

Honolulu Board of Water Supply Stakeholder Advisory Group

Meeting 5 – January 12, 2016, 4:00 pm to 6:30 pm
Neal S. Blaisdell Center, Hawai'i Suites

Meeting Notes

PURPOSE AND ORGANIZATION OF MEETING NOTES

The purpose of these notes is to provide an overview of the Board of Water Supply (BWS) Stakeholder Advisory Group meeting. They are not intended as a transcript or as minutes. Major points of the presentations are summarized herein, primarily for context. Copies of presentation materials were provided to all participants and are available on the BWS website. Participants made many comments and asked many questions during the meeting. These are paraphrased to be more concise.

ATTENDEES

There were 24 stakeholders and BWS and CDM Smith staff present. The stakeholders represent diverse interests and communities island-wide.

The following Stakeholders Advisory Group members attended:

Eric Au	Sheraton Waikiki
Jackie Boland	AARP Hawai'i
Pono Chong	Chamber of Commerce Hawai'i
Richard Dahl	James Campbell Company, LLC
Mark Fox	The Nature Conservancy, Hawai'i
Neil Hannahs	Kamehameha Schools
Rick Hobson	Building Industry Association of Hawai'i
Shari Ishikawa	Hawaiian Electric Co.
Micah A. Kāne	Hawai'i Community Foundation
Will Kane	Mililani Town Association
Ralph Mesick	First Hawaiian Bank
Helen Nakano	Resident of City Council District 5
Robbie Nicholas	Resident of City Council District 3
Dean Okimoto	Nalo Farms
Alison Omura	Coca-Cola Bottling Co.
Kathleen Pahinui	Resident of City Council District 2
Dick Poirier	Resident of City Council District 9
Elizabeth Reilly	Resident of City Council District 4
John Reppun	KEY Project
Cynthia Rezentes	Resident of City Council District 1
Francois Rogers	Blue Planet Foundation

Josh Stanbro
Cruz Vina Jr.
Suzanne Young

Hawai'i Community Foundation
Resident of Council District 8
Honolulu Board of Realtors

MEETING AGENDA

- Welcome
- Public Comment on Agenda Items
- Accept Notes from Meetings 3 and 4 (For possible action)
- Update on Activities of the BWS (For possible action)
- Objectives of the Water Master Plan (For possible action)
- Water Quality and Treatment Activities (For possible action)
- Update on Condition Assessment of Reservoirs (For possible action)
- Summary and Next Steps (Information only)

WELCOME

Dave Ebersold, Facilitator and Vice President of CDM Smith, welcomed and wished the group a Happy New Year. Dave announced a tour of the BWS's Hālawā Shaft on Saturday, February 20, 2016.

PUBLIC COMMENT ON AGENDA ITEMS

None.

REVIEW and ACCEPTANCE OF NOTES FROM MEETING 3 AND 4

The notes from Meeting 3 were accepted with one change on the last page (change year referenced for next meeting from November 2016 to 2015). The notes from Meeting 4 were accepted without changes.

UPDATES ON BOARD OF WATER SUPPLY ACTIVITIES

Ernest Lau, Manager of the BWS, greeted the Stakeholder Advisory Group and encouraged all to ask questions while he reported on proposed amendments to the City Charter and the status of the Red Hill Administrative Order on Consent (AOC).

Proposed amendments to the City Charter – Ernest told the group that every 10 years, a Charter Commission reviews proposed amendments to the City Charter and recommends certain amendments to be placed on the General Election ballot. That commission is currently reviewing more than 150 proposed amendments, a few of which would affect the BWS. In particular, proposed amendment #20 recommends changing the governance of the Board of Water Supply. The proposal would effectively make the City Council the authorizing body to approve the BWS's annual operating budget and Capital Improvement Program.

In 1929, the BWS was created as a semi-autonomous agency under a Water Board appointed by the Mayor and approved by the City Council. It was created in this form

because water is such an important resource and semi-autonomy allows the BWS to work outside of the influence of politics.

Ernest gave several reasons why the BWS is concerned about this proposed amendment:

- The City Council already has a very full plate with other agencies and programs, and adding the BWS to its responsibilities does not seem like a good idea.
- Bond ratings institutions like Fitch Ratings and Moody's recognize that a semi-autonomous water utility is one of the better governance models. This has been a basis for the BWS receiving better bond ratings, leading to cost savings for customers.
- Longer-term planning, like the Water Master Plan, is best done under semi-autonomy. Politics in such planning can reflect shorter-term thinking.
- Revenues collected by the BWS are used to provide water service to customers; because of our semi-autonomy, those funds cannot be diverted for other non-water uses, as has been attempted in the past.

