptions.

The Division estimates that operators could avoid $3-21 million in the any of the first six years of this analysis compared to the requirements of the proposed regulations.

Table 16. Alternative 2 Cost Savings

Scenario	Year 1		Year 2		Year 3	
	IW	P&A Cost	IW	P&A Cost	IW	P&A Cost
Exempt Baseline Cohort Savings[a] [b]	234	$3,159,719	224	$3,016,716	213	$2,865,627
Exempt New IW Savings[b]	-	-	195	$17,557,925	195	$17,557,925
Total Savings	234	$3,159,719	419	$20,574,641	408	$20,423,552

Scenario	Year 4		Year 5		Year 6	
	IW	P&A Cost	IW	P&A Cost	IW	P&A Cost
Exempt Baseline Cohort Savings[a] [b]	137	$1,840,348	39	$522,655	37	$501,097
Exempt New IW Savings[b]	195	$17,557,925	195	$17,557,925	195	$17,557,925
Total Savings	332	$19,398,273	234	$18,080,580	233	$18,059,022

[a] One-quarter of the idle wells per year in the baseline cohort are assumed to have idle age of less than eight years.
[b] Fifteen percent of idle wells are assumed to be located outside of a half-mile of a USDW.
Note: A fluid level test is conducted on all idle wells.

On the other hand, there are two profound social and environmental costs associated with the second alternative. One, although some idle wells have a lower risk profile based on their idle age and their location relative to a USDW, these wells still pose a risk to the environment as they age and remain untested. The lack of a regular casing pressure test requirement for all idle wells in the second alternative places both the operator and the Division in a reactive position rather than a proactive position should a mechanical integrity issue go undetected. This would result in unmitigated risks to underground sources of drinking water and natural resources. Two, the exempt idle wells under the second alternative pose a liability to the State if an operator exits the industry while accumulating idle wells that go untested and unplugged.

Because of these lingering concerns over any possible exemption from a casing pressure test requirement, the Division rejects the less burdensome second alternative.

Fiscal Impacts

Local Government

The proposed regulations will not impose any significant costs on local governments. The Division will be the lead agency for enforcing the new requirements and will be the lead agency for permitting plugging and abandonment operations.

Local governments in oil and gas producing areas will likely experience some fiscal benefits from economic activity induced by the regulatory requirements. They will also benefit from reduced environmental liabilities associated with idle wells in their communities.

State Government

With the passage of AB 2729, the Division asked for and was granted 15 additional staff members, and a baseline appropriation of $1.5 million ($2.5 million ongoing) to run the idle well program through a budget change proposal[58] approved by the California State Legislature. The fiscal impacts were funded by the per barrel assessment on oil produced in California.

The regulations will also have the effect of reducing potential liabilities associated with plugging and abandonment of deserted oil and gas wells that would otherwise be left idle for years to come. As stated in the benefits section, the Division has plugged and abandoned more than 1,350 orphan wells at a cost of more than $27 million since 1977. The proposed regulations would reduce liability to the State by making operators plug and abandon wells while the operators are financially solvent. The Division estimates that over the first six years of implementation, the proposed regulations would result in the plugging and abandonment of 4,724 idle wells at a cost of over $350 million, with a majority of these wells being long-term idle wells.

Other State Agencies

The California Air Resources Board and the State Water Resources Control Board may experience minor cost savings associated with their respective regulatory roles over idle wells. The Air Resources Board, in their efforts to reduce greenhouse gas emissions, have implemented regulations designed to reduce fugitive emissions from oil and gas fields, which also cover idle wells. The proposed regulations will likely reduce the number of idle wells that may be leaking methane emissions that would likely have to be resolved through enforcement actions made by the Air Resources Board.

The State Water Resources Control Board in their role protecting the State's water resources, including collaboration with the Division in regulation of underground injection control, may experience minor savings associated with reduced risks to groundwater and the reduction of idle wells within the areas of review of underground injection control projects.

[58] Department of Conservation Budget Change Proposal for implementation of Assembly Bill 2729 <http://web1a.esd.dof.ca.gov/Documents/bcp/1718/FY1718_ORG3480_BCP1370.pdf>

Conclusion

The SRIA for the idle wells proposed regulation uses a conservative approach to estimating the direct costs, many of which come directly from the operators. The population of wells in this analysis are also conservatively estimated, as the current oil price and economic climate affecting the industry is static over the six years of analysis.

