

**MINUTES**  
**DEPARTMENT OF WATER SUPPLY**  
**COUNTY OF HAWAI‘I**  
**WATER BOARD MEETING**  
**June 26, 2018**

**Hilo Operations Center Conference Room, 889 Leilani Street, Hilo, Hawai‘i**

MEMBERS PRESENT: Mr. William Boswell, Jr., Vice-Chairperson  
Mr. David De Luz, Jr.  
Mr. Leningrad Elarionoff  
Mr. Kenneth Sugai  
Ms. Kanoe Wilson  
Mr. Keith K. Okamoto, Manager-Chief Engineer, Department of  
Water Supply (ex-officio member)

ABSENT: Mr. Craig Takamine, Chairperson  
Mr. Bryant Balog, Water Board Member  
Mr. Nestorio Domingo, Water Board Member  
Mr. Eric Scicchitano, Water Board Member  
Director, Planning Department (ex-officio member)  
Director, Department of Public Works (ex-officio member)

OTHERS PRESENT: Ms. Jessica Yeh, Deputy Corporation Counsel  
Mr. Kaena Horowitz, Deputy Corporation Counsel  
Mr. Kelly Kimball, Brown and Caldwell  
Mr. Peter Ono, Brown and Caldwell  
Ms. Michele Sorensen, Brown and Caldwell  
Mr. Richard Hardin, Lālāmilo Wind Company LLC  
Mr. Richard Horn, Lālāmilo Wind Company LLC  
Mr. Will Rolston  
Councilman Tim Richards (10:06 a.m.)  
Mr. Jeff Zimpfer, National Park Service (10:07 a.m.)

DEPARTMENT OF  
WATER SUPPLY STAFF: Mr. Kawika Uyehara, Deputy  
Ms. Nyssa Kushi, Information and Education Specialist  
Mr. Kurt Inaba, Engineering Division Head  
Ms. Candace Gray, Assistant Waterworks Controller  
Mr. Daryl Ikeda, Chief of Operations  
Mr. Clyde Young, Operations Division  
Mr. Eric Takamoto, Operations Division  
Mr. Warren Ching, Energy Management Analyst

1) CALL TO ORDER – Vice-Chairperson Boswell called the meeting to order at 10:00 a.m.

- 2) STATEMENTS FROM THE PUBLIC - None
- 3) APPROVAL OF MINUTES – ACTION: Mr. Elarionoff moved for approval of the Minutes of the May 22, 2018, Water Board Meeting; seconded by Mr. De Luz, and carried unanimously by voice vote.
- 4) APPROVAL OF ADDENDUM AND/OR SUPPLEMENTAL AGENDA - None
- 5) **PRESENTATION BY BROWN AND CALDWELL ON JOB NO. 2017-1061, POWER SYSTEM STUDIES:**

Mr. Kelly Kimball, P.E., of Brown and Caldwell introduced their technical advisors, Ms. Michele Sorensen, P.E., and Mr. Peter Ono, P.E., and went through a presentation of their findings to date on pump and motor issues for Keahuolū, Honokōhau, Hualālai and Keopu deepwells.

Scope of Services: The base contract is to provide power system studies and an electrical system program for the Department which involved an in-depth analysis of roughly 35 of its sites, giving the Department labels that made it safe for working on equipment and looking at the electrical safety program to make sure it was in line with their other work.

The Department asked them to look at electrical failure modes and some power quality analysis for four of the wells, named above, looking at the mechanical failure modes. While they were performing the analysis, it turned out they were seeing some items they needed to look at closer on the mechanical side so the scope of work was extended to include that.

The deliverable for all four wells are technical memos, which are in draft format. Their evaluation and analysis of each of the four well sites and those recommendations are based on the likely causes of failure and are not a root cause failure analysis, meaning they did not find a single smoking gun. They are presenting the likely causes of failure to address, monitor, and report. The outcome does address the likely causes of failure which is intended to promote increased service life and reliability. Out of the ten likely causes, there are probably three that are extremely likely and need to be addressed. Once those are addressed, if the issues continue, they will need another in-depth look at some of the less likely causes of failure in order to definitively determine where the root cause of the failures is coming from.