He asked stakeholders to be aware and informed about the proposed amendments, and asked them to share their opinions with the Charter Commission members. He was clear that the BWS could not ask stakeholders to take a specific position. He said it is in the best interest of the BWS that proposed amendment #20 is not placed on the November 2016 General Election ballot and that he would keep the Stakeholder Advisory Group informed.

Red Hill Fuel Storage Tanks AOC – Ernest reported that the State Department of Health, US Environmental Protection Agency (EPA), and US Navy have signed an AOC to address the WWII-vintage underground storage tanks at Red Hill. These agencies signed a voluntary agreement to try to address the problems and concerns related to fuel leakage into the ground only 100 feet above a precious drinking water aquifer.

These agencies invited the BWS to participate in meetings, but required the signing of a non-disclosure agreement. Such an agreement is of significant concern because it is contrary to transparency with the public on this important issue. Ernest said he would be talking soon with the BWS's Board of Directors about how to approach the suggested agreement.

QUESTIONS, COMMENTS, AND ANSWERS

Q. When does the Charter Commission decide what proposed amendments to place on the General Election ballot?

A. It is unclear. There are so many proposals before the Charter Commission that they are still discussing the process of how to winnow down to a reasonable number for the ballot.

Q. What prompted the proposed amendment #20? Is a person or group behind it?

A. Donna Ikeda, former legislator and a member of the Charter Commission, introduced the amendment, but we don't know what prompted it. The amendment is almost identical to a proposal to the City Council in 2013, introduced by City Council Member Ikaika Anderson. In 2013, the BWS was able to convince the City Council that it was not a good idea.

Comment: This is around the third time that this proposal has come up. It comes up about every 3-5 years. People have tried to encourage the BWS to pick up the responsibilities of managing O'ahu's wastewater – which had the EPA's Consent Decree – without giving the BWS additional manpower to handle the added responsibilities. It looks like they're going around it in a different way this time, through the Charter Amendment process.

Q. Would it be helpful if a subset of the Stakeholder Advisory Group advocated a position on the proposed amendment?

A. You are all recognized leaders in the community. When the Charter Commission hears a reaction from important community leaders like you, they may respond differently from how they respond to representatives of the BWS.

Comment: The BWS doesn't need to be defensive. The proposal has come up several times before. It gives the BWS the opportunity to show fiscal responsibility. The BWS has done a great job; many other utilities have had difficulties with billing system conversions. The BWS's fiscal responsibility, the ability to manage its own debts and budgets in an efficient manner outside of the Council process is attractive. That's a situation that a lot of other City and County agencies would love to have. Stress that the BWS is handling its budget well and keeping customers happy. The BWS is not a high priority to be addressed through the Charter amendment process.

Dave told stakeholders that Ernest Lau and Barry Usagawa are available to talk with the organizations represented by the Stakeholder Advisory Group participants about the BWS and its services, if invited.

WATER MASTER PLAN OBJECTIVES

The group previously discussed and reached consensus on the first three of five objectives for the Water Master Plan:

- Water Quality, Health and Safety
- System Reliability and Adequacy
- Cost and Affordability

The discussion continued with the next draft objective: Conservation and Efficiency.

Draft text carried forward from Meeting 2	Final text incorporating Stakeholder Advisory Group edits
Conservation and Efficiency	Water Conservation
Achieve water and energy efficiency via infrastructure design and construction, system operations and maintenance and consideration of renewable energy options.	Achieve water conservation to optimize resource sustainability via: <ul style="list-style-type: none"> • Using and promoting best management practices and policies • Infrastructure design and construction • System operations and maintenance • Conservation planning • Providing information, education and incentives to achieve behavioral change

The group reached consensus to include this objective in the WMP.

Stakeholders contributed the following observations, ideas, and edits, to arrive at the final version:

Comment: In achieving water conservation and efficiency, we want to be sure we do not degrade other resources. We should achieve water conservation and efficiency in a manner that we continue to provide the conservation effort, watershed management, possibly the stormwater utilities we heard about at our last meeting, and more. We have to keep a level of sensitivity that we do not degrade one set of resources to improve another set of resources, to the detriment of the greater use.

