SUPPLEMENT TO FORM 399 ECONOMIC IMPACT ANALYSIS

WATER LOSS PERFORMANCE STANDARDS FOR URBAN RETAIL WATER SUPPLIERS
December 3, 2021

To Note: The numbers presented with headers, when they appear, indicate the associated question(s) in the 399 form.

BACKGROUND

Water Code section 10608.34 (added by Senate Bill (SB) 555 of 2015) requires the State Water Resources Control Board (State Water Board or Board) to develop and adopt performance standards for water loss for urban retail water suppliers[1] (URWS), while considering lifecycle cost accounting. The proposed Water Loss Performance Standards (WLPS or regulation) aim to reduce water loss, reduce the energy and associated greenhouse gas emissions associated with supplying and treating water that is lost to leakage[2] and achieve more efficient water use in California. Additionally, section 10608.34 established water loss reporting for URWS, in which URWS have been required to report their water loss estimates through annual water loss audits since 2017.

Nationwide, water supply infrastructure has been inadequately maintained and rehabilitated over past decades, which has led to its deterioration and overall higher long-term operational costs (Sedlak, 2015). In California prior to the passage of SB 555, monitoring of water losses was limited to voluntary efforts by URWS. There was no statewide standard or obligation regarding the volume of water lost from distribution systems due to leakage. An average water supplier in California loses approximately 35 gallons per connection per day through leakage, which translates to total statewide water losses of about 316,000 acre-feet (AF) or 103 million gallons on an annual basis, as per data reported by URWS from 2017 to 2020.[3]

Climate change has been adversely affecting water resources due to rising temperatures and changing precipitation patterns, resulting in longer and more frequent droughts. As a

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[1] "Urban retail water supplier" means a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes.

[2] California has a high energy consumption associated with water supply, accounting for 20% of total electricity use and 30% of total natural gas consumed in the state (PPIC Water Policy Center, 2016).

[3] These figures are based on data from water loss auditing in California over 2016-17, 2017-18, 2018-19, and 2019-20.

result, California has been focusing on greater conservation and water use efficiency. With the advent of the multi-year drought in 2011, and after a number of drought emergency responses that helped California minimize impacts of that historic drought, several Governor-issued Executive Orders (B-37-16 and B-40-17)[4] directed state agencies to take permanent actions to conserve water, reduce loss of water through leakage, and take other direct actions to reduce large leaks that waste large amounts of water.

PROPOSED REGULATION

The proposed regulation has the following elements:

- Urban retail water suppliers will be required to comply with individual numeric volumetric standards for water loss. Compliance will be required by 2028, or by 2031 for suppliers meeting certain criteria relating to serving disadvantaged communities/residents. These standards will be calculated using a model developed by the State Water Board that assesses the additional benefits and costs associated with reducing the leakage to the volumetric standard. The standard will require leakage reduction only if the net benefit is positive for the supplier, given the system and water resource conditions. If the net benefit is negative, the standard will be increased to the point at which the net benefit is positive, if possible. Otherwise, in cases where a positive net benefit is not possible, the standard will be a requirement to maintain current water loss.
- Urban retail water suppliers that exceed their individual apparent loss standards will be required to report an inventory of their apparent losses and any calculations used to determine apparent losses. Apparent loss standards will be assessed concurrently with real loss standards, with compliance demonstrated by 2028 and every third year after 2028 (or 2031) with three-year averages of reported apparent losses. The apparent loss standard for each URWS is equal to the average of the baseline (2017 through 2020) apparent losses plus a buffer of 5 gallons per connection per day.
- Suppliers will be required to comply with data submission requirements in 2023, 2024, 2026, and 2027, unless they have existing low leakage levels and high-quality data. The data submissions will help the State Water Board:
  - Improve data quality of water loss estimates during the early implementation period (2023).

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[4]

https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/executive_orders.html

- Better determine the operational and economic feasibility of reducing water loss through means that require larger capital investment, such as pressure management (2023, and updated in 2026) and asset management (2024, and updated in 2027), for individual water distribution systems.
- The proposed regulation also allows for the following:
    - Adjustments: URWS can provide the State Water Board with individualized data to replace the economic model defaults as each system improves its data accuracy and begins field implementation of water loss control approaches. This updated data leads to an adjustment to the supplier's standard. Suppliers can request these adjustments until July 1, 2023.
    - Variances: In case of natural disasters or other unexpected adverse circumstances, suppliers can request variances at any time, which would provide the supplier with temporary relief regarding compliance.
    - URWS with existing low losses: Suppliers with existing water losses lower than 16 gallons per service connection per day or the equivalent amount in gallons per mile per day that also meet data quality criteria will not be required to reduce their water loss further or respond to questionnaires. Suppliers can qualify for this alternative compliance pathway until July 2023.
    - Compliance Plan: Suppliers with standards that require a real loss reduction of more than 30% from baseline losses can request more time to meet their standard, given they show progress and meet other requirements.

