

Exhibit B: Scope of Work

Task A and Tasks 1 through 5 are offered to each participating agency to support your water loss control work.

Task A: Level 1 Validation

WSO provides Level 1 Validation, a process of reviewing the annual water audit (detailed in the requirements set forth by The Department of Water Resources, Title 23 CCR § 700.3).

This task involves:

- **Data transfer:** WSO will request the water audit and supporting documentation necessary for level 1 validation from each agency.
- **Validation session:** WSO will schedule and lead an interview with appropriate staff to confirm the inputs and Data Validity Grades provided in the water audit.
- **Documentation:** WSO will furnish all necessary documentation for compliance with the requirements set forth by the Department of Water Resources, Title 23 CCR § 700.3.

All BAWSCA agencies should sign up for this task, unless you have an in-house Water Audit Validator that is *not already involved in the water audit compilation process* and who is certified through the CA-NV Section of the AWWA.

Beyond the required Level 1 Validation as described above, the following tasks accommodate varying needs for water loss management. Please confer with WSO regarding the scope that best fits your agency's data and readiness.

Task One: Program Management

For any agency working on tasks beyond Level 1 Validation, WSO will set up systems of data collection and management, track progress, and communicate frequently.

WSO will work to:

- Understand the full context of and incentives for water loss control activity at the Participating Agency
- Acknowledge past challenges and hurdles in managing water loss
- Develop project communication and management approaches
- Provide monthly updates on work complete (via BAWSCA invoicing)

Sign up for Task One: Program Management if you pursue any of the tasks beyond validation work (Tasks Two through Five).

Task Two: Water Audits & Data Sources

2.a: Water Audit Compilation

With the support of each Participating Agency's staff, WSO will compile a water audit in the American Water Works Association (AWWA) Free Water Audit Software.

In Task 2.a, WSO will:

- Collect and review water audit data (inclusive of all water audit inputs except for billing data, which is addressed in Task 2.b)
- Complete the water audit compilation in the AWWA Free Water Audit Software
- Produce supporting documentation required for level 1 validation
- Identify strengths and shortcomings of available information and instruments

2.b: Billing Data Analysis

WSO will intake and review the agency's billing data for the audit period.

In Task 2.b, WSO will:

- Review data for integrity and completeness
- Prorate billing data for best alignment with production data
- Identify and visualize anomalous records
- Identify notable findings and potential errors

WSO recommends that Participating Agencies sign up for both tasks 2.a and 2.b. If you are unable to access your raw billing data records sign up for task 2.a only.

Sign up for Task 2.a if:

- You are new to the water audit compilation process or unfamiliar with the AWWA Water Audit.
- You seek third party support to confirm and corroborate water audit compilation decisions.
- You are unsure about the data sources best fit for the water audit.
- You have concerns about the accuracy or completeness of water audit data sources.
- You need support selecting appropriate Data Validity Grades.
- You need support producing required supporting documentation for Level 1 Validation.

Sign up for 2.b if:

- You want a careful study of your billing data on a record by record basis, inclusive of:
 - Pro-rating consumption volumes to align with audit period timeframe
 - Anomalous record review
 - Data integrity and completeness checks
- You want third-party review and confirmation of your billing data query

2.c Source Meter Volumetric Accuracy Testing

In this task, WSO will design and conduct a volumetric source meter accuracy test. Source meter accuracy testing establishes a field-verified volume of water supplied, the baseline of the water audit. For each source meter accuracy test, WSO will:

- Conduct a site visit
- Draft a test design
- Conduct a volumetric accuracy test with comparative meter or reservoir reference volume
- Complete a data chain assessment, if relevant
- Analyze test results
- Document test procedure for future meter accuracy investigation

Sign up for Task 2.c if:

- You own and operate sources of supply into distribution beyond your SFPUC connections
- You need verification and/or documentation of your supply meter's accuracy (highly recommended given the important of the Water Supplied input in the water audit)

2.d Field Pressure Survey

In this task, WSO will identify the best fit goals for pressure data collection for the participating agency. The following table summarizes three potential goals and our approach toward achieving each one.

<i>Goal:</i>	Understand System Average Pressure	Investigate Pressure Transients	Identify Potential District Metered Areas
<i>Approach:</i>	<ul style="list-style-type: none">○ Select logging sites○ Deploy pressure loggers○ Analyze and visualize pressure data○ Calculate average system pressure○ Recommend potential targeted pressure reductions	<ul style="list-style-type: none">○ Select logging sites○ Deploy high-frequency pressure loggers○ Analyze and visualize pressure data○ Analyze and explain transients○ Recommend transient mitigation	<ul style="list-style-type: none">○ Identify pressure zone boundaries and critical infrastructure○ Study zonal hydraulic isolation○ Establish zonal pressure average and pressure range○ Recommend further study toward DMA installation and management

Sign up for Task 2.d if:

- You have limited pressure data and need to improve your water audit's "Average Operating Pressure" input
- You want to identify opportunities for leakage saving via pressure management

2.e Water Audit Miscellaneous Support

WSO will provide technical support and guidance to Participating Agency in completing its water audit. Level of support and associated costs will be determined through discussions with the Participating Agency.

