

OLOWALU WATER COMPANY, INC.

305 E Wakea Ave., Ste 100
Kahului, Maui, Hawaii 96732

Phone: (808) 877-4202
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August 3, 2023

M. Kaleo Manuel
Deputy Director
Commission on Water Resource Management
1151 Punchbowl Street, Suite 227
Honolulu, HI 96813

Re: Olowalu Water Use Applications
Olowalu Aquifer System

Dear Deputy Director Manuel:

This letter is submitted with the following water use permits for:

GWUPA-E	Olowalu Elua	6-4936-001
GWUPA-N	Olowalu Elua	6-4936-001
GWUPA-N	OWC 2	requested

SWUPA-E	Olowalu Stream Lower Intake	961
SWUPA-N	Olowalu Stream Lower Intake	961
GWUPA-E	Olowalu Pump N	6-4937-001
GWUPA-N	Olowalu Pump N	6-4937-001
GWUPA-N	Olowalu Pump O	6-4837-001

Olowalu Water Company, Inc. ("OWC") Company Description

Olowalu Water Company Inc. (OWC) is a public water system (PWS 209) regulated by the Hawaii Public Utilities Commission ("PUC")¹ that provides potable and non-potable water service to customers in Olowalu,

¹ OWC obtained its Certificate of Public Convenience and Necessary (CPCN) to operate as a public utility pursuant to Decision and Order No. 17953 entered on August 7, 2000 in Docket No. 99-0157.

island of Maui. Applicant's customers include private owners who were historically served by Pioneer Mill Ltd. and owners of agricultural and agricultural zoned residential lots. There are currently 65 customers served by OWC's potable water system and 65 customers served with non-potable water including 11 common area HOA meters. OWC's service area of approximately 750 acres is defined by plat TMK 4-8-03.

There are an additional 68 undeveloped lots identified as Authorized Planned TMK's as shown on OWC Schedule A that will require potable water service in the future. This future use will be described in New Use applications to be submitted concurrently with the existing use applications.

Potable System

OWC's potable water system consists of ground water taken from the Olowalu Elua well, State Well No. 6-4936-001 ('OWC Well '1) at elevation 204 feet above mean sea level (msl) where it is pumped to an existing 50,000-gallon Tank No. 1 located at an elevation 205 feet msl near the Olowalu Cultural Reserve ('OCR'). There it is chlorinated and then pumped approximately 2,000 feet through 6" HDPE pipe to a 500,000-gallon potable reservoir tank located at 374 feet msl above the Olowalu Mauka subdivision. Distribution of potable and fire protection water to the agricultural lots and a series of fire hydrants is through a system of 12" and 8" PVC waterlines. Below the new subdivisions, the system connects to older sections of the Pioneer Mill system to transport water approximately one mile to the Olowalu Makai areas using 8" schedule 40 PVC and 6" HDPE lines.

Non-Potable System

OWC's non-potable water system is a blend of surface and groundwater which consists of a limited amount of surface water sourced from the Olowalu Stream and groundwater pumped from Olowalu Pump N, State Well No. 6-4937-001 ('N Pump'). The Olowalu Stream diversion located at 210 feet msl feeds a stone and concrete lined transmission ditch leading to a non-potable booster pump located near the existing well site at 200 feet msl where, together with groundwater from the Shaft N Pump, the blended non-potable water is pumped via 6" PVC pipe to the upper reservoir at 360 feet msl. From there, the water is filtered and distributed throughout the Olowalu Mauka subdivision in a system of underground PVC pipes and filters. Individual service laterals for the non-potable (irrigation) water are extended from the water source to

each lot. Part of the distribution system includes the existing system formerly used by Pioneer Mill Co. Ltd. for sugar cane irrigation.

Interim Instream Flow Standards

OWC's three sources (OWC Well 1, N Pump, and Olowalu Stream) are located in the Olowalu Aquifer System.

In 2018, CWRM established an Interim Instream Flow Standard (IIFS) for the Olowalu Stream, then modified the IIFS in November 2022 as follows:

1. That the interim IFS be amended such that the interim IFS is located immediately below the Lower Olowalu Flume at an elevation of approximately 180 ft, reflecting a change in location from the abandoned USGS station 1664200 at an elevation of 130 ft.
2. That the interim IFS be amended to be 2.5 cubic feet per second (1.62 million gallons per day) reflecting a change in the hydrology of Olowalu Stream.

Potable Sources and Requested Amount

OWC Well 1 is OWC's sole source of potable water. OWC has applied for a second well permit for Olowalu Well 2 as a backup well in close proximity to OWC Well 1.

OWC is requesting an existing amount of 78,217 gpd. This amount is based on the 12-month average calculated for OWC's existing use for the 12 months prior to WMA designation as shown on Exhibit 1 to the Olowalu Elua GWUPA. Concurrently, OWC is submitting a proposed new additional use of 28,000 gpd, for a total new and existing use of 106,217 gpd.

The Olowalu Aquifer System has a sustainable yield of 2 mgd. See Staff Submittal dated June 14, 2022. The sum total of OWC's potable water requested amount (0.106 mgd) is approximately 5% of the sustainable yield of the Olowalu Aquifer System.

Non-Potable Sources

OWC's distributed non-potable water is a blend of surface and groundwater from two different sources. Groundwater is used as an alternative source when surface water is insufficient to meet demand. Accordingly, the amount of groundwater used to meet existing uses fluctuates, depending on rainfall and the availability of stream flow.

OWC's supply of non-potable water has, until recently, relied solely on surface water from Olowalu Stream.

OWC restored the N Pump skimming well and installed a 500 gpm replacement pump in 2022 to help mitigate fluctuations in availability of surface water. The N Pump was operational for only the last 3 of the 12 months prior to designation of the WMA. Since then, the N Pump has operated continuously, with an average daily pumping of 270,382 gpd for a full 12 months as described in Exhibit 1 of the N Pump GWUPA which is the basis of the existing requested amount for the N-pump. In 2023, work was done to repair leaks at the Olowalu Stream intake, requiring 100% of stream water to remain in the stream. The use of the N-pump as an alternative source allowed customers to continue to receive irrigation water during this period.

Olowalu Cultural Reserve

The Olowalu Cultural Reserve (OCR) receives Olowalu stream water directly from the lower stream diversion at no cost outside of OWC's system. OCR's uses include lo'i kalu, diversified Ag crops and native plant nurseries, each with expected future growth dependent on water availability. OWC's SWUPA-E includes a requested amount of 150,000 gpd for OCR which is based on the amount described in Table 8 of the WMA FOF. This amount is excluded from OWC's requested amount but included in the SWUPA for OCR's benefit to preserve their water use and support their mission: To preserve the Native Hawaiian cultural site, the Olowalu valley, located on the island of Maui.

Non-Potable Requested Amount

OWC requests the following amounts for its existing non-potable uses: 261,575 gpd from Olowalu Stream and 270,382 gpd from Olowalu Shaft N Pump.

For the existing amount requested from Olowalu Stream, we have used total monthly metered consumption as a proxy for OWC's use of stream water. This is shown as Total Billed Usage on OWC Non-Potable Exhibit 1 of the SWUPA, and as individual use on Exhibit 3: Non-Potable Consumption History By TMK.

The amount requested in the SWUPA-E from Olowalu N Pump is based on a full 12-months' of pumping as described above under *Non Potable Sources* and on Exhibit 1.

Supply & Demand

A summary of total supply and demand of both potable and non-potable water is shown on Exhibit A: *Olowalu Combined Potable and Non-Potable Supply and Demand* attached hereto.

Efficiency of the Potable System

The OWC system has four miles of water mains and 550,000 gallons of daily storage, with a daily demand of only 78,000. A single small leak of 30 gallons a minute will lose 43,200 gallons a day; more than half the daily consumption. Small underground leaks are difficult to locate in our 4 mile long system of pipes and can last for months before being found. If a leak takes several days to fix, the losses skew heavily for the month and year.

OWC incurred two substantial line breaks during the 12-month WMA period. The first was a 4" line that serviced a fire hydrant. This supply line was buried under a large amount of vegetation so the leak never surfaced. We identified the problem in February by the observation of excessive daily pumping amounts and ran our leak isolation protocol on March 1, 2022. We were able to isolate the area, and by using the leak detection equipment, we were able to find it. The leak was substantial enough that daily losses from this event weight the averages for the whole year. The second major leak was found in June 2022. A 2" HDPE lateral in the Mauka subdivision was cracked and also contributed significantly to the loss averages.

To assure minimization of water loss, OWC recently conducted a potable water audit with CWRM and DOH. The results of the audit are attached as Exhibit 7 to the GWUPA.

System Efficiency Protocol

OWC has established several protocols to improve operations and minimize water losses. Daily readings and site inspections with system readings are the initial steps to help management identify potential problems or leaks. Management reviews both the online SCADA information along with the daily field staff reports so that any issues can be addressed swiftly. Office staff is available to receive customer calls on leaks or service-related issues during business hours and after-hours emergency service is available on call, for which common spare parts are inventoried for such repairs. Annually our staff performs a Water loss

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audit with CWRM and DOH that also helps management assess our performance as a system.

Another annual program to help staff with billing efficiency is the meter replacements to the new cellular readable units. Also, upcoming capital improvement projects include a major upgrade to the SCADA system to enable more remote monitoring and less manual operation.

Non-Potable System Efficiency

Recently in the second quarter of 2023, OWC repaired leaks at the diversion underneath the headwall and behind the diversion channel with non-toxic expandable polyurethane foam, and modified the outfall to allow constant instream flow below the diversion even in low flow conditions. OWC also installed a new liner in its upper reservoir with new PVC piping from the diversion to minimize losses.

Please contact me at 808-877-4202 or at [REDACTED] if you have any questions on the use applications.

Regards,
OLOWALU WATER COMPANY INC.



Glenn Tremble
Secretary/Treasurer

Attachments

EXHIBIT A

OLOWALU WATER COMPANY INC
COMBINED POTABLE AND NON POTABLE
SUPPLY AND DEMAND

Attachment to SWUPA-E: #16 Table 1 (B)
#17 Table 2(I)
#7
Attachment to GWUPA: #11 Table 1 (I,J,K,M)
#6

OLOWALU POTABLE AND NON POTABLE WATER USE COMBINED						
SUMMARY OF EXISTING AND REQUESTED USE (Average Gallons Per Day) [1]						
GWUPA	SWUPA-E	Potable or Non Potable	Max GPD based on Pump Capacity or Stream Flow	REQUESTED USE (avg.GPD over 12 months)	EXISTING AVERAGE SOURCE USE for WMA 12 Months (GPD)	COMMENTS
OWC Well 1		Potable	360,000	78,217	78,217	Existing Well 1 is OWC only potable well, pumping about 25% of it's capacity. OWC has applied for a second potable OWC Well 2 as a backup source.
Olowalu Shaft N Pump		Non Potable	720,000	270,382	56,830	N-Pump was only operational for 3 of the 12 month WMA period, but operated continously thereafter. Requested use covers the event of zero stream water and is based on full 12 month period as shown on OWC Exhibit 1
	Olowalu Stream-OWC	Non Potable	Max that can be stored after IIFS is met	261,575	261,575	Requested Use for OWC is maximum allowed after IIFS is met.
	Olowalu Stream-OCR	Non Potable	N.A.	150,000	27,752	Olowalu Cultural Reserve requested amount is based on CWRM Table 8 of WMA FOF.
	Total Stream Water	Non Potable		411,575	289,327	
TOTAL SOURCE				760,174	424,374	Olowalu Aquifer has a 2.0 MGD Sustainable Yield per CWRM. Other than private wells unknown to applicant, OWC accounts for most all of the Olowalu region's consumption from the Olowalu Aquifer.
[1] Based on data provided in GWUPA and SWUPA-E applications.						
SUMMARY OF EXISTING CONSUMPTION						
Olowalu Water Company		Potable			78,217	See OWC Exhibit 1 for detail
Olowlu Water Company		Non Potable			261,575	See OWC Exhibit 1 for detail
TOTAL CONSUMPTION					339,792	



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

APPLICATION FOR GROUND WATER USE PERMIT

FORM GWUPA

- ☐ New Use
☐ Modification of WUP No. _____
☒ Existing Use

For Official Use Only:

For detailed instructions on filling out this application form completely, refer to the attached instructions. Incomplete applications will not be accepted for processing.

APPLICANT INFORMATION

1. APPLICANT INFORMATION			2. SOURCE LANDOWNER INFORMATION		
Name/Company	Olowalu Water Company Inc	Contact Person	Glenn Tremble	Name/Company	Olowalu Elua Associates LLC
Contact Person				Contact Person	Peter Martin
Mailing Address	305 E. Wakea Ave., Ste 100 Kahului, HI 96732		Mailing Address	305 E. Wakea Ave., Ste 100 Kahului, HI 96732	
Phone	(808) 877-4202	Fax		Phone	(808) 877-4202
E-mail			E-mail		

SOURCE INFORMATION

3. ISLAND		Maui		
4. AQUIFER SYSTEM AREA		Olowalu		
5. SOURCE INFORMATION		4A. SUSTAINABLE YIELD FOR ITEM 4		
Attach additional sheets, if necessary.		2 MGD		
Well Number (if known)	Well Name	Existing or Proposed?	TMK	Flowmeter installed?
6-4936-001	Olowalu Elua	Existing	4 zone - 8 sector - 003 plat : 108 parcel	<input checked="" type="checkbox"/> Yes, date installed 10 / 4 / 99 <input type="checkbox"/> No
			zone - sector - plat : parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone - sector - plat : parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone - sector - plat : parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone - sector - plat : parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone - sector - plat : parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No

USE INFORMATION

6. TOTAL QUANTITY OF WATER REQUESTED: In the space below, enter total from Box M in Item 11 (Table 1) of this application.	
78,217 gallons per day, averaged over 1 year	
USE: <input type="checkbox"/> Agriculture <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Industrial	
Check all that apply. <input type="checkbox"/> Irrigation <input type="checkbox"/> Military <input checked="" type="checkbox"/> Municipal	
8. LOCATION OF WATER USE: Show the location of the use on a map, attached as a .pdf to this application. See Item 11 (Table 1, column B) of this application. See Exhibits 3 & 4	

Note 2: Signing below indicates that the signatories understand and affirm that the information provided on this application is accurate and true to the best of their knowledge. Further, the signatories understand that: (1) if necessary, further information may be required before the application is considered complete; (2) if a water use permit is granted by the Commission, this permit is subject to any existing legal uses, changes in sustainable yields and instream flow standards, reserved uses as defined by the Commission, and Hawaiian Home Lands' future uses; and (3) **the applicant is responsible for paying the public notice fees associated with this application.** Additionally, as stated in Note 1, above, HRS § 174C-51(1) the landowner shall be the joint applicant in the event the applicant is a lessee, licensee, developer or any person with a terminable interest or estate in the land that is the water source of the permitted water.

9. APPLICANT		10. SOURCE LANDOWNER/JOINT APPLICANT (if applicable)	
Signature		Signature	
Glenn Tremble		Peter Martin	
Print Name		Print Name	
8/1/23		8/1/23	
Date		Date	

USE INFORMATION

11. TABLE 1: LAND USE CONSISTENCY (Attach additional copies, if necessary.)

LAND USE CONSISTENCY						EFFICIENCY OF USE			
A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: <ul style="list-style-type: none">Property tax map, showing location of use referenced to established property boundaries.Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				See Exhibit 1: 12 month actual prior to WMA designation. See Schedule A for TMK's
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
TOTAL POTABLE USE								K	GPD
USES THAT DO NOT REQUIRE POTABLE WATER									
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
TOTAL NON-POTABLE USE								L	GPD
TOTAL QUANTITY OF WATER REQUESTED (sum of total potable use and total non-potable use) =								M	GPD

Please explain if there are any limitations (e.g., legal, contractual) on the proposed water use(s) described in Table 1. Ref. HRS § 174C-51(5).

* Pursuant to Decision and Order No. 17953 filed on August 7, 2000 in Docket No. 02-0196, Olowalu Water Company received its Certificate of Public Convenience and Necessity from the Hawaii Public Utility Commission to operate as a public utility providing potable water utility service.

USE INFORMATION (continued)

12. TABLE 2: AGRICULTURE/IRRIGATION INFORMATION
List all crops that will be grown, including landscape and golf course irrigation uses. Copy Table 2 and attach additional sheets to complete your list, if necessary.

A	B	C	D	E	F	G	H	I
TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: <ul style="list-style-type: none">Property tax map with an outline around the area of each irrigation use listed in this table.Photograph of the area of each use.	CROP	TOTAL ACREAGE	NET IRRIGATED ACREAGE	BEGIN GROWTH PERIOD (month)	END GROWTH PERIOD (month)	IRRIGATION SYSTEM (refer to instructions)	IRRIGATION PRACTICE (refer to instructions)	COMMENTS (Continue comments below, if more space is needed.)
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
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____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								

Comments (continued from Column I). Please clearly indicate the crop (i.e., the row in table) these comments relate to.

OTHER PERTINENT INFORMATION

13. TABLE 3: ALTERNATIVES ANALYSIS

	A. Analysis of <i>potable</i> alternatives Attach additional sheets if necessary.	B. Analysis of <i>non-potable</i> alternatives Attach additional sheets if necessary.
Municipal sources		
Wastewater reuse		
Ditch system		
Desalinization		
Surface water		
Other	Catchment as an alternative is not practical for the west side of Maui which historically gets little to no rainfall the majority of the year.	

14. PUBLIC INTEREST

§174C-2(C), HRS states: *The state water code shall be liberally interpreted to***[a]** *obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However,* **[b]** *adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.*

Explain how the use in your application is consistent with items **[a]** and **[b]** above.

a) OWC's ground water is treated for safe domestic consumption and distributed to approximately 65 consumers for their domestic use which is a "beneficial use" as defined by HRS 174C-2(C).

b) OWC meets the State's need for "municipal uses", providing potable water service to the Olowalu region of Maui that the County of Maui is unable to service. OWC's existing well and storage tanks are self-contained within fenced enclosures that do not encroach on or disturb other natural resources, fish, wildlife or threatened plant or animal species, nor interfere with traditional and customary Hawaiian rights,. These facilities are periodically inspected by the State Dept. of Health for compliance with health and water company management standards which OWC meets. Hence OWC's water system meets the State's public interest objectives of "preservation and enhancement of waters of the State for municipal uses".

15. KA PA'AKAI ANALYSIS:

- a. Please provide the identity and scope of cultural, historical, and natural resources in which traditional and customary Native Hawaiian rights are exercised in this area.
- b. Identify the extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.
- c. What feasible action, if any, could be taken to reasonably protect Native Hawaiian rights?

OTHER PERTINENT INFORMATION

16. INTERFERENCE WITH THE RIGHTS OF THE DEPARTMENT OF HAWAIIAN HOME LANDS

Explain how the use of water will not interfere with the rights of the Department of Hawaiian Home Lands, as provided in section 221 of the Hawaiian Homes Commission Act.

There are no DHHL lands within OWC's service area which draw from the Olowalu aquifer. Hence, OWC's existing use would not affect DHHL lands which draw from other aquifers. Because DHHL has priority over other municipal users, the uses under this application would not interfere with DHHL's water rights.

17. INTERFERENCE WITH ANY EXISTING LEGAL USES

Explain how the use of water will not interfere with any other existing legal use(s) of water.

OWC's withdrawal of ground water for municipal domestic use by its customers is legally authorized by the Dept. of Health and regulated by the PUC under the terms of its CPCN granted 8/07/2000 by Order No.17953. Any other legal uses of the same water would be regulated by CWRM so as not to interfere with any other existing legal use of water.

18. EFFICIENCY

If a water conservation plan was prepared, please attach to this application.

If no water conservation plan was prepared, please explain how your use of water will be as efficient as possible.

OWC's potable water is stored within storage tanks that undergo annual inspection to prevent leakage, and its water mains are rarely damaged. A replacement plan is in place to upgrade laterals from HDPE to copper for longevity and to reduce risk of leaks and losses. Meters are also replaced on a regular schedule to facilitate remote reading, and the entire SCADA system is being upgraded in 2023 to provide more timely and accurate information, improved resiliency and automation control.

19. PUBLIC WATER SYSTEM INFORMATION

Check the appropriate box or boxes.

☐ PUC-Regulated Private System / ☐ Non-PUC-Regulated Private System / ☐ Not a Public Water System

☐ Intended dedication to Honolulu Board of Water Supply or to County of Maui, Department of Water Supply.

If a Level-1 validated AWWA water loss audit was completed, please attach.

20. CHAPTER 343

This project proposes:

☐ Use of state or county lands, or use of state or county funds

☐ Use within a state conservation district

☐ Use within a shoreline setback area

☐ Use within a national or Hawaii registered historic site

☐ Use within the Waikiki Special District

☐ The construction, expansion or modification of helicopter facility

☐ A wastewater treatment unit

☐ Waste-to-energy facility

☐ Landfill

☐ Oil refinery

☐ Power-generating facility

☐ None of the above 11 items

☐ If none of the above 11 items are applicable, no 343 compliance is necessary

☐ An Environmental Assessment was completed, and

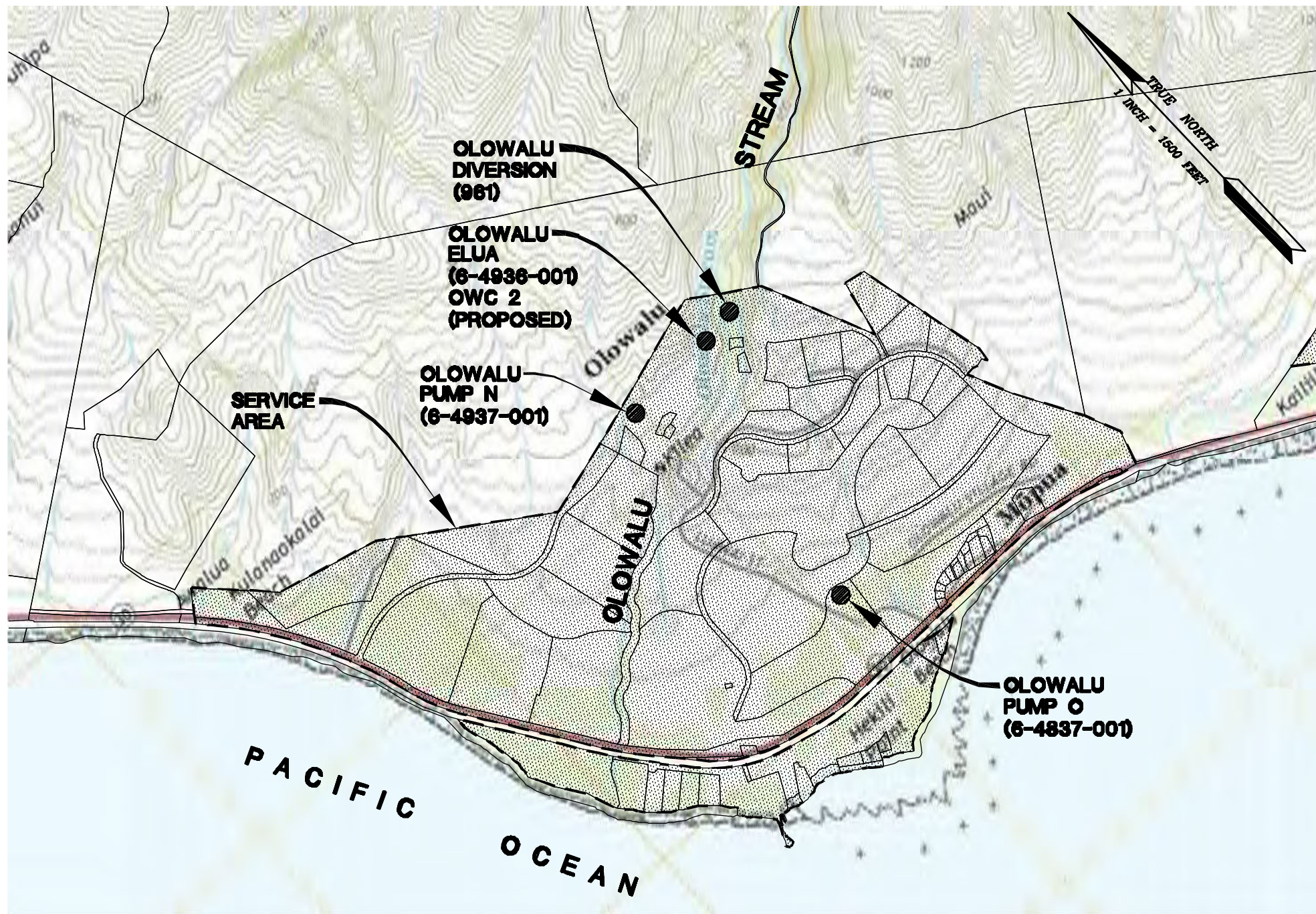
☐ An Environmental Impact Statement was required and has been accepted (attach letter of acceptance). Publication date in The Environmental Notice:

☐ A Finding of No Significant Impact has been determined (attach letter). Publication date in The Environmental Notice:

21. TABLE 4: 12-MONTH AVERAGE CALCULATION AS OF THE DATE OF DESIGNATION. FOR EXISTING USES ONLY.

MM/YY	AVERAGE DAILY PUMPAGE FOR THE MONTH (GALLONS PER DAY)	Check one per row			
		Metered	Estimated	Active but unknown	Inactive

OLOWALU WATER COMPANY, INC (POTABLE)			
AVERAGE DAILY PUMPAGE (12 Mo Prior To WMA)			
MM/YY	Well 1 Pumpage (GAL)	Average Pumped Per Day (GPD)	Metered
08/21	2,159,700	69,668	Yes
09/21	1,765,000	58,833	Yes
10/21	2,204,800	71,123	Yes
11/21	2,170,000	72,333	Yes
12/21	2,446,700	78,926	Yes
01/22	2,576,600	83,116	Yes
02/22	2,831,000	101,107	Yes
03/22	2,130,000	68,710	Yes
04/22	2,620,800	87,360	Yes
05/22	2,730,200	88,071	Yes
06/22	2,272,910	75,764	Yes
07/22	2,591,490	83,596	Yes
Total	28,499,200	938,607	
12 Months Avg	2,374,933	78,217	Yes



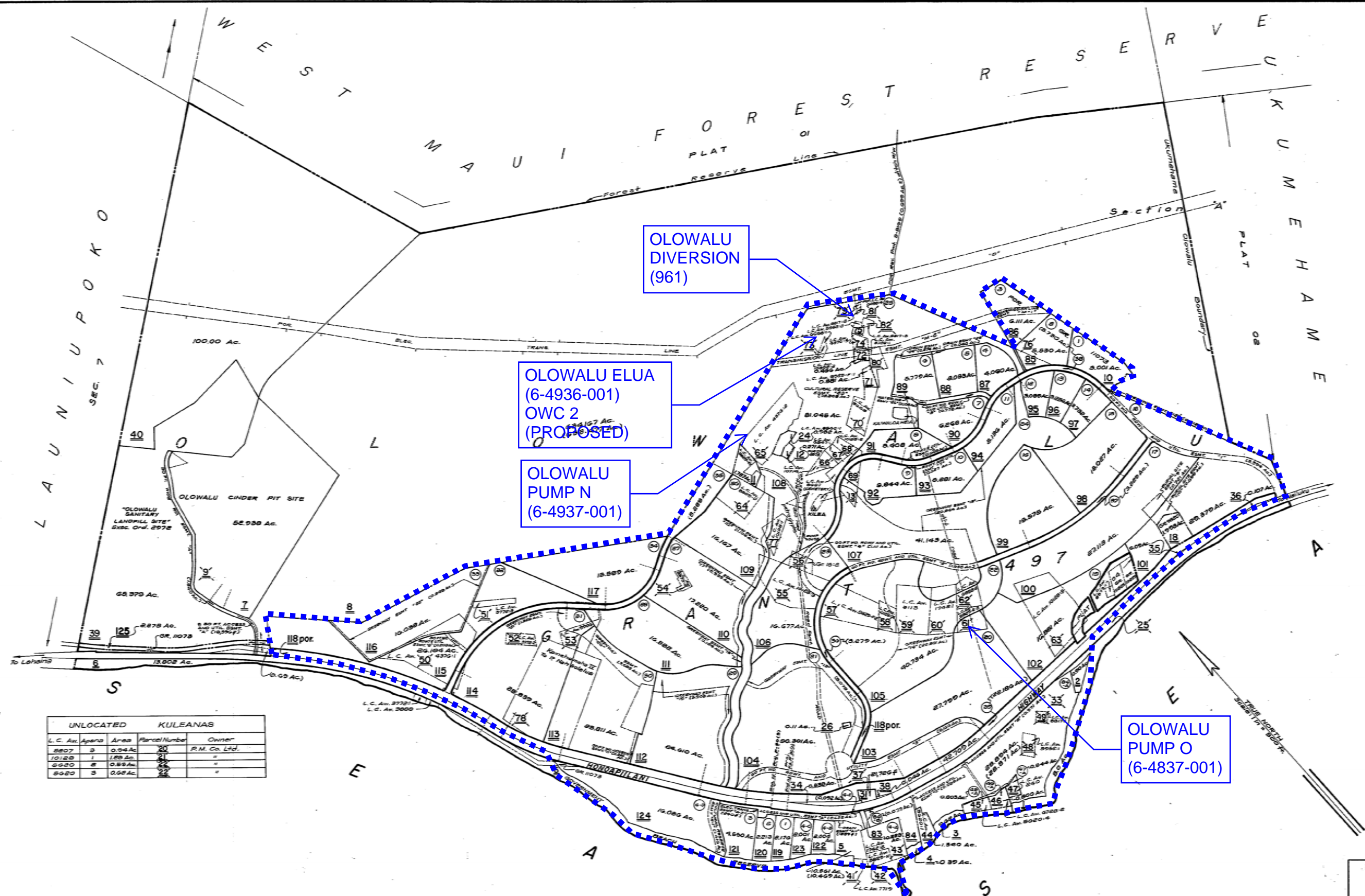
0 1500 3000 4500 6000
SCALE: 1 INCH = 1500 FEET

ATTACHMENT SWUPA-E 9, SWUPA-N 11, GWUPA 8
USGS - OLOWALU QUAD/TMK MAP
LOWALU STREAM

SOURCE: TAX MAPS BUREAU & SURVEY DEPARTMENT

BY GTS/ECB
8/1/1K/HRETRACED APRIL 23, 2005
DATE: MAY 1934

DWG NO. 2021

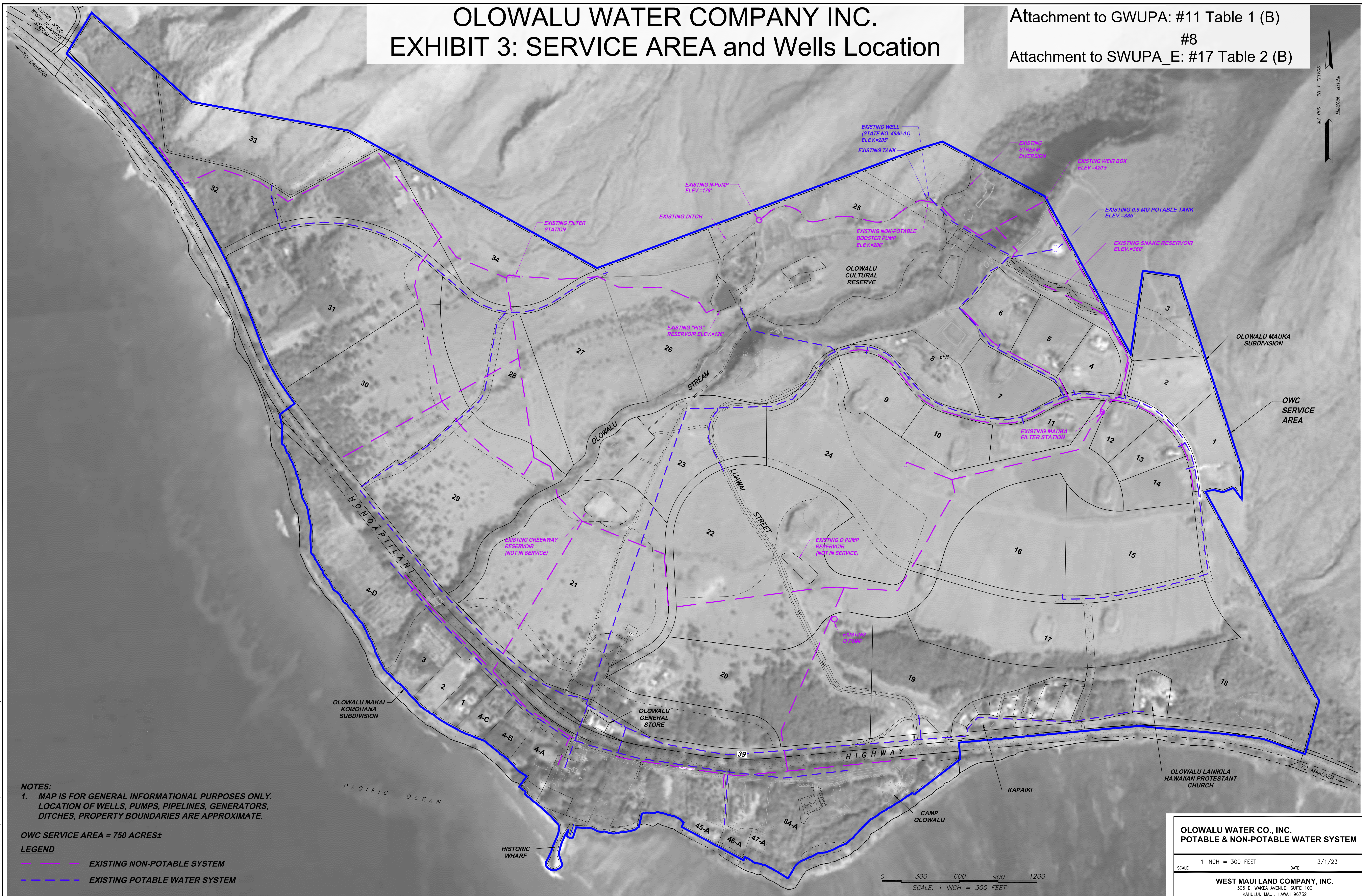
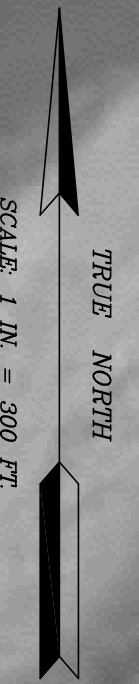


PIONEER MILL PLANTATION, OLOWALU, MAUI.