The Division conservatively estimates that the annual cost of compliance could vary from approximately $148 to $270 million. As indicated in the report, this estimate is likely an overestimate of the actual cost of the regulation, but does reflect a full consideration of possible costs. While smaller operators will likely experience some hardship, particularly initially, in complying with these costs, the typical oil and gas operator, as described above, will be able to absorb the costs of this regulation within their operating budgets.

In the short-term, the regulated industry is expected to see marginally reduced profits as operators meet the proposed requirements. Small operators are particularly vulnerable to the regulatory cost burden and, in some cases, may be forced to exit the industry. The State may experience lower production over the first few years of the proposed regulations as operators divert spending from direct production and small operators stop production altogether. However, any reduction in production would be difficult to distinguish from the continuing decline in oil production in California resulting from market forces and the continued depletion of known, currently accessible oil and gas reserves. The Division expects the industry to find innovative ways to adjust to the cost burden resulting from the proposed regulations.

In addition to these proposed regulations, the Division has other pending rulemakings that could become effective around the same time as this rulemaking, including one that would affect gas producers with pipelines in sensitive areas and another that would affect operators with Class II Underground Injection Control wells. The cumulative costs of the regulations could pose a financial burden on operators that are affected by more than one of the proposed regulations. However, most of the operators that are affected by more than one proposed regulation are large operators that should be able to absorb these costs. However, profit margins will shrink in the short-term. Small operators that must comply with multiple regulations could exit the industry. Furthermore, statewide oil and gas operators are likely to experience some reduction in production activity in the short-term.

The benefits of the proposed regulations, however, are numerous, as they are expected to protect both the environment – particularly through methane reduction and groundwater contamination prevention – and public health, reduce liability from orphan wells to the taxpayers and residents, and reduce long-term risk to California operators in revenue generation.

Appendix A: Short-term Age Cohorts in 2018 Inventory by Count

Age in 2018 Inventory	Count
5	963
6	1,101
4	1,188
3	1,303
2	1,697
1	1,793
7	1,840
Median	**1,303**

Appendix B: Idle Well Inventory, Per Year

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total IW Inventory, Jan. 31	27,603	27,627	27,612	27,648	27,991	28,329
(+) New Idle Wells:	0	1,303	1,303	1,303	1,303	1,303
Total LTIW Inventory, Jan. 31	17,718	18,322	18,225	18,041	18,388	18,846
(+) New LTIW:	0	1,840	1,101	963	1,188	1,303
Waiver Plan (@ 2.26%):	623	624	624	625	633	640
Management Plan (@2.45% LITW):	431	449	447	442	451	462
RTU (10% of Management Plan):	43	45	45	44	45	46
Note: The following information contains details about the attrition rate of the initial cohort of idle wells, or the "already" idle wells population. In Year 1, the Inventory minus the waivers and the failures results in the following year's starting point. The "Baseline" inventory subject to testing in Year 5 is the Year 1 Cohort and so on.						
"Baseline" Inventory Cohort	27,603	26,367	25,169	24,022	23,181	22,336
minus (-) Waiver:	623	624	624	625	633	640
minus (-) RTU:	43	45	45	44	45	46
minus (-) Buried:	1,763	1,763	1,763	1,763	1,763	1,763
minus (-) Partial Plugged:	161	54	54	54	54	54
"Baseline" Cohort Subject to Testing*	25,013	23,881	22,683	21,536	20,686	19,833
Portion (1/4):	6,253	5,970	5,671	3,642	5,172	4,958
P&A Testing Failures:	429	397	366	151	89	82
P&A Compliance Failures:	46	43	39	16	7	6
P&A Cleanout Tag Failures:	138	134	118	49	116	112
New Idle Wells: P&A Testing Failures:	-	65	65	65	65	65
New Idle Wells: P&A Compliance Failures:	-	10	10	10	10	10

Appendix C: Survey

Department of Conservation

Industry Costs for Idle Wells Testing

Survey Respondent Profile

The Department of Conservation is gathering cost estimates associated with the surveying, documenting, testing, and proper maintenance of California's oil and gas wells. The cost estimates will be used to determine the economic impact of the Department's proposed idle wells regulations.

Cost information will be provided as an aggregate cost without specific attribution to respondents. The report will not reveal the names of the survey participants nor will the respondents' names be tied to their specific responses.