Examples of this work may include:

- **Billing Data Chain Assessment:** an especially detailed review of billing data (beyond Task 3.b) that interrogates the processes of billing data collection, transmission, and reporting. This work is well fit for new AMI systems to corroborate successful processing of high-resolution data.
- **Process Map Development:** a process by which WSO visually maps the agency's water audit's data sources and associated data maintenance practices. This can be 1) a useful educational tool to communicate the importance of different departments' contributions to the water audit and 2) a valuable documentation practice to understand current processes and identify improvements.

If there are specific water loss assistance tasks that are not already included in the those offered, WSO can develop a task and scope to suit your needs here.

Task Three: Leakage Analysis & Recovery

3.a Component Analysis of Real Losses

For this task, WSO will perform a component analysis of real losses to establish the unique leakage profile and inform targeted and cost-effective leak management strategies for an agency.

WSO's component analysis of real losses entails modeling background leakage using infrastructure and pressure data, quantifying reported leakage using repair records, assessing of unreported leakage proactively discovered through leak detection, and estimating ongoing hidden leakage. By working with documentation on your infrastructure, pressure, leak detection, and repair practices, WSO will also identify and recommend data collection and management improvements that provide more accurate insight into leakage.

WSO's work on this task will provide:

- Determination of leakage volumes: background, unreported, reported, and hidden leakage
- Break frequency analysis and comparison to national and international datasets
- Evaluation of documented leak response times
- Review of leak documentation and recommendations for improved data collection
- Analysis of cost-effective intervention against leakage
- Leakage management program design

Please note that completing a component analysis of real losses will support planning for your compliance with leakage performance standards required by the state. Please discuss the availability and readiness of your repair records with WSO to determine the scale and scope of this variable task.

Sign up for Task 3.a if:

- You have not yet interrogated the completeness or quality of your repair record database.
- You want to assess the different types of leakage in your system to better inform your leakage management strategy and prioritize interventions.

3.b Leak Detection Survey

WSO offers acoustic leak detection survey services for hidden water loss identification and recovery. In this survey work, an expert leak detection technician listens for leak noise on all available appurtenances on main pipe and service connections. Geophones and correlators will be used to pinpoint and confirm potential leaks as necessary.

In this task, WSO will:

- Prepare for and lead a leak detection kick off meeting to walk through the methodology and discuss procedures for traffic control, leak identification and leak confirmation.
- Perform a comprehensive acoustic leak detection survey
- Collaborate with the agency to ensure agreement on existence and location of leak findings
- Provide documentation of each suspected leakage event

Sign up for Task 3.b if:

- You want to pursue hidden leakage savings
- You want to corroborate the findings of your water audit and component analysis

Task Four: Customer Meter Accuracy & Testing

4.a Apparent Loss Analysis

Apparent losses result from customer meter inaccuracy, meter reading errors, data transcription errors, inaccurate consumption estimates, and theft. Apparent losses produce revenue loss, and the accuracy of apparent loss estimations affects insight into system leakage volumes.

To assess apparent losses, WSO will:

- Design a random and representative meter test sample
- Prioritize large customer meters for testing
- Analyze existing (and/or newly completed) test results
- Review and refine estimates for unauthorized consumption and systemic data handling errors
- Calculate and value apparent losses due to customer meter inaccuracy
- Recommend further study and customer meter management

Sign up for Task 4.a if:

- You plan to pursue meter accuracy testing within the year (see task 5.b).
- You want to assess and identify improvements in your meter accuracy testing program for small and/or large customer meters.
- You want to investigate and document non-default values for unauthorized consumption and/or systematic data handling errors.

4.b Customer Meter Accuracy Testing via Subcontractor

For participating utilities without customer meter testing programs in place, WSO will facilitate customer meter bench testing through a subcontracted service provider.