FOR PROPERTY ASSESSMENT PURPOSES - SUBJECT TO CHANGE

DEPARTMENT OF FINANCE PROPERTY ASSESSMENT DIVISION MAPPING BRANCH STATE OF HAWAII TAX MAP		
COUNTY OF MAUI		
ZONE	SECTION	PLAT
4	8	03
SCALE: 1 IN = 500 FT.		

Attachment to GWUPA: #11 Table 1 (B)
#8
Attachment to SWUPA_E: #17 Table 2 (B)



Olowalu Well 1



OWC Olowalu Elua 1 No. 6-4936-001

TMK 4-8-003:108



LOWALU WATER COMPANY, INC

Consumption History - Detailed

Sort Order: Customer No.
From 9/1/2021 Through 8/1/2022

Limited to : Active Company

Code Filters:

Service and Rate code POTABLE USAGE AND PW1

Location No.	Customer No.	Customer Name				Location Address			Parcel			Route	
Service	Bill Date	Rate Code	Units	SerialNo	Meter Size	Prior Read	Prior Read Date	Current Read	Current Read Date	Actual	Adjusted	Billed	Charges
480031030000													
POTABLE USAGE	9/1/2021	PW1	gal	OV001600	5/8" METER	349,790.00	8/2/2021	352,150.00	9/1/2021	2,360.00	0.00	2,360.00	4.58
POTABLE USAGE	10/1/2021	PW1	gal	OV001600	5/8" METER	352,150.00	9/1/2021	353,650.00	10/1/2021	1,500.00	0.00	1,500.00	2.91
POTABLE USAGE	11/1/2021	PW1	gal	OV001600	5/8" METER	353,650.00	10/1/2021	354,340.00	11/1/2021	690.00	0.00	690.00	1.34
POTABLE USAGE	12/1/2021	PW1	gal	OV001600	5/8" METER	354,340.00	11/1/2021	354,880.00	12/1/2021	540.00	0.00	540.00	1.05
POTABLE USAGE	12/31/2021	PW1	gal	OV001600	5/8" METER	354,880.00	12/1/2021	356,070.00	12/31/2021	1,190.00	0.00	1,190.00	2.31
POTABLE USAGE	2/1/2022	PW1	gal	OV001600	5/8" METER	356,070.00	12/31/2021	356,490.00	2/1/2022	420.00	0.00	420.00	0.81
POTABLE USAGE	3/1/2022	PW1	gal	OV001600	5/8" METER	356,490.00	2/1/2022	357,270.00	3/1/2022	780.00	0.00	780.00	1.51
POTABLE USAGE	4/1/2022	PW1	gal	OV001600	5/8" METER	357,270.00	3/1/2022	358,970.00	4/1/2022	1,700.00	0.00	1,700.00	3.30
POTABLE USAGE	5/2/2022	PW1	gal	OV001600	5/8" METER	358,970.00	4/1/2022	360,440.00	5/2/2022	1,470.00	0.00	1,470.00	2.85
POTABLE USAGE	6/1/2022	PW1	gal	OV001600	5/8" METER	360,440.00	5/2/2022	362,510.00	6/1/2022	2,070.00	0.00	2,070.00	4.02
POTABLE USAGE	7/1/2022	PW1	gal	OV001600	5/8" METER	362,510.00	6/1/2022	366,100.00	7/1/2022	3,590.00	0.00	3,590.00	6.96
POTABLE USAGE	8/1/2022	PW1	gal	OV001600	5/8" METER	366,100.00	7/1/2022	368,610.00	8/1/2022	2,510.00	0.00	2,510.00	4.87
												18,820.00	
480031030000													
POTABLE USAGE	9/1/2021	PW1	gal	OVP002000	5/8" METER	2,309,850.00	8/2/2021	2,311,270.00	9/1/2021	1,420.00	0.00	1,420.00	2.75
POTABLE USAGE	10/1/2021	PW1	gal	OVP002000	5/8" METER	2,311,270.00	9/1/2021	2,311,850.00	10/1/2021	580.00	0.00	580.00	1.13
POTABLE USAGE	11/1/2021	PW1	gal	OVP002000	5/8" METER	2,311,850.00	10/1/2021	2,313,280.00	11/1/2021	1,430.00	0.00	1,430.00	2.77
POTABLE USAGE	12/1/2021	PW1	gal	OVP002000	5/8" METER	2,313,280.00	11/1/2021	2,314,010.00	12/1/2021	730.00	0.00	730.00	1.42
POTABLE USAGE	12/31/2021	PW1	gal	OVP002000	5/8" METER	2,314,010.00	12/1/2021	2,315,760.00	12/31/2021	1,750.00	0.00	1,750.00	3.40
POTABLE USAGE	2/1/2022	PW1	gal	OVP002000	5/8" METER	2,315,760.00	12/31/2021	2,316,930.00	2/1/2022	1,170.00	0.00	1,170.00	2.27
POTABLE USAGE	3/1/2022	PW1	gal	OVP002000	5/8" METER	2,316,930.00	2/1/2022	2,317,060.00	3/1/2022	130.00	0.00	130.00	0.25
POTABLE USAGE	4/1/2022	PW1	gal	OVP002000	5/8" METER	2,317,060.00	3/1/2022	2,317,340.00	4/1/2022	280.00	0.00	280.00	0.54
POTABLE USAGE	5/2/2022	PW1	gal	OVP002000	5/8" METER	2,317,340.00	4/1/2022	2,317,560.00	5/2/2022	220.00	0.00	220.00	0.43
POTABLE USAGE	6/1/2022	PW1	gal	OVP002000	5/8" METER	2,317,560.00	5/2/2022	2,317,820.00	6/1/2022	260.00	0.00	260.00	0.50
POTABLE USAGE	7/1/2022	PW1	gal	OVP002000	5/8" METER	2,317,820.00	6/1/2022	2,318,000.00	7/1/2022	180.00	0.00	180.00	0.35
POTABLE USAGE	8/1/2022	PW1	gal	OVP002000	5/8" METER	2,318,000.00	7/1/2022	2,318,130.00	8/1/2022	130.00	0.00	130.00	0.25
												8,280.00	
256 LUAWAI STREET COTTAGE 480030100002													
POTABLE USAGE	9/1/2021	PW1	gal	29946840	5/8" METER	130,066.00	8/2/2021	130,555.00	9/1/2021	489.00	0.00	489.00	0.95
POTABLE USAGE	10/1/2021	PW1	gal	29946840	5/8" METER	130,555.00	9/1/2021	132,092.00	10/1/2021	1,537.00	0.00	1,537.00	2.98
POTABLE USAGE	11/1/2021	PW1	gal	29946840	5/8" METER	132,092.00	10/1/2021	133,660.00	11/2/2021	1,568.00	0.00	1,568.00	3.04
POTABLE USAGE	12/1/2021	PW1	gal	29946840	5/8" METER	133,660.00	11/2/2021	134,895.00	12/1/2021	1,235.00	0.00	1,235.00	2.40
POTABLE USAGE	12/31/2021	PW1	gal	29946840	5/8" METER	134,895.00	12/1/2021	136,200.00	12/31/2021	1,305.00	0.00	1,305.00	2.53
POTABLE USAGE	2/1/2022	PW1	gal	29946840	5/8" METER	136,200.00	12/31/2021	137,176.00	2/1/2022	976.00	0.00	976.00	1.89
POTABLE USAGE	3/1/2022	PW1	gal	29946840	5/8" METER	137,176.00	2/1/2022	137,939.00	3/1/2022	763.00	0.00	763.00	1.48
POTABLE USAGE	4/1/2022	PW1	gal	29946840	5/8" METER	137,939.00	3/1/2022	138,397.00	4/2/2022	458.00	0.00	458.00	0.89
POTABLE USAGE	5/2/2022	PW1	gal	29946840	5/8" METER	138,397.00	4/2/2022	139,283.00	5/2/2022	886.00	0.00	886.00	1.72
POTABLE USAGE	6/1/2022	PW1	gal	29946840	5/8" METER	139,283.00	5/2/2022	140,454.00	6/1/2022	1,171.00	0.00	1,171.00	2.27
POTABLE USAGE	6/23/2022	PW1	gal	29946840	5/8" METER	140,454.00	6/1/2022	140,769.00	6/8/2022	315.00	0.00	315.00	0.00
												10,703.00	
480030100002													
POTABLE USAGE	7/1/2022	PW1	gal	29946840	5/8" METER	140,769.00	6/8/2022	143,607.00	7/1/2022	2,838.00	0.00	2,838.00	5.51
POTABLE USAGE	8/1/2022	PW1	gal	29946840	5/8" METER	143,607.00	7/1/2022	149,290.00	8/1/2022	5,683.00	0.00	5,683.00	11.03
												8,521.00	
282B LUAWAI ST 480030850002													
POTABLE USAGE	9/1/2021	PW1	gal	190287914	5/8" METER	16,772.00	8/2/2021	17,998.00	9/1/2021	1,226.00	0.00	1,226.00	2.38
POTABLE USAGE	10/1/2021	PW1	gal	190287914	5/8" METER	17,998.00	9/1/2021	18,194.00	10/1/2021	196.00	0.00	196.00	0.38
POTABLE USAGE	11/1/2021	PW1	gal	190287914	5/8" METER	18,194.00	10/1/2021	20,230.00	11/2/2021	2,036.00	0.00	2,036.00	3.95
POTABLE USAGE	12/1/2021	PW1	gal	190287914	5/8" METER	20,230.00	11/2/2021	22,494.00	12/1/2021	2,264.00	0.00	2,264.00	4.39
POTABLE USAGE	12/31/2021	PW1	gal	190287914	5/8" METER	22,494.00	12/1/2021	25,362.00	12/31/2021	2,868.00	0.00	2,868.00	5.56
POTABLE USAGE	2/1/2022	PW1	gal	190287914	5/8" METER	25,362.00	12/31/2021	27,946.00	2/1/2022	2,584.00	0.00	2,584.00	5.01
POTABLE USAGE	3/1/2022	PW1	gal	190287914	5/8" METER	27,946.00	2/1/2022	30,041.00	3/1/2022	2,095.00	0.00	2,095.00	4.06
POTABLE USAGE	4/1/2022	PW1	gal	190287914	5/8" METER	30,041.00	3/1/2022	32,224.00	4/2/2022	2,183.00	0.00	2,183.00	4.24
POTABLE USAGE	5/2/2022	PW1	gal	190287914	5/8" METER	32,224.00	4/2/2022	34,066.00	5/2/2022	1,842.00	0.00	1,842.00	3.57
POTABLE USAGE	6/1/2022	PW1	gal	190287914	5/8" METER	34,066.00	5/2/2022	36,220.00	6/1/2022	2,154.00	0.00	2,154.00	4.18
POTABLE USAGE	7/1/2022	PW1	gal	190287914	5/8" METER	36,220.00	6/1/2022	39,118.00	7/1/2022	2,898.00	0.00	2,898.00	5.62
POTABLE USAGE	8/1/2022	PW1	gal	190287914	5/8" METER	39,118.00	7/1/2022	41,624.00	8/1/2022	2,506.00	0.00	2,506.00	4.86
												24,852.00	
480030850002													
POTABLE USAGE	9/1/2021	PW1	gal	15144153	5/8" METER	10.00	8/2/2021	10.00	9/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	10/1/2021	PW1	gal	15144153	5/8" METER	10.00	9/1/2021	10.00	10/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	11/1/2021	PW1	gal	15144153	5/8" METER	10.00	10/1/2021	10.00	11/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/1/2021	PW1	gal	15144153	5/8" METER	10.00	11/1/2021	10.00	12/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/31/2021	PW1	gal	15144153	5/8" METER	10.00	12/1/2021	10.00	12/31/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	2/1/2022	PW1	gal	15144153	5/8" METER	10.00	12/31/2021	10.00	2/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	3/1/2022	PW1	gal	15144153	5/8" METER	10.00	2/1/2022	10.00	3/1/2022	0.00	0.00	0.00	0.00
POT													

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable						Attachment to GWUPA: #11 Table 1 (B,I)							
POTABLE USAGE	12/31/2021	PW1	gal	210232410	5/8" METER	36,085.00	12/2/2021	44,086.00	12/31/2021	8,001.00	0.00	8,001.00	15.52
POTABLE USAGE	2/1/2022	PW1	gal	210232410	5/8" METER	44,086.00	12/31/2021	54,806.00	2/1/2022	10,720.00	0.00	10,720.00	21.29
POTABLE USAGE	3/1/2022	PW1	gal	210232410	5/8" METER	54,806.00	2/1/2022	66,707.00	3/2/2022	11,901.00	0.00	11,901.00	24.38
POTABLE USAGE	4/1/2022	PW1	gal	210232410	5/8" METER	66,707.00	3/2/2022	76,964.00	4/2/2022	10,257.00	0.00	10,257.00	20.07
POTABLE USAGE	5/2/2022	PW1	gal	210232410	5/8" METER	76,964.00	4/2/2022	86,314.00	5/2/2022	9,350.00	0.00	9,350.00	18.14
POTABLE USAGE	6/1/2022	PW1	gal	210232410	5/8" METER	86,314.00	5/2/2022	95,595.00	6/1/2022	9,281.00	0.00	9,281.00	18.01
POTABLE USAGE	7/1/2022	PW1	gal	210232410	5/8" METER	95,595.00	6/1/2022	105,149.00	7/1/2022	9,554.00	0.00	9,554.00	18.53
POTABLE USAGE	8/1/2022	PW1	gal	210232410	5/8" METER	105,149.00	7/1/2022	114,592.00	8/1/2022	9,443.00	0.00	9,443.00	18.32
142,984.00													
480030880001													
POTABLE USAGE	9/1/2021	PW1	gal	18652048	5/8" METER	336,266.00	8/2/2021	426,402.00	9/1/2021	90,136.00	0.00	90,136.00	259.32
POTABLE USAGE	10/1/2021	PW1	gal	18652048	5/8" METER	426,402.00	9/1/2021	430,627.00	10/1/2021	4,225.00	0.00	4,225.00	8.20
POTABLE USAGE	11/1/2021	PW1	gal	18652048	5/8" METER	430,627.00	10/1/2021	437,270.00	11/1/2021	6,643.00	0.00	6,643.00	12.89
POTABLE USAGE	12/1/2021	PW1	gal	18652048	5/8" METER	437,270.00	11/1/2021	437,990.00	12/1/2021	720.00	0.00	720.00	1.40
POTABLE USAGE	12/31/2021	PW1	gal	18652048	5/8" METER	437,990.00	12/1/2021	439,040.00	12/31/2021	1,050.00	0.00	1,050.00	2.04
POTABLE USAGE	2/1/2022	PW1	gal	18652048	5/8" METER	439,040.00	12/31/2021	441,182.00	2/1/2022	2,142.00	0.00	2,142.00	4.16
POTABLE USAGE	3/1/2022	PW1	gal	18652048	5/8" METER	441,182.00	2/1/2022	444,285.00	3/1/2022	3,103.00	0.00	3,103.00	6.02
POTABLE USAGE	4/1/2022	PW1	gal	18652048	5/8" METER	444,285.00	3/1/2022	445,952.00	4/1/2022	1,667.00	0.00	1,667.00	3.23
POTABLE USAGE	5/2/2022	PW1	gal	18652048	5/8" METER	445,952.00	4/1/2022	446,246.00	5/2/2022	294.00	0.00	294.00	0.57
POTABLE USAGE	6/1/2022	PW1	gal	18652048	5/8" METER	446,246.00	5/2/2022	447,213.00	6/1/2022	967.00	0.00	967.00	1.88
POTABLE USAGE	7/1/2022	PW1	gal	18652048	5/8" METER	447,213.00	6/1/2022	449,720.00	7/1/2022	2,507.00	0.00	2,507.00	4.86
POTABLE USAGE	8/1/2022	PW1	gal	18652048	5/8" METER	449,720.00	7/1/2022	462,229.00	8/1/2022	12,509.00	0.00	12,509.00	25.97
125,963.00													
480030890001													
POTABLE USAGE	9/1/2021	PW1	gal	14289469	1" METER	8,221,410.00	8/2/2021	8,233,149.00	9/1/2021	11,739.00	0.00	11,739.00	23.96
POTABLE USAGE	10/1/2021	PW1	gal	14289469	1" METER	8,233,149.00	9/1/2021	8,235,182.00	10/1/2021	2,033.00	0.00	2,033.00	3.94
POTABLE USAGE	11/1/2021	PW1	gal	14289469	1" METER	8,235,182.00	10/1/2021	8,236,099.00	11/1/2021	917.00	0.00	917.00	1.78
POTABLE USAGE	12/1/2021	PW1	gal	14289469	1" METER	8,236,099.00	11/1/2021	8,237,461.00	12/1/2021	1,362.00	0.00	1,362.00	2.64
POTABLE USAGE	12/31/2021	PW1	gal	14289469	1" METER	8,237,461.00	12/1/2021	8,239,915.00	12/31/2021	2,454.00	0.00	2,454.00	4.76
POTABLE USAGE	2/1/2022	PW1	gal	14289469	1" METER	8,239,915.00	12/31/2021	8,239,954.00	2/1/2022	39.00	0.00	39.00	0.08
POTABLE USAGE	3/1/2022	PW1	gal	14289469	1" METER	8,239,954.00	2/1/2022	8,241,828.00	3/1/2022	1,874.00	0.00	1,874.00	3.64
POTABLE USAGE	4/1/2022	PW1	gal	14289469	1" METER	8,241,828.00	3/1/2022	8,243,505.00	4/1/2022	1,677.00	0.00	1,677.00	3.25
POTABLE USAGE	5/2/2022	PW1	gal	14289469	1" METER	8,243,505.00	4/1/2022	8,251,109.00	5/2/2022	7,604.00	0.00	7,604.00	14.75
POTABLE USAGE	6/1/2022	PW1	gal	14289469	1" METER	8,251,109.00	5/2/2022	8,251,123.00	6/1/2022	14.00	0.00	14.00	0.03
POTABLE USAGE	7/1/2022	PW1	gal	14289469	1" METER	8,251,123.00	6/1/2022	8,253,249.00	7/1/2022	2,126.00	0.00	2,126.00	4.12
POTABLE USAGE	8/1/2022	PW1	gal	14289469	1" METER	8,253,249.00	7/1/2022	8,258,937.00	8/1/2022	5,688.00	0.00	5,688.00	11.03
37,527.00													
480030890002													
POTABLE USAGE	9/1/2021	PW1	gal	190287912	5/8" METER	112,214.00	8/2/2021	127,387.00	9/1/2021	15,173.00	0.00	15,173.00	32.95
POTABLE USAGE	10/1/2021	PW1	gal	190287912	5/8" METER	127,387.00	9/1/2021	154,880.00	10/1/2021	27,493.00	0.00	27,493.00	66.38
POTABLE USAGE	11/1/2021	PW1	gal	190287912	5/8" METER	154,880.00	10/1/2021	175,628.00	11/2/2021	20,748.00	0.00	20,748.00	47.56
POTABLE USAGE	12/1/2021	PW1	gal	190287912	5/8" METER	175,628.00	11/2/2021	183,402.00	12/1/2021	7,774.00	0.00	7,774.00	15.08
POTABLE USAGE	12/31/2021	PW1	gal	190287912	5/8" METER	183,402.00	12/1/2021	193,980.00	12/31/2021	10,578.00	0.00	10,578.00	20.91
POTABLE USAGE	2/1/2022	PW1	gal	190287912	5/8" METER	193,980.00	12/31/2021	203,014.00	2/1/2022	9,034.00	0.00	9,034.00	17.53
POTABLE USAGE	3/1/2022	PW1	gal	190287912	5/8" METER	203,014.00	2/1/2022	210,489.00	3/2/2022	7,475.00	0.00	7,475.00	14.50
POTABLE USAGE	4/1/2022	PW1	gal	190287912	5/8" METER	210,489.00	3/2/2022	220,338.00	4/2/2022	9,849.00	0.00	9,849.00	19.11
POTABLE USAGE	5/2/2022	PW1	gal	190287912	5/8" METER	220,338.00	4/2/2022	231,892.00	5/2/2022	11,554.00	0.00	11,554.00	23.47
POTABLE USAGE	6/1/2022	PW1	gal	190287912	5/8" METER	231,892.00	5/2/2022	244,481.00	6/1/2022	12,589.00	0.00	12,589.00	26.18
POTABLE USAGE	7/1/2022	PW1	gal	190287912	5/8" METER	244,481.00	6/1/2022	256,812.00	7/1/2022	12,331.00	0.00	12,331.00	25.51
POTABLE USAGE	8/1/2022	PW1	gal	190287912	5/8" METER	256,812.00	7/1/2022	271,215.00	8/1/2022	14,403.00	0.00	14,403.00	30.94
159,001.00													
480030900000													
POTABLE USAGE	9/1/2021	PW1	gal	81330543M	5/8" METER	488,167.00	8/2/2021	495,314.00	9/1/2021	7,147.00	0.00	7,147.00	13.87
POTABLE USAGE	10/1/2021	PW1	gal	81330543M	5/8" METER	495,314.00	9/1/2021	501,649.00	10/1/2021	6,335.00	0.00	6,335.00	12.29
POTABLE USAGE	11/1/2021	PW1	gal	81330543M	5/8" METER	501,649.00	10/1/2021	508,658.00	11/1/2021	7,009.00	0.00	7,009.00	13.60
POTABLE USAGE	12/1/2021	PW1	gal	81330543M	5/8" METER	508,658.00	11/1/2021	515,989.00	12/1/2021	7,331.00	0.00	7,331.00	14.22
POTABLE USAGE	12/31/2021	PW1	gal	81330543M	5/8" METER	515,989.00	12/1/2021	525,065.00	12/31/2021	9,076.00	0.00	9,076.00	17.61
POTABLE USAGE	2/1/2022	PW1	gal	81330543M	5/8" METER	525,065.00	12/31/2021	533,258.00	2/1/2022	8,193.00	0.00	8,193.00	15.89
POTABLE USAGE	3/1/2022	PW1	gal	81330543M	5								

EXHIBIT 2 - Potable

Attachment to GWUPA: #11 Table 1 (B,I)
480030910002

POTABLE USAGE	9/1/2021	PW1	gal	32022474	5/8" METER	207,193.00	8/2/2021	216,916.00	9/1/2021	9,723.00	0.00	9,723.00	18.86
POTABLE USAGE	10/1/2021	PW1	gal	32022474	5/8" METER	216,916.00	9/1/2021	226,718.00	10/1/2021	9,802.00	0.00	9,802.00	19.02
POTABLE USAGE	11/1/2021	PW1	gal	32022474	5/8" METER	226,718.00	10/1/2021	241,428.00	11/2/2021	14,710.00	0.00	14,710.00	31.74
POTABLE USAGE	12/1/2021	PW1	gal	32022474	5/8" METER	241,428.00	11/2/2021	250,701.00	12/2/2021	9,273.00	0.00	9,273.00	17.99
POTABLE USAGE	12/31/2021	PW1	gal	32022474	5/8" METER	250,701.00	12/2/2021	257,477.00	12/31/2021	6,776.00	0.00	6,776.00	13.15
POTABLE USAGE	2/1/2022	PW1	gal	32022474	5/8" METER	257,477.00	12/31/2021	265,455.00	2/1/2022	7,978.00	0.00	7,978.00	15.48
POTABLE USAGE	3/1/2022	PW1	gal	32022474	5/8" METER	265,455.00	2/1/2022	273,436.00	3/2/2022	7,981.00	0.00	7,981.00	15.48
POTABLE USAGE	4/1/2022	PW1	gal	32022474	5/8" METER	273,436.00	3/2/2022	280,625.00	4/2/2022	7,189.00	0.00	7,189.00	13.95
POTABLE USAGE	5/2/2022	PW1	gal	32022474	5/8" METER	280,625.00	4/2/2022	288,201.00	5/2/2022	7,576.00	0.00	7,576.00	14.70
POTABLE USAGE	6/1/2022	PW1	gal	32022474	5/8" METER	288,201.00	5/2/2022	296,517.00	6/1/2022	8,316.00	0.00	8,316.00	16.13
POTABLE USAGE	7/1/2022	PW1	gal	32022474	5/8" METER	296,517.00	6/1/2022	305,414.00	7/1/2022	8,897.00	0.00	8,897.00	17.26
POTABLE USAGE	8/1/2022	PW1	gal	32022474	5/8" METER	305,414.00	7/1/2022	316,153.00	8/1/2022	10,739.00	0.00	10,739.00	21.34

108,960.00

480030920000

POTABLE USAGE	9/1/2021	PW1	gal	180369205	5/8" METER	2,964,273.00	8/2/2021	2,965,620.00	9/1/2021	1,347.00	0.00	1,347.00	2.61
POTABLE USAGE	10/1/2021	PW1	gal	180369205	5/8" METER	2,965,620.00	9/1/2021	2,965,968.00	10/1/2021	348.00	0.00	348.00	0.68
POTABLE USAGE	11/1/2021	PW1	gal	180369205	5/8" METER	2,965,968.00	10/1/2021	2,966,994.00	11/2/2021	1,026.00	0.00	1,026.00	1.99
POTABLE USAGE	12/1/2021	PW1	gal	180369205	5/8" METER	2,966,994.00	11/2/2021	2,974,526.00	12/1/2021	7,532.00	0.00	7,532.00	14.61
POTABLE USAGE	12/31/2021	PW1	gal	180369205	5/8" METER	2,974,526.00	12/1/2021	2,980,661.00	12/31/2021	6,135.00	0.00	6,135.00	11.90
POTABLE USAGE	2/1/2022	PW1	gal	180369205	5/8" METER	2,980,661.00	12/31/2021	2,987,247.00	2/1/2022	6,586.00	0.00	6,586.00	12.78
POTABLE USAGE	3/1/2022	PW1	gal	180369205	5/8" METER	2,987,247.00	2/1/2022	2,993,653.00	3/1/2022	6,406.00	0.00	6,406.00	12.43
POTABLE USAGE	4/1/2022	PW1	gal	180369205	5/8" METER	2,993,653.00	3/1/2022	3,000,321.00	4/2/2022	6,668.00	0.00	6,668.00	12.94
POTABLE USAGE	5/2/2022	PW1	gal	180369205	5/8" METER	3,000,321.00	4/2/2022	3,005,199.00	5/2/2022	4,878.00	0.00	4,878.00	9.46
POTABLE USAGE	6/1/2022	PW1	gal	180369205	5/8" METER	3,005,199.00	5/2/2022	3,005,726.00	6/1/2022	527.00	0.00	527.00	1.02
POTABLE USAGE	7/1/2022	PW1	gal	180369205	5/8" METER	3,005,726.00	6/1/2022	3,007,360.00	7/1/2022	1,634.00	0.00	1,634.00	3.17
POTABLE USAGE	8/1/2022	PW1	gal	180369205	5/8" METER	3,007,360.00	7/1/2022	3,008,406.00	8/1/2022	1,046.00	0.00	1,046.00	2.03