Looking at the mechanical causes of failure, they are bearings (any rotating part that has bearings associated with it); seals that are designed to keep foreign substances out of the motor and pump assemblies; hydraulic transients (or water hammer) which are sudden changes in fluid dynamics or pumping actions that cause pretty extreme pressures on equipment, check valves, pipes, etc.; and well casing drift (how straight the well is relative to the equipment being placed in it). He referenced a diagram in his presentation of what pumps look like and what some of the major components are. The pump assembly, which is the bowls and impellers that move the water to the surface; suction inlet where the

groundwater is sucked into the pump assembly; the coupling between the upper pump assembly and the suction inlet; and the lower housing which is the submersible motor and the thruster. If you break it up into two components, the upper portion is the pump assembly and the lower portion is the motor which is driving the pump. The Major Mechanical Failure Points diagram shows an up-close of the lower motor assembly. There are three major mechanical failure points--the thrust bearing, the seals (shaft seal and electrical cable seal), and radial bearings that keep the pump from wobbling and keeps the shaft straight. Thrust bearings are the most likely causes of failure. The thrust bearing itself translates the rotational force of the motor to move the water to the surface. It is designed to compensate for the column of water that sits above the pumps. Most of these wells are 1,400 to 2,000 feet deep and have anywhere from a 14- to a 20-inch column, so there is a ton of force on them. The thrust bearing compensates for that and pumps with any changes in fluid dynamics. They are comprised of a carbon disk. There is a fluid film that is between the two housings. When the thrust bearing rotates and comes up to speed, it develops what is called a water wedge which is the fluid that buffers the two mechanical components. That water wedge is actually like hydroplaning. They cannot run in reverse as they will grind and damage themselves. They have to come up to speed very quickly and they have to be shut down very quickly. As soon as you stop hydroplaning, you end up grinding the carbon disk which will damage the equipment. Continuing with the reasons why thrust bearings fail, one of the reasons is overheating. Too low or too high an external cooling flow results in the loss of fluid lubricity. Essentially as the entire assembly heats up, you could boil the water that is in between and you lose lubrication, the device contacts while spinning very fast, and you end up with failure of the submersible pump. For motor overheating, you have to talk about the well and the well casing. The wells are 1,200 to 2,000 feet deep; and when the well is drilled, they case the actual well itself, so there are blank casings--essentially solid pipe that goes all the way down. The last bit of the well at the bottom has perforations which allows groundwater to enter into the pump and motor. Poor cooling flow is when the pump and motor assembly is actually in the perforations. When that happens, the water is intruding horizontally into the suction unit in the middle between the motor and the pump; and it is not actually travelling across the motor itself, which is the component that is getting hot. In order for the motor to cool itself effectively, it needs a minimum or maximum amount of cool water flow across the motor to cool the device. The proper orientation is with the motor and pump set in the blank casing section with the perforations below which allows the cooling water to come up across the motor. This is not always possible because when the well is drilled, the standing water levels are at a certain elevation; and over time as you pump the water out for use, the standing levels can drop, which means you need to drop the pump and motor to compensate for that. How to handle improper cooling set-ups, especially if you have to drop into the perforations, is what is called a flow inducer shroud. This is essentially a sheet metal that encapsulates the pump and motor assembly so you can place the pump and motor within the perforations and have groundwater intrude from the perforations down to the bottom of the shroud and then up and across the motor, into the pump section, through the pump, and up the column to the surface. It creates uniform cooling flow, travelling at the manufacturer's specified velocity past the motor. There is a minimum and maximum. Manufacturers say if you are moving the cooling water too quickly, there is not enough time for the water to take the heat that is in the motor away because it is moving too quickly. At the minimum set point,