Response: This sounds like a guiding principle that could apply to all of the objectives.

Comment: Include recycled water as another option in conservation efficiency; e.g. “... and consideration of renewable energy, *recycled water*, and other non-potable water options.” Using runoff used for landscape irrigation is another good way to conserve water.

Response: By “non-potable” sources, do you mean to include brackish water along with recycled water? Does this include tailoring the water to the source? Is this concept like trying to tailor the use to the quality of the water?

Reply: Yes.

Comment: This is a good point. Will we be addressing this under the “Water Resource Sustainability” objective?

Comment: The BWS is already embracing a lot of cultural practices that are right in line with much of what’s stated in the Conservation and Efficiency and Water Resource Sustainability objectives. It might be appropriate to insert some language reflecting cultural look-back. Barry Usagawa has been very supportive of restoration,

recharging the watershed, and re-establishing native Hawaiian forests. Since it's a practice that's the BWS is doing already, the cultural aspect should be noted.

Comment: Education of the end-user is important and should be added.

Comment: Water is life, but there are lots of things that add to the quality of life on the island. You don't want to achieve energy efficiency and infrastructure design at the cost of degrading quality of life.

Response: Should we have a preamble that addresses the concept of not degrading other resources and quality of life as we pursue the objectives of conservation and more?

Reply: Yes.

Question: Why is "energy" in this objective? It's assumed that striving for energy efficiency would be a given.

Answer: It was added at an earlier meeting.

Comment: If you take advantage of opportunities like generating electricity with water, you can keep energy costs down. There are many renewable energy options other than fossil fuel to keep pumps running and other operations.

Comment: The words "renewable energy" are tripping us up. "Sustainable" or "self-supporting" are better.

Comment: The "renewable energy" issue goes with the objective of "System Reliability and Adequacy."

Comment: We need to come back to the point about optimizing the amount of rain we capture. We need to promote and optimize rain capture.

Comment: If it's about energy of the system, it nests better with "System Reliability and Adequacy". This objective would be better if it was just about conservation of water.

Comment: We also have renewable energy options under the "Costs and Affordability" objective.

Comment: Word for word, this is already under the objective "Costs and Affordability."

Response: The objective was retitled **Water Conservation**.

Question: Is "energy efficiency" adequately covered under the objective "Costs and Affordability"?

Answer: Yes.

Question: Where does water conservation fit into not just educating the public but actually getting them to do best management practices like low flow toilets, shower restrictors? Are we going to address implementation later?

Answer: Yes.

Comment: Could we add “social marketing” to public education, and consider public education toward what end? This is meant to achieve behavioral change.

Comment: The BWS should pursue water conservation using the strategies that give us the best bang for the buck. It may turn out that educating the broad general public is not the method that achieves the greatest water conservation. Maybe the BWS should target a particular type of customer group where greatest conservation can be achieved by a smaller segment of the population.

Comment: The conservation ideas that everyone contributed over the last meetings aren’t embodied in the objective yet.

Comment: One of the biggest things in new home development is the incentive to put solar panels on rooftops. People were allowed to sell back electricity that they produced on their roof at a 1-to-1 ratio; now it’s less. Along with public education should be incentives for users to get people to reduce consumption.

Response: Would adding a bullet before public education that indicates development of a Conservation Plan achieve what is being suggested?

Reply: Hawaiian Electric gave an incentive related to replacing incandescent bulbs with low energy bulbs. The incentive got everyone to run out and install the more efficient product.

Comment: The BWS is already doing a lot of the suggestions being made. We should mention conservation planning rather than get too specific with how to implement public education.

Comment: All of this needs to be designed in a way that achieves a target – a level of conservation.

Comment: Public education and incentives achieve behavioral change.

Comment: Add user information and public education; they are not the same thing. Public education is a process. User information is directed to targeted groups about doing something.

Comment: One of the most valuable things the BWS does is go into the schools. That’s what conservation is about: educating the public about doing something.

Comment: User information provides consumers a dashboard of what their use patterns are. Education provides information about how to change those patterns. Incentives give the consumers money in their pockets to buy those changes.

Comment: Does this objective address the concept of “time of use”? Would “time of use” be addressed through education, or infrastructure? To conserve water, we need to talk about more of the time of use approach. It seems like time of use is a separate line.