1. What is your role in the oil and gas industry?

O Owner Operator or Contract Operator
O Contractor (including consultant and service company)

Operator Profile

2. If you are an operator, in which of the following counties do you have oil and gas operations? (Check all that apply)

- ☐ Alameda County
- ☐ Alpine County
- ☐ Amador County
- ☐ Butte County
- ☐ Calaveras County
- ☐ Colusa County
- ☐ Contra Costa County
- ☐ Del Norte County
- ☐ El Dorado County
- ☐ Fresno County
- ☐ Glenn County
- ☐ Humboldt County
- ☐ Imperial County
- ☐ Inyo County
- ☐ Kern County
- ☐ Kings County
- ☐ Lake County
- ☐ Lassen County
- ☐ Los Angeles County
- ☐ Madera County
- ☐ Marin County
- ☐ Mariposa County
- ☐ Mendocino County
- ☐ Merced County
- ☐ Modoc County
- ☐ Mono County
- ☐ Monterey County
- ☐ Napa County
- ☐ Nevada County
- ☐ Orange County
- ☐ Placer County
- ☐ Plumas County
- ☐ Riverside County
- ☐ Sacramento County
- ☐ San Benito County
- ☐ San Bernardino County
- ☐ San Diego County
- ☐ San Francisco County
- ☐ San Joaquin County
- ☐ San Luis Obispo County
- ☐ San Mateo County
- ☐ Santa Barbara County
- ☐ Santa Clara County
- ☐ Santa Cruz County
- ☐ Shasta County
- ☐ Sierra County
- ☐ Siskiyou County
- ☐ Solano County
- ☐ Sonoma County
- ☐ Stanislaus County
- ☐ Sutter County
- ☐ Tehama County
- ☐ Trinity County
- ☐ Tulare County
- ☐ Tuolumne County
- ☐ Ventura County
- ☐ Yolo County
- ☐ Yuba County

Comments:

3. If you are an operator, how many idle wells do you currently own or operate?

- ○ 1 to 100
- ○ 101 to 250
- ○ 251 or more

Comments:

Contractor Profile

4. If you are a contractor, which of the following services do you or could you provide to the oil and gas operators? (Check all that apply)

O Risk management analysis and consulting
O Testing of wells (e.g. fluid testing, casing pressure testing, clean out tags, mechanical integrity tests, wireline/logging, etc.)
O Plugging and abandoning of wells
O Remediation of wells
O Surveying of well locations
O Other (please specify)

Section 1772.2. Testing of Idle Wells

Section 1772.2 of the proposed regulations is comprised of testing requirements on idle wells. If you are a contractor and do not provide the contract services referred to in the questions below, leave the answer blank.

5. Section 1772.2(a)(1) of the proposed regulations requires that, within 24 months of a well becoming an idle well, the operator shall conduct a fluid level test for all idle wells using acoustical, mechanical, or other reliable methods, or other diagnostic tests approved by the Supervisor.

Which of the following fluid level tests do you expect to conduct for the majority of your idle wells? (select one)

O Acoustical
O Mechanical
O Other (please specify)

6. Please provide an average cost estimate, per idle well, to conduct the fluid level test selected in the previous question ($).

Fluid level test, cost per idle well ($):

7. Comments regarding the cost of a fluid-level test, per proposed Section 1772.2(a)(1):

8. Section 1772.2(a)(2) of the proposed regulations requires that, within 24 months of a well becoming an idle well, or within 30 days of a fluid level test indicating that the fluid in the well is above a USDW, whichever is sooner, the operator shall conduct a casing pressure test.

Please provide an average cost estimate, per idle well, to conduct a casing pressure test in accordance with proposed Section 1772.2(a)(2).

Casing pressure test, conducted in accordance with proposed Section 1772.2(a)(2), cost per idle well ($):

9. Comments regarding the cost of casing pressure test, per proposed Section 1772.2(a)(2):

4

10. Section 1772.2(a)(3) of the proposed regulations requires that, within 24 months of a well becoming an idle well, the operator shall perform a cleanout tag on the well to verify the current effective depth of the well.

Approximately what percentage of your idle wells may require a cleanout tag using the following methods:

Best case scenario (e.g., use of slicklines or wirelines and no rig) (%):	
Medium case scenario (e.g., use of coiled tubing) (%):	
Worst case scenario (e.g., requires use of rig) (%):	

11. Comments regarding cleanout tag scenarios:

12. Please provide an average cost estimate, per idle well, to perform a cleanout tag in accordance with the requirement in proposed Section 1772.2(a)(3) for the following methods:

Best case scenario (e.g., use of slicklines or wirelines and no rig), cost per idle well ($):	
Medium case scenario (e.g., use of coiled tubing), cost per idle well ($):	
Worst case scenario (e.g., requires use of rig), cost per idle well ($):	

13. Comments regarding the cost of the cleanout tag, per proposed Section 1772.2(a)(3):

14. Section 1772.2(a)(4) of the proposed regulations requires that if there is any indication that an idle well exhibits a high risk of corrosion or other mechanical integrity issues, including damage caused by subsidence or other factors, then the Division may require the operator to conduct an ultrasonic or magnetic flux survey, or equivalent survey approved by the Division, to measure mechanical integrity.