44,133.00

480030930001

POTABLE USAGE	9/1/2021	PW1	gal	16302431	5/8" METER	11,493.00	8/2/2021	11,493.00	9/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	10/1/2021	PW1	gal	16302431	5/8" METER	11,493.00	9/1/2021	11,493.00	10/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	11/1/2021	PW1	gal	16302431	5/8" METER	11,493.00	10/1/2021	11,493.00	11/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/1/2021	PW1	gal	16302431	5/8" METER	11,493.00	11/1/2021	11,526.00	12/1/2021	33.00	0.00	33.00	0.06
POTABLE USAGE	12/31/2021	PW1	gal	16302431	5/8" METER	11,526.00	12/1/2021	11,526.00	12/31/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	2/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	12/31/2021	11,526.00	2/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	3/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	2/1/2022	11,526.00	3/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	4/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	3/1/2022	11,526.00	4/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	5/2/2022	PW1	gal	16302431	5/8" METER	11,526.00	4/1/2022	11,526.00	5/2/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	6/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	5/2/2022	11,526.00	6/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	7/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	6/1/2022	11,526.00	7/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	8/1/2022	PW1	gal	16302431	5/8" METER	11,526.00	7/1/2022	11,526.00	8/1/2022	0.00	0.00	0.00	0.00

33.00

480030930002

POTABLE USAGE	9/1/2021	PW1	gal	85613993M	5/8" METER	1,109,293.00	8/2/2021	1,110,286.00	9/1/2021	993.00	0.00	993.00	1.93
POTABLE USAGE	10/1/2021	PW1	gal	85613993M	5/8" METER	1,110,286.00	9/1/2021	1,110,895.00	10/1/2021	609.00	0.00	609.00	1.18
POTABLE USAGE	11/1/2021	PW1	gal	85613993M	5/8" METER	1,110,895.00	10/1/2021	1,111,043.00	11/1/2021	148.00	0.00	148.00	0.29
POTABLE USAGE	12/1/2021	PW1	gal	85613993M	5/8" METER	1,111,043.00	11/1/2021	1,113,263.00	12/1/2021	2,220.00	0.00	2,220.00	4.31
POTABLE USAGE	12/31/2021	PW1	gal	85613993M	5/8" METER	1,113,263.00	12/1/2021	1,115,908.00	12/31/2021	2,645.00	0.00	2,645.00	5.13
POTABLE USAGE	2/1/2022	PW1	gal	85613993M	5/8" METER	1,115,908.00	12/31/2021	1,119,038.00	2/1/2022	3,130.00	0.00	3,130.00	6.07
POTABLE USAGE	3/1/2022	PW1	gal	85613993M	5/8" METER	1,119,038.00	2/1/2022	1,123,060.00	3/1/2022	4,022.00	0.00	4,022.00	7.80
POTABLE USAGE	4/1/2022	PW1	gal	85613993M	5/8" METER	1,123,060.00	3/1/2022	1,127,772.00	4/1/2022	4,712.00	0.00	4,712.00	9.14
POTABLE USAGE	5/2/2022	PW1	gal	85613993M	5/8" METER	1,127,772.00	4/1/2022	1,131,559.00	5/2/2022	3,787.00	0.00	3,787.00	7.35
POTABLE USAGE	6/1/2022	PW1	gal	85613993M	5/8" METER	1,131,559.00	5/2/2022	1,135,278.00	6/1/2022	3,719.00	0.00	3,719.00	7.21
POTABLE USAGE	7/1/2022	PW1	gal	85613993M	5/8" METER	1,135,278.00	6/1/2022	1,139,108.00	7/1/2022	3,830.00	0.00	3,830.00	7.43
POTABLE USAGE	8/1/2022	PW1	gal	85613993M	5/8" METER	1,139,108.00	7/1/2022	1,151,931.00	8/1/2022	12,823.00	0.00	12,823.00	26.80

42,638.00

480030940001

POTABLE USAGE	9/1/2021	PW1	gal	190287909	5/8" METER	109,762.00	8/2/2021	113,830.00	9/1/2021	4,068.00	0.00	4,068.00	7.89
POTABLE USAGE	10/1/2021	PW1	gal	190287909	5/8" METER	113,830.00	9/1/2021	125,679.00	10/1/2021	11,849.00	0.00	11,849.00	24.24
POTABLE USAGE	11/1/2021	PW1	gal	190287909	5/8" METER	125,679.00	10/1/2021	131,847.00	11/2/2021	6,168.00	0.00	6,168.00	11.97
POTABLE USAGE	12/1/2021	PW1	gal	190287909	5/8" METER	131,847.00	11/2/2021	135,328.00	12/2/2021	3,481.00	0.00	3,481.00	6.75
POTABLE USAGE	12/31/2021	PW1	gal	190287909	5/8" METER	135,328.00	12/2/2021	137,800.00	12/31/2021	2,472.00	0.00	2,472.00	4.80
POTABLE USAGE	2/1/2022	PW1	gal	190287909	5/8" METER	137,800.00	12/31/2021	140,803.00	2/1/2022	3,003.00	0.00	3,003.00	5.83
POTABLE USAGE	3/1/2022	PW1	gal	190287909	5/8" METER	140,803.00	2/1/2022	147,484.00	3/2/2022	6,681.00	0.00	6,681.00	12.96
POTABLE USAGE	4/1/2022	PW1	gal	190287909	5/8" METER	147,484.00	3/2/2022	152,112.00	4/2/2022	4,628.00	0.00	4,628.00	8.98
POTABLE USAGE	5/2/2022	PW1	gal	190287909	5/8" METER	152,112.00	4/2/2022	158,764.00	5/2/2022	6,652.00	0.00	6,652.00	12.90
POTABLE USAGE	6/1/2022	PW1	gal	190287909	5/8" METER	158,764.00	5/2/2022	166,376.00	6/1/2022	7,612.00	0.00	7,612.00	14.77
POTABLE USAGE	7/1/2022	PW1	gal	190287909	5/8" METER	166,376.00	6/1/2022	172,922.00	7/1/2022	6,546.00	0.00	6,546.00	12.70
POTABLE USAGE	8/1/2022	PW1	gal	190287909	5/8" METER	172,922.00	7/1/2022	181,759.00	8/1/2022	8,837.00	0.00	8,837.00	17.14

71,997.00

480030940002

POTABLE USAGE	9/1/2021	PW1	gal	17501497	5/8" METER	10,945.00	8/2/2021	10,945.00	8/3/2021	0.00	0.00	0.00	0.00
				210232569	5/8" METER	0.00	8/3/2021	0.00	9/1/2021				
POTABLE USAGE	10/1/2021	PW1	gal	210232569	5/8" METER	0.00	9/1/2021	1.00	10/1/2021	1.00	0.00	1.00	0.00
POTABLE USAGE	11/1/2021	PW1	gal	210232569	5/8" METER	1.00	10/1/2021	1.00	11/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/1/2021	PW1	gal	210232569	5/8" METER	1.00	11/1/2021	1.00	12/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/31/2021	PW1	gal	210232569	5/8" METER	1.00	12/1/2021	1.00	12/31/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	2/1/2022	PW1	gal	210232569	5/8" METER	1.00	12/31/2021	1.00	2/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	3/1/2022	PW1	gal	210232569	5/8" METER	1.00	2/1/2022	166.00	3/1/2022	165.00	0.00	165.00	0.32
POTABLE USAGE	4/1/2022	PW1	gal	210232569	5/8" METER	166.00	3/1/2022	166.00	4/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	5/2/2022	PW1	gal	210232569	5/8" METER	166.00	4/1/2022	166.00	5/2/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	6/1/2022	PW1	gal	210232569	5/8" METER	166.00	5/2/2022	166.00	6/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	7/1/2022	PW1	gal	210232569	5/8" METER	166.00	6/1/2022	166.00	7/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	8/1/2022	PW1	gal	210232569	5/8" METER	166.00	7/1/2022	166.00	8/1/2022	0.00	0.00	0.00	0.00

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable										Attachment to GWUPA: #11 Table 1 (B,I)			
POTABLE USAGE	8/1/2022	PW1	gal	211039110	5/8" METER	1,104.00	7/1/2022	1,148.00	8/1/2022	209.00	0.00	165.00	0.41
				17001021	1" METER	2,365.00	7/1/2022	2,530.00	8/1/2022				
										1.269.00			
480030950001													
POTABLE USAGE	3/1/2022	PW1	gal	211039105	5/8" METER	0.00	2/22/2022	0.00	3/1/2022	0.00	0.00	0.00	0.00
				190949833	1" METER	0.00	2/22/2022	0.00	3/1/2022				
POTABLE USAGE	4/1/2022	PW1	gal	211039105	5/8" METER	0.00	3/1/2022	0.00	4/1/2022	0.00	0.00	0.00	0.00
				190949833	1" METER	0.00	3/1/2022	0.00	4/1/2022				
POTABLE USAGE	5/2/2022	PW1	gal	211039105	5/8" METER	0.00	4/1/2022	0.00	5/2/2022	0.00	0.00	0.00	0.00
				190949833	1" METER	0.00	4/1/2022	0.00	5/2/2022				
POTABLE USAGE	6/1/2022	PW1	gal	211039105	5/8" METER	0.00	5/2/2022	10.00	6/1/2022	10.00	0.00	10.00	0.02
				190949833	1" METER	0.00	5/2/2022	0.00	6/1/2022				
POTABLE USAGE	7/1/2022	PW1	gal	211039105	5/8" METER	10.00	6/1/2022	10.00	7/1/2022	5.00	0.00	5.00	0.01
				190949833	1" METER	0.00	6/1/2022	5.00	7/1/2022				
POTABLE USAGE	8/1/2022	PW1	gal	211039105	5/8" METER	10.00	7/1/2022	10.00	8/1/2022	0.00	0.00	0.00	0.00
				190949833	1" METER	5.00	7/1/2022	5.00	8/1/2022				
										15.00			
480030960001													
POTABLE USAGE	9/1/2021	PW1	gal	190866783	5/8" METER	396,178.00	8/2/2021	408,342.00	9/1/2021	12,164.00	0.00	12,164.00	25.07
POTABLE USAGE	10/1/2021	PW1	gal	190866783	5/8" METER	408,342.00	9/1/2021	421,420.00	10/1/2021	13,078.00	0.00	13,078.00	27.46
POTABLE USAGE	11/1/2021	PW1	gal	190866783	5/8" METER	421,420.00	10/1/2021	462,462.00	11/2/2021	41,042.00	0.00	41,042.00	108.11
POTABLE USAGE	12/1/2021	PW1	gal	190866783	5/8" METER	462,462.00	11/2/2021	473,544.00	12/1/2021	11,082.00	0.00	11,082.00	22.23
POTABLE USAGE	12/31/2021	PW1	gal	190866783	5/8" METER	473,544.00	12/1/2021	486,476.00	12/31/2021	12,932.00	0.00	12,932.00	27.08
POTABLE USAGE	2/1/2022	PW1	gal	190866783	5/8" METER	486,476.00	12/31/2021	501,133.00	2/1/2022	14,657.00	0.00	14,657.00	31.60
POTABLE USAGE	3/1/2022	PW1	gal	190866783	5/8" METER	501,133.00	2/1/2022	554,287.00	3/1/2022	53,154.00	0.00	53,154.00	145.41
POTABLE USAGE	4/1/2022	PW1	gal	190866783	5/8" METER	554,287.00	3/1/2022	571,180.00	4/2/2022	16,893.00	0.00	16,893.00	37.46
POTABLE USAGE	5/2/2022	PW1	gal	190866783	5/8" METER	571,180.00	4/2/2022	636,302.00	5/2/2022	65,122.00	0.00	65,122.00	182.28
POTABLE USAGE	6/1/2022	PW1	gal	190866783	5/8" METER	636,302.00	5/2/2022	717,405.00	6/1/2022	81,103.00	0.00	81,103.00	231.50
POTABLE USAGE	7/1/2022	PW1	gal	190866783	5/8" METER	717,405.00	6/1/2022	738,680.00	7/1/2022	21,275.00	0.00	21,275.00	48.94
POTABLE USAGE	8/1/2022	PW1	gal	190866783	5/8" METER	738,680.00	7/1/2022	765,525.00	8/1/2022	26,845.00	0.00	26,845.00	64.38
										369,347.00			
480030960002													
POTABLE USAGE	9/1/2021	PW1	gal	180143120	5/8" METER	4,414.00	8/2/2021	4,470.00	9/1/2021	56.00	0.00	56.00	0.11
POTABLE USAGE	10/1/2021	PW1	gal	180143120	5/8" METER	4,470.00	9/1/2021	4,498.00	10/1/2021	28.00	0.00	28.00	0.05
POTABLE USAGE	11/1/2021	PW1	gal	180143120	5/8" METER	4,498.00	10/1/2021	4,527.00	11/2/2021	29.00	0.00	29.00	0.06
POTABLE USAGE	12/1/2021	PW1	gal	180143120	5/8" METER	4,527.00	11/2/2021	4,586.00	12/1/2021	59.00	0.00	59.00	0.11
POTABLE USAGE	12/31/2021	PW1	gal	180143120	5/8" METER	4,586.00	12/1/2021	4,609.00	12/31/2021	23.00	0.00	23.00	0.04
POTABLE USAGE	2/1/2022	PW1	gal	180143120	5/8" METER	4,609.00	12/31/2021	4,650.00	2/1/2022	41.00	0.00	41.00	0.08
POTABLE USAGE	3/1/2022	PW1	gal	180143120	5/8" METER	4,650.00	2/1/2022	4,653.00	3/1/2022	3.00	0.00	3.00	0.01
POTABLE USAGE	4/1/2022	PW1	gal	180143120	5/8" METER	4,653.00	3/1/2022	5,264.00	4/2/2022	611.00	0.00	611.00	1.19
POTABLE USAGE	5/2/2022	PW1	gal	180143120	5/8" METER	5,264.00	4/2/2022	5,276.00	5/2/2022	12.00	0.00	12.00	0.02
POTABLE USAGE	6/1/2022	PW1	gal	180143120	5/8" METER	5,276.00	5/2/2022	5,289.00	6/1/2022	13.00	0.00	13.00	0.03
POTABLE USAGE	7/1/2022	PW1	gal	180143120	5/8" METER	5,289.00	6/1/2022	5,303.00	7/1/2022	14.00	0.00	14.00	0.03
POTABLE USAGE	8/1/2022	PW1	gal	180143120	5/8" METER	5,303.00	7/1/2022	6,735.00	8/1/2022	1,432.00	0.00	1,432.00	2.78
										2,321.00			
480030970002													
POTABLE USAGE	9/1/2021	PW1	gal	44693829	5/8" METER	3,336,917.00	8/2/2021	3,336,917.00	8/3/2021	417.00	0.00	417.00	0.81
				210232563	5/8" METER	0.00	8/3/2021	417.00	9/1/2021				
POTABLE USAGE	10/1/2021	PW1	gal	210232563	5/8" METER	417.00	9/1/2021	553.00	10/1/2021	136.00	0.00	136.00	0.26
POTABLE USAGE	11/1/2021	PW1	gal	210232563	5/8" METER	553.00	10/1/2021	2,419.00	11/2/2021	1,866.00	0.00	1,866.00	3.62
POTABLE USAGE	12/1/2021	PW1	gal	210232563	5/8" METER	2,419.00	11/2/2021	6,891.00	12/2/2021	4,472.00	0.00	4,472.00	8.68
POTABLE USAGE	12/31/2021	PW1	gal	210232563	5/8" METER	6,891.00	12/2/2021	23,814.00	12/31/2021	16,923.00	0.00	16,923.00	37.54
POTABLE USAGE	2/1/2022	PW1	gal	210232563	5/8" METER	23,814.00	12/31/2021	37,571.00	2/1/2022	13,757.00	0.00	13,757.00	29.24
POTABLE USAGE	3/1/2022	PW1	gal	210232563	5/8" METER	37,571.00	2/1/2022	47,273.00	3/2/2022	9,702.00	0.00	9,702.00	18.82
POTABLE USAGE	4/1/2022	PW1	gal	210232563	5/8" METER	47,273.00	3/2/2022	76,851.00	4/2/2022	29,578.00	0.00	29,578.00	72.80
POTABLE USAGE	5/2/2022	PW1	gal	210232563	5/8" METER	76,851.00	4/2/2022	86,857.00	5/2/2022	10,006.00	0.00	10,006.00	19.42
POTABLE USAGE	6/1/2022	PW1	gal	210232563	5/8" METER	86,857.00	5/2/2022	90,702.00	6/1/2022	3,845.00	0.00	3,845.00	7.46
POTABLE USAGE	7/1/2022	PW1	gal	210232563	5/8" METER	90,702.00	6/1/2022	95,259.00	7/1/2022	4,557.00	0.00	4,557.00	8.84
POTABLE USAGE	8/1/2022	PW1	gal	210232563	5/8" METER	95,259.00	7/1/2022	105,674.00	8/1/2022	10,415.00	0.00	10,415.00	20.49
										105,674.00			
480030970001													
POTABLE USAGE	9/1/2021	PW1	gal	44693830	5/8" METER	1,949,605.00	8/2/2021	1,949,605.00	8/3/2021	5,078.00	0.00	5,078.00	9.85
				210212696	5/8" METER	0.00	8/3/2021	5,078.00	9/1/2021				
POTABLE USAGE	10/1/2021	PW1	gal	210212696	5/8" M								

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable										Attachment to GWUPA: #11 Table 1 (B,I)			
POTABLE USAGE	7/1/2022	PW1	gal	175631445	5/8" METER	1,433,366.00	6/1/2022	1,437,985.00	7/1/2022	4,619.00	0.00	4,619.00	8.96
POTABLE USAGE	8/1/2022	PW1	gal	175631445	5/8" METER	1,437,985.00	7/1/2022	1,443,289.00	8/1/2022	5,304.00	0.00	5,304.00	10.29
												189,563.00	
480031070000													
POTABLE USAGE	9/1/2021	PW1	gal	17563143	5/8" METER	965,749.00	8/2/2021	965,749.00	9/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	10/1/2021	PW1	gal	17563143	5/8" METER	965,749.00	9/1/2021	965,749.00	10/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	11/1/2021	PW1	gal	17563143	5/8" METER	965,749.00	10/1/2021	965,749.00	11/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/1/2021	PW1	gal	17563143	5/8" METER	965,749.00	11/1/2021	965,749.00	12/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/31/2021	PW1	gal	17563143	5/8" METER	965,749.00	12/1/2021	965,749.00	12/31/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	2/1/2022	PW1	gal	17563143	5/8" METER	965,749.00	12/31/2021	965,749.00	2/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	3/1/2022	PW1	gal	17563143	5/8" METER	965,749.00	2/1/2022	965,751.00	3/1/2022	2.00	0.00	2.00	0.00
POTABLE USAGE	4/1/2022	PW1	gal	17563143	5/8" METER	965,751.00	3/1/2022	965,751.00	4/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	5/2/2022	PW1	gal	17563143	5/8" METER	965,751.00	4/1/2022	965,751.00	5/2/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	6/1/2022	PW1	gal	17563143	5/8" METER	965,751.00	5/2/2022	965,751.00	6/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	7/1/2022	PW1	gal	17563143	5/8" METER	965,751.00	6/1/2022	965,753.00	7/1/2022	2.00	0.00	2.00	0.00
POTABLE USAGE	8/1/2022	PW1	gal	17563143	5/8" METER	965,753.00	7/1/2022	965,753.00	8/1/2022	0.00	0.00	0.00	0.00
												4.00	
480031070000													
POTABLE USAGE	9/1/2021	PW1	gal	17563144	5/8" METER	1,398,732.00	8/2/2021	1,398,734.00	9/1/2021	2.00	0.00	2.00	0.00
POTABLE USAGE	10/1/2021	PW1	gal	17563144	5/8" METER	1,398,734.00	9/1/2021	1,398,734.00	9/30/2021	0.00	0.00	0.00	0.00
				201070804	1" METER	0.00	9/30/2021	0.00	10/1/2021				
				201098130	1" METER	0.00	9/30/2021	0.00	10/1/2021				
				201070804	1" METER	0.00	10/1/2021	0.00	11/1/2021				
POTABLE USAGE	11/1/2021	PW1	gal	201070804	1" METER	0.00	10/1/2021	0.00	11/1/2021	57.00	0.00	57.00	0.11
				201098130	1" METER	0.00	9/1/2021	57.00	11/2/2021				
POTABLE USAGE	12/1/2021	PW1	gal	201070804	1" METER	0.00	11/1/2021	0.00	12/1/2021	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	11/2/2021	57.00	12/2/2021				
POTABLE USAGE	12/31/2021	PW1	gal	201070804	1" METER	0.00	12/1/2021	1.00	12/31/2021	1.00	0.00	1.00	0.00
				201098130	1" METER	57.00	12/2/2021	57.00	12/31/2021				
POTABLE USAGE	2/1/2022	PW1	gal	201070804	1" METER	1.00	12/31/2021	1.00	2/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	12/31/2021	57.00	2/1/2022				
POTABLE USAGE	3/1/2022	PW1	gal	201070804	1" METER	1.00	2/1/2022	1.00	3/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	2/1/2022	57.00	3/2/2022				
POTABLE USAGE	4/1/2022	PW1	gal	201070804	1" METER	1.00	3/1/2022	1.00	4/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	3/2/2022	57.00	4/2/2022				
POTABLE USAGE	5/2/2022	PW1	gal	201070804	1" METER	1.00	4/1/2022	1.00	5/2/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	4/2/2022	57.00	5/2/2022				
POTABLE USAGE	6/1/2022	PW1	gal	201070804	1" METER	1.00	5/2/2022	1.00	6/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	5/2/2022	57.00	6/1/2022				
POTABLE USAGE	7/1/2022	PW1	gal	201070804	1" METER	1.00	6/1/2022	1.00	7/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	6/1/2022	57.00	7/1/2022				
POTABLE USAGE	8/1/2022	PW1	gal	201070804	1" METER	1.00	7/1/2022	1.00	8/1/2022	0.00	0.00	0.00	0.00
				201098130	1" METER	57.00	7/1/2022	57.00	8/1/2022				
												60.00	
480031190000													
POTABLE USAGE	9/1/2021	PW1	gal	17891622	3/4" METER	151,548.00	8/2/2021	167,722.00	9/1/2021	16,174.00	0.00	16,174.00	35.58
POTABLE USAGE	10/1/2021	PW1	gal	17891622	3/4" METER	167,722.00	9/1/2021	184,195.00	10/1/2021	16,473.00	0.00	16,473.00	36.36
POTABLE USAGE	11/1/2021	PW1	gal	17891622	3/4" METER	184,195.00	10/1/2021	236,721.00	11/1/2021	52,526.00	0.00	52,526.00	143.48
POTABLE USAGE	12/1/2021	PW1	gal	17891622	3/4" METER	236,721.00	11/1/2021	349,223.00	12/1/2021	112,502.00	0.00	112,502.00	328.21
POTABLE USAGE	12/31/2021	PW1	gal	17891622	3/4" METER	349,223.00	12/1/2021	381,548.00	12/31/2021	32,325.00	0.00	32,325.00	81.26
POTABLE USAGE	2/1/2022	PW1	gal	17891622	3/4" METER	381,548.00	12/31/2021	407,677.00	2/1/2022	26,129.00	0.00	26,129.00	62.18
POTABLE USAGE	3/1/2022	PW1	gal	17891622	3/4" METER	407,677.00	2/1/2022	430,325.00	3/1/2022	22,648.00	0.00	22,648.00	52.54
POTABLE USAGE	4/1/2022	PW1	gal	17891622	3/4" METER	430,325.00	3/1/2022	449,400.00	4/1/2022	19,075.00	0.00	19,075.00	43.18
POTABLE USAGE	5/2/2022	PW1	gal	17891622	3/4" METER	449,400.00	4/1/2022	580,150.00	5/2/2022	130,750.00	0.00	130,750.00	384.41
POTABLE USAGE	6/1/2022	PW1	gal	17891622	3/4" METER	580,150.00	5/2/2022	637,290.00	6/1/2022	57,140.00	0.00	57,140.00	157.69
POTABLE USAGE	7/1/2022	PW1	gal	17891622	3/4" METER	637,290.00	6/1/2022	688,936.00	7/1/2022	51,646.00	0.00	51,646.00	140.77
POTABLE USAGE	8/1/2022	PW1	gal	17891622	3/4" METER	688,936.00	7/1/2022	847,880.00	8/1/2022	158,944.00	0.00	158,944.00	471.25
												696,332.00	
480031210000													
POTABLE USAGE	9/1/2021	PW1	gal	17501448P	1" METER	70,696.00	8/2/2021	118,541.00	9/1/2021	47,845.00	0.00	47,845.00	129.06
POTABLE USAGE	10/1/2021	PW1	gal	17501448P	1" METER	118,541.00	9/1/2021	169,075.00	10/1/2021	50,534.00	0.00	50,534.00	137.34
POTABLE USAGE	11/1/2021	PW1	gal	17501448P	1" METER	169,075.00	10/1/2021	235,812.00	11/1/2021	66,737.00	0.00	66,737.00	187.25
POTABLE USAGE	12/1/2021	PW1	gal	17501448P	1" METER	235,812.00	11/1/2021	284,842.00	12/1/2021	49,030.00	0.00	49,030.00	132.71
POTABLE USAGE	12/31/2021	PW1	gal	17501448P	1" METER	284,842.00	12/1/2021	318,162.00	12/31/2021	33,320.00	0.00	33,320.00	84.33
POTABLE USAGE	2/1/2022	PW1	gal	17501448P	1" METER	318,162.00	12/31/2021	344,041.00	2/1/2022	25,879.00	0.00	25,879.00	61.41
POTABLE USAGE	3/1/2022	PW1	gal	17501448P	1" METER	344,041.00	2/1/2022	388,129.00	3/1/2022	44,088.00	0.00	44,088.00	117.49
POTABLE USAGE	4/1/2022	PW1	gal	17501448P	1" METER	388,129.00	3/1/2022	427,078.00	4/1/2022	38,949.00	0.00	38,949.00	101.66
POTABLE USAGE	5/2/2022	PW1	gal	17501448P	1" METER	427,078.00	4/1/2022	471,671.00	5/2/2022	44,593.00	0.00	44,593.00	119.05
POTABLE USAGE	6/1/2022	PW1	gal	17501448P	1" METER	471,671.00	5/2/2022	525,621.00	6/1/2022	53,950.00	0.00	53,950.00	147.87
POTABLE USAGE	7/1/2022	PW1	gal	17501448P	1" METER	525,621.00	6/1/2022	565,591.00	7/1/2022	39,970.00	0.00	39,970.00	104.81
POTABLE USAGE	8/1/2022	PW1	gal	1750									

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable						Attachment to GWUPA: #11 Table 1 (B,I)							
POTABLE USAGE	3/1/2022	PW1	gal	14073979	5/8" METER	2,366,910.00	2/1/2022	2,419,928.00	3/1/2022	53,018.00	0.00	53,018.00	145.00
POTABLE USAGE	4/1/2022	PW1	gal	14073979	5/8" METER	2,419,928.00	3/1/2022	2,466,498.00	4/1/2022	46,570.00	0.00	46,570.00	125.14
POTABLE USAGE	5/2/2022	PW1	gal	14073979	5/8" METER	2,466,498.00	4/1/2022	2,518,019.00	5/2/2022	51,521.00	0.00	51,521.00	140.38
POTABLE USAGE	6/1/2022	PW1	gal	14073979	5/8" METER	2,518,019.00	5/2/2022	2,556,197.00	6/1/2022	38,178.00	0.00	38,178.00	99.29
POTABLE USAGE	7/1/2022	PW1	gal	14073979	5/8" METER	2,556,197.00	6/1/2022	2,604,242.00	7/1/2022	48,045.00	0.00	48,045.00	129.68
POTABLE USAGE	8/1/2022	PW1	gal	14073979	5/8" METER	2,604,242.00	7/1/2022	2,663,377.00	8/1/2022	59,135.00	0.00	59,135.00	163.84
568,740.00													
480030840000													
POTABLE USAGE	9/1/2021	PW1	gal	15745131	1" METER	4,813,101.00	8/2/2021	4,893,184.00	9/1/2021	80,083.00	0.00	80,083.00	228.36
POTABLE USAGE	10/1/2021	PW1	gal	15745131	1" METER	4,893,184.00	9/1/2021	4,965,006.00	10/1/2021	71,822.00	0.00	71,822.00	202.91
POTABLE USAGE	11/1/2021	PW1	gal	15745131	1" METER	4,965,006.00	10/1/2021	5,043,241.00	11/1/2021	78,235.00	0.00	78,235.00	222.66
POTABLE USAGE	12/1/2021	PW1	gal	15745131	1" METER	5,043,241.00	11/1/2021	5,121,377.00	12/1/2021	78,136.00	0.00	78,136.00	222.36
POTABLE USAGE	12/31/2021	PW1	gal	15745131	1" METER	5,121,377.00	12/1/2021	5,212,517.00	12/31/2021	91,140.00	0.00	91,140.00	262.41
POTABLE USAGE	2/1/2022	PW1	gal	15745131	1" METER	5,212,517.00	12/31/2021	5,307,846.00	2/1/2022	95,329.00	0.00	95,329.00	275.31
POTABLE USAGE	3/1/2022	PW1	gal	15745131	1" METER	5,307,846.00	2/1/2022	5,401,070.00	3/1/2022	93,224.00	0.00	93,224.00	268.83
POTABLE USAGE	4/1/2022	PW1	gal	15745131	1" METER	5,401,070.00	3/1/2022	5,503,587.00	4/1/2022	102,517.00	0.00	102,517.00	297.45
POTABLE USAGE	5/2/2022	PW1	gal	15745131	1" METER	5,503,587.00	4/1/2022	5,613,980.00	5/2/2022	110,393.00	0.00	110,393.00	321.71
POTABLE USAGE	6/1/2022	PW1	gal	15745131	1" METER	5,613,980.00	5/2/2022	5,719,305.00	6/1/2022	105,325.00	0.00	105,325.00	306.10
POTABLE USAGE	7/1/2022	PW1	gal	15745131	1" METER	5,719,305.00	6/1/2022	5,818,991.00	7/1/2022	99,686.00	0.00	99,686.00	288.73
POTABLE USAGE	8/1/2022	PW1	gal	15745131	1" METER	5,818,991.00	7/1/2022	5,939,617.00	8/1/2022	120,626.00	0.00	120,626.00	353.23
1,126,516.00													
480030440000													
POTABLE USAGE	9/1/2021	PW1	gal	13260822	1" METER	2,762,285.00	8/2/2021	2,906,394.00	9/1/2021	144,109.00	0.00	144,109.00	425.56
POTABLE USAGE	10/1/2021	PW1	gal	13260822	1" METER	2,906,394.00	9/1/2021	2,989,323.00	10/1/2021	82,929.00	0.00	82,929.00	237.12
POTABLE USAGE	11/1/2021	PW1	gal	13260822	1" METER	2,989,323.00	10/1/2021	3,049,827.00	11/1/2021	60,504.00	0.00	60,504.00	168.05
POTABLE USAGE	12/1/2021	PW1	gal	13260822	1" METER	3,049,827.00	11/1/2021	3,148,376.00	12/1/2021	98,549.00	0.00	98,549.00	285.23
POTABLE USAGE	12/31/2021	PW1	gal	13260822	1" METER	3,148,376.00	12/1/2021	3,223,015.00	12/31/2021	74,639.00	0.00	74,639.00	211.59
POTABLE USAGE	2/1/2022	PW1	gal	13260822	1" METER	3,223,015.00	12/31/2021	3,232,740.00	2/1/2022	9,725.00	0.00	9,725.00	18.87
POTABLE USAGE	3/1/2022	PW1	gal	13260822	1" METER	3,232,740.00	2/1/2022	3,264,584.00	3/1/2022	31,844.00	0.00	31,844.00	79.78
POTABLE USAGE	4/1/2022	PW1	gal	13260822	1" METER	3,264,584.00	3/1/2022	3,288,369.00	4/1/2022	23,785.00	0.00	23,785.00	55.52
POTABLE USAGE	5/2/2022	PW1	gal	13260822	1" METER	3,288,369.00	4/1/2022	3,306,613.00	5/2/2022	18,244.00	0.00	18,244.00	41.00
POTABLE USAGE	6/1/2022	PW1	gal	13260822	1" METER	3,306,613.00	5/2/2022	3,365,966.00	6/1/2022	59,353.00	0.00	59,353.00	164.51
POTABLE USAGE	7/1/2022	PW1	gal	13260822	1" METER	3,365,966.00	6/1/2022	3,500,261.00	7/1/2022	134,295.00	0.00	134,295.00	395.33
POTABLE USAGE	8/1/2022	PW1	gal	13260822	1" METER	3,500,261.00	7/1/2022	3,835,520.00	8/1/2022	335,259.00	0.00	335,259.00	1,014.30
1,073,235.00													
480030050000													
POTABLE USAGE	9/1/2021	PW1	gal	OI000800	5/8" METER	605,560.00	8/2/2021	614,421.00	9/1/2021	8,861.00	0.00	8,861.00	17.19
POTABLE USAGE	10/1/2021	PW1	gal	OI000800	5/8" METER	614,421.00	9/1/2021	623,158.00	10/1/2021	8,737.00	0.00	8,737.00	16.95
POTABLE USAGE	11/1/2021	PW1	gal	OI000800	5/8" METER	623,158.00	10/1/2021	630,141.00	11/1/2021	6,983.00	0.00	6,983.00	13.55
POTABLE USAGE	12/1/2021	PW1	gal	OI000800	5/8" METER	630,141.00	11/1/2021	639,638.00	12/1/2021	9,497.00	0.00	9,497.00	18.42
POTABLE USAGE	12/31/2021	PW1	gal	OI000800	5/8" METER	639,638.00	12/1/2021	649,472.00	12/31/2021	9,834.00	0.00	9,834.00	19.08
POTABLE USAGE	2/1/2022	PW1	gal	OI000800	5/8" METER	649,472.00	12/31/2021	657,429.00	2/1/2022	7,957.00	0.00	7,957.00	15.44
POTABLE USAGE	3/1/2022	PW1	gal	OI000800	5/8" METER	657,429.00	2/1/2022	666,452.00	3/1/2022	9,023.00	0.00	9,023.00	17.50
POTABLE USAGE	4/1/2022	PW1	gal	OI000800	5/8" METER	666,452.00	3/1/2022	677,013.00	4/1/2022	10,561.00	0.00	10,561.00	20.87
POTABLE USAGE	5/2/2022	PW1	gal	OI000800	5/8" METER	677,013.00	4/1/2022	687,310.00	5/2/2022	10,297.00	0.00	10,297.00	20.18
POTABLE USAGE	6/1/2022	PW1	gal	OI000800	5/8" METER	687,310.00	5/2/2022	695,230.00	6/1/2022	7,920.00	0.00	7,920.00	15.36
POTABLE USAGE	7/1/2022	PW1	gal	OI000800	5/8" METER	695,230.00	6/1/2022	701,150.00	7/1/2022	5,920.00	0.00	5,920.00	11.48
POTABLE USAGE	8/1/2022	PW1	gal	OI000800	5/8" METER	701,150.00	7/1/2022	707,471.00	8/1/2022	6,321.00	0.00	6,321.00	12.26
101,911.00													
480030050000													
POTABLE USAGE	9/1/2021	PW1	gal	OI000900	5/8" METER	938,735.00	8/2/2021	944,291.00	9/1/2021	5,556.00	0.00	5,556.00	10.78
POTABLE USAGE	10/1/2021	PW1	gal	OI000900	5/8" METER	944,291.00	9/1/2021	950,174.00	10/1/2021	5,883.00	0.00	5,883.00	11.41
POTABLE USAGE	11/1/2021	PW1	gal	OI000900	5/8" METER	950,174.00	10/1/2021	955,359.00	11/1/2021	5,185.00	0.00	5,185.00	10.06
POTABLE USAGE	12/1/2021	PW1	gal	OI000900	5/8" METER	955,359.00	11/1/2021	960,395.00	12/1/2021	5,036.00	0.00	5,036.00	9.77
POTABLE USAGE	12/31/2021	PW1	gal	OI000900	5/8" METER	960,395.00	12/1/2021	965,186.00	12/31/2021	4,791.00	0.00	4,791.00	9.29
POTABLE USAGE													