Discussion:

- The issue of peak hour demand is where time of use comes into play. Conservation is certainly part of that.
- Time of use would help operational adjustments; demand response; and load storage.
- Time of use is a specific strategic objective. It helps us use existing capacity that we have. It saves on cost. We need to keep this idea.
- To the Blue Planet Foundation, time of use is a key element for conservation. We need to work outside of the system with new tools. Do we need a mechanism to implement time of use?
- It’s not just how much we conserve, but when.
- Systems operations may be where time of use comes into play. Part of time of use comes into conservation planning. What conservation programs can we pursue to achieve those changes?
- Water is not currently as sensitive to time of use as power is because of water reservoir storage. If we get into a drought situation down the road, time of use may become very important for conservation. We can also look closer at the water/energy nexus. We see cost savings to the water customer while helping the electrical utility with time of use. Perhaps when we move into smart meters we can create incentives to use the water at different times of day.

Comment: Everything being discussed with regards to conservation deals with voluntary action by customers. Leave room for mandatory conservation. Other countries require conservation. It may come to the point here that we will have to do that.

Response: The BWS has Administrative Rules that have the force and effect of law. The Low Groundwater Plan was first implemented in the 1980s with mandatory restrictions on water usage.

Comment: Barry has developed a comprehensive water conservation plan that is being updated right now, but we are beginning to implement some of its recommendations. The BWS is considering expanding the stormwater capture program to encourage customers to harvest rainwater on their own properties.

Another measure under consideration is whether or not the BWS should bring back rebates for even “lower-flow” toilets.

Response: The Stakeholder Advisory Group gave us great feedback on conservation in our last workshops. The Conservation Plan could be a topic for future discussion.

Comment: A statement that captures what’s being said is, “Achieve water conservation via promotion of best management practices or policies to achieve maximum sustainability of the resource.” This objective addresses what the BWS will do. They should promote best management practices.

Discussion:

- There are a number of best management practices that are not within the BWS’s control.
- The BWS is leading by example by implementing best management practices like rainwater catchments. The BWS itself can implement best management practices, and it can also recognize others (commerce or governments) who do as well.
- When we try to maximize something, we may do that at the tradeoff of something else, like cost. “Optimize” may be a better word than “maximize.”
- “Optimize” is a good word. We are talking about a level of conservation that achieves resource sustainability. The BWS has to implement their actions and also educate and encourage the consumer. The target is long-term resource sustainability.
- The next objective we will discuss is long-term “Water Resources Sustainability”. We are talking about conservation here. How do you achieve sustainability by harvesting rainwater?

Question: Do we need to combine conservation and sustainability? Does conservation deserve its own objective?

Answer: Yes, it deserves its own objective.

Comment: Optimize groundwater recharge and rainwater capture.

Dave noted that the fifth objective – Water Resource Sustainability – will be discussed at the next meeting.

WATER QUALITY AND TREATMENT

Erwin Kawata, Water Quality Division Program Administrator for the BWS, greeted stakeholders and said that he would cover these topics in his presentation:

- An overview of water quality
- Drinking water regulations and the agencies that enforce them
- Drinking water testing and the BWS’s water quality program
- A few questions that he often gets on water quality

Erwin said all water starts with rain. It falls on the land, percolates into the ground and it collects in aquifers. As the water moves through the ground, it picks up minerals that exist naturally in the environment, like sodium, calcium, and magnesium.

Also as the water slowly percolates through the ground, it goes through a natural filtration process. Bacteria that the water picked up on the surface of the land slowly become inactivated. This is largely because there are no nutrients on which the bacteria need to live.

Our groundwater contains naturally occurring minerals. It has very high clarity and has almost no turbidity or cloudiness. Water underground does not change seasonally as it might on the surface of the land. It has a very low bacteria count. Our groundwater doesn't need any extensive treatment to improve its taste or smell.

On the mainland, some water suppliers have to remove naturally occurring minerals like manganese or arsenic. We don't have to do that, but we have had experiences in Central O'ahu where agriculture has influenced our water quality.

There are a number of groundwater sources all over the island and they all have different characteristics. After the water percolates and travels underground, it can take up to 25 years before it reaches our water sources. As it travels, water can take on different characteristics. For example, water in Central O'ahu is much harder in terms of calcium and magnesium content than the soft water of Windward.

All drinking water quality is regulated, and has been since 1974 when the Safe Drinking Water Act was enacted. In 1974, 18 contaminants were regulated. Today, 91 contaminants are regulated, of which 75 apply to the BWS.