A. ESTIMATED PRIVATE SECTOR COST IMPACTS
4. Enter the number of businesses that will be created

The RIMS II model cannot directly estimate the creation or elimination of businesses. The overall increase in jobs represents the net impact, which can be associated with both creation and elimination. The direct increase occurs in the form of demand for leak detection, repair, and consulting services; this may promote creation of new business to advise URWS on compliance with the proposed regulation. At the same time, new businesses generally promote competition among existing firms, which can result in exiting of less-competitive firms.

In addition, water rates are likely to increase in the short term to cover initial capital investment. Although the potential increase in water rates on average is not large based on State Water Board calculations, suppliers in various regions may react differently depending on their ability to finance the initial capital costs. Thus, in certain regions with high water use, there could be a relatively higher increase in water rates than the baseline estimate, which may theoretically lead to a possibility of exit or entry of businesses that

use water intensively.[5] However, businesses have absorbed increases in water rates over the years, and are anticipated to do so for future increases as well.

The increase in gross output will not only affect the industries that provide the contracted services, but also all the related equipment manufacturers, maintenance operators, equipment suppliers, and other businesses that provide intermediate services or goods to those leak detection contractors. Therefore, leak detection service contractors and their various suppliers will likely see an increase in demand for their services as a result of the proposed regulation. However, barriers to entry, such as the cost of equipment or innovation needed to provide goods and services for leak detection and repair work, is likely to limit the number of new indirectly impacted service contractor businesses.

The cost of compliance could be a financial burden on smaller businesses. However, there are a number of mechanisms in the proposed regulation that will help suppliers and indirectly-affected businesses manage costs: variances are allowed in cases of unexpected adverse conditions, which could prevent exiting of such smaller businesses; adjustments to the volumetric standard can be made if the supplier's own data are different from the State's default values; more time is provided to suppliers struggling to meet their standard if that standard requires a large (more than 30%) reduction in real loss; and flexibility is provided for suppliers serving disadvantaged communities.

7. Will the regulation affect the ability of California businesses to compete with other states by making it more costly to produce goods or services here?

Water service is provided locally and consumers generally don't have a choice of their water service supplier. As discussed above, water prices will not change significantly due to this regulation. Water loss control services are labor-intensive and will likely be provided by California-based businesses. The other inputs needed for water loss control, such as trucks or pipes, tend to be provided by sectors that compete across state lines. The regulation will not materially affect the relative competitiveness of California as a place these suppliers decide to locate.

B. ESTIMATED COSTS

Average annual costs are used to predict costs, as the difference between upfront and regular costs is anticipated to be marginal.

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[5] In order to quantify these disparate impacts, information on individuals and businesses served by each water system is required. Due to data limitation, these analyses are not feasible at this stage.

1. a. Initial costs for a small business and
1. b. Initial costs for a typical business

The 399 form provides the total costs for the year with the highest costs over the assumed lifetime of the proposed regulation. The highest costs are expected to occur in 2022 due to initial costs. The ongoing costs provided are total costs from the year 2029, which is the first year after suppliers are required to meet standards (2028). The number of years refers to the assumed lifecycle of the proposed regulation.

1. c. Initial costs for an individual

The proposed regulation would not have direct impacts on individuals. It is anticipated that the proposed regulation will have indirect impacts on individuals. In the first year of the regulation, water bills would increase slightly by about $0.01 per household. For the three later years presented in the table, the actual water supply costs would decrease by roughly $9 to 10 per year due to the benefits from saved water, which could delay any rise in water prices for individual households.

1. d. Describe any other economic costs that may occur:

The direct costs of conducting leak detection and repair are calculated based on a unit cost of surveying and repairing detected and located leaks for each mile of the distribution system. The calculation of the direct costs is based on input values for each utility over a 30-year period for the time horizon of the economic assessment, and then aggregated up to the state level. The total costs for all the impacted utilities at the state level would be about 500 million dollars over the 30-year lifetime. A typical utility is then defined as a utility with the average cost and benefit among all the impacted utilities. The highest direct cost for a typical utility would be from leak detection, which is approximately 1.21 million dollars while the repair cost is $431,369 over the 30-year lifecycle period.