In this work, small and large meters would be tested to better understand typical customer meter accuracy. The service provider will bench test small meters and in-situ test large meters in accordance with AWWA M6 meter testing standards. To participate in this task, agencies would need to:

- Sign up for Task 5.a so that WSO can assist in the preparation of the meter testing program and analysis of test results
- Pull and replace the small meters identified for testing
- Provide access in the field to large meters identified for testing

Sign up for Task 4.b if:

- You aim to improve your understanding of customer meter accuracy
- You want to refine the water audit input to better estimate apparent losses
- You want to enhance or corroborate an internal customer meter testing program via a third party
-

Task Five: Report Preparation

WSO views accessible reporting as an essential part of a water loss control program. Our reports document all water loss investigations and findings for future reference and stakeholder communication. Each report will describe the task's analysis, synthesize findings, and outline recommended next steps.

The reporting task is required if you sign up for any task *beyond Task A - Level 1 Validation* (except for Task 2B – Billing Analysis or Task 6, wherein reporting is included).

Task Six SWRCB Water Loss Standard Assistance

Each BAWSCA agency will receive a leakage performance target from the State Water Resources Control Board (SWRCB), in accordance with SB555. Compliance with the volumetric standard will be required by 2028. There are also two opportunities to apply for adjusting the standard: 1) agencies can file custom economic model inputs during the rulemaking process, before August 2021 and 2) agencies can file an official adjustment application after standard adoption and before July 1, 2023.

6.a Custom Input Assistance

In this task, WSO will calculate custom inputs and compile supporting documents for the SWRCB's economic model. This support can occur during the upcoming rulemaking process (before August 2021) or after standard adoption and before July 1, 2023 (depending on the agency's data availability and goals). In this task, WSO will:

- Request and compile relevant data (e.g. leakage repair documentation, leak detection results, financial data, infrastructure data, etc.)
- Review data collected to identify what custom inputs may be calculated
- Calculate customized value for inputs where the minimum data threshold is met
- Compile supporting documents for input adjustment application

Sign up for Task 6.a if:

- You are interested in filing an adjustment to your leakage performance standard.
- You would like assistance navigating the model and evaluating a performance standard adjustment filing.

6.b Off-Ramp Assistance

In this task, WSO will support an agency in documenting justification for the off-ramp or "alternative compliance" route offered by SWRCB. In this task, WSO will:

- Collect of relevant data and supporting documents
- Document activities and/or data proving compliance with each off-ramp criterion
- Compile of off-ramp request

Sign up for Task 6.b if:

- You qualify for all off-ramp criteria and would like assistance filing alternative compliance documentation with the SWRCB.

6.c Water Loss Standard Compliance Plan

In this task, WSO will work with you to develop a compliance plan, outlining a draft strategy to meet your leakage performance standard. In this task, WSO will:

- Review your water loss standard modeled by the State
- Evaluate data uncertainty and recommendations for data improvement
- If available, consider results of leak simulation model, real loss component analysis, and/or pilot results
- Develop a timeline, cost estimate, and key milestones associated with the water loss compliance plan, based on existing data sources

Sign up for Task 6.c if:

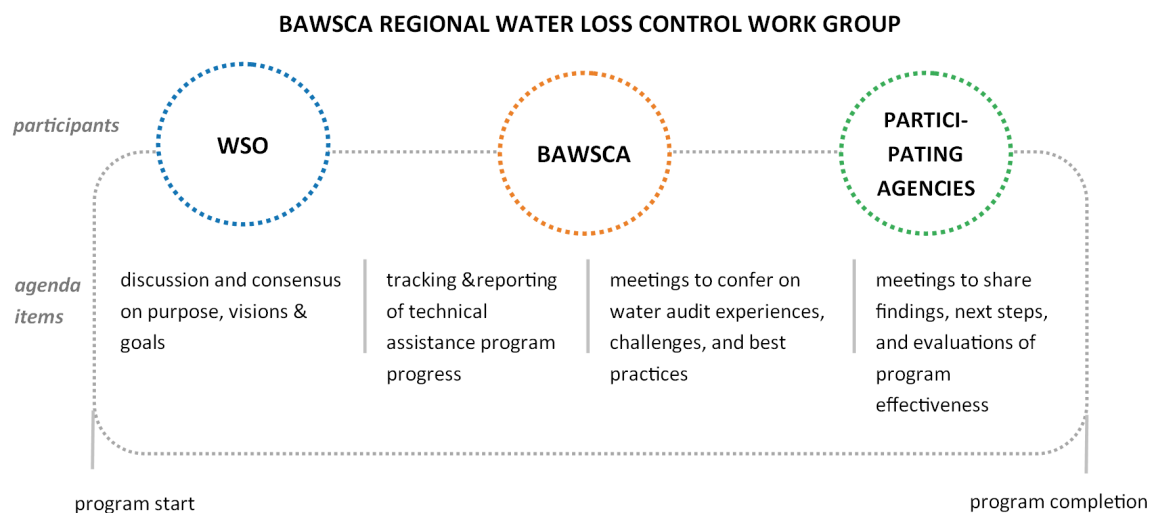
- You want to consider short and medium term investments that will support meeting your leakage performance target.
- You want support mapping out the next steps (timeline, budget, data requirements) involved in making progress toward your leakage performance target.