EXHIBIT 2 - Potable

Attachment to GWUPA: #11 Table 1 (B,I)													
POTABLE USAGE	12/31/2021	PW1	gal	43786481	5/8" METER	441,556.00	12/1/2021	451,639.00	12/31/2021	10,083.00	0.00	10,083.00	19.62
POTABLE USAGE	2/1/2022	PW1	gal	43786481	5/8" METER	451,639.00	12/31/2021	461,955.00	2/1/2022	10,316.00	0.00	10,316.00	20.23
POTABLE USAGE	3/1/2022	PW1	gal	43786481	5/8" METER	461,955.00	2/1/2022	470,170.00	3/1/2022	8,215.00	0.00	8,215.00	15.94
POTABLE USAGE	4/1/2022	PW1	gal	43786481	5/8" METER	470,170.00	3/1/2022	474,113.00	4/1/2022	3,943.00	0.00	3,943.00	7.65
POTABLE USAGE	5/2/2022	PW1	gal	43786481	5/8" METER	474,113.00	4/1/2022	481,733.00	5/2/2022	7,620.00	0.00	7,620.00	14.78
POTABLE USAGE	6/1/2022	PW1	gal	43786481	5/8" METER	481,733.00	5/2/2022	485,770.00	6/1/2022	4,037.00	0.00	4,037.00	7.83
POTABLE USAGE	7/1/2022	PW1	gal	43786481	5/8" METER	485,770.00	6/1/2022	487,664.00	7/1/2022	1,894.00	0.00	1,894.00	3.67
POTABLE USAGE	8/1/2022	PW1	gal	43786481	5/8" METER	487,664.00	7/1/2022	491,252.00	8/1/2022	3,588.00	0.00	3,588.00	6.96
55,982.00													
480030450000													
POTABLE USAGE	9/1/2021	PW1	gal	180369204	5/8" METER	7,809,607.00	8/2/2021	7,811,882.00	9/1/2021	2,275.00	0.00	2,275.00	4.41
POTABLE USAGE	10/1/2021	PW1	gal	180369204	5/8" METER	7,811,882.00	9/1/2021	7,814,115.00	10/1/2021	2,233.00	0.00	2,233.00	4.33
POTABLE USAGE	11/1/2021	PW1	gal	180369204	5/8" METER	7,814,115.00	10/1/2021	7,865,162.00	11/1/2021	51,047.00	0.00	51,047.00	138.92
POTABLE USAGE	12/1/2021	PW1	gal	180369204	5/8" METER	7,865,162.00	11/1/2021	8,033,107.00	12/1/2021	167,945.00	0.00	167,945.00	498.97
POTABLE USAGE	12/31/2021	PW1	gal	180369204	5/8" METER	8,033,107.00	12/1/2021	8,175,089.00	12/31/2021	141,982.00	0.00	141,982.00	419.00
POTABLE USAGE	2/1/2022	PW1	gal	180369204	5/8" METER	8,175,089.00	12/31/2021	8,247,808.00	2/1/2022	72,719.00	0.00	72,719.00	205.67
POTABLE USAGE	2/19/2022	PW1	gal	180369204	5/8" METER	8,247,808.00	2/1/2022	8,247,808.00	2/2/2022	0.00	0.00	0.00	0.00
438,201.00													
480030450000													
POTABLE USAGE	3/1/2022	PW1	gal	180369204	5/8" METER	8,247,808.00	2/2/2022	8,313,038.00	3/1/2022	65,230.00	0.00	65,230.00	182.61
POTABLE USAGE	4/1/2022	PW1	gal	180369204	5/8" METER	8,313,038.00	3/1/2022	8,471,717.00	4/1/2022	158,679.00	0.00	158,679.00	470.43
POTABLE USAGE	5/2/2022	PW1	gal	180369204	5/8" METER	8,471,717.00	4/1/2022	8,628,458.00	5/2/2022	156,741.00	0.00	156,741.00	464.46
POTABLE USAGE	5/16/2022	PW1	gal	180369204	5/8" METER	8,628,458.00	5/2/2022	8,664,090.00	5/5/2022	35,632.00	0.00	35,632.00	91.45
416,282.00													
480030450000													
POTABLE USAGE	6/1/2022	PW1	gal	180369204	5/8" METER	8,664,090.00	5/5/2022	8,768,069.00	6/1/2022	103,979.00	0.00	103,979.00	301.96
POTABLE USAGE	7/1/2022	PW1	gal	180369204	5/8" METER	8,768,069.00	6/1/2022	8,871,858.00	7/1/2022	103,789.00	0.00	103,789.00	301.37
POTABLE USAGE	8/1/2022	PW1	gal	180369204	5/8" METER	8,871,858.00	7/1/2022	9,015,786.00	8/1/2022	143,928.00	0.00	143,928.00	425.00
351,696.00													
480030460000													
POTABLE USAGE	9/1/2021	PW1	gal	14237606	5/8" METER	777,350.00	8/2/2021	784,745.00	9/1/2021	7,395.00	0.00	7,395.00	14.35
POTABLE USAGE	10/1/2021	PW1	gal	14237606	5/8" METER	784,745.00	9/1/2021	792,295.00	10/1/2021	7,550.00	0.00	7,550.00	14.65
POTABLE USAGE	11/1/2021	PW1	gal	14237606	5/8" METER	792,295.00	10/1/2021	802,476.00	11/1/2021	10,181.00	0.00	10,181.00	19.87
POTABLE USAGE	12/1/2021	PW1	gal	14237606	5/8" METER	802,476.00	11/1/2021	827,051.00	12/1/2021	24,575.00	0.00	24,575.00	57.59
POTABLE USAGE	12/31/2021	PW1	gal	14237606	5/8" METER	827,051.00	12/1/2021	833,259.00	12/31/2021	6,208.00	0.00	6,208.00	12.04
POTABLE USAGE	2/1/2022	PW1	gal	14237606	5/8" METER	833,259.00	12/31/2021	841,397.00	2/1/2022	8,138.00	0.00	8,138.00	15.79
POTABLE USAGE	3/1/2022	PW1	gal	14237606	5/8" METER	841,397.00	2/1/2022	848,913.00	3/1/2022	7,516.00	0.00	7,516.00	14.58
POTABLE USAGE	4/1/2022	PW1	gal	14237606	5/8" METER	848,913.00	3/1/2022	856,428.00	4/1/2022	7,515.00	0.00	7,515.00	14.58
POTABLE USAGE	5/2/2022	PW1	gal	14237606	5/8" METER	856,428.00	4/1/2022	917,758.00	5/2/2022	61,330.00	0.00	61,330.00	170.60
POTABLE USAGE	6/1/2022	PW1	gal	14237606	5/8" METER	917,758.00	5/2/2022	922,573.00	6/1/2022	4,815.00	0.00	4,815.00	9.34
POTABLE USAGE	7/1/2022	PW1	gal	14237606	5/8" METER	922,573.00	6/1/2022	944,877.00	7/1/2022	22,304.00	0.00	22,304.00	51.64
POTABLE USAGE	8/1/2022	PW1	gal	14237606	5/8" METER	944,877.00	7/1/2022	962,514.00	8/1/2022	17,637.00	0.00	17,637.00	39.41
185,164.00													
480030470000													
POTABLE USAGE	9/1/2021	PW1	gal	17501508	5/8" METER	548,138.00	8/2/2021	565,334.00	9/1/2021	17,196.00	0.00	17,196.00	38.25
				17501508	5/8" METER	565,334.00	9/1/2021	575,237.00	10/1/2021				
17,196.00													
480030470000													
POTABLE USAGE	10/27/2021	PW1	gal	17501508	5/8" METER	565,334.00	9/1/2021	575,237.00	10/1/2021	9,903.00	0.00	9,903.00	19.21
POTABLE USAGE	11/1/2021	PW1	gal	17501508	5/8" METER	575,237.00	10/1/2021	584,601.00	11/1/2021	9,364.00	0.00	9,364.00	18.17
POTABLE USAGE	12/1/2021	PW1	gal	17501508	5/8" METER	584,601.00	11/1/2021	593,715.00	12/1/2021	9,114.00	0.00	9,114.00	17.68
POTABLE USAGE	12/31/2021	PW1	gal	17501508	5/8" METER	593,715.00	12/1/2021	610,122.00	12/31/2021	16,407.00	0.00	16,407.00	36.19
POTABLE USAGE	2/1/2022	PW1	gal	17501508	5/8" METER	610,122.00	12/31/2021	635,766.00	2/1/2022	25,644.00	0.00	25,644.00	60.68
POTABLE USAGE	3/1/2022	PW1	gal	17501508	5/8" METER	635,766.00	2/1/2022	660,140.00	3/1/2022	24,374.00	0.00	24,374.00	57.06
POTABLE USAGE	4/1/2022	PW1	gal	17501508	5/8" METER	660,140.00	3/1/2022	704,465.00	4/1/2022	44,325.00	0.00	44,325.00	118.22
POTABLE USAGE	5/2/2022	PW1	gal	17501508	5/8" METER	704,465.00	4/1/2022	752,546.00	5/2/2022	48,081.00	0.00	48,081.00	129.79
POTABLE USAGE	6/1/2022	PW1	gal	17501508	5/8" METER	752,546.00	5/2/2022	755,307.00	6/1/2022	2,761.00	0.00	2,761.00	5.36
POTABLE USAGE	7/1/2022	PW1	gal	17501508	5/8" METER	755,307.00	6/1/2022	761,465.00	7/1/2022	6,158.00	0.00	6,158.00	11.95
POTABLE USAGE	8/1/2022	PW1	gal	17501508	5/8" METER	761,465.00	7/1/2022	773,891.00	8/1/2022	12,426.00	0.00	12,426.00	25.76
208,557.00													
480030050000													
POTABLE USAGE	9/1/2021	PW1	gal	19704754	5/8" METER	341,355.00	8/2/2021	347,602.00	9/1/2021	6,247.00	0.00	6,247.00	12.12
POTABLE USAGE	10/1/2021	PW1	gal	19704754	5/8" METER	347,602.00	9/1/2021	349,038.00	10/1/2021	1,436.00	0.00	1,436.00	2.79
POTABLE USAGE	11/1/2021	PW1	gal	19704754	5/8" METER	349,038.00	10/1/2021	350,939.00	11/1/2021	1,901.00	0.		

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable						Attachment to GWUPA: #11 Table 1 (B,I)							
POTABLE USAGE	3/1/2022	PW1	gal	33238040	5/8" METER	1,441,175.00	2/1/2022	1,456,791.00	3/1/2022	15,616.00	0.00	15,616.00	34.11
POTABLE USAGE	4/1/2022	PW1	gal	33238040	5/8" METER	1,456,791.00	3/1/2022	1,471,949.00	4/1/2022	15,158.00	0.00	15,158.00	32.91
POTABLE USAGE	5/2/2022	PW1	gal	33238040	5/8" METER	1,471,949.00	4/1/2022	1,487,740.00	5/2/2022	15,791.00	0.00	15,791.00	34.57
POTABLE USAGE	6/1/2022	PW1	gal	33238040	5/8" METER	1,487,740.00	5/2/2022	1,503,068.00	6/1/2022	15,328.00	0.00	15,328.00	33.36
POTABLE USAGE	7/1/2022	PW1	gal	33238040	5/8" METER	1,503,068.00	6/1/2022	1,518,517.00	7/1/2022	15,449.00	0.00	15,449.00	33.68
POTABLE USAGE	8/1/2022	PW1	gal	33238040	5/8" METER	1,518,517.00	7/1/2022	1,535,465.00	8/1/2022	16,948.00	0.00	16,948.00	37.60
212,062.00													
480030120000													
POTABLE USAGE	9/1/2021	PW1	gal	32709993	5/8" METER	2,200,634.00	8/2/2021	2,211,368.00	9/1/2021	10,734.00	0.00	10,734.00	21.32
POTABLE USAGE	10/1/2021	PW1	gal	32709993	5/8" METER	2,211,368.00	9/1/2021	2,238,850.00	10/1/2021	27,482.00	0.00	27,482.00	66.34
POTABLE USAGE	11/1/2021	PW1	gal	32709993	5/8" METER	2,238,850.00	10/1/2021	2,258,094.00	11/1/2021	19,244.00	0.00	19,244.00	43.62
POTABLE USAGE	12/1/2021	PW1	gal	32709993	5/8" METER	2,258,094.00	11/1/2021	2,271,032.00	12/1/2021	12,938.00	0.00	12,938.00	27.10
POTABLE USAGE	12/31/2021	PW1	gal	32709993	5/8" METER	2,271,032.00	12/1/2021	2,279,673.00	12/31/2021	8,641.00	0.00	8,641.00	16.76
POTABLE USAGE	2/1/2022	PW1	gal	32709993	5/8" METER	2,279,673.00	12/31/2021	2,291,379.00	2/1/2022	11,706.00	0.00	11,706.00	23.87
POTABLE USAGE	3/1/2022	PW1	gal	32709993	5/8" METER	2,291,379.00	2/1/2022	2,315,576.00	3/1/2022	24,197.00	0.00	24,197.00	56.60
POTABLE USAGE	4/1/2022	PW1	gal	32709993	5/8" METER	2,315,576.00	3/1/2022	2,337,445.00	4/1/2022	21,869.00	0.00	21,869.00	50.50
POTABLE USAGE	5/2/2022	PW1	gal	32709993	5/8" METER	2,337,445.00	4/1/2022	2,375,132.00	5/2/2022	37,687.00	0.00	37,687.00	97.78
POTABLE USAGE	6/1/2022	PW1	gal	32709993	5/8" METER	2,375,132.00	5/2/2022	2,401,906.00	6/1/2022	26,774.00	0.00	26,774.00	64.16
POTABLE USAGE	7/1/2022	PW1	gal	32709993	5/8" METER	2,401,906.00	6/1/2022	2,430,252.00	7/1/2022	28,346.00	0.00	28,346.00	69.01
POTABLE USAGE	8/1/2022	PW1	gal	32709993	5/8" METER	2,430,252.00	7/1/2022	2,470,236.00	8/1/2022	39,984.00	0.00	39,984.00	104.85
269,602.00													
480030260000													
POTABLE USAGE	9/1/2021	PW1	gal	40591923	5/8" METER	1,335,964.00	8/2/2021	1,350,117.00	9/1/2021	14,153.00	0.00	14,153.00	30.28
POTABLE USAGE	10/1/2021	PW1	gal	40591923	5/8" METER	1,350,117.00	9/1/2021	1,367,202.00	10/1/2021	17,085.00	0.00	17,085.00	37.96
POTABLE USAGE	11/1/2021	PW1	gal	40591923	5/8" METER	1,367,202.00	10/1/2021	1,383,938.00	11/1/2021	16,736.00	0.00	16,736.00	37.05
POTABLE USAGE	12/1/2021	PW1	gal	40591923	5/8" METER	1,383,938.00	11/1/2021	1,398,240.00	12/1/2021	14,302.00	0.00	14,302.00	30.67
POTABLE USAGE	12/31/2021	PW1	gal	40591923	5/8" METER	1,398,240.00	12/1/2021	1,405,755.00	12/31/2021	7,515.00	0.00	7,515.00	14.58
POTABLE USAGE	2/1/2022	PW1	gal	40591923	5/8" METER	1,405,755.00	12/31/2021	1,416,998.00	2/1/2022	11,243.00	0.00	11,243.00	22.66
POTABLE USAGE	3/1/2022	PW1	gal	40591923	5/8" METER	1,416,998.00	2/1/2022	1,430,576.00	3/1/2022	13,578.00	0.00	13,578.00	28.77
POTABLE USAGE	4/1/2022	PW1	gal	40591923	5/8" METER	1,430,576.00	3/1/2022	1,445,406.00	4/1/2022	14,830.00	0.00	14,830.00	32.05
POTABLE USAGE	5/2/2022	PW1	gal	40591923	5/8" METER	1,445,406.00	4/1/2022	1,463,908.00	5/2/2022	18,502.00	0.00	18,502.00	41.68
POTABLE USAGE	6/1/2022	PW1	gal	40591923	5/8" METER	1,463,908.00	5/2/2022	1,481,805.00	6/1/2022	17,897.00	0.00	17,897.00	40.09
POTABLE USAGE	7/1/2022	PW1	gal	40591923	5/8" METER	1,481,805.00	6/1/2022	1,504,028.00	7/1/2022	22,223.00	0.00	22,223.00	51.42
POTABLE USAGE	8/1/2022	PW1	gal	40591923	5/8" METER	1,504,028.00	7/1/2022	1,523,956.00	8/1/2022	19,928.00	0.00	19,928.00	45.41
187,992.00													
480030310000													
POTABLE USAGE	9/1/2021	PW1	gal	16465165	5/8" METER	1,117,457.00	8/2/2021	1,138,436.00	9/1/2021	20,979.00	0.00	20,979.00	48.16
POTABLE USAGE	10/1/2021	PW1	gal	16465165	5/8" METER	1,138,436.00	9/1/2021	1,156,205.00	10/1/2021	17,769.00	0.00	17,769.00	39.75
POTABLE USAGE	11/1/2021	PW1	gal	16465165	5/8" METER	1,156,205.00	10/1/2021	1,174,409.00	11/1/2021	18,204.00	0.00	18,204.00	40.89
POTABLE USAGE	12/1/2021	PW1	gal	16465165	5/8" METER	1,174,409.00	11/1/2021	1,188,877.00	12/1/2021	14,468.00	0.00	14,468.00	31.11
POTABLE USAGE	12/31/2021	PW1	gal	16465165	5/8" METER	1,188,877.00	12/1/2021	1,205,372.00	12/31/2021	16,495.00	0.00	16,495.00	36.42
POTABLE USAGE	2/1/2022	PW1	gal	16465165	5/8" METER	1,205,372.00	12/31/2021	1,220,572.00	2/1/2022	15,200.00	0.00	15,200.00	33.02
POTABLE USAGE	3/1/2022	PW1	gal	16465165	5/8" METER	1,220,572.00	2/1/2022	1,238,489.00	3/1/2022	17,917.00	0.00	17,917.00	40.14
POTABLE USAGE	4/1/2022	PW1	gal	16465165	5/8" METER	1,238,489.00	3/1/2022	1,257,827.00	4/1/2022	19,338.00	0.00	19,338.00	43.87
POTABLE USAGE	5/2/2022	PW1	gal	16465165	5/8" METER	1,257,827.00	4/1/2022	1,278,372.00	5/2/2022	20,545.00	0.00	20,545.00	47.03
POTABLE USAGE	6/1/2022	PW1	gal	16465165	5/8" METER	1,278,372.00	5/2/2022	1,295,934.00	6/1/2022	17,562.00	0.00	17,562.00	39.21
POTABLE USAGE	7/1/2022	PW1	gal	16465165	5/8" METER	1,295,934.00	6/1/2022	1,317,025.00	7/1/2022	21,091.00	0.00	21,091.00	48.46
POTABLE USAGE	8/1/2022	PW1	gal	16465165	5/8" METER	1,317,025.00	7/1/2022	1,340,885.00	8/1/2022	23,860.00	0.00	23,860.00	55.71
223,428.00													
480040170000													
POTABLE USAGE	9/1/2021	PW1	gal	15792454	5/8" METER	2,557,397.00	8/2/2021	2,598,447.00	9/1/2021	41,050.00	0.00	41,050.00	108.13
POTABLE USAGE	10/1/2021	PW1	gal	15792454	5/8" METER	2,598,447.00	9/1/2021	2,632,933.00	10/1/2021	34,486.00	0.00	34,486.00	87.92
POTABLE USAGE	11/1/2021	PW1	gal	15792454	5/8" METER	2,632,933.00	10/1/2021	2,668,707.00	11/1/2021	35,774.00	0.00	35,774.00	91.88
POTABLE USAGE	12/1/2021	PW1	gal	15792454	5/8" METER	2,668,707.00	11/1/2021	2,695,551.00	12/1/2021	26,844.00	0.00	26,844.00	64.38
POTABLE USAGE	12/31/2021	PW1	gal	15792454	5/8" METER	2							

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable						Attachment to GWUPA: #11 Table 1 (B,I)							
POTABLE USAGE	12/31/2021	PW1	gal	17890568	5/8" METER	1,469,403.00	12/1/2021	1,496,429.00	12/31/2021	27,026.00	0.00	27,026.00	64.94
POTABLE USAGE	2/1/2022	PW1	gal	17890568	5/8" METER	1,496,429.00	12/31/2021	1,525,213.00	2/1/2022	28,784.00	0.00	28,784.00	70.35
POTABLE USAGE	3/1/2022	PW1	gal	17890568	5/8" METER	1,525,213.00	2/1/2022	1,553,428.00	3/1/2022	28,215.00	0.00	28,215.00	68.60
POTABLE USAGE	4/1/2022	PW1	gal	17890568	5/8" METER	1,553,428.00	3/1/2022	1,599,719.00	4/1/2022	46,291.00	0.00	46,291.00	124.28
POTABLE USAGE	5/2/2022	PW1	gal	17890568	5/8" METER	1,599,719.00	4/1/2022	1,640,281.00	5/2/2022	40,562.00	0.00	40,562.00	106.63
POTABLE USAGE	6/1/2022	PW1	gal	17890568	5/8" METER	1,640,281.00	5/2/2022	1,678,983.00	6/1/2022	38,702.00	0.00	38,702.00	100.90
POTABLE USAGE	7/1/2022	PW1	gal	17890568	5/8" METER	1,678,983.00	6/1/2022	1,719,817.00	7/1/2022	40,834.00	0.00	40,834.00	107.47
POTABLE USAGE	8/1/2022	PW1	gal	17890568	5/8" METER	1,719,817.00	7/1/2022	1,769,369.00	8/1/2022	49,552.00	0.00	49,552.00	134.32
426,929.00													
480040040000													
POTABLE USAGE	9/1/2021	PW1	gal	43786470	5/8" METER	1,107,026.00	8/2/2021	1,129,373.00	9/1/2021	22,347.00	0.00	22,347.00	51.75
POTABLE USAGE	10/1/2021	PW1	gal	43786470	5/8" METER	1,129,373.00	9/1/2021	1,142,408.00	10/1/2021	13,035.00	0.00	13,035.00	27.35
POTABLE USAGE	11/1/2021	PW1	gal	43786470	5/8" METER	1,142,408.00	10/1/2021	1,161,457.00	11/1/2021	19,049.00	0.00	19,049.00	43.11
POTABLE USAGE	12/1/2021	PW1	gal	43786470	5/8" METER	1,161,457.00	11/1/2021	1,174,929.00	12/1/2021	13,472.00	0.00	13,472.00	28.50
POTABLE USAGE	12/31/2021	PW1	gal	43786470	5/8" METER	1,174,929.00	12/1/2021	1,188,695.00	12/31/2021	13,766.00	0.00	13,766.00	29.27
POTABLE USAGE	2/1/2022	PW1	gal	43786470	5/8" METER	1,188,695.00	12/31/2021	1,199,617.00	2/1/2022	10,922.00	0.00	10,922.00	21.82
POTABLE USAGE	3/1/2022	PW1	gal	43786470	5/8" METER	1,199,617.00	2/1/2022	1,213,095.00	3/1/2022	13,478.00	0.00	13,478.00	28.51
POTABLE USAGE	4/1/2022	PW1	gal	43786470	5/8" METER	1,213,095.00	3/1/2022	1,229,182.00	4/1/2022	16,087.00	0.00	16,087.00	35.35
POTABLE USAGE	5/2/2022	PW1	gal	43786470	5/8" METER	1,229,182.00	4/1/2022	1,247,016.00	5/2/2022	17,834.00	0.00	17,834.00	39.93
POTABLE USAGE	6/1/2022	PW1	gal	43786470	5/8" METER	1,247,016.00	5/2/2022	1,263,075.00	6/1/2022	16,059.00	0.00	16,059.00	35.27
POTABLE USAGE	7/1/2022	PW1	gal	43786470	5/8" METER	1,263,075.00	6/1/2022	1,280,386.00	7/1/2022	17,311.00	0.00	17,311.00	38.55
POTABLE USAGE	8/1/2022	PW1	gal	43786470	5/8" METER	1,280,386.00	7/1/2022	1,295,347.00	8/1/2022	14,961.00	0.00	14,961.00	32.40
188,321.00													
480040180000													
POTABLE USAGE	9/1/2021	PW1	gal	43786472	5/8" METER	3,305,391.00	8/2/2021	3,343,380.00	9/1/2021	37,989.00	0.00	37,989.00	98.71
POTABLE USAGE	10/1/2021	PW1	gal	43786472	5/8" METER	3,343,380.00	9/1/2021	3,379,236.00	10/1/2021	35,856.00	0.00	35,856.00	92.14
POTABLE USAGE	11/1/2021	PW1	gal	43786472	5/8" METER	3,379,236.00	10/1/2021	3,417,838.00	11/1/2021	38,602.00	0.00	38,602.00	100.59
POTABLE USAGE	12/1/2021	PW1	gal	43786472	5/8" METER	3,417,838.00	11/1/2021	3,451,979.00	12/1/2021	34,141.00	0.00	34,141.00	86.85
POTABLE USAGE	12/31/2021	PW1	gal	43786472	5/8" METER	3,451,979.00	12/1/2021	3,485,172.00	12/31/2021	33,193.00	0.00	33,193.00	83.93
POTABLE USAGE	2/1/2022	PW1	gal	43786472	5/8" METER	3,485,172.00	12/31/2021	3,526,859.00	2/1/2022	41,687.00	0.00	41,687.00	110.10
POTABLE USAGE	3/1/2022	PW1	gal	43786472	5/8" METER	3,526,859.00	2/1/2022	3,562,042.00	3/1/2022	35,183.00	0.00	35,183.00	90.06
POTABLE USAGE	4/1/2022	PW1	gal	43786472	5/8" METER	3,562,042.00	3/1/2022	3,599,860.00	4/1/2022	37,818.00	0.00	37,818.00	98.18
POTABLE USAGE	5/2/2022	PW1	gal	43786472	5/8" METER	3,599,860.00	4/1/2022	3,632,568.00	5/2/2022	32,708.00	0.00	32,708.00	82.44
POTABLE USAGE	6/1/2022	PW1	gal	43786472	5/8" METER	3,632,568.00	5/2/2022	3,662,819.00	6/1/2022	30,251.00	0.00	30,251.00	74.87
POTABLE USAGE	7/1/2022	PW1	gal	43786472	5/8" METER	3,662,819.00	6/1/2022	3,698,421.00	7/1/2022	35,602.00	0.00	35,602.00	91.35
POTABLE USAGE	8/1/2022	PW1	gal	43786472	5/8" METER	3,698,421.00	7/1/2022	3,732,897.00	8/1/2022	34,476.00	0.00	34,476.00	87.89
427,506.00													
480040030000													
POTABLE USAGE	9/1/2021	PW1	gal	32709995	5/8" METER	1,657,394.00	8/2/2021	1,683,989.00	9/1/2021	26,595.00	0.00	26,595.00	63.61
POTABLE USAGE	10/1/2021	PW1	gal	32709995	5/8" METER	1,683,989.00	9/1/2021	1,709,963.00	10/1/2021	25,974.00	0.00	25,974.00	61.70
POTABLE USAGE	11/1/2021	PW1	gal	32709995	5/8" METER	1,709,963.00	10/1/2021	1,741,097.00	11/1/2021	31,134.00	0.00	31,134.00	77.59
POTABLE USAGE	12/1/2021	PW1	gal	32709995	5/8" METER	1,741,097.00	11/1/2021	1,774,039.00	12/1/2021	32,942.00	0.00	32,942.00	83.16
POTABLE USAGE	12/31/2021	PW1	gal	32709995	5/8" METER	1,774,039.00	12/1/2021	1,831,790.00	12/31/2021	57,751.00	0.00	57,751.00	159.57
POTABLE USAGE	2/1/2022	PW1	gal	32709995	5/8" METER	1,831,790.00	12/31/2021	1,894,936.00	2/1/2022	63,146.00	0.00	63,146.00	176.19
POTABLE USAGE	3/1/2022	PW1	gal	32709995	5/8" METER	1,894,936.00	2/1/2022	1,921,621.00	3/1/2022	26,685.00	0.00	26,685.00	63.89
POTABLE USAGE	4/1/2022	PW1	gal	32709995	5/8" METER	1,921,621.00	3/1/2022	1,952,103.00	4/1/2022	30,482.00	0.00	30,482.00	75.58
POTABLE USAGE	5/2/2022	PW1	gal	32709995	5/8" METER	1,952,103.00	4/1/2022	1,995,791.00	5/2/2022	43,688.00	0.00	43,688.00	116.26
POTABLE USAGE	6/1/2022	PW1	gal	32709995	5/8" METER	1,995,791.00	5/2/2022	2,027,998.00	6/1/2022	32,207.00	0.00	32,207.00	80.90
POTABLE USAGE	7/1/2022	PW1	gal	32709995	5/8" METER	2,027,998.00	6/1/2022	2,055,072.00	7/1/2022	27,074.00	0.00	27,074.00	65.09
POTABLE USAGE	8/1/2022	PW1	gal	32709995	5/8" METER	2,055,072.00	7/1/2022	2,084,372.00	8/1/2022	29,300.00	0.00	29,300.00	71.94
426,978.00													
480040020000													
POTABLE USAGE	9/1/2021	PW1	gal	1969012	5/8" METER	1,295,245.00	8/2/2021	1,305,694.00	9/1/2021	10,449.00	0.00	10,449.00	20.58
POTABLE USAGE	10/1/2021	PW1	gal	1969012	5/8" METER	1,305,694.00	9/1/2021	1,318,150.00	10/1/2021	12,456.00	0.00	12,456.00	25.83
POTABLE USAGE	11/1/2021	PW1	gal	1969012	5/8" METER	1,318,150.00	10/1/2021	1,327,899.00	11/				