Which of the following methods would you typically use to determine corrosion rate or casing integrity?

O **Ultrasonic survey**
O **Magnetic flux survey**
O **Multi-arm caliper**
O **Other (please specify)**

15. Please provide an average cost estimate, per idle well, to determine corrosion rates or casing integrity using the method selected in the previous question.

Survey used to determine corrosion rate or casing integrity, cost per idle well ($):	

16. Comments regarding the cost of determining corrosion rates or casing integrity, per proposed Section 1772.2(a)(4):

17. Section 1772.2(a)(5) of the proposed regulations requires that within 15 years of a well becoming an idle well, the operator shall provide the Division with an engineering analysis demonstrating, to the Division's satisfaction, that it is viable to return the well to operation in the future. The engineering analysis shall document that the well could be used to access potential oil and gas reserves, that it has mechanical integrity, and that it meets current well construction requirements.

To what extent is the proposed engineering analysis already available for submission to the Division for all idle wells?

	Fully available	Partially available	Not yet available
Engineering analysis, in accordance with the requirements in proposed Section 1772.2(a)(5), demonstrating that it is viable to return the idle well to operation in the future, for all idle wells:	○	○	○

18. In the previous question, if you selected "partially available" or "not yet available" for the listed requirement, please provide an average cost estimate, per idle well, for meeting the engineering analysis in full:

Engineering analysis, in accordance with the requirements in proposed Section 1772.2(a)(5), demonstrating that it is viable to return the idle well to operation in the future, cost per idle well ($):	

19. Comments regarding the cost of the engineering analysis, per proposed Section 1772.2(a)(5):

7

20. Section 1772.2(b) of the proposed regulations requires that, within 12 months of failing to comply with a testing requirement, the operator shall do one of the following: (1) bring the well into compliance to the satisfaction of the Division; (2) partially plug and abandon the well in accordance with proposed Section 1772.1; or (3) plug and abandon the well in accordance with Section 3208.

Regarding the remediation of noncompliant idle wells, please describe the most common scenario or likely well configuration you expect to encounter that would lead to a requirement to bring an idle well into compliance, per proposed Section 1772.2(b)(1):

21. Please provide an average cost estimate, per idle well, to perform the following actions under the most commonly expected scenarios ($):

Bring the well into compliance, cost per typical idle well ($):	
Partially plug and abandon the well, in accordance with the requirements in proposed Section 1772.1, cost per idle well ($):	
Plug and abandon the well, in accordance with Public Resources Code Section 3208, cost per idle well ($):	

22. Comments regarding the cost of remediation, plugging and abandoning, and partially plugging and abandoning, per proposed Section 1772.2(b):

Section 1772.4. Securing of Idle Wells in Public Places

23. Section 1772.4 of the proposed regulations requires that the operator shall secure all idle wells and attendant facilities in locations accessible to the public so as to prevent unauthorized access to the well and attendant facilities and other risks of damage to life, health, property, and natural resources.

Approximately what percentage of your idle wells meets the standard to be considered "secure" under the proposed regulation (%)?	

24. Please provide an average cost estimate, per idle well, to secure all idle wells and attendant facilities in locations that are currently accessible to the public ($).

Securing of idle wells and attendant facilities, in accordance with the requirements in proposed Section 1772.4, cost per idle well ($):	