the water is not moving fast enough to carry enough of the heat through, so there is a minimum and maximum feet per second that the manufacturer recommends for these pump and motor assemblies and you have to exist within that region in order to assure they are being cooled effectively. The shroud also provides motor exterior protection. When you shroud and case the motor and drop it down below the casing, instead of it bouncing around, the shroud provides some protection for the pump and motor assembly. It allows it to be installed in the perforation and is one of the ways to solve the issue of improper cooling. The other thing from a mechanical standpoint that is more of a contributor to some of these mechanical failures is what is called well casing drift. The American Water Works Association has standards on how plumb the well has to be, and those standards are relatively loose in that the well can be relatively crooked. The reason that is a problem is that the pump and motor assembly can be up to 30 to 50 feet long; and if the well casing is crooked, it causes binding on the motor. The radial bearings talked about earlier are designed to keep the shaft, motor, and pump perfectly straight so there is no wobble. When you start to introduce factors like well casing drift, you start to already bind the shaft which means the motor has to work harder. The second piece is when there is limited space between the diameter of the casing and the outside of the motor, the tolerances are pretty tight already; but when the well is even partially off kilter, the motor leans toward one side and contributes to motor overheat because it is up against the casing. The shroud also helps with that by centering the pump and motor in the well casing.

Mr. De Luz asked when you have that angle, if they are suggesting the shroud is able to correct it, plus or minus.

Mr. Kimball replied it is, as long as the pump and motor outer diameter is decreased such that the shroud would actually fit in the well casing, but that is a detriment from the standpoint of demand. Essentially, you have to put a smaller pump and motor in the same well casing in order to get the shroud in; but it may decrease your ability to keep up with the supply on the surface.

Mr. De Luz asked if he understood correctly, what he is saying is the maximum efficiency in productivity is for the casing and the pump to be perpendicular.

Mr. Kimball replied that was correct. He continued that the other reasons for mechanical failures are when the radial bearings fail as a result of wobbling. Second are the seals. Most of the time they are oil filled, like vegetable oil; and if it leaks out into the water, it is not a bad thing. If the seals fail over time because of wear, there are two different major seals--the shaft seal and the cable seal. If either one of those fail, you will start to have water getting into the pump which then causes less of a cooling factor than the oil, which then allows the motor to heat up. There is also water hammer. That thrust bearing is dealing with a very heavy water column to the surface and tons of water pushing on it. Water hammer is the trade name for when you have sudden changes in pumping application so if you have water traveling down very quickly and turn it off suddenly, it causes vibrations in the water which can cause extreme pressures on the equipment. To help with that, throughout the 2,000-foot section of the column pipe going down, you have a series of check valves so when the motor is pushing water up to surface and it shuts off in

roughly four seconds, that is not good for water hammer. Thrust bearings have to turn off very quickly; and when that happens, you cause undue pressure on check valves, pump columns, motors, pumps, assemblies, etc. How do you validate whether or not the check valves are in the right location and the right quantity and equipment selection is there? You conduct what is called a transient analysis which is a theoretical analysis of the pump system and you model how you turn on and off the pump to determine if you are in the red zone for water hammer.