EXHIBIT 2 - Potable

EXHIBIT 2 - Potable

										Attachment to GWUPA: #11 Table 1 (B,I)			
POTABLE USAGE	11/1/2021	PW1	gal	14074226	5/8" METER	316,290.00	10/1/2021	322,770.00	11/1/2021	6,480.00	0.00	6,480.00	12.57
POTABLE USAGE	12/1/2021	PW1	gal	14074226	5/8" METER	322,770.00	11/1/2021	324,400.00	12/1/2021	1,630.00	0.00	1,630.00	3.16
POTABLE USAGE	12/31/2021	PW1	gal	14074226	5/8" METER	324,400.00	12/1/2021	326,090.00	12/31/2021	1,690.00	0.00	1,690.00	3.28
POTABLE USAGE	2/1/2022	PW1	gal	14074226	5/8" METER	326,090.00	12/31/2021	327,560.00	2/1/2022	1,470.00	0.00	1,470.00	2.85
POTABLE USAGE	3/1/2022	PW1	gal	14074226	5/8" METER	327,560.00	2/1/2022	328,580.00	3/1/2022	1,020.00	0.00	1,020.00	1.98
POTABLE USAGE	4/1/2022	PW1	gal	14074226	5/8" METER	328,580.00	3/1/2022	330,450.00	4/1/2022	1,870.00	0.00	1,870.00	3.63
POTABLE USAGE	5/2/2022	PW1	gal	14074226	5/8" METER	330,450.00	4/1/2022	331,690.00	5/2/2022	1,240.00	0.00	1,240.00	2.41
POTABLE USAGE	6/1/2022	PW1	gal	14074226	5/8" METER	331,690.00	5/2/2022	333,190.00	6/1/2022	1,500.00	0.00	1,500.00	2.91
POTABLE USAGE	7/1/2022	PW1	gal	14074226	5/8" METER	333,190.00	6/1/2022	335,520.00	7/1/2022	2,330.00	0.00	2,330.00	4.52
POTABLE USAGE	8/1/2022	PW1	gal	14074226	5/8" METER	335,520.00	7/1/2022	337,030.00	8/1/2022	1,510.00	0.00	1,510.00	2.93

25,130.00

480030180000

POTABLE USAGE	9/1/2021	PW1	gal	85337499	5/8" METER	2,908,479.00	8/2/2021	2,961,897.00	9/1/2021	53,418.00	0.00	53,418.00	146.23
POTABLE USAGE	10/1/2021	PW1	gal	85337499	5/8" METER	2,961,897.00	9/1/2021	3,012,465.00	10/1/2021	50,568.00	0.00	50,568.00	137.45
POTABLE USAGE	11/1/2021	PW1	gal	85337499	5/8" METER	3,012,465.00	10/1/2021	3,066,640.00	11/1/2021	54,175.00	0.00	54,175.00	148.56
POTABLE USAGE	12/1/2021	PW1	gal	85337499	5/8" METER	3,066,640.00	11/1/2021	3,119,317.00	12/1/2021	52,677.00	0.00	52,677.00	143.95
POTABLE USAGE	12/31/2021	PW1	gal	85337499	5/8" METER	3,119,317.00	12/1/2021	3,163,765.00	12/31/2021	44,448.00	0.00	44,448.00	118.60
POTABLE USAGE	2/1/2022	PW1	gal	85337499	5/8" METER	3,163,765.00	12/31/2021	3,210,208.00	2/1/2022	46,443.00	0.00	46,443.00	124.74
POTABLE USAGE	3/1/2022	PW1	gal	85337499	5/8" METER	3,210,208.00	2/1/2022	3,260,096.00	3/1/2022	49,888.00	0.00	49,888.00	135.36
POTABLE USAGE	4/1/2022	PW1	gal	85337499	5/8" METER	3,260,096.00	3/1/2022	3,320,398.00	4/1/2022	60,302.00	0.00	60,302.00	167.43
POTABLE USAGE	5/2/2022	PW1	gal	85337499	5/8" METER	3,320,398.00	4/1/2022	3,397,780.00	5/2/2022	77,382.00	0.00	77,382.00	220.04
POTABLE USAGE	6/1/2022	PW1	gal	85337499	5/8" METER	3,397,780.00	5/2/2022	3,474,037.00	6/1/2022	76,257.00	0.00	76,257.00	216.57
POTABLE USAGE	7/1/2022	PW1	gal	85337499	5/8" METER	3,474,037.00	6/1/2022	3,543,271.00	7/1/2022	69,234.00	0.00	69,234.00	194.94
POTABLE USAGE	8/1/2022	PW1	gal	85337499	5/8" METER	3,543,271.00	7/1/2022	3,625,037.00	8/1/2022	81,766.00	0.00	81,766.00	233.54

716,558.00

480031180000

POTABLE USAGE	9/1/2021	PW1	gal	18255506	5/8" METER	101,559.00	8/2/2021	107,094.00	9/1/2021	5,535.00	0.00	5,535.00	10.74
POTABLE USAGE	10/1/2021	PW1	gal	18255506	5/8" METER	107,094.00	9/1/2021	112,254.00	10/1/2021	5,160.00	0.00	5,160.00	10.01
POTABLE USAGE	11/1/2021	PW1	gal	18255506	5/8" METER	112,254.00	10/1/2021	117,765.00	11/2/2021	5,511.00	0.00	5,511.00	10.69
POTABLE USAGE	12/1/2021	PW1	gal	18255506	5/8" METER	117,765.00	11/2/2021	123,059.00	12/1/2021	5,294.00	0.00	5,294.00	10.27
POTABLE USAGE	12/31/2021	PW1	gal	18255506	5/8" METER	123,059.00	12/1/2021	128,656.00	12/31/2021	5,597.00	0.00	5,597.00	10.86
POTABLE USAGE	2/1/2022	PW1	gal	18255506	5/8" METER	128,656.00	12/31/2021	133,737.00	2/1/2022	5,081.00	0.00	5,081.00	9.86
POTABLE USAGE	3/1/2022	PW1	gal	18255506	5/8" METER	133,737.00	2/1/2022	138,854.00	3/1/2022	5,117.00	0.00	5,117.00	9.93
POTABLE USAGE	4/1/2022	PW1	gal	18255506	5/8" METER	138,854.00	3/1/2022	144,322.00	4/2/2022	5,468.00	0.00	5,468.00	10.61
POTABLE USAGE	5/2/2022	PW1	gal	18255506	5/8" METER	144,322.00	4/2/2022	149,755.00	5/2/2022	5,433.00	0.00	5,433.00	10.54
POTABLE USAGE	6/1/2022	PW1	gal	18255506	5/8" METER	149,755.00	5/2/2022	156,045.00	6/1/2022	6,290.00	0.00	6,290.00	12.20
POTABLE USAGE	7/1/2022	PW1	gal	18255506	5/8" METER	156,045.00	6/1/2022	162,411.00	7/1/2022	6,366.00	0.00	6,366.00	12.35
POTABLE USAGE	8/1/2022	PW1	gal	18255506	5/8" METER	162,411.00	7/1/2022	164,558.00	8/1/2022	2,147.00	0.00	2,147.00	4.17

62,999.00

480031180000

POTABLE USAGE	9/1/2021	PW1	gal	190028139P	1" METER	108,612.00	8/2/2021	115,620.00	9/1/2021	7,008.00	0.00	7,008.00	13.60
POTABLE USAGE	10/1/2021	PW1	gal	190028139P	1" METER	115,620.00	9/1/2021	120,704.00	10/1/2021	5,084.00	0.00	5,084.00	9.86
POTABLE USAGE	11/1/2021	PW1	gal	190028139P	1" METER	120,704.00	10/1/2021	126,065.00	11/1/2021	5,361.00	0.00	5,361.00	10.40
POTABLE USAGE	12/1/2021	PW1	gal	190028139P	1" METER	126,065.00	11/1/2021	132,486.00	12/1/2021	6,421.00	0.00	6,421.00	12.46
POTABLE USAGE	12/31/2021	PW1	gal	190028139P	1" METER	132,486.00	12/1/2021	140,591.00	12/31/2021	8,105.00	0.00	8,105.00	15.72
POTABLE USAGE	2/1/2022	PW1	gal	190028139P	1" METER	140,591.00	12/31/2021	146,462.00	2/1/2022	5,871.00	0.00	5,871.00	11.39
POTABLE USAGE	3/1/2022	PW1	gal	190028139P	1" METER	146,462.00	2/1/2022	152,040.00	3/1/2022	5,578.00	0.00	5,578.00	10.82
POTABLE USAGE	4/1/2022	PW1	gal	190028139P	1" METER	152,040.00	3/1/2022	158,684.00	4/1/2022	6,644.00	0.00	6,644.00	12.89
POTABLE USAGE	5/2/2022	PW1	gal	190028139P	1" METER	158,684.00	4/1/2022	165,730.00	5/2/2022	7,046.00	0.00	7,046.00	13.67
POTABLE USAGE	6/1/2022	PW1	gal	190028139P	1" METER	165,730.00	5/2/2022	174,027.00	6/1/2022	8,297.00	0.00	8,297.00	16.10
POTABLE USAGE	7/1/2022	PW1	gal	190028139P	1" METER	174,027.00	6/1/2022	182,950.00	7/1/2022	8,923.00	0.00	8,923.00	17.31
POTABLE USAGE	8/1/2022	PW1	gal	190028139P	1" METER	182,950.00	7/1/2022	189,578.00	8/1/2022	6,628.00	0.00	6,628.00	12.86

80,966.00

480031180000

POTABLE USAGE	9/1/2021	PW1	gal	190287910	5/8" METER	238,407.00	8/2/2021	266,340.00	9/1/2021	27,933.00	0.00	27,933.00	67.73
POTABLE USAGE	10/1/2021	PW1	gal	190287910	5/8" METER	266,340.00	9/1/2021	287,560.00	10/1/2021	21,220.00	0.00	21,220.00	48.80
POTABLE USAGE	11/1/2021	PW1	gal	190287910	5/8" METER	287,560.00	10/1/2021	315,693.00	11/1/2021	28,133.00	0.00	28,133.00	68.35
POTABLE USAGE	12/1/2021	PW1	gal	190287910	5/8" METER	315,693.00	11/1/2021	343,738.00	12/1/2021	28,045.00	0.00	28,045.00	68.08
POTABLE USAGE	12/31/2021	PW1	gal	190287910	5/8" METER	343,738.00	12/1/2021	365,689.00	12/31/2021	21,951.00	0.00	21,951.00	50.71
POTABLE USAGE	2/1/2022	PW1	gal	190287910	5/8" METER	365,689.00	12/31/2021	384,897.00	2/1/2022	19,208.00	0.00	19,208.00	43.52
POTABLE USAGE	3/1/2022	PW1	gal	190287910	5/8" METER	384,897.00	2/1/2022	404,503.00	3/1/2022	19,606.00	0.00	19,606.00	44.57
POTABLE USAGE	4/1/2022	PW1	gal	190287910	5/8" METER	404,503.00	3/1/2022	428,017.00	4/1/2022	23,514.00	0.00	23,514.00	54.81
POTABLE USAGE	5/2/2022	PW1	gal	190287910	5/8" METER	428,017.00	4/1/2022	451,322.00	5/2/2022	23,305.00	0.00	23,305.00	54.26
POTABLE USAGE	6/1/2022	PW1	gal	190287910	5/8" METER	451,322.00	5/2/2022	478,326.00	6/1/2022	27,004.00	0.00	27,004.00	64.87
POTABLE USAGE	7/1/2022	PW1	gal	190287910	5/8" METER	478,326.00	6/1/2022	506,491.00	7/1/2022	28,165.00	0.00	28,165.00	68.45
POTABLE USAGE	8/1/2022	PW1	gal	190287910	5/8" METER	506,491.00	7/1/2022	527,446.00	8/1/2022	20,955.00	0.00	20,955.00	48.10

289,039.00

480031060002

POTABLE USAGE	9/1/2021	PW1	gal	18260855	1" METER	7,985,817.00	8/2/2021	8,296,052.00	9/1/2021	310,235.00	0.00	310,235.00	937.22
POTABLE USAGE	10/1/2021	PW1	gal	18260855	1" METER	8,296,052.00	9/1/2021	8,361,950.00	9/14/2021	238,007.00	0.00	238,007.00	714.76
				210232423P	1" METER	0.00	9/14/2021	172,109.00	10/1/2021				
POTABLE USAGE	11/1/2021	PW1	gal	210232423P	1" METER	172,109.00	10/1/2021	262,915.00	11/1/2021	90,806.00	0.00	90,806.00	261.38
POTABLE USAGE	12/1/2021	PW1	gal	210232423P	1" METER	262,915.00	11/1/2021	381,595.00	12/1/2021	118,680.00	0.00	118,680.00	347.23
POTABLE USAGE	12/31/2021	PW1	gal	210232423P	1" METER	381,595.00	12/1/2021	472,981.00	12/31/2021	91,386.00	0.00	91,386.00	263.17
POTABLE USAGE	2/1/2022	PW1	gal	210232423P	1" METER	472,981.00	12/31/2021	623,970.00	2/1/2022	150,989.00	0.00	150,989.00	446.75
POTABLE USAGE	3/1/2022	PW1	gal	210232423P	1" METER	623,970.00	2/1/2022	746,396.00	3/1/2022	122,426.00	0.00	122,426.00	358.77
POTABLE USAGE	4/1/2022	PW1	gal	210232423P	1" METER	746,396.00	3/1/2022	759,163.00	4/1/2022	12,767.00	0.00	12,767.00	26.65
POTABLE USAGE	5/2/2022	PW1	gal	210232423P	1" METER	759,163.00	4/1/2022	944,999.00	5/2/2022	185,836.00	0.00	185,836.00	554.07
POTABLE USAGE	6/1/2022	PW1	gal	210232423P	1" METER	944,999.00	5/2/2022	1,137,290.00	6/1/2022	192,291.00	0.00	192,291.00	573.96
POTABLE USAGE	7/1/2022	PW1	gal	210232423P	1" METER	1,137,290.00	6/1/2022	1,277,379.00	7/1/2022	140,089.00	0.00	140,089.00	413.17
POTABLE USAGE	8/1/2022	PW1	gal	210232423P	1" METER	1,277,379.00	7/1/2022	1,422,926.00	8/1/2022	145,547.00	0.00	145,547.00	429.98

EXHIBIT 2 - Potable

Attachment to GWUPA: #11 Table 1 (B,I)
480040080000

POTABLE USAGE	9/1/2021	PW1	gal	32071843	5/8" METER	1,222,673.00	8/2/2021	1,235,362.00	9/1/2021	12,689.00	0.00	12,689.00	26.45
POTABLE USAGE	10/1/2021	PW1	gal	32071843	5/8" METER	1,235,362.00	9/1/2021	1,244,020.00	10/1/2021	8,658.00	0.00	8,658.00	16.80
POTABLE USAGE	11/1/2021	PW1	gal	32071843	5/8" METER	1,244,020.00	10/1/2021	1,254,957.00	11/1/2021	10,937.00	0.00	10,937.00	21.85
POTABLE USAGE	12/1/2021	PW1	gal	32071843	5/8" METER	1,254,957.00	11/1/2021	1,262,946.00	12/1/2021	7,989.00	0.00	7,989.00	15.50
POTABLE USAGE	12/31/2021	PW1	gal	32071843	5/8" METER	1,262,946.00	12/1/2021	1,269,804.00	12/31/2021	6,858.00	0.00	6,858.00	13.30
POTABLE USAGE	2/1/2022	PW1	gal	32071843	5/8" METER	1,269,804.00	12/31/2021	1,273,375.00	2/1/2022	3,571.00	0.00	3,571.00	6.93
POTABLE USAGE	3/1/2022	PW1	gal	32071843	5/8" METER	1,273,375.00	2/1/2022	1,281,425.00	3/1/2022	8,050.00	0.00	8,050.00	15.62
POTABLE USAGE	4/1/2022	PW1	gal	32071843	5/8" METER	1,281,425.00	3/1/2022	1,286,265.00	4/1/2022	4,840.00	0.00	4,840.00	9.39
POTABLE USAGE	5/2/2022	PW1	gal	32071843	5/8" METER	1,286,265.00	4/1/2022	1,294,204.00	5/2/2022	7,939.00	0.00	7,939.00	15.40
POTABLE USAGE	6/1/2022	PW1	gal	32071843	5/8" METER	1,294,204.00	5/2/2022	1,304,908.00	6/1/2022	10,704.00	0.00	10,704.00	21.24
POTABLE USAGE	7/1/2022	PW1	gal	32071843	5/8" METER	1,304,908.00	6/1/2022	1,321,772.00	7/1/2022	16,864.00	0.00	16,864.00	37.38
POTABLE USAGE	8/1/2022	PW1	gal	32071843	5/8" METER	1,321,772.00	7/1/2022	1,336,672.00	8/1/2022	14,900.00	0.00	14,900.00	32.24

113,999.00

480030310000

POTABLE USAGE	9/1/2021	PW1	gal	36061628	5/8" METER	36,361.00	8/2/2021	36,361.00	9/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	10/1/2021	PW1	gal	36061628	5/8" METER	36,361.00	9/1/2021	36,361.00	10/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	11/1/2021	PW1	gal	36061628	5/8" METER	36,361.00	10/1/2021	36,361.00	11/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/1/2021	PW1	gal	36061628	5/8" METER	36,361.00	11/1/2021	36,361.00	12/1/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	12/31/2021	PW1	gal	36061628	5/8" METER	36,361.00	12/1/2021	36,361.00	12/31/2021	0.00	0.00	0.00	0.00
POTABLE USAGE	2/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	12/31/2021	36,361.00	2/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	3/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	2/1/2022	36,361.00	3/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	4/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	3/1/2022	36,361.00	4/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	5/2/2022	PW1	gal	36061628	5/8" METER	36,361.00	4/1/2022	36,361.00	5/2/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	6/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	5/2/2022	36,361.00	6/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	7/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	6/1/2022	36,361.00	7/1/2022	0.00	0.00	0.00	0.00
POTABLE USAGE	8/1/2022	PW1	gal	36061628	5/8" METER	36,361.00	7/1/2022	36,361.00	8/1/2022	0.00	0.00	0.00	0.00

0.00

480030310000

POTABLE USAGE	9/1/2021	PW1	gal	43479803	3/4" METER	6,211,416.00	8/2/2021	6,244,150.00	9/1/2021	32,734.00	0.00	32,734.00	82.52
POTABLE USAGE	10/1/2021	PW1	gal	43479803	3/4" METER	6,244,150.00	9/1/2021	6,274,465.00	10/1/2021	30,315.00	0.00	30,315.00	75.07
POTABLE USAGE	11/1/2021	PW1	gal	43479803	3/4" METER	6,274,465.00	10/1/2021	6,307,112.00	11/1/2021	32,647.00	0.00	32,647.00	82.25
POTABLE USAGE	12/1/2021	PW1	gal	43479803	3/4" METER	6,307,112.00	11/1/2021	6,338,008.00	12/1/2021	30,896.00	0.00	30,896.00	76.86
POTABLE USAGE	12/31/2021	PW1	gal	43479803	3/4" METER	6,338,008.00	12/1/2021	6,372,136.00	12/31/2021	34,128.00	0.00	34,128.00	86.81
POTABLE USAGE	2/1/2022	PW1	gal	43479803	3/4" METER	6,372,136.00	12/31/2021	6,402,333.00	2/1/2022	30,197.00	0.00	30,197.00	74.71
POTABLE USAGE	3/1/2022	PW1	gal	43479803	3/4" METER	6,402,333.00	2/1/2022	6,432,811.00	3/1/2022	30,478.00	0.00	30,478.00	75.57
POTABLE USAGE	4/1/2022	PW1	gal	43479803	3/4" METER	6,432,811.00	3/1/2022	6,472,329.00	4/1/2022	39,518.00	0.00	39,518.00	103.42
POTABLE USAGE	5/2/2022	PW1	gal	43479803	3/4" METER	6,472,329.00	4/1/2022	6,517,864.00	5/2/2022	45,535.00	0.00	45,535.00	121.95
POTABLE USAGE	6/1/2022	PW1	gal	43479803	3/4" METER	6,517,864.00	5/2/2022	6,563,967.00	6/1/2022	46,103.00	0.00	46,103.00	123.70
POTABLE USAGE	7/1/2022	PW1	gal	43479803	3/4" METER	6,563,967.00	6/1/2022	6,605,575.00	7/1/2022	41,608.00	0.00	41,608.00	109.85
POTABLE USAGE	8/1/2022	PW1	gal	43479803	3/4" METER	6,605,575.00	7/1/2022	6,650,720.00	8/1/2022	45,145.00	0.00	45,145.00	120.75

439,304.00

Service	Units	Rate Code	Actual	Adjusted	Billed	Charges
POTABLE USAGE	gal	PW1	16,240,080.00	-150,301.00	16,089,779.00	40,939.79
Total POTABLE USAGE - gal			16,240,080.00	-150,301.00	16,089,779.00	40,939.79

SCHEDULE AAttachment to GWUPA: #11 Table 1 (B)
#12 Table 2 (A,C)**OLOWALU WATER CO. (NON POTABLE)****Source:**Olowalu Elua 6-4936-001
OWC 2

	User TMK	GROSS ACRES	Authorized Planned TMK	GROSS ACRES
1	480030020000	0.900	480030980000	15.027
2	480030050000	10.561	480030980001	incl above
3	480030050000	incl abv	480030980002	incl above
4	480030050000	incl abv	480030980003	incl above
5	480030050000	incl abv	480030980004	incl above
6	480030050000	incl abv	480030990000	15.575
7	480030050000	incl abv	480031000001	2.629
8	480030050000	incl abv	480031000002	2.181
9	480030050000	incl abv	480031000003	6.045
10	480030050000	incl abv	480031000004	8.907
11	480030100002	1.913	480031000005	7.351
12	480030440000	1.340	480031010001	5.395
13	480030450000	0.803	480031010002	1.503
14	480030460000	0.800	480031010003	12.422
15	480030470000	0.544	480031010004	4.768
16	480030840000	28.894	480031010005	5.291
17	480030840000	incl abv	480031020001	2.439
18	480030840000	incl abv	480031020002	2.242
19	480030840000	incl abv	480031020003	6.307
20	480030840000	incl abv	480031020004	3.602
21	480030850002	3.450	480031020005	2.291
22	480030850002	incl abv	480031030001	2.612
23	480030870000	4.060	480031030002	2.165
24	480030880001	1.235	480031030004	7.044
25	480030890001	4.095	480031030005	8.798
26	480030890002	1.651	480031040001	2.598
27	480030900000	6.268	480031040002	2.050
28	480030910001	4.398	480031040004	11.196
29	480030910002	1.010	480031050001	2.229
30	480030920000	5.844	480031050002	2.654

SCHEDULE AAttachment to GWUPA: #11 Table 1 (B)
#12 Table 2 (A,C)

	User TMK	GROSS ACRES	Authorized Planned TMK	GROSS ACRES
31	480030930001	3.413	480031050003	4.366
32	480030930002	1.868	480031050004	4.302
33	480030940001	3.132	480031050005	27.183
34	480030940002	2.010	480031060001	13.703
35	480030950001	2.559	480031070003	10.000
36	480030950002	0.500	480031090001	9.486
37	480030960001	2.440	480031090002	6.681
38	480030960002	0.816	480031100001	4.440
39	480030970001	3.000	480031100002	4.821
40	480030970002	0.732	480031100003	7.959
41	480031030003	7.180	480031110001	4.136
42	480031040003	18.909	480031110002	2.437
43	480031040005	incl abv	480031110003	6.034
44	480031060002	2.974	480031110004	3.975
45	480031070001	31.143	480031120001	2.470
46	480031140003	7.390	480031120002	2.716
47	480031140001	6.531	480031120003	8.487
48	480031140002	5.958	480031120004	7.488
49	480031140004	5.391	480031120005	3.449
50	480031140005	3.569	480031130001	5.400
51	480031150001	3.614	480031130002	4.851
52	480031150002	2.515	480031130003	8.483
53	480031150003	5.995	480031130004	2.173
54	480031150004	6.862	480031130005	4.304
55	480031150005	7.198	480031160000	16.038
56	480031180000	42.709	480031170000	15.589
57	480031180000	incl abv	480031200000	2.213
58	480031180000	incl abv	480031200000	2.213
59	480031180000	incl abv		
60	480031180000	incl abv		
61	480031190000	2.176		
62	480031210000	4.550		
63	480031220000	2.004		
64	480031230000	2.001		
65	480031240000	16.086		

480030020000-P

OWC ATTACHMENT TO GWUPA-E: #12



08/29/2021

480030050000-P

OWC ATTACHMENT TO GWUPA-E: #12



480030100002-P

OWC ATTACHMENT TO GWUPA-E: #12



08/29/2021

480030110000-P

OWC ATTACHMENT TO GWUPA-E: #12



08/21/2021

480030120000-P

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480030310000-P

OWC ATTACHMENT TO GWUPA-E: #12



08/29/2021

480030440000-P

OWC ATTACHMENT TO GWUPA-E: #12



08/29/2021

480030450000-P

OWC ATTACHMENT TO GWUPA-E: #12



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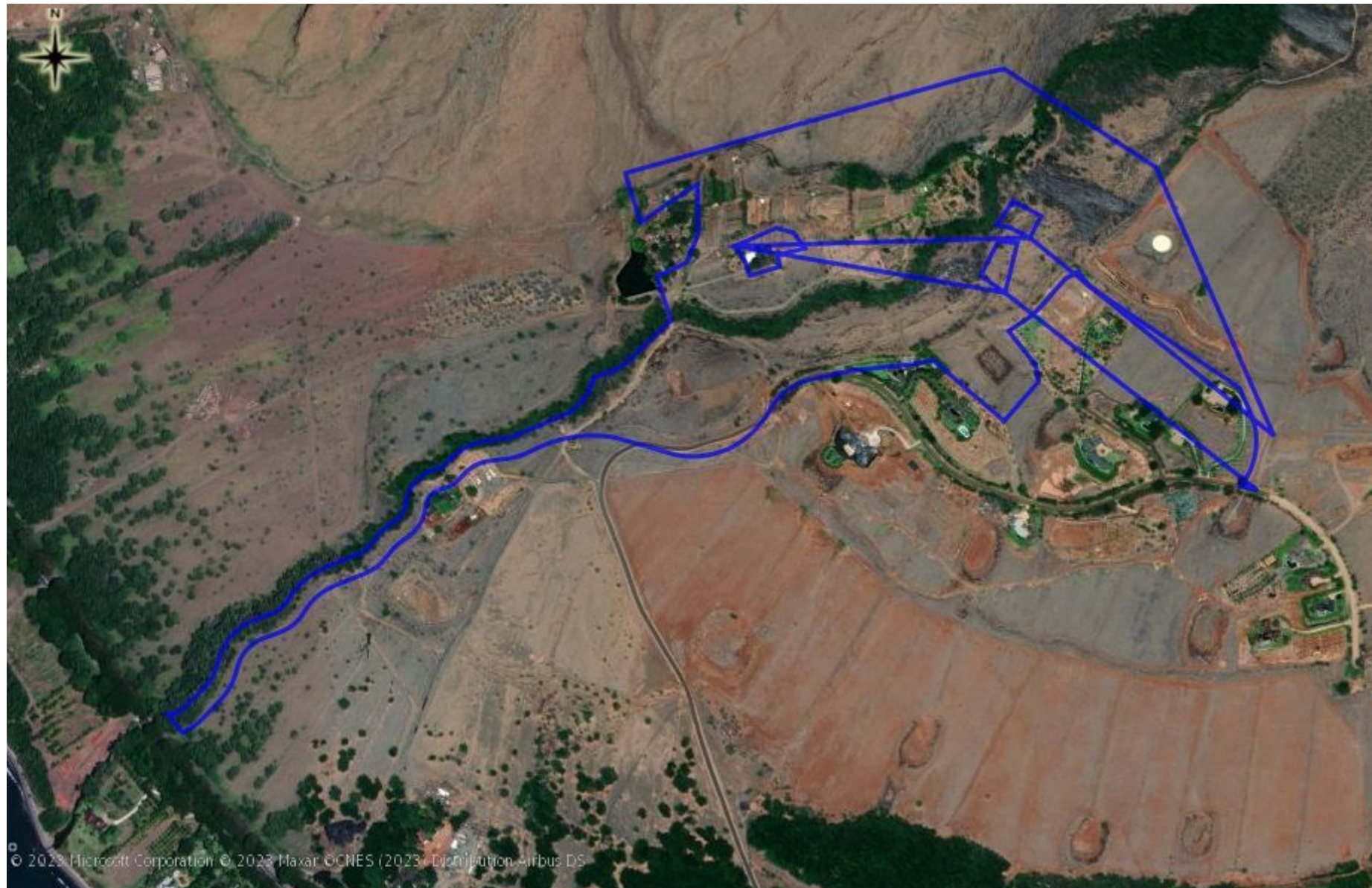
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08/29/2021

MEMORANDUM

To: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management
Fr: Trisha Kehaulani Watson, J.D., Ph.D.
Honua Consulting, LLC
Re: *Ka Pa'akai* Analysis Memo
Olowalu Water Co. GWUPA
Well Number 6-4936-001 (Olowalu Elua) and OWC 2
Date: July 1, 2023

Executive Summary

Olowalu Water Company has applied to the State of Hawaii Department of Land and Natural Resources Commission on Water Resource Management (CMRW) for a Ground Water Use Permit (GWUPA). The application is for the existing use of Well Number 6-4936-001 (Olowalu Elua) and for the proposed use of Well OWC 2. This *Ka Pa'akai* analysis was completed by Honua Consulting, LLC for consideration by CWRM.