Regulations have specific limits and provisions:

- Drinking water standards have maximum contaminant limits and provisions for how to test for them.
- Regulations also specify required treatment to remove contaminants and the type of enforcement that regulators will take if water suppliers do not follow proper treatment standards.
- They also require public notification in the certain cases of exceeding the water quality standards.

The BWS also participates in a program of collecting water quality information about unregulated contaminants, commonly referred to as the *Unregulated Contaminant*

Monitoring Rule. Unregulated contaminants are new contaminants that could be emerging in the environment.

The EPA is responsible for administering the Safe Drinking Water Act. It gives authority to states to implement and enforce the regulations. In Hawai'i, the State of Hawai'i Department of Health is the agency with that responsibility.

Drinking water regulations are national standards that apply to all states. Only chemicals that are known to affect health are regulated. The EPA reevaluates the rules every six years. Regulations in place today are regulating contaminants currently found in drinking water.

Prior to 1974, there wasn't a standardized way to test water quality. From 1974 – 2010, the Department of Health conducted standardized water quality testing. In 2010, the BWS took over responsibility for water quality testing and established chemical and microbial laboratories, water treatment and resource monitoring. We monitor all of our water resources and treatment processes.

The BWS started chemical testing in 1931, testing for chloride and pH. We started bacteriological examinations in 1933.

In 2013, after Ernest Lau became Manager, the BWS established the Water Quality Division. Forming this division was a very strong statement about the importance of water and that it remains of high quality in the future.

The Water Quality Division takes its responsibility to protect water quality very seriously. Our continuous surveillance provides an early warning for potential contamination. The Safe Drinking Water Act requires testing for 75 contaminants. The BWS monitors for over 200 contaminants. The Water Quality Division also monitors for aesthetics [taste and odor]. The mainland has challenges with the aesthetics of their water all the time. The BWS deliberately uses less chlorine, which affects taste. Using less chlorine means we are required to test more often; but we do this to preserve the taste – the aesthetics – of our water.

Chlorination is done at all BWS treatment facilities. Activated carbon is the filtration system used in Central O'ahu to treat the water that contains agriculture chemicals that were discovered in 1982. This filtration system continues to be used today. It is important to remember that what we do at the surface of the land can impact the quality of the water below. Proper application of things like pesticides, and proper waste disposal are key to protecting water quality.

Common questions include:

Do I need a water filter?

No. If the water has to be filtered, the BWS will filter it. Filtration on private property is a choice. Just remember that if you take on that responsibility, you must operate your filtration system properly.

Is our water contaminated?

No, the BWS is prohibited by law from delivering contaminated water.

Which is safer: bottled water or tap water?

They are both safe. There is a difference between bottled water and tap water. One is in a bottle. Bottled water is considered a food product. It undergoes a process that removes all of its minerals. This is an individual choice.

Does the water get contaminated in a main break?

In a main break, water is shooting out of the pipe and no contaminants can get in. Then the section of pipe with the break is isolated from the rest of the system. The system is under pressure. For anything to get into the system, it would have to overcome that pressure. Before the repaired or new section of pipe is placed into service, it is disinfected and flushed so that the water flowing through will not be contaminated.

What is the biggest threat to O'ahu's water quality?

Activities that take place in the environment. The environment has an ability to absorb a certain amount of impact; the use of chemicals is the #1 concern. Our water quality can become threatened when we reach the point that those activities release chemicals beyond the environment's capability to absorb them.

QUESTIONS & ANSWERS

Q. How long will you have to treat Central O'ahu's water with filtration?

A. We've treated Central O'ahu water for contaminants for 30+ years now and instead of seeing a decrease, we've seen increases. Some of our pump stations used to show "zero" [no measurable amount of] contaminants from agriculture; now we are measuring some. We anticipate using the filtration system indefinitely, maybe 50 to 100 years into the future.

Q. Do you see similar contamination anywhere else on the island?

A. No, but there are other places we are concerned about, like Red Hill. The Navy's fuel tanks are so close to the water supply that we are very concerned. Some people say that if contamination gets in the water, we can just treat it. That's not necessarily true. If the amount of contamination is very large, we can't treat the water enough to make it safe. Treatment is only as good as the amount of contamination. The

option of treatment may become infeasible. With extremely high contaminant levels, treatment is not that easy. Some contaminants are very easy to remove with treatment; others are very difficult.