Going on to electrical failures, the top of the list is motor overheating. There were also some grounding issues. The electrical system settings, essentially are how to set the electrical equipment to protect the mechanical equipment down hole. They also looked at the power quality, which is the quality of the power coming in from Hawai'i Electric Light Company (HELCO). The majority of the things they found on the electrical side were more betterments. There were not many things found that were in the red zone when it came to being likely causes of failure on the electrical side. For motor overheating, causes are insufficient cooling water which can lead to motor burnout. He mentioned the Hualālai tear-down report and a photo showing some of the motor windings. Another issue is motor binding (misalignment in the casing). When you first do a start-up on a new pump assembly down hole and you are trying to start the pump up to do your testing, in a lot of cases, they found that it required much more electrical current, full-load amps to get the motor up and running than they would have expected or per manufacturer's recommendations. This leads them to believe that some of the motor binding is actually occurring down hole. One of the ways to handle misalignment in the casing is to do a gyroscopic analysis of the well casing which maps out exactly what the well looks like so you can confirm where you are putting the pump and motor and that you are not in a big dog leg in the well casing. This was a problem, being that it required higher full-load amps to get the motor up, which meant it was running at a higher temperature condition from the beginning. Poor power quality, voltage sags, phase unbalances, and other factors--as the incoming voltage from HELCO droops or sags, the same electrical current has to go up by the same proportion in order to maintain the pumping capacity of the mechanical equipment. The current can be measured in the form of heat and as voltage sags, the current goes up and the motor starts to heat up even. Some of their initial findings were that they were within the HELCO tariffs meaning that they are a broad range, and they were marginally within what the manufacturer would accept in terms of incoming power quality. They definitely could be a contributor to the issues, but they are still in the process of doing the power quality analysis. The other piece is down-hole thermal sensors. These are just sensors down hole, on the motor casing, that directly monitor the temperature of the motor assembly. That can give an early warning and help with trending and provide more information. Another piece on the electrical side is grounding. Note that these were all betterments. They did not find anything that was an issue on the grounding side. They recommended some transformer configuration changes for new wells but that the existing set-ups were probably appropriate. They recommended some cable types, which are essentially an isolated ground in the cable that goes down hole through the motor itself; and they reviewed the topside ground fault settings with some minor tweaks but they were definitely within the threshold. For electrical system settings, each one of the motors has a variable speed drive and a standard soft starter that can turn the motor on and off. There

are multiple settings, and they went through each of those and reviewed and compared with the manufacturers' standards and recommended betterments. The only issue they found was the overload setting, where during start-up, the overload setting had to be placed marginally higher than what was recommended by the manufacturer but still within tolerances in order to get the motor up to speed; and they think that may be because of the binding down-hole. The second piece they looked up was the ramp-up and ramp-down time. In four seconds or less, these pumps have to come up to full speed and at the same time, come down at the same rate. That is due to the hydroplaning. There is a balance between having the thrust bearing operate appropriately and not causing severe water hammer. Water hammer does not like when things are turned off and on really quickly, and a thrust bearing does not like it when you use slow start-up or ramp-down. They looked at the settings on ramp-up and ramp-down on each of the four wells, and they were all within tolerances. For other settings, they only had minor adjustments that were recommended as part of the betterments process. For power quality, as mentioned earlier, they feel that getting the power quality meters installed in different parts of the systems involves shutting down the wells; and that has been a challenge because not all of the wells are up and running so they had to hold off until there were scheduled down-times for the wells that are running. They are still in the process of gathering that power quality information in order to do a true analysis. They did look at some of the information they received from the Honokōhau Well in two different locations in the system; and they showed some power quality swings at that site, but they were within the HELCO tariffs which do not mean a lot because they are pretty broad. They were at the limits for what the manufacturers say they would accept for proper pump and motor operation. Another betterment that came out of the electrical piece was related to instrumentation. Currently, they recommended that a maximum amount of down-hole sensors be installed in order to get some sense of early warning--whether you are measuring temperature via the RTDs (resistance temperature detectors), pressure sensors, and any other instrumentation that is available down-hole in order to give a sense of trend on what is happening. They recommended an increased level of Supervisory Control and Data Acquisition (SCADA) system to give some lead time on early indicators of failure. Even with these betterments, they will not be able to predict all failures; but they will put the Department in a better position to make real-time decisions. An example would be Palani Well which had RTDs in which there was no early indication of motor overheating or any other significant issues. On the flip side of that, for the most recent failure of Honokōhau Well, there was indication that the well was trending towards a failure but required to be operational to provide water to clients.