A full *Ka Pa'akai* analysis was completed. There are numerous cultural resources (archaeological resources) identified in the areas near the project area. The existing use and ditch do not impact these resources and continued use should not impact these resources. There were also no traditional or customary practices identified within the immediate boundaries project area, although there are cultural practices in the surrounding area, including in the nearby Olowalu Cultural Preserve. The potential that the proposed action would affect or impair these resources is negligible, but standard archaeological best practices are recommended to ensure the nearby cultural resources are not impacted. Environmental monitoring of the nearshore marine system is also recommended to ensure that the action does not impact the coastal environment's nutrient budget. Additionally, best management practices should be implemented to ensure that no unanticipated affects to cultural resources occur and that there is a mechanism in place for practitioners to report any such potential occurrences to the project. It is also recommended that additional resources be allocated to the cultural preserve to increase the cultural practices taking place there.

Proposed Action

Olowalu Water Company has applied to the State of Hawaii Department of Land and Natural Resources Commission on Water Resource Management (CMRW) for a Ground Water Use Permit (GWUPA). The application is for the existing use of Well Number 6-4936-001 (Olowalu Elua) and for the proposed use of Well OWC 2. Research and ethnographic data were aggregated the necessary information to complete this *Ka Pa'akai* analysis.

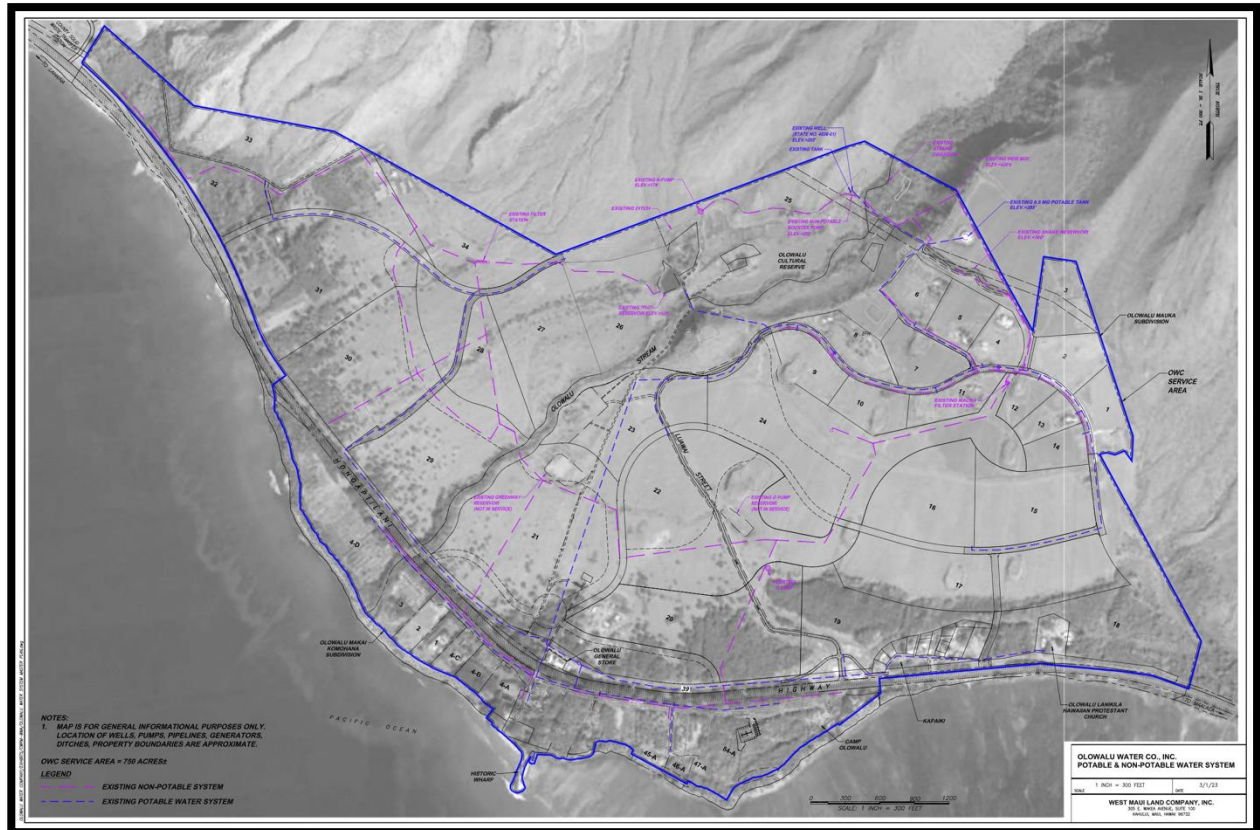


Figure 1. Project Site Location

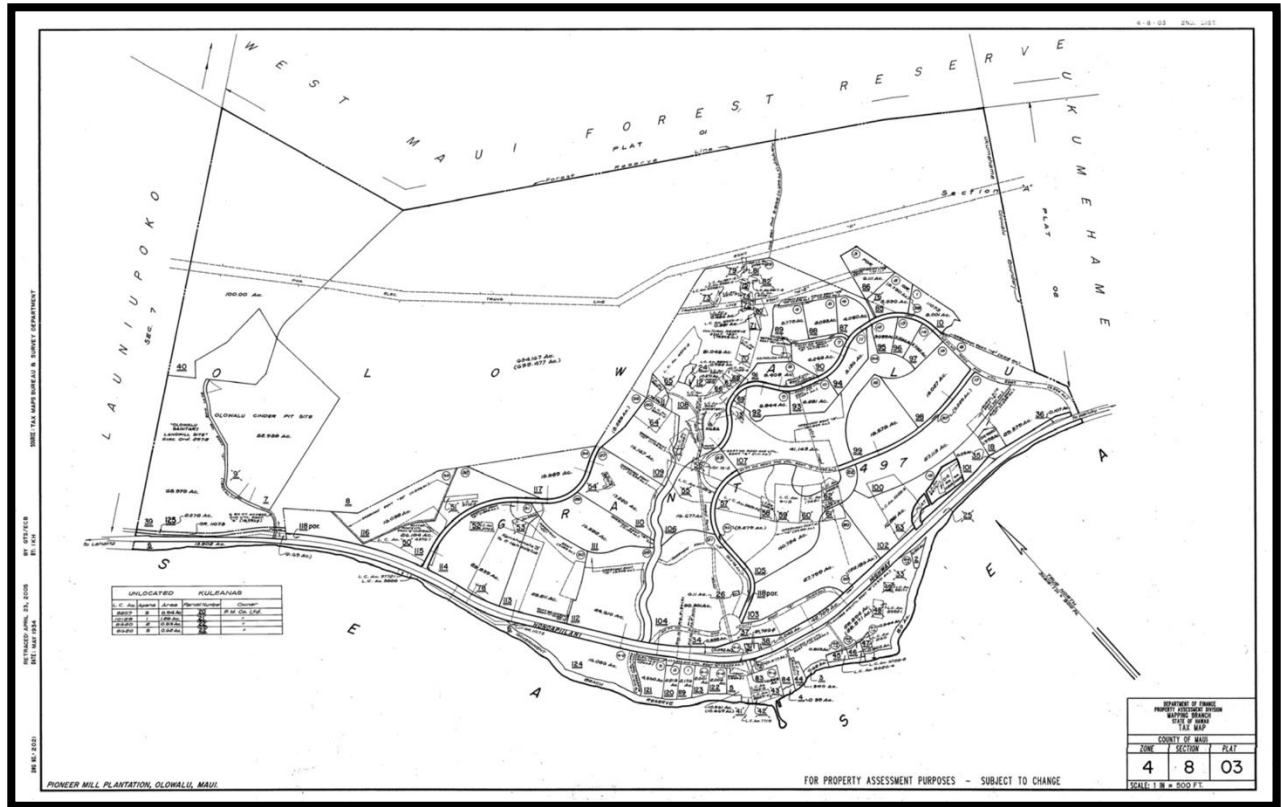


Figure 2. Project Site Location

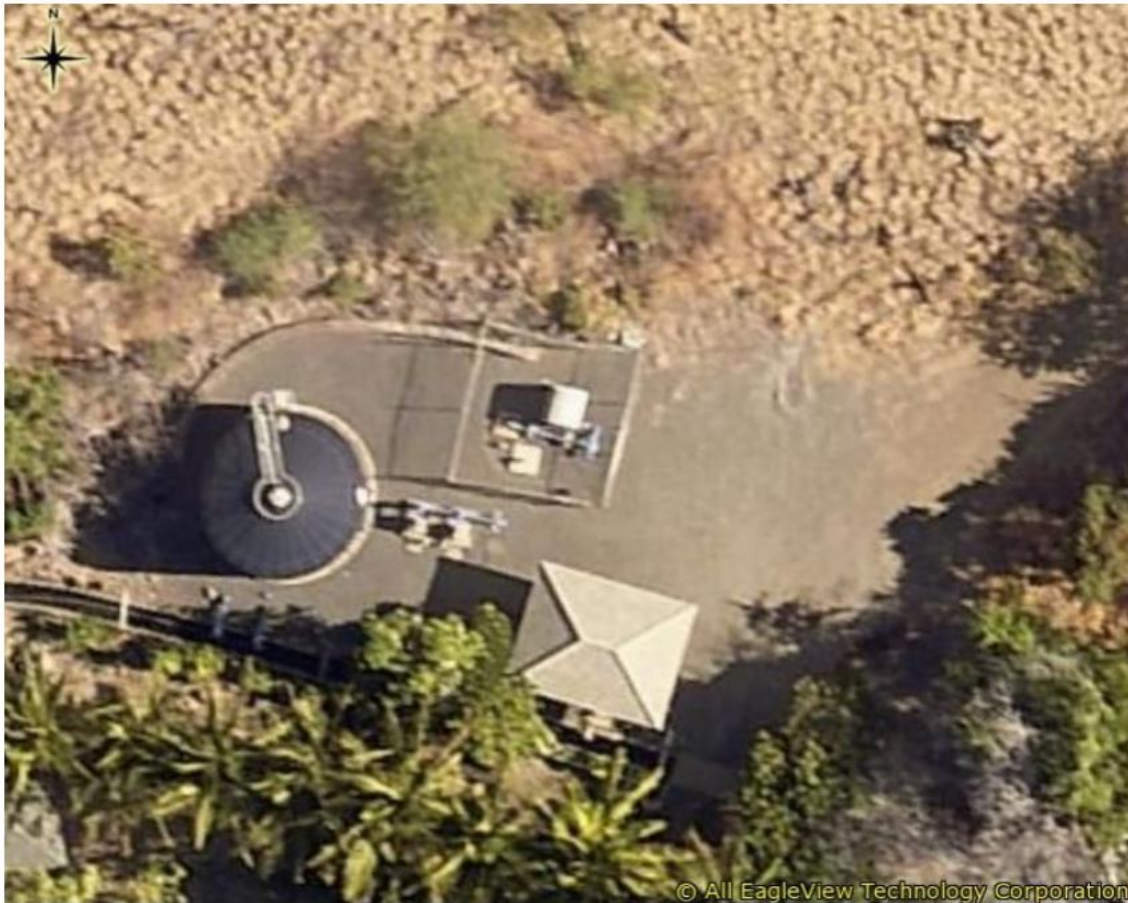


Figure 3. Olowalu Well 1

Background and Compliance Standards

The State and its agencies have an obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible.¹ State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices. In *Ka Pa'akai*, the Hawai'i Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

- 1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;

¹ Article XII, Section 7 of the Hawai'i State Constitution, *Ka Pa'akai O Ka 'Āina v. Land Use Commission*, 94 Haw. 31 [2000](*Ka Pa'akai*), Act 50 HSL 2000.

- 2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- 3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

The appropriate information concerning Olowalu ahupua'a was collected, focusing on areas near or adjacent to the project area.

Background Research

Honua Consulting, as part of its standard methodology, identifies wai (fresh water) sources within a project area and in the surrounding geographic extent and treats these resources as “cultural resources” under *Ka Pa'akai*. Honua also identifies and consults on potential impacts a project will have on cultural practices that utilize or are otherwise associated with wai.

Fresh water (wai) is of tremendous significance to Native Hawaiians. It is closely associated with a variety of Hawaiian gods. According to traditional accounts, Kāne and Kanaloa were the “water finders:” “Ka-ne and Kanaloa were the water-finders, opening springs and pools over all the islands, each pool known now as Ka-Wai-a-ke-Akua (The water provided by a god)” (Westervelt 1915: 38). Kāne is widely known to be closely associated with all forms of water, as outlined in the mele “He Mele No Kane.”

There was no element more important or precious than water. There was no god more powerful than Kāne. Pua Kanahale recounts the oli “‘O Kāne, ‘o wai ia alii o Hawai‘i?” and notes of the oli: “The chant begins with Kāne and focuses on this deity as the connective force of all the po'e akua, or god family. All the entities mentioned in each paukū, or verse, are a manifestation of Kāne” (2011: 24). The association between water and Kāne is logical considering certain interpretations of Hawaiian mythology identify Kāne as the most powerful of all the Hawaiian gods.

Further investigation into the relationship between Kāne and Pele would be appropriate and helpful. Some interpretations identify Kāne as Pele's father (Westervelt 1915). A full analysis of the different perspectives on Pele and Kāne would be helpful to refining an approach in developing community education programs for geothermal energy and culture. A brief analysis is provided below.

He Mele No Kane asks:

E ui aku ana au ia oe,
Aia i hea ka Wai a Kane?

One question I ask of you:
Where flows the water of Kane?

Aia i lalo, i ka honua, i ka Wai hu,
I ka wai kau a Kane me Kanaloa-
He waipuna, he wai e inu,
He wai e mana, he wai e ola,
E ola no, ea!

Deep in the ground, in the gushing spring,
In the ducts of Kane and Kanaloa,
A well spring of water, to quaff,
A water of magic power- The water of life!
Life! O give us this life!

This mele and other mo'olelo are clear: Kāne is water. It is deeply valued among the Hawaiian people. The only exceptions may be mist, known to be associated with Lilinoa, and snow, associated with Poliahu. There is an extensive body of traditional knowledge about the expeditions of Kāne and Kanaloa during which Kāne drove his 'ō'ō (digging stick) into the earth in search of water.

There is heightened sensitivity regarding water on Maui, where the project is located. Contemporaneous protections around water as a “public trust resource” extend back to the Kingdom, where the concept of owning water contradicted Hawaiian cultural values and traditions. Under the monarchy, control of water was reserved for use by the people who lived on and worked the land. The use of surface water was strictly controlled through the kapu system to ensure that all land tenants enjoyed an abundant availability of water. Farming, particularly kalo or taro, occurred regularly, especially in places with notably fertile lands like those found in the watersheds of Maui. As early as 1839, the public use of water was codified by Kauikeaouli, Kamehameha III. His “Respecting Water for Irrigation” law stated: “In all places which are watered by irrigation, those farms which have not formally received a division of water, shall, when this new regulation respecting lands is circulated, be supplied in accordance with this law, the design of which is to correct in full all those abuses which men have introduced. All those farms which were formally denied a division of water, shall receive their equal proportion. Those bounties which God has provided for the several places should be equally distributed, in order that there may be an equal distribution of happiness among all those who labor in those places” (Cited in *Reppun v. Board of Water Supply*, 656 P.2d 57 1982). This public right eventually found its way into existing law, where the Hawaii Water Code continues to recognize and protect traditional farming and mahi 'ai (farmers).

It is critical for this *Ka Pa'akai* analysis to consider impacts to cultural practices, even when the practices may take place outside the project area if project activities within the project area have the potential to impact traditional practices and customs. In this particular case, it is appropriate to carefully consider the impact water usage may have on farmers and other practitioners within the watershed(s) from which the water for this project will be drawn. Even though this project area is near the shoreline, if the water usage potentially results in an allocation of water that diverts those resources from cultural and/or traditional uses, that potential impact should be considered. Based on the information provided by the client, there is no evidence that water usage of this well will impact traditional or customary practices.

In addition to the analysis of water provided above, a listing of place names as provided in the newly released book *‘Olu‘olu nā Mauna o ‘E‘eka* is provided below in its entirety. The book, published in late September 2022, was commissioned by the North Beach-West Maui Benefit Fund Inc. and developed by a cultural scholar in consultation with kūpuna and area descendants and represents a comprehensive listing of valued places in West Maui. In his foreword, attorney Lance D. Collins writes of the community’s collaborative efforts in the development and publication of this text, stating: “The HK West Maui Community Fund expresses its profound gratitude to the North Beach-West Maui Benefit Fund for agreeing to publish this important work for a general, public audience. Both organizations hope this project will continue to deepen interested in the study and understanding of West Maui and its peoples as well as the collecting of traditional place-names throughout Hawai‘i.” As the assemblage of place names below was collected by the community, it is surely a comprehensive and contemporaneous collection of community and cultural knowledge.

Table 1. Listing of Place Names from Olu‘olu nā Mauna o ‘E‘eka (2022)

Name	Meaning and Description
Auau	‘Au‘au Literally, to bathe. Channel between Maui and Lāna‘i
Halepohaku	Halepōhaku Hale-pōhaku Literally, stone house. Mountain peak (3,786 feet) between the valleys of Olowalu and Ukumehame
Hau	See Kai o Hau
Hawaiikekee	Meaning underdetermined, perhaps: distorted Hawai‘i ‘Ili in the ahupua‘a of Olowalu

<p>Hawaii Route 30</p>	<p>Otherwise known as “Honoapiilani Meaning Bay(s) of Pi’ilani; figuratively, the islands joined [hono] by Pi’ilani.</p> <p>“...ua wail Kapalua wale iho no o Lahaina i ka laī, ma kona hoopuni ia ana e na mokupuni, nolaila mai kekahi inoa ona, via hoi na Honoapiilani, a me he mea ia, ekolu inoa o keia kulanakauhale, he oiaio no, ekolu wale inoa, o Lele kona inoa kahiko, o Lahaina, he inoa hou ia, a o na Honoapiilani, he inoa mua no ia. [...Lahaina in the calm is bordered on two sides as it is surrounded by the islands; that’s where one of its names comes from, Nāhonoapi’ilani and it’s as if this town has three names, Lele is its ancient name, Lahaina is a new name, and Nāhonoapi’ilani is a former name.]” /Ke Au Okoa, Buke 7, Helu 28, 26 ‘Okakopa 1871/ “Lahaina is said by early native writers to have had two other names in ancient times, it being first known as Honoapiilani. Subsequently this was changed to Lele, and in later times to Lahaina-as known to this day.” /SOM 70/ Variants: Nā Hono a [‘o] Pi’ilani.</p>
<p>Hekili</p>	<p>Literally, thunder</p> <p>Shoreline port in the ahupua’a of Olowalu. Variants: Hekili Point, L. Hekili, Lae o Hekili</p>
<p>Honoapiilani Highway</p>	<p>Meaning Bay(s) of Pi’ilani. Hawai’i route 30, which extends south from the town of Wailuku [Wailuku] towards Mā’alaea, turns west into the moku of Lahaina, and continues north through to the moku of Kā’anapali, terminating in the ahupua’a of Honokōhau.</p>

Hono o na Moku	<p>Literally, Bay of islands.</p> <p>A poetic name for the seas found between the islands of Maui, Lānaʻi and Molokaʻi. Variant: Hawaii Route 30</p>
Kailiili	<p>Literally, the pebble</p> <p>Shoreline area along Mōpua, ahupuaʻa of Olowalu</p>
Kai o Haui	<p>Kai o Haui meaning sea of Haui</p> <p>“hau i a word known only in the chant called Haui ka lani...; according to Andrews...an ancient, poetical name for the hāʻule which he translates ‘fallen’ but more probably has, to strike + -i, transitivizer. A more accurate translation of the chant’s title is “the chief is struck down.”...A less plausible interpretation is hau i ka lani, offer to the royal chief.” /HD/; “Hau i (haʻ-uʻi), n. I. A mythological character conspicuous in Hawaiian tradition. Haui was said to be the first of Hawaii’s aliis, or chiefs, and a Demi-god: O Haui ka lani, he alii kieke, Haui is the lani (highest), a distinguished chief, He kumu alii, he kumu akua. Begetter of chiefs, origin of the gods. 2. The title of a chief, as a noble, a descendant of kings,” /Parker/</p> <p>“Kai-o-Hau i, sea from Lahaina to Maalaea.” /SOM 5/</p>

Kalolopahu	<p>Literally, the exploding brains.</p> <p>The name of the 1789 massacre that happened off the shore of Olowalu. Enraged at the death of one of his watchmen and the appropriation of one of his small boats in Mākena, Captain Simon Metcalf pursued those who he accused as the perpetrators to Olowalu in his vessel, the Eleanora. Upon return of some of the watchman's remains, as well as the keel of the boat, Captain Metcalf lured the villagers of Olowalu toward the Eleanora and opened fire with his cannons, slaughtering over a hundred villagers.</p> <p>Variant: Olowalu Massacre</p>
Kaluaaha	<p>Literally, In defining another region of the same name, "Ka-lua-‘aha...lit., the gathering pit." /PNOH/</p> <p>‘Ili in the ahupua’a of Olowalu.</p> <p>Variants: Kaluaaho, Kaluaana, Kaluaha</p>
Kaluaaho	<p>Literally, In defining another region of the same name, "Ka-lua-‘aha...lit., the gathering pit." /PNOH/</p> <p>‘Ili in the ahupua’a of Olowalu.</p> <p>Variants: Kaluaaho, Kaluaana, Kaluaha</p>
Lae o Hekili	<p>Literally, thunder</p> <p>Shoreline port in the ahupua’a of Olowalu.</p> <p>Variants: Hekili Point, L. Hekili, Lae o Hekili</p>

<p>Lahaina</p>	<p>Pronunciation and meaning underdetermined, perhaps: “lahaina n. 1. A variety of sugar cane, usually free tasseling, heavy stooling, and with rather semi erect to recumbent growth; large, long heavy tops...2. A variety of sweet potato...3. Poising; leaping.” /HD/; or, lā hainā—merciless sun.</p> <p>The name of one of three moku of Maui Komohana. Lahaina is also the name of the kalana found in the moku of Lahaina. From 1820 to 1845, Lahaina was the capital of the Hawaiian Kingdom.</p> <p>Although scholars provide evidence that an older pronunciation for Lahaina was “Lāhainā,” most modern-day scholars choose the spelling that reflects modern-day pronunciation, “Lahaina.” Even in the vast majority of her works, native Hawaiian speaker and renowned scholar Mary Kawena Pukui chose to represent this place name without diacritical markings, as have other contemporary scholars. This is likewise reflected in the pronunciations of residents, kūpuna, and in recordings of mānaleo. “...ua waiho kapalua wale iho no o Lahaina I ka lai, ma Kona hoopuni ia ana e na mokupuni, nolaila man kekahi inoa ona, oia hoi na Honoapiilani, a me he mea ia, ekolu inoa o kea kulanakauhale, he oiaio no, ekolu wale inoa, o Lele Kona inoa kahiko, o Lahaina, he inoa you ia, a o na Honoapiilani, he inoa mum no ia. [...Lahaina in the calm is bordered on two sides as it is surrounded by the islands; that’s where one of its names comes from Nāhonoapi’ilani, and it’s as if this town has three names, it’s true, only three names; Lele is its ancient name, Lahaina is a new name,</p>
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	<p>and Nāhonopi'ilani is a former name.]” /Ke Au Okoa, Buke 7, Helu 28, 26 ‘Okakopa 1871/</p> <p>Variants: Lāhainā, Lāhaina, Raheina</p>
Liha	<p>Meaning: underdetermined, perhaps: “liha. 1. N. Nit, louse egg. Also, lia. 2. Same as liliha; dreadful, fearful. “ /HD/</p> <p>Peak below Līhau, found between the valleys of launiupoko and Olowalu.</p>
Lihau	<p>“lī.hau. 1. nvi. Gentle cool rain that was considered lucky for fishermen (Ul. 241); moist and fresh, as plants in the dew or rain; cool, fresh, as dew-laden air ... 2. N. A variety of sweet potato (no data).” /HD/</p> <p>Storied mountain and peak (4,193 feet) between the valleys of Launiupoko and Olowalu.</p> <p>“Ma ia po no ua hala aku la ua kamaeu nei mauka, a ua hele pololei aku oia a hiki i ka hale o na makua pono i o Lihau e noho mai ana me na manao o ka pihoihoi no keia owela o ke ahi ma ke kai a ia Mekanikeoe i hiki aku ai malaila ua loli ae la kona mau helehelena e like me ka nui nohea oia aina Lihau a oia ka kona makuakane Puukilea i pane ae ai i kana wahine Punahoa Auhea oe e kuu wahine? [That night this mischievous one disappeared inland, and he went directly to the house of Lihau’s own parents, who were sitting there wondering about the flow of fire upon the ocean. As Mekanikeoe arrived, his features changed to match that of the youthful beauty of the land, Lihau, and</p>

	<p>that is how her father Pu'ukilea repsonded to his wife Punahoa. Say, my wife?]" /<i>Ka Leo o ka Lahui</i>, Buke 2, Helu 942, 16 Mei 1894/</p> <p>"He wahine ui io maoli no keia. Aohe lua e loaa ai kona ui ma Maui a puni, koe wale o Waialohiikalauakolea, ke aliiwahine i hanaiia iluna o ka piko o ke kuahiwi o Haleakala. O keiki kaikamahine hoi o Lihau, oia ke kaikamahine a Pa'upa'u ame Aalaloloa, he mau alii nui no na kuahiwi o Maui komohana; a he mau kupua nohoi laua me kekahi keiki keia na Kalikoluamea (k) ame Kupulanakehau (w). A mamuli o Lihau ula ke koahanau o Wakea i heaia ai keiki kaikamahine o Lihau. [This was truly an exceedingly beautiful woman. Her beautyf was unmatched around Maui, except for that of Wai'alohiikalau"ākōlea, the princess who was raised upon the peak of the mountain of Haleakalā. As for this girl Pīhau, she was the daughter of Pa'upa'u and 'A'alaloloa, chiefs of the mountains of Maui Komohana; and these two were also demigods of sorts. And they were all family from within the line of Līhau'ula, a sibling of Wāke. They were children of Kahikoluamea (m) and Kupulanakēhau (f). It was after Līhau'ula, the sibling of Wākea, that this girl was called Līhau.]" / <i>Ka Na'i Aupuni</i>, Buke 3, Helu 115, 10 Iune 1907/</p> <p>Variant: Lihauwaiekeekeikalani</p>
Lihauawaiekeekeikalani	<p>Literally, Līhau of the waters that recede into the heavens.</p> <p>A name for Līhau, the moutain and peak (4,193 feet) between the valleys of Launiupoko and Olowalu. See a/so: Līhau.</p>

	<p>Regarding Lahaina: “Kona Maui Hiohiona: Ua paku ia mai oia e ka lalani mauna o Lihaukaiekeekeikalani, ka maina nona na lehua kaulana e lei ia’i e na kamalii o kakou iloko o kona mau la, a i piiuniia mai hoi e na mokupuni eha.... [Its attributes: It is partitioned by the mountain line of Lihauwai’eke’ekeikalani, the mountain to which belongs the famed lehua worn as garlands by our children during its days, and surrounded by the four islands....]” / <i>Ke Au Okoa</i>, Buke 7, Helu 28, 26 ‘Okakopa 1871/</p>
Mopua	<p>Literally, melodious (said to be the name of a legendary character).” /PNOH/</p> <p>‘Ili along the shoreline in the ahupua’a of Olowalu</p>
Nalowale	<p>nalo.wale. vs. Lost, gone, forgotten, vanished, missing, hidden, extinct, disappeared (especially if unaccountably so).” /HD/</p> <p>Name given to a small heiau in the vicinity of the Kawaialoa heiau in the ahupua’a of Olowalu, the name of which has been lost (nalewale).</p>
Olowalu	<p>Meaning: “olo.walu...1. Mvi. Joint action; simultaneous sounds; din of many voices, sounds, as of horns or roosters; to rush or attack in concert; a group, as of hills (olowalu pu’u)... 2. n. Storehouse, as for chiefs’ property. Rare.” /HD/</p> <p>Valley, stream, peninsula, ahupua’a, and sugar plantation in the moku of Lahaina, situated between the ahupua’a of ‘Ukumehame and Launiupoko. The site of the former Olowalu Mill of the Olowalu Company and the Olowalu Landing.</p>

Olowalu Gap	<p>Meaning: No Hawaiian name yet recovered.</p> <p>Low spot on the ridge between the valleys of Olowalu and 'Iao (Wailuku)</p>
Olowalu Kanakila Church	<p>Lanakila Meaning Victorious</p> <p>Historic church and cemetery founded in 1835 by E. Spaulding in the Mōpua vicinity of the ahupua'a of Olowalu. The church burned down around 1930. /Olowalu Lanakila Hawaiian Church/</p>
Olowalu Massacre	See Kalolopahu
Olualu	See Olowalu
Paumaumau	<p>Paumaumau Pa'umaumau Pa'ūmaumau Pau-maumau Pa'u-maumau Pa'ūmaumau</p> <p>Pronunciation and meaning undetermined, perhaps the pau-maumau—forever done; pa'u maumau—continued tedium; or, pa'ū maumau—continuously damp.</p> <p>'Ili in Olowalu</p>
Pioneer Mill Company	Historic sugar mill in the town of Lahaina, moku of Lahaina