Q. Is there a pH level that the BWS tries to maintain?

A. pH is how acidic or basic the water is. The pH of BWS water varies but not by much. Typical pH levels are:

- Metropolitan Honolulu 7.8-8.3
- Windward, North Shore, Mililani 7.0 – 7.1
- Ewa 7.5
- Wahiawā 6.9

Q. Is the BWS's water the best tasting water?

A. I'm not sure. In terms of water utilities, the BWS is among the top 50 largest water suppliers in the country. There are thousands of water utilities nationwide.

Q. What is the lesson of [lead contamination in] Flint, Michigan or outbreaks of Legionnaire's Disease?

A. Investigate potential change before you do it. Flint Michigan did not investigate what would happen when they made the switch to river water.

Q. Why is the BWS testing more than 200 compounds instead of the 75 required by law? Is the BWS saying that the EPA standards are not safe?

A. We use over 10 different test methods. Some of these can test up to 30 different compounds at a time. This enables us to test for different kinds of organic chemicals, synthetic, fuel-based, and other chemicals that are not required by Federal rules. We ask the laboratory for reports on the maximum number compounds or contaminants that we can get from the tests. We get more for our money.

Compounds that have been identified scientifically as a health concern are already regulated by law. But in addition to those, there is information about other compounds that we want to know. There are always contaminants of emerging concern. Some of those are not regulated and not on the EPA's concern list, but they are a concern at a local level. The BWS is vigilant because we want to know.

Q. What is the frequency of the tests?

A. Chemical testing is performed once per year. Biological testing is performed monthly.

Q. Do you test for taste?

A. No, taste is not one of our tests.

Q. Why does water served in a Kāneʻohe restaurant taste better than water in restaurants in town?

A. Water in town is much more mineralized than in Kāneʻohe, which has softer water. Taste can also be impacted by the plumbing as well. Old piping can potentially impact the water.

Q. What are your concerns over a very long period of time about the quality of our water?

A. We need to be vigilant to what we apply in the environment. Some things used in the past don't degrade well. Today, organophosphates (like pesticides and herbicides) decompose and change into components that don't linger.

Comment: Let's map those chemicals.

Response: There is a map like that on the Department of Health website, of all the islands and where the contaminants are. Most are not related to health concerns. [website: health.hawaii.gov/sdwb/groundwater-contamination-viewer]

UPDATE ON CONDITION ASSESSMENT OF RESERVOIRS

Jon Toyoda, Sr. Vice President of CDM Smith and the consultant project manager of the BWS Water Master Plan, said that condition assessments have been done on BWS wells and pump stations, filtration plants, data and control systems, corporation yards, pipelines, and reservoirs.

The rough estimate of replacement capital costs for these elements of the BWS water system is over \$10 billion. By comparison, reservoirs have a replacement cost of \$1 billion. The largest component of replacement costs is for the system pipelines.

Reservoirs are located throughout the island, close to customers. Reservoirs provide:

- Operating storage – to balance peak and average demand
- Fire water storage – public safety
- Emergency storage – restores reliable service; customers can get water in cases of emergency

Of the BWS's 171 reservoirs, 169 are made of concrete. The reservoirs range in age from brand new to over 100 years old.

They also range in size from 0.1 million to 6 million gallons. Most of BWS's reservoirs are relatively small – less than 0.5 million gallons. Jon showed photos and illustrations of typical reservoirs: at grade, partially buried; buried; and elevated.

He said that most reservoirs are conventionally- reinforced concrete. About ¼ are pre-stressed concrete, where the tank is under compression. Pre-stressed concrete tanks generally have thinner walls and are less expensive.

Conventional concrete tanks have a long history of successful performance with minimal maintenance. Some reservoirs are wire-wound. Some have been retrofitted with external post-tensioned galvanized cables wrapped around the tank exterior. Strand-wound tanks have a proven, long-term success record; these are considered best in class of the modern tanks used throughout the country.

Jon went on to describe three assessment techniques used:

- Visual inspections - All 171 reservoirs
- Interior inspections – Remote Operated Vehicles were used to inspect the 30 reservoirs that are more than 40 years old and/or have never before had their interiors inspected.
- Desktop analysis – Used to evaluate numerically how 17 reservoirs of different designs and materials would survive in hurricanes or earthquakes

Jon explained what the exterior inspections showed:

- Condition of the tank concrete, rebar, paint and appurtenances (such as ladders)
- Condition of repairs that have been made previously
- Whether or not the concrete has developed voids (missing concrete)
- Condition of slabs (leaks, cracks and deterioration)
- Condition of roofs (ponding, cracks and deterioration)
- Overall condition of reservoir sites, including the vegetation, landscaping, roads, and fences.