The costs on small businesses are examined separately. California Government Code section 11346.3, subdivision (b) defines a small business as a business that is all of the following: (a) independently owned and operated; (b) not dominant in its field of operation; and (c) has fewer than 100 employees. Among the 265 water systems impacted by the proposed regulation, 6 are identified as small businesses with these criteria. The total cost is about $975,363 for small businesses, less than half that of the typical utility over the lifecycle period.

Though the economic model is utility-specific, costs were aggregated to give an estimate of the direct statewide costs. There are 460 utilities counted as urban retailer water suppliers, of which 265 utilities would be impacted by the proposed regulation. This means that these water systems may need to conduct leak detection and repair to comply with the proposed water loss standard. The total statewide cost is composed of the leak detection cost, leak repair cost, and monitoring/reporting cost. The total costs for all the

impacted utilities at the state level would be about 500 million dollars over the 30-year lifetime.

2. If multiple industries are impacted, enter the share of total costs for each industry

To generate RIMS II input values, we first categorize all the industries by North American Industry Classification System (NAICS) name and code that make up the capital costs used in the economic model. Table 5 lists the industries that are directly related with leak detection and repair. The State Water Board has separated the costs reported in Table 5 into NAICS categories with the matched NAICS codes listed in Table 6 of the Standardized Regulatory Impact Analysis (SRIA), which is presented below.

Macroeconomic Inputs by Industry in 30 Years

Direct Cost Category	NAICS	Industry Description	RIMS II Code	Direct Cost ($)
Leak detection service	334519	Other Measuring and Controlling Device Manufacturing	33451A	319,730,743
Leak repairing equipment	334513	Industrial process variable instruments manufacturing	334513	35,436,938
Leak repairing service	541990	All Other Professional, Scientific, and Technical Services	5419A0	78,875,766
Monitoring and reporting	541990	All Other Professional, Scientific, and Technical Services	5419A0	66,250,000

C. ESTIMATED BENEFITS

1. Briefly summarize the benefits of the regulation, which may include among others, the health and welfare of California residents, worker safety and the State's environment:

Reduced unknown losses

Smaller and unidentified leaks often remain undetected unless efforts are made to locate them with specialized equipment, or other specific methods and analysis. Overall, the proposed regulation is anticipated to reduce statewide water loss by 35 percent. The total amount of water saved at the state level is approximately 3.4 million acre-feet, and the associated total benefit is as high as about 4.8 billion dollars.

Avoided costs - additional water resources

With an increasing urban population and the impacts of climate change, water resources will come under increasing strain. Reducing leakage is an effective approach for prolonging the use of existing water resources and protecting watersheds.

Avoided costs - additional energy consumption

Supplying water in California is energy intensive; 19% of the state's total electricity use and 32% of total natural gas consumed in the state is used to treat, convey, and distribute water to end users. Reducing water loss not only saves water but reduces the embedded energy in treating and supplying potable water. This results in reduced greenhouse gas emissions.

Reduction in distribution system breaks

Breaks or large failures in distribution system infrastructure, such as pipelines, hydrants, or valves, have adverse impacts, including damage to property and disruptions to water supply, traffic, and essential services. Water loss control helps prevent the occurrence of large breaks; this protects distribution infrastructure and can reduce the occurrence of breaks.

Prolonged asset life

Water loss control practices improve the maintenance of distribution infrastructure, which contributes to prolonging water infrastructure life and promoting systematic infrastructure rehabilitation.

Potable water quality protection

Pipeline breaks may cause intrusion of external contaminants into the pipeline, thus compromising water quality. Proactive water loss control reduces the risk associated with water contamination in distribution infrastructure.

Accessibility of safe drinking water

The proposed regulation will encourage infrastructure monitoring and maintenance to reduce leakage. This approach will enable water suppliers with fewer resources to plan and implement water loss control in a cost-effective manner over a long compliance period. More efficient water distribution preserves revenue, which suppliers could use to fund conservation, water loss reduction programs, or low-income affordability programs. Greater investment in these programs could improve accessibility to safe and affordable water and improve efficiency of water use in California. Despite upfront costs, lower water supply costs could mitigate rate increases on a long-term basis.

Increase in transparency and ratepayer trust

Large breaks lose large amounts of potable water as well as cause damages and outages, which hinder conservation efforts and negatively impact ratepayers, leading to distrust. Conversely, leak detection activities and increasing awareness about water loss

control efforts can boost ratepayer trust. Proactive water loss control reduces interruptions in commercial activities, thus mitigating negative economic impacts from water outages. Additionally, the public availability of data received from questionnaires (such as the quality of water loss estimates, pressure management activities, and asset management protocols) will improve transparency in practices that the supplier conducts to monitor and maintain the water distribution system.