<p>Punahoa</p>	<p>Literally, companion spring.</p> <p>Shoreline and spring near the mouth of the Olowalu Stream in the ahupua’a of Olowalu.</p> <p>“Ma ia po no ua hala aku la ua kamaeu nei mauka, a ua hele pololei Aku dia a hiki i ka hale o na makua ponoī o Lihau e noho mai ana me na manao o ka pihoihoi no keia owela o ke ahi ma ke kai a ia Makanikeoe i hiki aku ai malaila ua loli ae la kona mau helehelena e like me ka ui nohea oia aina Lihau a oia ka kona makuakane Puukilea i pane ae ai i kana wahine Punahoa Auhea oe e kuu wahine? [That night this mischievous one disappeared inland, and he went directly to the house of Lihau’s own parents, who were sitting there wondering about the glow of fire upon the ocean. As Makenikeoe arrived, his features changed to match that of the youthful beauty of that land. Lihau, and that is how her father Pu’ukilea responded to his wife Punahoa. Say, my wife?] /Ka Leo o ka Lahui, Buke 2. Helu 942, 16 Mei 1894/</p>
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<p>Puu Kilea</p>	<p>Literally, small but conspicuous hill. /PNOH/</p> <p>Famed hill in the ahupua'a of Olowalu, just north of the Kawaialoa heiau. The north side of the hill features impressive panels of pre-contact and contemporary petroglyphs. On the northwest side can be found the "Olowalu Bluff Shelter (Bishop Museum Site M-4)." Graves have also been recorded on the summit of this hill.</p> <p>"Ma ia po no ua hala aku la ua kamaeu nei mauka, a ua hele pololei Aku dia a hiki i ka hale o na makua pono i Lihau e noho mai ana me na manao o ka pihoihoi no keia owela o ke ahi ma ke kai a ia Mekanikeoe i hiki aku ai malaila ua loli ae la kona mau helehelena e like me ka ui nohea oia aina Lihau a oia ka kona makuakane Puukilea i pane ae ai i kana wahine Punahoa Auhea oe e kuu wahine? [That night this mischievous one disappeared inland, and he went directly to the house of Lihau's own parents, who were sitting there wondering about the glow of fire upon the ocean. As Mekanikeoe arrived, his features changed to match that of the youthful beauty of that land. Lihau, and that is how her father Pu'ukilea responded to his wife Punahoa. Say, my wife?] /Ka Leo o ka Lahui, Buke 2. Helu 942, 16 Mei 1894/ Variants: Puu Kilea, Puukilea</p>
<p>Puukoleaohilo</p>	<p>Pu'ukōleaohilo Pu'u-kolea-o-Hilo</p> <p>Meaning: plover of Hilo hill.</p> <p>"ili in the ahupua'a of Olowalu.</p>

	<p>Variants: Puukoliolio, Puukolihilo, Puukoleohilo</p>
Puukoleohilo	See Puukoleaohilo
Puukolihilo	See Puukoleaohilo
Puuokapolei	<p>Pu'uokapolei Pu'u-o-Kapolei</p> <p>Literally, Kapolei's hill.</p> <p>Unidentified region in the ahupua'a of Olowalu.</p> <p>“Maanei e hookomo ana makou i kekahi mahele pili i ka moolelo o Kamehemeha mahope iho o keiki kua ana i ‘Kakanilua’. A ua loa mai keia mahele mai kekahi mea paanaau moolelo Hawaii mai he alii hanau no hoi ia no ka aina. He eha la mahope iho o ke kua o Kakanilua, ua loa i na ‘līi o Hawaii na hookipa oluolu ia ana e ka Moi Kahekili o Maui. Ua olelo mai la o Kahekili i ua poe alii la o Hawaii a e ka’ulua iki lakou e noho ai, oia o Puuokapolei ma Olowalu. O ko lakou kalana ia a hoea i Lahaina. [Here we will put in a section about the history of Kamehameha just after battling at ‘Kakanilua.’ This section was gotten from a Hawaiian oral history keeper, one born as a chief from the land. Four days after the battle of Kakanilua, the chiefs of Hawaii received pleasant invitations by King Kahekili of Maui. Kahekili said to these chiefs of Hawaii to stay for a bit on Maui and to rest. The land that Kahekili gave to them as a place for them to stay, it was Pu’uokapolei at Olowalu. It was to be their district all the way to Lahaina.]” /Ka</p>

	Na'i Aupuni, Buke 1, Helu 21, 20 Kekemapa 1905/
Puu Ulaula	<p>Literally, Red Hill</p> <p>Point (3,058 feet) along Kaluako'i Ridge found along the boundary between the ahupua'a of Launiupoko and the ahupua'a of Kaua'ula in the katana of Lahaina.</p> <p>"Course 4 of the Launiupoko/Kauaula boundary runs 'up Luakoi ridge to the angle of the ridge (Puuulaula)' called 'Luakoi' (q.v.) on USGS; elevation 2800 ft." /Place Names (ULUK) /</p> <p>Variant: Ulaula.</p>
Ulaula	See Puu Ulaula
Unahi	<p>Literally, Fish scale.</p> <p>A fishing ground of the ahupua'a of Olowalu.</p>
Wailoa	<p>Literally, n. Name of a star near the Pleiades, said to be a member of the group called Kaulua. It is also said to be a name of an ancient chief. Lit., long stream. /PNOH/</p> <p>'Ili in the ahupua'a of Olowalu. Perhaps related to Kawaialoa.</p>

Additionally, historic documents show extensive agricultural activities occurred in Olowalu. This was largely due to the extent of the valley. House sites indicate that habitation was a traditional occurrence in the area. Numerous important historic sites are also present in Olowalu. Kawaialoa Heiau was located "on the rising ground south of Kilea Hill [the burial hill]." Olowalu Trail was an important alanui, or trail. There are also significant petroglyphs in Olowalu.

The Olowalu Cultural Reserve is also located in relative proximity to the project area, although distinctly outside its boundaries. Established as a 501(c)(3) organization named

Kipuka Olowalu, the organization was formed: “To perpetuate traditional and customary practices of kanaka maoli [Native Hawaiians] of these Hawaiian Islands and to regain the spiritual connection of hanai ‘āina of our Hawaiian ancestors by ensuring these beliefs and customs are passed down to future generations.” (See History of Kipuka Olowalu, Appendix A). The organization conducts traditional and customary practices in Olowalu for the purpose of restoring the land. Project includes lo‘i restoration, native plantings, invasive species removal, and re-establishing proper cultural protocols for all who enter.

A site visit was conducted on April 6, 2023. The following images are from that site visit:

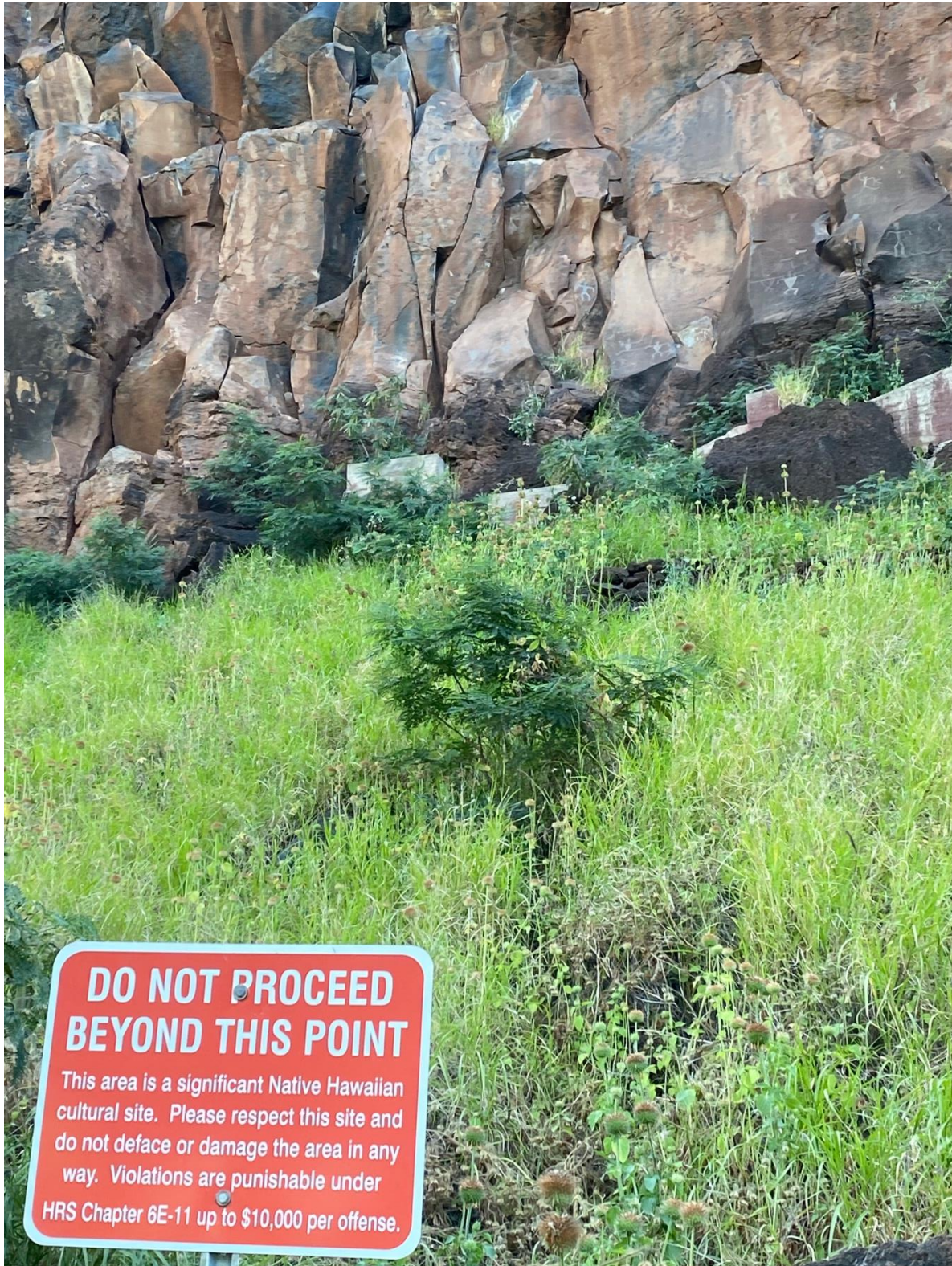


Figure 4. Signage in the foreground marking the location of the Olowalu Petroglyphs



Figure 5. Photo of stream and diversion location



Figure 6. The Olowalu Cultural Preserve, with lo'i kalo



Figure 7. Olowalu Shaft

Ethnographic Data

Individuals with lineal and cultural ties were invited to be interviewed. One is a lineal descendant of Olowalu with direct lineage to the Pu'u Kīlea cemetery and burial pu'u (hill). The second is a lineal descendant to west Maui.

A summary of each interview was sent first to the individual interviewed for review. Consent to participate in the assessment is obtained from each individual. Consent is obtained verbally or in writing and kept on file with Honua Consulting.

The interviewee provided a rich body of information about the project area and larger geographic extent. All information provided by the interviewees was followed up on with extensive research and incorporated throughout the body of the assessment, with particular emphasis on integrating the information provided in the interviews into this memo.

Interview with Elmer Ka'ai

Interviewer: Trisha Kehaulani Watson

Interviewee: Elmer Ka'ai

Date: 6/01/2023

Location: In person

Biography

Mr. Ka'ai is a director of government and community affairs. He was born and raised in Honolulu, where he currently lives. He has strong lineal ties to Olowalu and still regularly visits and cares for the burial pu'u where his family is buried.

Overview

Mr. Ka'ai is a lineal descendent of the area, with ancestors who first settled Olowalu. He mentioned that he still has family who lives there, and Mr. Ka'ai's grandfather was born and raised in the area. His grandfather told him stories about how they were self-sustaining in the valley by using its resources.

General Discussion

As a cultural and lineal descendent of the project area, Mr. Ka'ai brings an understanding of Olowalu and the surrounding area. He does not support water diversions for more housing, especially if the housing is not for local people. He understands that it's an existing use, but he does not support how West Maui is being over-developed.

Cultural Resources

Mr. Ka'ai noted that there are culturally significant sites in the area. The first is a pu'u with the petroglyphs. The other site is the cultural reserve, which primarily consists of cultural agricultural resources. There are also other important historic sites right next to the stream, as families actively lived in that area. Mr. Ka'ai mentioned that there are known burials in the valley, and further noted that there may be unknown burials at lower elevations closer to the project site.

Mr. Ka'ai explained that the nearby Olowalu Valley is sacred, standing as a connection between 'Iao Valley and the south side.

Traditions and Customs

Mr. Ka'ai noted that his family are caretakers of the cultural reserve, which includes maintaining lo'i, and terraces. There are currently efforts to revitalize the area against a backdrop of continued development. It is important to Mr. Ka'ai, lineal descendants, and residents that whatever is in the valley can continue on.

Impacts

Mr. Ka'ai has less concern about ground water use than he does surface water use. He believes that the development already has the use of its own well and that source should be the extent of the water provided for residential development. He would be concerned about new construction if there is any.

Mitigation Measures and Recommendations

Mr. Ka'ai believes that should the project proceed, the Commission should put strong limits on the use of water for landscaping. He notes that other places (like Las Vegas) do not allow for landscaping and limit new housing to hardscaping or xeriscaping. He thinks it's inappropriate to have lush yards with foreign plants when there are ongoing water shortages and Hawaiians struggling to maintain lo'i that they need to feed their families with.

Mr. Ka'ai also provided the following images of and from the burial pu'u.



Figure 8. View of Olowalu Valley from pu'u. The diversion location can be seen in the distance.



Figure 9. View from pu'u



Figure 10. Designated marker at burial pu'u



Figure 11. Burial mound on pu'u



Figure 12. Coastal waters as seen from pu'u

Interview with Hinalaimoana Wong-Kalu

Interviewer: Trisha Kehaulani Watson

Interviewee: Hinalaimoana Wong-Kalu

Date: 6/01/2023

Location: In person

Biography

Hinaleimoana Kwai Kong Wong-Kalu, known affectionately as “Kumu Hina”, is a Native Hawaiian māhū – a traditional third gender person who occupies “a place in the middle” between male and female, as well as a modern transgender woman. She is known for her work as a kumu hula, a filmmaker, and as a community leader in the field of Kanaka Maoli language and cultural preservation. She teaches Native Hawaiian philosophy and traditions while promoting cross-cultural alliances throughout the Pacific Islands. Described as a “powerful performer with a clear, strong voice”, she has been hailed as a cultural icon, and is a prominent leader in our community today.

Kumu Hina was born in the Nu‘uanu district of O‘ahu, but she is a lineal descendant of West Maui. Her maternal side of the family lived in Honokohau. She is a lineal descendant to the Honokahua burial preserve, with ‘ohana buried there. Her family had a home in Napili – Honokōwai where she spent a lot of her time growing up.

She attended Kamehameha Schools and the University of Hawai‘i at Mānoa, where she began her activism journey. She is a founder of the Kulia Na Mamo transgender health project, a former Hawaiian language kumu at Leeward Community College, and candidate for the Office of Hawaiian Affairs, notably being one of the first transgender candidates for statewide political office in the United States. She also served as the Chair of the O‘ahu Island Burial Council and was cultural director of Hālau Lokahi Public Charter School. She is a recipient of the National Education Association Ellison Onizuka Human and Civil Rights Award, Native Hawaiian Community Educator of the year, and a White House Champion of Change. Recently, USA Today named Wong-Kalu one of ten Women of the Century from Hawai‘i. In 2020, Kumu Hina directed, produced and narrated *Kapaemahu*, an animated short film based on the Hawaiian story of four legendary māhū who brought the healing arts from Tahiti to Hawai‘i.

Overview

Ms. Wong-Kalu has lineal ties to West Maui. She recounts how the water diversions in the area directly led to her family’s inability to farm their lo‘i. The result was an inability to use their land to sustain themselves and this forced them to from their subsistence lifestyle, which they had been practicing for generations.

General Discussion

As a cultural and lineal descendent of West Maui and a highly regarded cultural practitioner, Ms. Wong-Kalu brings a critical perspective of how such diversion practices have long adversely affected Hawaiian families in West Maui and how its adversely effected traditional practices and ways of life.

Cultural Resources

Ms. Wong-Kalu emphasized how all of West Maui is interconnected. From an ecological standpoint, it's one region with a series of overlapping resources. The water is a cultural resource, and a very important one. The food that comes from these lo'i feeds families. This food is a cultural resource too. As are the places, which have been used for generations, as sites of cultural practices.

Traditions and Customs

Ms. Wong-Kalu notes that West Maui was an important, thriving community of kānaka. Each bay and valley had a thriving community where the 'ohana lived and flourished. While farming was among the most important practice, every practice associated with Hawaiian living occurred in West Maui.

Impacts

These kānaka were largely forced out by development and the plantations. Then plantations became housing. She doesn't think the water should be diverted at all, because of the impacts it has on Hawaiians.

Mitigation Measures and Recommendations

Ms. Wong-Kalu did not provide any mitigation measures for the action, she just strongly believes water should be left for the families that live on the land.

Analysis

As previously noted in this memo, in *Ka Pa'akai*, the Hawai'i Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through the following three-part test:

- 1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
- 2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- 3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area.

Through the research and ethnographic data, numerous cultural resources were identified in the surrounding geographic extent, and there are numerous resources near the wells, which already exists. If there is new construction required for this permit, there should be careful consideration of the cultural resources in the area. An archaeological survey should be completed to ensure no sites are impacted by any new construction.

There are numerous cultural sites in the nearby area, including a burial pu'u and cultural preserve. There are numerous identified traditions or customs in the surrounding area, including ceremonial practices, agricultural practices and fishing. There are also petroglyphs and habitation sites in Olowalu, as well as the historic Olowalu Trail.

The potential that the proposed action would lead to any new effect or impairment of these resources is negligible because it is an existing use, but there is no doubt that historically water diversions have been devastating to traditional practices and Hawaiian communities. The Commission is best suited to determine if there are kalo farmers in the area that use this surface water, and if so, the Commission should ensure these farmers and practitioners have sufficient water for their needs.

Environmental monitoring of the nearshore marine system is also recommended to ensure that the action does not impact the coastal environment's nutrient budget. Additionally, best management practices should be implemented to ensure that no unanticipated affects to cultural resources occur and that there is a mechanism in place for practitioners to report any such potential occurrences to the project. It is also recommended that additional resources be allocated to the cultural preserve to increase the cultural practices taking place there. From observations during the site visit, the lo'i kalo is overgrown and seems dry. With additional resources, including perhaps additional water, the preserve has the potential to become a vibrant hub of cultural practice.

The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action.

Of the identified cultural resources and traditional and customary practices that occur in the surrounding project area, the potential that the proposed action would newly affect or impair these resources is negligible.

The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

As this application is for an existing use, the potential for any new effect or impairment of cultural resources (including practices) is negligible, no action is required to protect Native Hawaiian rights. Nonetheless, best management practices should be implemented to ensure that no unanticipated affects to cultural resources occur and that there is a mechanism in place for practitioners to report any such potential occurrences to the project. Additionally, should new development result from this action, there should be limits to landscaping that minimize water use and traditional access for practitioners should be guaranteed and protected.

LOWALU WATER COMPANY, INC.**WATER CONSERVATION POLICY**

Wise water use is essential to ensure there is enough water to serve everyone. All customers are strongly encouraged to adopt as many of the following water conservation measures as are applicable.

1) Indoor Applications

- (1) Replace all old, inefficient toilets, inefficient bathroom faucets, aerators and showerheads with WaterSense labeled models. WaterSense labeled products are 20 percent more water-efficient and perform as well as or better than standard models.
- (2) Giving a home's main bathroom a high-efficiency makeover by installing a WaterSense labeled toilet, showerhead, and faucet aerator can pay for itself in as little as 1 year.

2) Outdoor Applications

- (1) If you have a non-potable meter, use it for outdoor irrigation rather than potable water. It will make the most of what little surface water Mother Nature provides and will reduce ground water withdrawal from the aquifer.
- (2) Use drip irrigation for hedges, orchard plants and trees, vegetable and ornamental flower gardens.
- (3) Water lawns only at dawn or dusk to reduce evaporation and set timers to minimize sprinkler use.
- (4) Maintain your sprinkler system, replace broken heads, check for and repair leaks, adjust timers for rain. Replacing a clock-based controller with a WaterSense labeled irrigation controller can reduce an average home's irrigation water use by up to 30 percent and can save an average home up to 15,000 gallons of water annually.
- (5) Add mulch around shrubs and plants to help reduce evaporation. See article by Dominic Pastillo on our website for tips <https://westmauiwater.com/conservation> .
- (6) Wash your car at an automated car wash that recycles water or use a bucket instead of a hose.

- (7) Use a broom or blower instead of a hose to clean sidewalks, patios and driveways.
- (8) Design new landscaping for new dwellings or additions to favor drought tolerant design that minimizes lawn area and uses native and low water, drought resistant plants.

Please see the following websites for additional conservation measures

<https://westmauiwater.com/conservation>

<https://www.epa.gov/watersense/statistics-and-facts>

To report a water waste concern, please contact us at (808) 877-4202 or utility@westmauiwater.com.

AWWA Free Water Audit Software v5.0

American Water Works Association Copyright © 2014, All Rights Reserved.

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:

Email Address:

Telephone | Ext.:

Name of City / Utility:

City/Town/Municipality:

State / Province:

Country:

Year: Calendar Year

Audit Preparation Date:

Volume Reporting Units:

PWSID / Other ID:

The following guidance will help you complete the Audit

All audit data are entered on the [Reporting Worksheet](#)

<input type="text"/>	Value can be entered by user
<input type="text"/>	Value calculated based on input data
<input type="text"/>	These cells contain recommended default values

Use of Option (Radio) Buttons: ☒ 0.25% ☐

Pcnt: Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

<p><u>Instructions</u></p> <p>The current sheet. Enter contact information and basic audit details (year, units etc)</p>	<p><u>Reporting Worksheet</u></p> <p>Enter the required data on this worksheet to calculate the water balance and data grading</p>	<p><u>Comments</u></p> <p>Enter comments to explain how values were calculated or to document data sources</p>	<p><u>Performance Indicators</u></p> <p>Review the performance indicators to evaluate the results of the audit</p>	<p><u>Water Balance</u></p> <p>The values entered in the Reporting Worksheet are used to populate the Water Balance</p>	<p><u>Dashboard</u></p> <p>A graphical summary of the water balance and Non-Revenue Water components</p>
<p><u>Grading Matrix</u></p> <p>Presents the possible grading options for each input component of the audit</p>	<p><u>Service Connection Diagram</u></p> <p>Diagrams depicting possible customer service connection line configurations</p>	<p><u>Definitions</u></p> <p>Use this sheet to understand the terms used in the audit process</p>	<p><u>Loss Control Planning</u></p> <p>Use this sheet to interpret the results of the audit validity score and performance indicators</p>	<p><u>Example Audits</u></p> <p>Reporting Worksheet and Performance Indicators examples are shown for two validated audits</p>	<p><u>Acknowledgements</u></p> <p>Acknowledgements for the AWWA Free Water Audit Software v5.0</p>

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

AWWA Free Water Audit Software: Reporting Worksheet						WAS v5.0 American Water Works Association Copyright © 2014, All Rights Reserved.																																																																																																																																			
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border-collapse: collapse;"><tr><td style="width: 40%;">Billed metered:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">6</td><td style="width: 20%; border: 1px solid black; text-align: right;">18.553</td><td style="width: 10%; text-align: right;">MG/Yr</td></tr><tr><td>Billed unmetered:</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">n/a</td><td style="border: 1px solid black;"></td><td style="text-align: right;">MG/Yr</td></tr><tr><td>Unbilled metered:</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">n/a</td><td style="border: 1px solid black;"></td><td style="text-align: right;">MG/Yr</td></tr><tr><td>Unbilled unmetered:</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">5</td><td style="border: 1px solid black; background-color: yellow; text-align: right;">0.077</td><td style="text-align: right;">MG/Yr</td></tr></table><div style="border: 1px solid black; padding: 2px; margin-top: 5px;">AUTHORIZED CONSUMPTION: 18.630 MG/Yr</div></div> <div style="margin-top: 10px;"><p>WATER LOSSES (Water Supplied - Authorized Consumption) 12.300 MG/Yr</p><p>Apparent Losses</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Unauthorized consumption:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">5</td><td style="width: 20%; border: 1px solid black; text-align: right;">0.077</td><td style="width: 10%; text-align: right;">MG/Yr</td></tr></table><p style="font-size: x-small; color: blue;">Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Customer metering inaccuracies:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">5</td><td style="width: 20%; border: 1px solid black; text-align: right;">0.379</td><td style="width: 10%; text-align: right;">MG/Yr</td></tr><tr><td>Systematic data handling errors:</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">5</td><td style="border: 1px solid black; background-color: yellow; text-align: right;">0.000</td><td style="text-align: right;">MG/Yr</td></tr></table><div style="border: 1px solid red; padding: 2px; margin-top: 5px; font-size: x-small; color: red;">Systematic data handling errors are likely, please enter a positive, non-zero value; otherwise grade = 1 (not displayed)</div><div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Apparent Losses: 0.456 MG/Yr</div></div> <div style="margin-top: 10px;"><p>Real Losses (Current Annual Real Losses or CARL)</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Real Losses = Water Losses - Apparent Losses:</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">?</td><td style="width: 20%; border: 1px solid black; text-align: right;">11.844</td><td style="width: 10%; text-align: right;">MG/Yr</td></tr></table><div style="border: 1px solid black; padding: 2px; margin-top: 5px;">WATER LOSSES: 12.300 MG/Yr</div></div> <div style="margin-top: 10px;"><p>NON-REVENUE WATER</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">NON-REVENUE WATER:</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">?</td><td style="width: 20%; border: 1px solid black; text-align: right;">12.377</td><td style="width: 10%; text-align: right;">MG/Yr</td></tr></table><p style="font-size: x-small;">= Water Losses + Unbilled Metered + Unbilled Unmetered</p></div> <div style="margin-top: 10px;"><p>SYSTEM DATA</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Length of mains:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">7</td><td style="width: 20%; border: 1px solid black; text-align: right;">4.0</td><td style="width: 10%; text-align: right;">miles</td></tr><tr><td>Number of <u>active</u> AND <u>inactive</u> service connections:</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">9</td><td style="border: 1px solid black; text-align: right;">69</td><td></td></tr><tr><td>Service connection density:</td><td style="text-align: center;">?</td><td style="text-align: center;">?</td><td style="text-align: center;">?</td><td style="border: 1px solid black; background-color: yellow; text-align: right;">17</td><td style="text-align: right;">conn./mile main</td></tr></table><div style="margin-top: 10px;"><p>Are customer meters typically located at the curbside or property line? Yes</p><p style="font-size: x-small;">Average length of customer service line: ? (length of service line, <u>beyond</u> the property boundary, that is the responsibility of the utility)</p><p style="color: blue; font-weight: bold;">Average length of customer service line has been set to zero and a data grading score of 10 has been applied</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Average operating pressure:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">3</td><td style="width: 20%; border: 1px solid black; text-align: right;">70.0</td><td style="width: 10%; text-align: right;">psi</td></tr></table></div></div> <div style="margin-top: 10px;"><p>COST DATA</p><table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 40%;">Total annual cost of operating water system:</td><td style="width: 10%; text-align: center;">+</td><td style="width: 10%; text-align: center;">?</td><td style="width: 10%; text-align: center;">10</td><td style="width: 20%; border: 1px solid black; text-align: right;">\$140,000</td><td style="width: 10%; text-align: right;">\$/Year</td></tr><tr><td>Customer retail unit cost (applied to Apparent Losses):</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">7</td><td style="border: 1px solid black; text-align: right;">\$2.57</td><td style="text-align: right;">\$/1000 gallons (US)</td></tr><tr><td>Variable production cost (applied to Real Losses):</td><td style="text-align: center;">+</td><td style="text-align: center;">?</td><td style="text-align: center;">8</td><td style="border: 1px solid black; text-align: right;">\$2,153.45</td><td style="text-align: right;">\$/Million gallons</td></tr></table><div style="text-align: right; font-size: x-small; margin-top: 5px;"><input type="checkbox"/> Use Customer Retail Unit Cost to value real losses</div></div> <div style="margin-top: 10px;"><p>WATER AUDIT DATA VALIDITY SCORE:</p><div style="border: 1px solid red; padding: 5px; text-align: center; color: red; font-weight: bold; margin: 10px 0;">*** YOUR SCORE IS: 59 out of 100 ***</div><p style="font-size: x-small;">A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score</p></div> <div style="margin-top: 10px;"><p>PRIORITY AREAS FOR ATTENTION:</p><p style="font-size: x-small;">Based on the information provided, audit accuracy can be improved by addressing the following components:</p><div style="border: 1px solid red; padding: 2px; margin: 2px 0;">1: Volume from own sources</div><div style="border: 1px solid red; padding: 2px; margin: 2px 0;">2: Systematic data handling errors</div><div style="border: 1px solid red; padding: 2px; margin: 2px 0;">3: Billed metered</div></div>						Volume from own sources:	+	?	5	30.930	MG/Yr	Water imported:	+	?	n/a		MG/Yr	Water exported:	+	?	n/a		MG/Yr	Pcnt:	+	?	0	0	MG/Yr		+	?	0	0	MG/Yr		+	?	0	0	MG/Yr	Billed metered:	+	?	6	18.553	MG/Yr	Billed unmetered:	+	?	n/a		MG/Yr	Unbilled metered:	+	?	n/a		MG/Yr	Unbilled unmetered:	+	?	5	0.077	MG/Yr	Unauthorized consumption:	+	?	5	0.077	MG/Yr	Customer metering inaccuracies:	+	?	5	0.379	MG/Yr	Systematic data handling errors:	+	?	5	0.000	MG/Yr	Real Losses = Water Losses - Apparent Losses:	?	?	?	11.844	MG/Yr	NON-REVENUE WATER:	?	?	?	12.377	MG/Yr	Length of mains:	+	?	7	4.0	miles	Number of <u>active</u> AND <u>inactive</u> service connections:	+	?	9	69		Service connection density:	?	?	?	17	conn./mile main	Average operating pressure:	+	?	3	70.0	psi	Total annual cost of operating water system:	+	?	10	\$140,000	\$/Year	Customer retail unit cost (applied to Apparent Losses):	+	?	7	\$2.57	\$/1000 gallons (US)	Variable production cost (applied to Real Losses):	+	?	8	\$2,153.45	\$/Million gallons
Volume from own sources:	+	?	5	30.930	MG/Yr																																																																																																																																				
Water imported:	+	?	n/a		MG/Yr																																																																																																																																				
Water exported:	+	?	n/a		MG/Yr																																																																																																																																				
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Unbilled unmetered:	+	?	5	0.077	MG/Yr																																																																																																																																				
Unauthorized consumption:	+	?	5	0.077	MG/Yr																																																																																																																																				
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AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0