Task Seven: Regional Water Loss Control Work Group

7.a Regional Water Loss Control Work Group Meetings

Developing a productive, well-attended Regional Water Loss Control Work Group (RWLC Work Group) will be a cornerstone of the BAWSCA Water Loss Control Program.

WSO together with BAWSCA will lead the LEAK Work Group meetings, provide technical input, schedule the meetings, prepare meeting agendas, steer the RWLC Work Group toward goal outcomes, share background information and additional resources, prepare meeting notes and keep track of action items identified during these meetings. The figure below presents a summary of participants and activity we expect for the RWLC Work Group meetings.



Possible subsequent RWLC Work Group meeting topics include:

- Source meter testing procedures
- Advanced metering infrastructure and the role of technology in water loss management
- The statistics of customer meter testing and customer meter management
- Component analysis of real loss methodology
- The economics of water loss control
- District metered area management
- Water loss in California

7.b Summary Reporting and Regulatory Updates

In addition to leading and coordinating the RWLC Work Group, WSO will provide monthly progress updates, communicating with BAWSCA staff on the status of the Participating Agencies. At the close of each year's work, WSO will provide summary reporting, reflecting on observed trends and the group's achievements.

Individual BAWSCA agencies do not need to sign up for this task, as BAWSCA is funding this work. To make this task most valuable to all member agencies, please attend all meetings that you can.

7.c Technical Assistance for the Review of SFPUC's meter testing practices

SFPUC is in the process of developing an update to the procedures use to test and calibrate the meters that are in place at the point of SF RWS deliveries to member agencies. BAWSCA will have the opportunity to review and comment on those updated procedures. WSO will assist BAWSCA in that review under this task.

Table 1: Costing per Task

Name	Reinhard Sturm	Kate Gasner	Kris Williams	Jessica Jagdeo	Total	
Role	Project Advisor	Project Director	Project Manager	Analyst		
Hourly Rate	\$260	\$210	\$180	\$140	hours	budget
Notes						
Task A: Level 1 Validation						
Level 1 Validation	10				10	\$2,500
Task 1: Program Management						
1.a Ongoing Administration		1	1		2	\$390
1.b Monthly Status & Budget Updates		2	2		4	\$780
Task 2: Water Audits & Data Sources						
2.a Water Audit Compilation	2	4	4	16	26	\$4,320
2.b Billing Data Analysis	2	4	8	12	26	\$4,480
2.c Source Meter Volumetric Accuracy Testing		2	16	8	26	\$4,420
2.d Field Pressure Survey	4	8	24	24	60	\$10,400
2.e Water Audit Miscellaneous Support	TBD based on participating agency needs				TBD	TBD
Task 3: Leakage Analysis & Recovery						
3.a Component Analysis of Real Losses	4	12	16	24	56	\$9,800
Gap Analysis Option	1	1	8	14	24	\$3,870
3.b Leak Detection - Preparation & Kick Off	2	2	4	4	12	\$2,220
Leak Detection - Survey	see survey rate tiers below				-	TBD
Task 4: Customer Meter Accuracy & Testing						
4.a Apparent Loss Analysis	2	8	12	24	46	\$7,720
4.b Customer Meter Volumetric Accuracy Testing	see meter testing rates provided by subcontractor				-	TBD
Task 5: Report Preparation						
5.a Reporting on Tasks 2, 3, and 4	1	2	4	8	15	\$2,520
Task 6: SWRCB Water Loss Standard Assistance						
6.a Custom Input Assistance	TBD based on participating agency needs				TBD	TBD
6.b Off-Ramp Assistance	2	8	4	12	26	\$4,600
6.c Water Loss Standard Compliance Plan	TBD based on participating agency needs				TBD	TBD
Task 7: Regional Water Loss Control Group						
7.a Regional Water Loss Control Group	24	24	24	30	102	\$19,800
7.b BAWSCA Communication	8	24	12	12	56	\$10,960
7.c SFPUC Meter Maintenance Support	2	8	4	10	24	\$4,320
Task 7 Total					158	\$35,080

Leak Detection Survey Rates	
Mileage Surveyed	\$/mile
Mile 1 through Mile 50	400
Mile 51 through Mile 100	350
Miles 101 +	300

Role	Rate (hourly)
Project Advisor	\$ 260
Project Director	\$ 210
Project Manager	\$ 180
Analyst	\$ 140