Boost to economic activity

Methods to control water losses include the use of different types of leak detection equipment, pressure monitoring and modulating devices and related software, repair and replacement technologies, and the installation of suitable pipe material. These actions may generate additional economic activity in water distribution infrastructure manufacturing, leak detection, pressure monitoring and modulation devices, water-efficiency, and consulting sectors. Reduced unexpected infrastructure failures and avoided water outages and property damage will improve economic conditions for households, commercial establishments, and businesses.

4. Briefly describe any expansion of businesses currently doing business within the State of California that would result from this regulation:

In the long-term, the State Water Board expects that the proposed regulation will reduce water loss in California and promote water use efficiency. In the long run, effective water loss control will slightly lower the costs of supplying water. The suppliers are anticipated to reduce lost revenue due to more efficient water distribution and reduced liabilities from unexpected pipe failures; they could use preserved revenue to fund conservation or more water loss reduction programs or low-income affordability programs. Improving access to or assurance of safe and affordable water, and increasing water use efficiency, would improve the quality of life in California, especially for low-income communities. Additionally, these lower water supply costs could mitigate rate increases, which would provide a competitive advantage to industries that use water intensively. This change in water rates will be relatively small and is unlikely to have substantial impact on the competitiveness of Californian businesses.

At the same time, the proposed regulation would increase the demand for leak detection and repair equipment and services in California, creating a competitive advantage for those businesses specifically.

D. 1, 2, 3; E. 2. Alternatives to the regulation

The State Water Board considered two alternatives to the water loss performance standards based on stakeholder comments. The two alternatives are evaluated for costs and benefits, economic impacts, and cost-effectiveness, relative to the proposed standards.

Alternative 1

The first alternative proposes using a more stringent leak detection survey frequency to calculate the standards; this would lead to quicker reduction in leakage as compared to the proposed regulation. Alternative 1 proposes leak detection surveys at double the frequency of the proposed regulation.

Under Alternative 1, 302 systems would be required to detect and repair leaks to maintain the corresponding water loss control level, more than the number under the proposed regulation (265). This is expected since Alternative 1 would require more stringent leak control.

Costs and Benefits

For a typical utility, the total cost to comply with Alternative 1 would be 3.08 million dollars in present value. The statewide total cost would be about 931 million dollars. As compared to the proposed regulation, Alternative 1 would lead to 86.19% higher costs. This is because Alternative 1 would require more frequent leak surveying, which costs more. The lifetime benefit from water loss reduction for a typical utility is about 18.9 million dollars in present value, which results in a total of 5.7 billion dollars statewide benefit. This is 39.12% higher than for the proposed regulation. With more frequent leak detection surveys, suppliers would be able to identify and repair leaks in less time, further reducing the total water loss and leading to a higher total benefit. The net benefit is about 34.67% higher than for the proposed regulation. It should be noted that even though Alternative 1 would generate a larger net benefit, the percentage increase in cost, about 86%, is much higher than the percentage increase in benefit, which is about 35%. This implies that the extra benefit is associated with a much larger cost.

Economic Impacts

The RIMS II model is used for the macroeconomic impact analysis, which is described in detail in the SRIA. Both the lifetime impacts and annual impacts are about 86% higher than the proposed regulation, consistent with the fact that the direct cost is about 86% higher and the same RIMS II multipliers were used.

Reason for Rejection

Alternative 1 is rejected because the additional benefits come with much higher costs, resulting in a lower benefit-to-cost ratio than the proposed regulation. Though it could lead to a rapid reduction in leakage, Alternative 1 would increase the annual costs to about $31 million per year. The initial costs per utility would increase by about 112% as compared to the proposed standards. The higher initial costs would impose a larger burden on the suppliers. Even though the long-run benefits are also relatively higher than the proposed standards, the more frequent leak detection activities may be difficult to implement by suppliers given the regulatory timeline. In addition, the cost effectiveness

analysis shows that, even though the total water loss reduction is higher in Alternative 1 (~38%), the average cost of reducing water loss is much higher than the proposed regulation (~34%).

Alternative 2

Alternative 2 is based on a proposal provided by stakeholders. Instead of individual standards, this proposal would require a decrease in leakage to a volume equal to the 85th percentile of overall leakage for California averaged over three years.

Under Alternative 2, 68 urban water systems would be required to reduce their water losses, which accounts for about one fourth of the systems that would be impacted by the proposed regulation. This is expected because Alternative 2 would require suppliers to reduce their leakage to a relatively higher threshold (the 85th percentile of average losses), which would mean that the majority of suppliers' reported leakage is already below the threshold proposed by Alternative 2.