**Recommendations Per Site:** The most recent failure at QLT (Keahuolū) Well was most likely caused by a thrust bearing failure. For motor and pump overheating, they recommended installing a smaller diameter pump and motor and the use of a flow inducer shroud. They also recommended that a "unit responsibility" be put in place for the replacement specifications, which essentially says there is one entity that is responsible for the pump, motor, cables, and everything that is down hole so that if something fails, the Department can point directly to whose responsibility it is to fix. Part two was water hammer. They could not rule out water hammer as a possible likely cause of failure. The reason is they had not done a transient pressure analysis to return proper selection of pump and type and

location of check valves. Without doing that, they would not be able to rule it out until further analysis is done. For manufacturers, as it relates to water hammer, of the six manufacturers they looked at, all of them have a wide range of recommendations on location and type of check valves to use throughout the column to the pump assembly, which means there is no clear message from them on what is needed to make sure the equipment is properly protected. In lieu of having a solid recommendation from the manufacturer, it was recommended that a transient pressure analysis be performed. They could not rule out power quality from HELCO. The electrical settings and adjustments that needed to occur, he believed all, if not most, have already been done at these four sites based on their recommendations. Bringing this into a frame of reference, Brown and Caldwell looked at the realm of possibilities, independent of what the tear-down reports were saying, came up with their own conclusions, and did a cross compare of what they were saying were the likely causes of failure and what the tear-down reports were saying. For example, on QLT, a piece of the executive summary says "The submersible motor engineering tear-down inspection report dated September 1, 2017, suggests that the pump failure may have been caused from a bad valve, pump issue, back spinning, or water hammer." When Brown and Caldwell took their likely causes of failure and compared them to that report, they were able to eliminate some of the cases they were saying could have been the cause of failure. One was a bad valve or back spinning. One of the first things an operations group does when they reinstall the pump column and the check valves is they check for operations. It is not likely, but not impossible, that a bad valve or back spinning is occurring on the check valves. For water hammer, they agreed they could not rule that out without further analysis; but the other issue they brought up as a pump issue, which is very generic, is saying there could be two hundred things that may be a pump issue so they agreed that the most likely cause was a pump issue caused by overheating. After review, they believe the likely cause of failure was motor overheating and was the failure of the thrust bearing. Given the physical attributes of the pump, motor, and well configuration, it is likely that there is insufficient cooling of the motor. What Brown and Caldwell is suggesting is that motor overheating is a likely cause and that the recommendation is to address the motor overheating, cross it off the list, monitor and report whether or not the issue is still persisting; and if it is, go an additional level down to look at some of the less likely issues.

Mr. De Luz asked if there were any well drifting casings that could have contributed to some of these causes or if they were all within tolerance.

Mr. Kimball replied they were within American Water Works Association standards, but they did not specifically look at the motor's outer diameter and length compared to the specific section of where the pump was installed because they had not done the gyroscopic analysis. As part of the repair and replace specifications, that is being performed.

Mr. Elarionoff expressed his disappointment with the presentation--the reason being that from listening to the Department's staff, they mention a broad range of possibilities. For example, if his truck died on the side of the road and he called a mechanic consultant, if the mechanic gave three or so reasons why it could happen, he would not accept that answer. He would want to know why. He, as a Board Member, has been sitting here long enough

and seeing this happen and wants to know why, all of a sudden, four wells go down. He does not want to know a range of reasons why, or the trend--he wants to know what caused it. He was hoping they would have answers but instead are providing recommendations on maybes.

Mr. Kimball agreed that he would also like to have those answers. He would like nothing more than having a definitive smoking gun to say this is the root cause of failure for all of these wells or maybe a single issue for each of the four wells, but he cannot. If you frame it up in the context of a car engine, that engine and other parts are pretty readily accessible and not 1,800 feet down in a hole, which provides an additional degree of their ability to gather the right information--understanding definitively what is happening with things like cooling water, radial bearings, etc.

Mr. Elarionoff asked what changed in the trend to have all four wells failing at one time.

Mr. Kimball replied he does not have an answer for that question. Some of it may be coincidence when it comes to all the failures lining up on top of each other, or near-term could be changes in pump and motor manufacturing standards that was a pre-existing issue with replacement of pumps and motors for causing an issue to rise to the top and cause failures. He did not have a good answer for that.