Remote Operated Vehicles were used to inspect the interiors of tanks full of water, and which could not have been inspected otherwise unless using divers or draining the reservoirs.

Jon then described the purpose and process of the desktop analysis. O‘ahu is classified as a high seismic zone, and this was one reason for performing the numerical analyses. As the team analyzed how the 17 different reservoirs would perform in an earthquake or hurricane (winds of 145 miles per hour), they also looked for opportunities to make seismic retrofits. From this information, the team developed seismic-retrofit conceptual details and cost estimates. Jon said while older reservoirs are not expected to meet current seismic standards, the analyses predicted how they would perform under modern standards.

Jon told stakeholders key results:

- 95% of BWS reservoirs are in good to excellent condition.
- 5% need near-term repair or rehabilitation.
 - Most of these are wire-wound reservoirs built in the 1960s.

Other findings of the reservoir condition assessment include:

- Certain reservoir configurations should be structurally inspected more frequently, approximately every 5 years.
- Concrete reservoirs do not have a fixed expiration date. If properly built and maintained, they can last a very long time.
- Seismic retrofits can be implemented at a relatively modest cost.

Based upon external and internal inspections, the condition assessment team identified 500 projects of different sizes, about ¼ of which would be prioritized as “high”. Those would cost \$15-\$20 million. The rest are considered low and medium priority projects, which collectively would cost \$85 - \$90 million.

Seismic events of the magnitude that could damage BWS reservoirs are very infrequent (less than every 250 years). However, there is little redundancy with reservoirs, so if one fails, the consequences can be serious. The estimated cost to make seismic retrofits to 14 of the reservoirs is \$25-30 million.

The findings will become an important part of the Water Master Plan. Methods and results will be documented. Results will be used to help prioritize repair and retrofit projects. Prioritized projects with cost estimates will be included in the 30-year Capital Improvement Plan. Highest priority projects are already being addressed.

QUESTIONS & ANSWERS

Q. Did you review any of the non-tank reservoirs that the BWS owns? Are any of those used for potable water?

A. We have five open reservoirs, and none are used for potable water. They will be included in the Water Master Plan, but the analysis is separate.

Q. What will happen to the Kailua Heights reservoir structure?

A. It has been replaced with another and needs to be demolished.

Q. How are you budgeting for all of these projects?

A. The projects being developed are based on condition assessments, evaluations of the piping and pumping systems, the 2040 population growth projections, and other factors. It will be up to others, including this group, to look at the costs, the rate impacts, and other things to determine how quickly they need to be implemented.

From an engineering perspective, we will make recommendations regarding the priority. The dollar volume of projects to be implemented each year is still to be determined. We are starting with budgeting \$80 million per year for projects, which is the current annual capital project budget at this time.

Q. There are a few reservoirs that are half or fully buried. How do you inspect the exteriors of those? Do you inspect the soil to see if there is a breach or if anything is coming into the soil?

A. The BWS has several reservoirs that are partially buried and one that is fully buried. They were inspected internally and structurally evaluated. All of these reservoirs are conventionally reinforced, so the external inspection is less of a concern.

Q. Of the 5% that need rehabilitation, are they concentrated in a particular area of the island?

A. No, they are all over.

Q. Do the levels of these reservoirs fluctuate over time? And, do we check for *Legionella*?

A. Most reservoirs' water levels vary. Typically, the level varies from 100% full to 75%. *Legionella* is not found in groundwater, so the BWS does not test for it.

Q. Are all reservoirs independent of each other? If one reservoir is out of service, can water feed from one to another? Do you have to bring water to the reservoir that is not in service?

A. Most reservoirs are relatively independent from each other. The BWS can fill reservoirs through a complex system of pumps. Reservoirs are connected with pipelines and are part of the water system. They are interconnected by pipelines and pumping system. There are some isolated areas, like ridge systems where there is a single reservoir.

SUMMARY AND NEXT STEPS

Dave announced that the stakeholder tour of Hālawa Shaft, Xeriscape garden, and rain barrel workshop will take place on February 20th. He encouraged everyone to look for upcoming email invitations about this event.

Dave announced that the next meeting will take place on March 16, 2016 at the Blaisdell Center.