Costs and Benefits

For a typical utility, the total cost to comply with Alternative 2 is 516 thousand dollars in present value. The total cost on a statewide basis is about 35 million dollars. Costs incurred by this alternative would be 93% lower than those for the proposed regulation. This is because Alternative 2 would result in less frequent leak surveying and repair, which would result in lower costs.

The lifetime economic benefit from water loss reduction for a typical utility under Alternative 2 is about 14 million dollars in present value, which results in a total of 964 million dollars in statewide economic benefit. The total benefit is 76% lower than that of the proposed regulation. Because they would conduct leak detection surveys less frequently, suppliers would not be able to identify and repair leaks in a timely manner, resulting in lower water savings and a lower total benefit. The net economic benefit of Alternative 2 is about 74% lower than that of the proposed regulation.

Economic Impacts

The macroeconomic impacts analysis for Alternative 2, using the RIMS II model, concluded that both the lifetime impacts and annual impacts are less than one tenth of that for the proposed regulation, which is consistent with the fact that the direct cost for

alternative 2 is about 93% lower than that for the proposed regulation with the same RIMS II multipliers.

Alternative 2 is rejected because it would not reduce statewide water loss to a level calculated as economically feasible. The current median leakage for the state is 26 gallons per connection per day, while the average is 35 gallons per connection per day. The proposed threshold per Alternative 2, i.e., the 85th percentile of statewide leakage, would result in a standard of 57.1 gallons per connection per day for all suppliers regardless of their system-specific characteristics, potential for reducing water loss, or water resilience. The proposed threshold would be twice that of the current median, which would not adequately improve statewide water loss control, reduce potential leakage, or improve maintenance of water infrastructure, and could result in a lapse in ongoing or future water loss control efforts.

Alternative 2 would impose lower costs on urban retail water suppliers, but the amount of total water loss reduction would be 76% lower than under the proposed regulation. Additionally, with inadequate water loss monitoring and maintenance of water supply infrastructure, suppliers and businesses would likely face higher costs in terms of unexpected leaks, water outages, and property damage. Water supply infrastructure has been inadequately maintained and rehabilitated over past decades, which has led to its deterioration and overall higher long-term operational costs, which suggests efforts towards water loss control would be beneficial (Sedlak, 2015). Thus, Alternative 2 would not achieve the goals of adequate economic water loss control as effectively as the proposed regulation. Therefore, Alternative 2 is rejected.

Thus, the State Water Board determines that no other alternative, including those considered internally or those proposed through the stakeholder process, is less burdensome and at least as effective in achieving the purposes of the regulation.

D. 4. Briefly discuss any quantification issues that are relevant to a comparison of estimated costs and benefits for this regulation or alternatives

Both alternatives impact different numbers of water suppliers. The number of impacted suppliers for each of these alternatives is different from that of the proposed regulation. This introduces inconsistency in comparing the cost-effectiveness metric of cost per supplier.

E. Major Regulations

3. For the regulation, and each alternative just described, enter the estimated total cost and overall cost-effectiveness ratio:

Cost-effectiveness is the average cost to reduce water loss by one acre-foot. This is calculated by dividing the estimated statewide total direct costs by the total volume of water anticipated to be saved in acre-feet statewide due to the proposed regulation.

5. Briefly describe the increase or decrease of investment in the State:

The direct cost impacts mostly consist of leak detection and repair services or equipment purchased to meet the requirements of the proposed regulations. The total increase in purchases from these two directly-affected industries is approximately $500 million over the regulation's lifetime. The indirect economic effect of this spending is expected to create about $897 million of gross outputs over the lifetime and $593 million in value added. This increase in outputs must be associated with higher investment spending. However, the impact of the proposed regulation will be relatively insubstantial (gross outputs average $29.9 million per year) relative to California's roughly $3 trillion annual economy.

Briefly describe the incentive for innovation in products, materials, or processes:

The proposed regulation would potentially increase incentives for innovation through two channels: First, increased use of leak detection and repair equipment will promote competition and innovation in this sector. Higher demand could increase the competition among equipment producers. If the market is large enough, some producers could have incentives to invest in developing new technologies in order to improve their productivity and obtain a larger market share. Second, the proposed regulation could increase the incentives for innovation in industries related to water-saving appliances. As can be seen in Table 13, the proposed regulation could increase water price in the short run if water suppliers pass some of the compliance costs to the consumers. This could further increase the demand for water-saving appliances, such as high efficiency shower heads, toilets, dishwashers, and washing machines, and therefore promote innovation in the related industries.

Benefits of the regulations
Please refer to C.1.