25. Comments regarding the costs for securing each idle well and attendant facility:

Comments

26. If you have any additional comments, please provide them in the space below:

10

Appendix D: Gross Output Impact by Category of Spending

Category of Spending	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1. Reporting Requirements	$1,146,100	$252,194	$252,169	$252,227	$252,775	$253,315
2. Fluid Level Test	$3,901,756	$4,712,070	$6,727,938	$6,084,894	$5,685,051	$6,283,958
3. Casing Pressure Test	$131,994,849	$157,987,077	$152,653,051	$116,456,599	$52,364,802	$69,211,365
4. Clean Out Tag	$89,960,794	$85,889,323	$81,587,664	$52,396,803	$74,402,913	$71,334,044
5. Mechanical Integrity Test Survey	$190,642	$190,642	$190,642	$190,642	$190,642	$190,642
6. Monitoring of Inaccessible Idle Wells	$245,404	$245,404	$245,404	$245,404	-	-
7. Engineering Analysis for 15-Year Idle Wells	$1,409,187	$1,953,863	$2,000,335	$2,030,405	$670,423	$817,356
8. Plugging and Abandoning	$90,629,229	$96,455,301	$93,744,865	$73,962,121	$55,181,479	$59,035,392
9. Partial Plugging	$4,952,273	$3,817,598	$3,817,598	$3,817,598	$3,817,598	$3,817,598
10. Remediation	$5,796,696	$5,796,696	$5,520,663	$3,588,431	$4,140,497	$3,864,464
Total	**$330,226,930**	**$357,300,169**	**$346,740,329**	**$259,025,123**	**$196,706,181**	**$214,808,133**

Appendix E: Earnings Impact by Category of Spending

Category of Spending	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1. Reporting Requirements	$317,440	$69,851	$69,844	$69,860	$70,012	$70,162
2. Fluid Level Test	$1,149,101	$1,387,745	$1,981,436	$1,792,054	$1,674,297	$1,850,680
3. Casing Pressure Test	$38,873,625	$46,528,561	$44,957,644	$34,297,476	$15,421,887	$20,383,346
4. Clean Out Tag	$26,494,232	$25,295,149	$24,028,273	$15,431,312	$21,912,301	$21,008,493
5. Mechanical Integrity Test Survey	$56,146	$56,146	$56,146	$56,146	$56,146	$56,146
6. Monitoring of Inaccessible Idle Wells	$93,476	$93,476	$93,476	$93,476	-	-
7. Engineering Analysis for 15-Year Idle Wells	$546,455	$757,669	$775,690	$787,351	$259,977	$316,954
8. Plugging and Abandoning	$26,691,092	$28,406,920	$27,608,673	$21,782,484	$16,251,423	$17,386,433
9. Partial Plugging	$1,458,487	$1,124,316	$1,124,316	$1,124,316	$1,124,316	$1,124,316
10. Remediation	$1,707,177	$1,707,177	$1,625,883	$1,056,824	$1,219,412	$1,138,118
Total	**$97,387,230**	**$105,427,010**	**$102,321,381**	**$76,491,298**	**$57,989,770**	**$63,334,647**

Appendix F: Employment Impact by Category of Spending

Category of Spending	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1. Reporting Requirements	5	1	1	1	1	1
2. Fluid Level Test	17	20	29	26	25	27
3. Casing Pressure Test	571	683	660	503	226	299
4. Clean Out Tag	389	371	353	227	322	308
5. Mechanical Integrity Test Survey	1	1	1	1	1	1
6. Monitoring of Inaccessible Idle Wells	1	1	1	1	0	0
7. Engineering Analysis for 15-Year Idle Wells	8	11	12	12	4	5
8. Plugging and Abandoning	392	417	405	320	239	255
9. Partial Plugging	21	17	17	17	17	17
10. Remediation	25	25	24	16	18	17
Total	**1,430**	**1,548**	**1,502**	**1,123**	**851**	**930**

Appendix G: Value Added (GSP) by Category of Spending

Category of Spending	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1. Reporting Requirements	$609,904	$134,207	$134,194	$134,224	$134,516	$134,803
2. Fluid Level Test	$2,549,006	$3,078,381	$4,395,342	$3,975,243	$3,714,027	$4,105,291
3. Casing Pressure Test	$86,231,849	$103,212,496	$99,727,792	$76,080,756	$34,209,772	$45,215,583
4. Clean Out Tag	$58,771,123	$56,111,244	$53,300,982	$34,230,678	$48,607,206	$46,602,322
5. Mechanical Integrity Test Survey	$124,546	$124,546	$124,546	$124,546	$124,546	$124,546
6. Monitoring of Inaccessible Idle Wells	$129,824	$129,824	$129,824	$129,824	-	-
7. Engineering Analysis for 15-Year Idle Wells	$770,281	$1,068,008	$1,093,410	$1,109,847	$366,462	$446,778
8. Plugging and Abandoning	$59,207,811	$63,013,966	$61,243,246	$48,319,237	$36,049,899	$38,567,649
9. Partial Plugging	$3,235,305	$2,494,026	$2,494,026	$2,494,026	$2,494,026	$2,494,026
10. Remediation	$3,786,965	$3,786,965	$3,606,633	$2,344,311	$2,704,975	$2,524,643
Total	**$215,416,613**	**$233,153,662**	**$226,249,995**	**$168,942,692**	**$128,405,428**	**$140,215,640**