American Water Works Association.
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Water Audit Report for: **OLOWALU WATER SYSTEM (209)**

Reporting Year: **2022** **1/2022 - 12/2022**

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 59 out of 100 ***

System Attributes:

Apparent Losses:	0.456	MG/Yr
+ Real Losses:	11.844	MG/Yr
= Water Losses:	12.300	MG/Yr

? Unavoidable Annual Real Losses (UARL): See limits in definition MG/Yr

Annual cost of Apparent Losses: \$1,172

Annual cost of Real Losses: \$25,505

Valued at **Variable Production Cost**

[Return to Reporting Worksheet to change this assumption](#)

Performance Indicators:

Financial: { Non-revenue water as percent by volume of Water Supplied: 40.0%

Non-revenue water as percent by cost of operating system: 19.2% Real Losses valued at Variable Production Cost

Operational Efficiency: { Apparent Losses per service connection per day: 18.10 gallons/connection/day

Real Losses per service connection per day: N/A gallons/connection/day

Real Losses per length of main per day*: 8,112.14 gallons/mile/day

Real Losses per service connection per day per psi pressure: N/A gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 11.84 million gallons/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]:

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

AWWA Free Water Audit Software: User Comments	
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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.	
General Comment:	
Audit Item	Comment
Volume from own sources:	Consumption History Report 2/1/2022-12/31/2022 - Customer# Well, Location# Well 01, Well 02, Well 03
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	Consumption History Report 2/1/2022-12/31/2022 - Filtered by Service code: Potable Use & Rate code PW1
Billed unmetered:	
Unbilled metered:	
Unbilled unmetered:	Monthly total Coliform testing, annual hydrant maintenance, Fires, hit hydrants
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	Measured by engineer
Number of active AND inactive service connections:	Consumption History Report P/E 12/31/2022 - Filtered by Service code: Potable Use & Rate code PW1 - sorted by Meter size
Average length of customer service line:	
Average operating pressure:	Average pressure from taken from various locations in the system
Total annual cost of operating water system:	P&L January through December 2022 - Total Operating Expenses
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	Production Expense report - chemicals & electricity(pumping) divided by Total System Input Volume

AWWA Free Water Audit Software: <u>Water Balance</u>							WAS v5.0
							American Water Works Association. Copyright © 2014, All Rights Reserved.
Water Audit Report for: OLOWALU WATER SYSTEM (209)							
Reporting Year: 2022							1/2022 - 12/2022
Data Validity Score: 59							
Own Sources (Adjusted for known errors) 30.930	System Input 30.930	Water Exported 0.000	Billed Water Exported				Revenue Water 0.000
		Water Supplied 30.930	Authorized Consumption 18.630	Billed Authorized Consumption 18.553	Billed Metered Consumption (water exported is removed) 18.553	Revenue Water 18.553	
					Billed Unmetered Consumption 0.000		
				Unbilled Authorized Consumption 0.077	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 12.377	
					Unbilled Unmetered Consumption 0.077		
			Water Losses 12.300	Apparent Losses 0.456	Unauthorized Consumption 0.077		
					Customer Metering Inaccuracies 0.379		
					Systematic Data Handling Errors 0.000		
				Real Losses 11.844	Leakage on Transmission and/or Distribution Mains Not broken down		
		Leakage and Overflows at Utility's Storage Tanks Not broken down					
Leakage on Service Connections Not broken down							

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

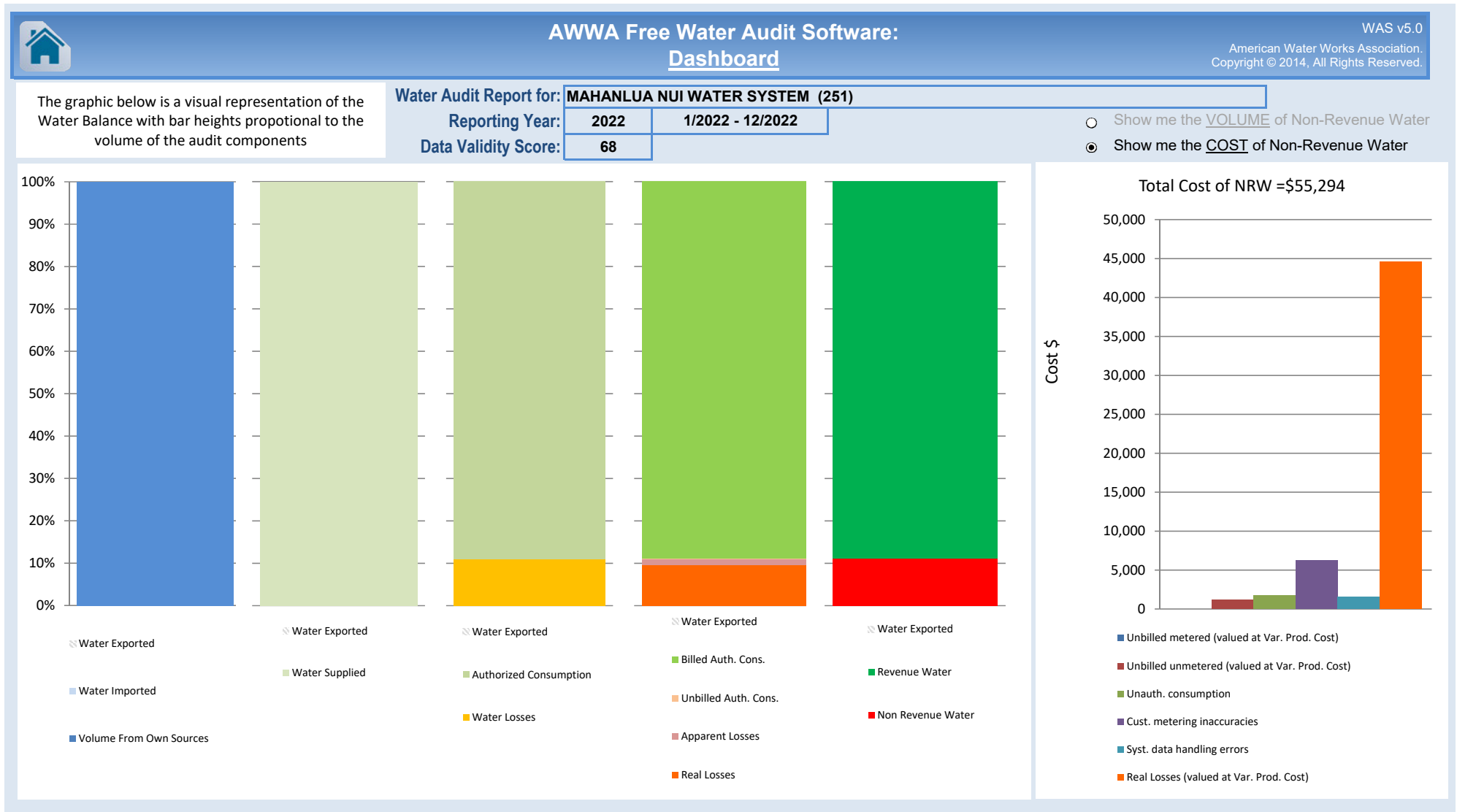


EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

AWWA Free Water Audit Software: Grading Matrix

WAS 5.0
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The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from Own Sources" component:		<u>to qualify for 2:</u> Organize and launch efforts to collect data for determining volume from own sources	<u>to qualify for 4:</u> Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		<u>to qualify for 8:</u> Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system; tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tank/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	<u>to qualify for 4:</u> Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		<u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		<u>to qualify for 8:</u> Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		<u>to qualify for 10:</u> Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		<u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)		<u>to qualify for 2:</u> Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	<u>To qualify for 4:</u> Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	<u>to qualify for 4:</u> Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		<u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		<u>to qualify for 8:</u> Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		<u>to qualify for 10:</u> Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		<u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)		<u>to qualify for 2:</u> Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	<u>To qualify for 4:</u> Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average future count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex. water used in periodic testing of unmetered fire connections), but other uses (ex. miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quality component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.

APPARENT LOSSES

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unauthorized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases; conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	Note: if customer water meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10: a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Worksheet asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet. b) Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breach pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breach pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		<u>to qualify for 2:</u> Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		<u>to qualify for 8:</u> Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		<u>to qualify for 2:</u> Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	<u>to qualify for 4:</u> Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		<u>to qualify for 6:</u> Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	<u>Launch effort to fully meter the customer population and charge rates based upon water volumes</u>	<u>to qualify for 8:</u> Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to qualify for 10:</u> Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to maintain 10:</u> Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:		<u>to qualify for 2:</u> Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		<u>to qualify for 8:</u> Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively



AWWA Free Water Audit Software: Customer Service Line Diagrams

WAS v5.0

American Water Works Association.
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Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, L_p , for the three most common piping configurations.

Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration $L_p = 0$ since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where L_p is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building, where L_p is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the L_p will vary notably in a community of different structures, therefore the average L_p value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

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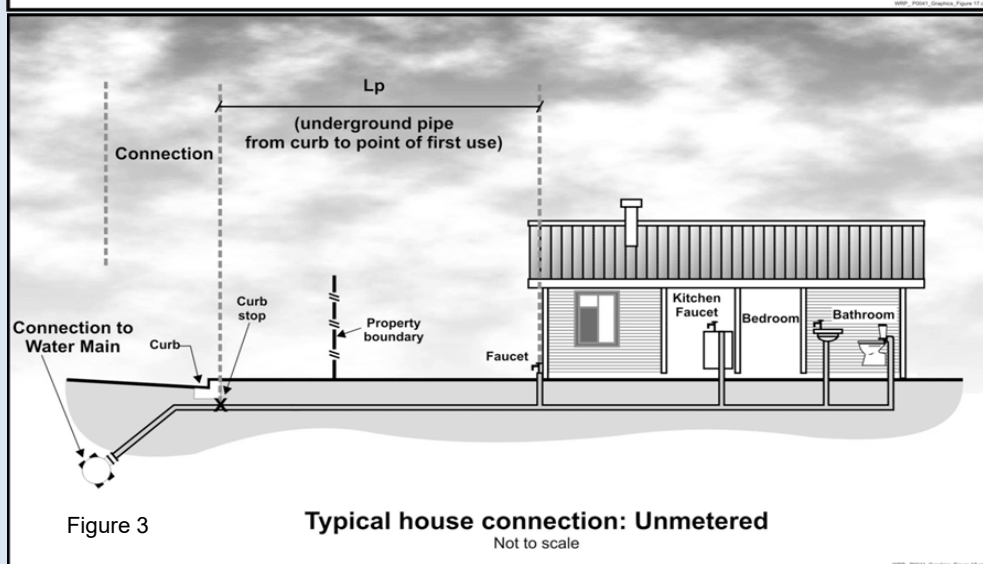
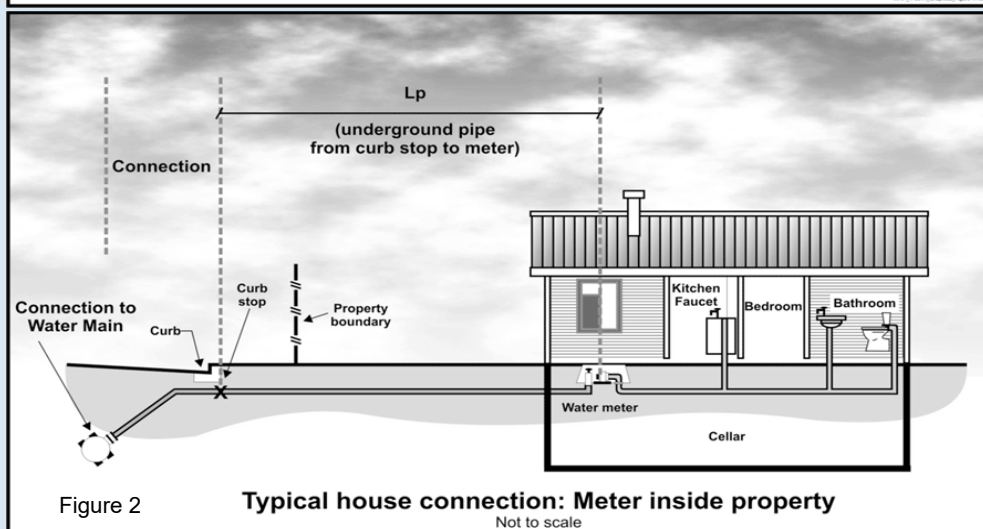
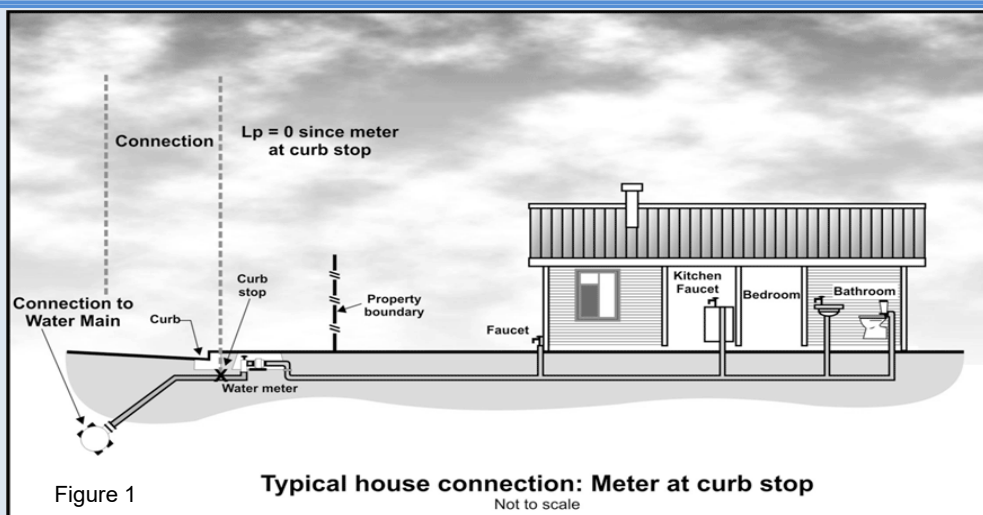


EXHIBIT 8
OWC ATTACHMENT TO GWUPA E : #19
AWWA WATER LOSS AUDIT

AWWA Free Water Audit Software:
Definitions

WAS v5.0

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Item Name	Description
<p>Apparent Losses</p> <p>Find</p>	<p>= unauthorized consumption + customer metering inaccuracies + systematic data handling errors</p> <p>Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use).</p> <p>NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.</p>
<p>AUTHORIZED CONSUMPTION</p> <p>Find</p>	<p>= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption</p> <p>The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes.</p> <p>Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.</p> <p>Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)</p>
<p>Average length of customer service line</p> <p>View Service Connection Diagram</p> <p>Find</p>	<p>This is the average length of customer service line, L_p, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of L_p is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping.</p> <p>If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10.</p> <p>If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average L_p length based upon the various customer land parcel sizes and building locations in the service area. L_p will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average L_p length for the entire system.</p> <p>Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, L_p, for each configuration.</p>
<p>Average operating pressure</p> <p>Find</p>	<p>This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.</p>
<p>Billed Authorized Consumption</p>	<p>All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.</p>
<p>Billed metered consumption</p> <p>Find</p>	<p>All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component. The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.</p>
<p>Billed unmetered consumption</p> <p>Find</p>	<p>All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined <u>by utility policy</u> to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.</p>

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AWWA WATER LOSS AUDIT

Item Name	Description
Customer metering inaccuracies Find	<p>Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger.</p> <p>The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for <u>all</u> customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly.</p> <p>Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.</p>
Customer retail unit cost Find	<p>The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, <u>but only if</u> these charges are based upon the volume of potable water consumed.</p> <p>For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer.</p> <p>Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either \$/1,000 gallons, \$/hundred cubic feet, or \$/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, \$.</p>
Infrastructure Leakage Index (ILI) Find	<p>The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.</p>
Length of mains Find	<p>Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as:</p> <p>Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]</p>
NON-REVENUE WATER Find	<p>= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.</p>
Number of active AND inactive service connections Find	<p>Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hydrants should be included in the "Length of mains" parameter.</p>
Real Losses Find	<p>Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.</p>
Revenue Water	<p>Those components of System Input Volume that are billed and have the potential to produce revenue.</p>
Service Connection Density Find	<p>=number of customer service connections / length of mains</p>

EXHIBIT 8
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AWWA WATER LOSS AUDIT

Item Name	Description
Systematic data handling errors <div>Find</div>	<p>Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports.</p> <p>Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component.</p> <p>Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. <u>Data Transfer Errors</u> result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors.</p> <p>Apparent losses also occur from <u>Data Analysis Errors</u> in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system.</p> <p>Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors.</p> <p>If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor <u>has</u> investigated the billing system and its controls, and <u>has</u> well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. <u>Note:</u> negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.</p>
Total annual cost of operating the water system <div>Find</div>	<p>These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.</p>
Unauthorized consumption <div>Find</div>	<p>Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system.</p> <p>Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.</p>
Unavoidable Annual Real Losses (UARL) <div>Find</div>	<p>UARL (gallons)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres)=(18.0Lm + 0.8Nc + 25.0Lc) xP</p> <p>where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres)</p> <p>The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both.</p> <p>NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If,</p> <p><u>in gallons:</u> (Lm x 32) + Nc < 3000 or P < 35psi</p> <p><u>in litres:</u> (Lm x 20) + Nc < 3000 or P < 25m</p> <p>then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.</p>

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Item Name	Description
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.
Unbilled metered consumption	Metered consumption which is authorized by the water utility, but, for any reason, is <u>deemed by utility policy</u> to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. It does <u>not</u> include water supplied to neighboring utilities (water exported) which may be metered but not billed.
Unbilled unmetered consumption	<p>Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case. This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value.</p> <p>If the water utility <u>has</u> carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities.</p> <p>Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.</p>
Units and Conversions	<p>The user may develop an audit based on one of three unit selections:</p> <p>1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet</p> <p>Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes):</p> <div><div>Enter Units:</div><div>Convert From...</div><div>=</div><div>Converts to....</div></div> <div><div>1</div><div>Million Gallons (US)</div><div></div><div>3.06888329</div><div>Acre-feet</div></div> <p>(conversion factor = 3.06888328973723)</p>
Use of Option Buttons	<p>To use the default percent value choose this button</p> <p>To enter a value choose this button and enter the value in the cell to the right</p> <div><div>Pcnt:</div><div>Value:</div></div> <div><div>1.25%</div><div><input checked="" type="radio"/></div><div><input type="radio"/></div><div></div></div> <p>NOTE: For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above.</p> <p>If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).</p>
Variable production cost (applied to Real Losses)	<p>The cost to produce and supply the next unit of water (e.g., \$/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable.</p> <p>It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost.</p> <p>The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.</p>
Volume from own sources	<p>The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of <u>treated</u> drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.</p>

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Item Name	Description
Volume from own sources: Master meter and supply error adjustment Find	<p>An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.</p>
Water exported Find	<p>The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water.</p> <p>Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.</p>
Water exported: Master meter and supply error adjustment Find	<p>An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.</p>
Water imported Find	<p>The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.</p>
Water imported: Master meter and supply error adjustment Find	<p>An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.</p>
WATER LOSSES Find	<p>= apparent losses + real losses</p> <p>Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.</p>



AWWA Free Water Audit Software: Determining Water Loss Standing

WAS v5.0

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Water Audit Report for: **LOWALU WATER SYSTEM (209)**

Reporting Year: **2022** **1/2022 - 12/2022**

Data Validity Score: **59**

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities in gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
 (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 - 5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		



Level 1 Validation Summary Notes/Certificate

This document includes detailed notes about utility practices as reviewed during third-party level-one water audit validation.

Call Information

Utility	Validator
System Name: Olowalu (209)	Validator: Neal Fujii, Nicholas Ing
Audit Period: CY2022	Validator Qualifications: Equivalent to AWWA CA-NV Level 1 Validation Certification
System Participants: Lea Tamayose, Alin Peterson (Olowalu Water Co.)	Validator General Comments: This is the first water audit validation interview for Olowalu water system by CWRM staff. Validator notes that the water audit results show a fairly high level of water loss and recommends that Olowalu Water Co. conduct source meter testing, large customer meter testing, leak detection surveys, and establish DMAs in suspected high-leakage areas of the distribution system. Given the level of water loss despite OWC's ongoing water loss control practices, OWC should consider consulting with a water loss control expert to further evaluate leakage losses.
Call Date: 6/29/2023	OWC staff is aware of the high level of water loss and are taking steps to reduce the losses. OWC staff reports that Olowalu is a very old system, however all mains in the potable system have been replaced – there are no legacy plantation lines in service for the potable system. Some main lines were replaced in 2012 (Olowalu Village area); in 2015 the main line from the Olowalu Store up to Luawai was replaced; and the line from the upper PRV to the straight section (Petroglyph Road) was replaced around 2010. The main line from the Olowalu Store to the Villages was replaced around 2009. All main potable lines makai of the highway were installed after ~1998. There is also a separate non-potable irrigation system that serves the same service area.
	Staff reviews pumpage daily for any anomalous volumes which may indicate leakage or unbilled unmetered consumption (e.g., fire department use). Staff have been conducting proactive leak detection comparing flows in 4 areas (DMA). There are 4 submeters in the Olowalu system, 2 on the PRV low-flow stages, 1 for the Olowalu Village, and 1 for the makai section of the system. In 2023 OWC replaced the well meter with one enabled for SCADA.

Past Year's Activity:

Data Management	Loss Recovery
<ul style="list-style-type: none"> Completed an AWWA water audit and a Level-1 water audit validation (CY2022). 	<ul style="list-style-type: none"> OWC staff have responded to and repaired reported leaks in the system during the past year.

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AWWA WATER LOSS AUDIT

- In 2021, OWC updated its billing software.
- OWC employs AMR and continues to upgrade to cellular technology (both scheduled replacement and meter failure), 100% of customers have AMR or cellular communication (telemetry).
- OWC staff conducts visual leak detection while driving the distribution system.
- OWC staff conduct regular PRV checks.
- OWC has established 4 DMAs in the Olowalu system by installing bypass meters on PRVs (low flow stage) and 2 other submeters and proactively compares DMA water supplied with customer consumption to monitor for leakage.
- Conducts acoustic leak detection (on backflow preventers) when suspected leaks appear due to anomalously high production; staff reports that 90% of the breaks occur on the service laterals or within the meter box.

Opportunities:

Data Management

- Volumetric source meter testing can improve the reliability of the VfOS volumes
- Customer meter testing can improve the reliability of the BMAC volumes
- Connecting the well flowmeter to the SCADA system would help monitor production and verify with the calculated production (based on run-time and pump capacity) in real time.
- See Loss Control Planning tab in AWWA Free Water Audit Software for additional guidance.

Loss Recovery

- Conduct proactive leak detection surveys.
- Continue to monitor district metered areas in suspected high-leakage areas.
- In 2023 OWC performed routine maintenance on the 2 potable reservoirs.
- See Loss Control Planning tab in AWWA Free Water Audit Software for additional guidance.

Selected Metrics & Signatures:

Metric	Units	Value
Miles of Mains		3.5
Count of Service Connections		69
Variable Production Cost	\$/MG	\$2,153
Customer Retail Unit Cost	\$/kgal	\$2.57
Real Losses per Connection per Day	gal/conn/day	n/a
Real Losses per Mile of Main	gal/mile/day	8,080
Cost of Real Losses per Mile of Main	\$/mile/yr	-
Infrastructure Leakage Index	Ratio	n/a
Apparent Losses per Connection per Day	gal/conn/day	20
Cost of Apparent Losses per Connection	\$/conn/yr	-

Validator Signature:  Name: _____

Utility Executive Signature:  Name: Glenn Tremblay

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Validation Call Notes

Audit Input	Grade	Audit Input Notes	Data Validity Grade Notes
Volume from Own Sources	5	<p>Source Meter Profile: Badger electromagnetic meter which is read monthly via AMR. This meter was replaced in 2023 since previous meter was old and did not have SCADA capability. The Olowalu water system is served by one potable well (6-4936-001) pumping to a 0.05 MG intermediate steel tanks, and boosted up to the upper 0.56 MG steel tank.</p> <p>Derivation: Manual reads from production meters as archived.</p> <p>Comments: Input derivation from supporting documents confirmed (Consumption History Report Customer# Olowalu Well). SCADA calculates water pumped based on pump run time and pump capacity - this is compared with flow meter when unusual production is reported. Note that OWC production does not exactly match WRIMS data due to mismatched reporting periods. Note that there is an existing independent non-potable water system (irrigation) which also shares the same service area. Exclusion of non-potable volumes confirmed.</p>	<p>Approximate Percent of Volume Metered: 100%</p> <p>Approximate Percent Tested and/or Calibrated: 0%</p> <p>Calibration Frequency: None.</p> <p>Volumetric Testing Frequency: None.</p> <p>Volumetric Testing Method: n/a.</p> <p>Comments: New meter installed in 2023.</p>
Volume from Own Sources Master Meter and Supply Error Adjustment	n/a	<p>Derivation: Select or Enter</p> <p>Change in Storage Considered: No.</p> <p>Comments: No meter calibration or testing in the past 5-years</p>	<p>Source Meter Read Method: Manual and remotely.</p> <p>Source Meter Read Frequency: Every other day (manual) and monthly (drive by).</p> <p>Data Review Practices: Each business day.</p> <p>Real-Time Storage Level Monitoring: Yes.</p> <p>Comments: No additional comments.</p>
Water Imported	n/a	<p>Import Meter Profile: n/a</p> <p>Derivation: n/a</p> <p>Comments: n/a</p>	<p>Approximate Percent of Volume Metered: n/a</p> <p>Approximate Percent Tested and/or Calibrated: n/a</p> <p>Calibration Frequency: n/a</p> <p>Volumetric Testing Frequency: n/a</p> <p>Volumetric Testing Method: n/a</p> <p>Comments: n/a</p>
Water Imported Master Meter and Supply Error Adjustment	n/a	<p>Derivation: n/a</p> <p>Comments: n/a</p>	<p>Import Meter Read Method: n/a</p> <p>Import Meter Read Frequency: n/a</p> <p>Data Review Practices: n/a</p> <p>Comments: n/a</p>

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Water Exported	n/a	Export Meter Profile: n/a Comments: n/a	Approximate Percent of Volume Metered: n/a Approximate Percent Tested and/or Calibrated: n/a Calibration Frequency: n/a Volumetric Testing Frequency: n/a Volumetric Testing Method: n/a Comments: n/a
Water Exported Master Meter and Supply Error Adjustment	n/a	Derivation: n/a Comments: n/a	Export Meter Read Method: n/a Export Meter Read Frequency: n/a Data Review Practices: n/a Comments: n/a
Billed Metered Authorized Consumption	6	Derivation: Consumption history report from billing system filtered by Service Code: Potable Use & Rate Code PW1. Customer Meter Profile: Mix of AMR and cellular technology, most meters are 5/8". Read Frequency: Monthly. Reading Technology: Mixture of AMR and cellular. Age Profile: Very few meters are 15 years old (or older). Meter replacement is ongoing Comments: Enter	Approximate Percent Metered: 100% Small Meter Testing Practices: Reactive - complaint based or flagged-consumption testing only. Number of Small Meters Tested: n/a Large Meter Testing Practices: Reactive - complaint based or flagged-consumption testing only. Number of Large Meters Tested: n/a General Replacement Practices: Upon failure and age. OWC continues a meter replacement program – goal is to have 100% cellular technology. Billing Data Review: Standard billing QC, plus review of volumes by use type each billing cycle. Comments: No additional comments.
Billed Unmetered Authorized Consumption	n/a	Profile: n/a Derivation: n/a Comments: Select	Policy for Metering Exemptions: n/a Comments: n/a
Unbilled Metered Authorized Consumption	n/a	Profile: n/a Derivation: n/a Comments: Select	Policy for Billing Exemptions: n/a
Unbilled Unmetered Authorized Consumption	5	Profile: HI default value was applied. Comments: Percentage changed to 0.25% during validation call.	Comments: Default grade applied.
Unauthorized Consumption	5	Comments: Default input applied.	Comments: Default grade applied.

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Customer Metering Inaccuracies	3	<p>Derivation: Rudimentary estimate.</p> <p>Comments: This value was changed from 0.25% to 2% during the validation call.</p> <p>*See BMAC comments regarding meter testing & replacement activities.</p>	<p>Customer Meter Testing: Limited (upon request AND consumption flag only).</p> <p>Customer Meter Replacement: Routine (proactive), based on age and upon failure or customer request.</p> <p>Comments: No additional comments.</p>
Systematic Data Handling Errors	5	<p>Comments: Default input applied.</p>	<p>Comments: Default grade applied.</p>
Length of Mains	7	<p>Derivation: Totaled from CAD based map.</p> <p>Hydrant Laterals Included: Uncertain.</p> <p>Comments: LoM modified based on LT e-mail on 7-12-23.</p>	<p>Map Format: Digital.</p> <p>Asset Management Systems: Not currently in place.</p> <p>Map Update Process: Accomplished through normal work order processes.</p> <p>Comments: No additional comments.</p>
Number of Service Connections	9	<p>Derivation: Detailed query from billing system to analyze unique record count.</p> <p>Basis for Query: Potable Use and Rate Code PW1.</p> <p>Comments: Select</p>	<p>Field Validation: Accomplished through normal meter reading processes.</p> <p>Estimate of Error: 0%.</p> <p>Comments: No additional comments.</p>
Average Operating Pressure	3	<p>How Pressure is Maintained: Water is pumped to a lower tanks and boosted to the upper tank. Two PRVs control system pressure.</p> <p>Pressure Range: 40 psi to 130 psi</p> <p>Derivation: Inferred from observations of pressure readings in field or review of pressure measurements.</p> <p>Comments: Select</p>	<p>Pressure Data Collection: Routine PRV inspection.</p> <p>Real-Time Monitoring: No real-time monitoring currently in place.</p> <p>Hydraulic Model: None currently in place.</p> <p>Comments: No additional comments.</p>
Annual Operating Cost	10	<p>Derivation: From official financial reports.</p> <p>Comments: Select</p>	<p>Auditing Practices: Annually by a third party CPA.</p> <p>Comments: No additional comments.</p>
Customer Retail Unit Cost	7	<p>Rate Structure: Tiered rate structure</p> <p>Derivation: Simple average of 3 tiered rates.</p> <p>Comments: All customers are on the same rate schedule.</p>	<p>M36 Review: Input calculations have not been reviewed by an M36 water loss expert.</p> <p>Comments: No additional comments.</p>
Variable Production Cost	8	<p>Primary Costs: Own sources only.</p> <p>Secondary Costs: None currently included.</p> <p>Comments: Chemicals + electricity (pumping) cost divided by volume of water supplied.</p>	<p>M36 Review: Primary costs only. Input calculations have not been reviewed by an M36 water loss expert.</p> <p>Comments: No additional comments.</p>