Mr. Elarionoff stated that the Water Board faces the people, and it is difficult to try to explain to them something that he does not have the answer to.

Mr. Kimball stated that the message he would like to convey is that, first of all, they wish they were able to give a single issue; but in light of not being able to do that, and they do not think it is physically possible to do that, he would hate to tell the Board something that was not true. In light of that, the best information he can give are the likely causes in order to have them addressed through repair and replace specifications and correct those deficiencies and address big-ticket items or most likely causes. He understood the frustration, but the only way to assess each well is to go through all of these studies.

Mr. Sugai asked if the groundwater temperatures have changed at all and if it may be a contributor.

Mr. Kimball replied it can be. The information they looked at was the groundwater temperatures had increased marginally over a five-year graph that was given to them but not to a level that would make it an issue for the manufacturer's recommendations. He asked Mr. Inaba if he had anything to add.

Mr. Inaba stated that the water temperatures, if anything, have been pretty steady.

Ms. Wilson asked about the power quality from HELCO and when would be the time Brown and Caldwell is hoping to gather that data.



Mr. Kimball replied it would be as soon as they can schedule with the Department to do a shut-down on a well to install the equipment.

Mr. Inaba added that the Department had just gotten a monitor put in the Honokōhau Well and there was a failure so there was very little information from that. For this one, the Department has most of the HELCO information so what they are looking at is the information on the power going down to the motor from the equipment topside. The power quality monitor has to be modified.

Mr. Kimball explained that on the incoming power supply from HELCO's transformer into the Department's system, they have a good chunk of that information from HELCO and the power quality meters. What they do not have is actual information of the power quality that is going directly down hole to the motor. It is a critical piece of information that is needed because it helps them make some valuable judgments on the stability of the electrical system, both owned by the Department and by HELCO. It gives a benchmark to assess and analyze. It is difficult to get the power quality meters installed just because some of the wells are down.

The Manager-Chief Engineer added that the monitors will be added to the repairs currently underway. The same goes with the RTDs.

Mr. Kimball stated that most of the recommendations are varied in terms of likely causes of failure. For QLT, the most recent was a thrust bearing failure and it would appear that the thrust range failed catastrophically, which could be attributed to motor overheating.

Mr. Elarionoff asked if the recommendations are based on the most likely problem down to the least likely problem.

Mr. Kimball replied that was correct and there were many more recommendations, but the report shows the top four. For Honokōhau, the most recent failure has no tear-down report, but the second to the last report was a thrust bearing failure. They were monitoring the RTDs on the motor in this well, and there were a lot of adjustments that were manually being made to the speed of the motor in order to achieve maximum cooling because they knew, via the RTDs, that it was getting hotter than it should. They did not know why, but they knew it was happening. The final failure was that the motor windings burned up. It megged zero when they did some electrical tests, but they do not have a tear-down report on that yet. Hualālai, the most recent failure, could be attributed to an air pocket in the motor caused by the breakdown of insulation, resulting in a short. This was directly out of a tear-down report so he did not have first-hand information on that piece. Second to the last failure was overheating, causing breakdown in the winding insulation. For Keopu, they did not have a tear-down report on the recent failure, but the second to the last failure appeared to be a motor defect.

Conclusions: 1) Address insufficient water flow resulting in inadequate motor cooling, proper pump selection, utilize a flow inducer shroud with more slimline motors. In some cases, you are going to get a smaller pump and its ability to meet demand; but the intent is

you have a more reliable system in that process. 2) Include unit responsibility in specifications as the Department goes through the repair and replace process for some of the wells that are down and get that from the contractor or the manufacturer so that when things do fail, there can be a single point of responsibility for the Department to investigate and negotiate with for fixing the problem. 3) Performing transient analysis on any of the four stations where water hammer could be an issue. 4) Modify the electrical equipment settings may have been implemented on all four wells.

The next steps are, as part of Amendment No. 2, they added three more wells--Wai‘aha, Kalaoa, and Palani. Repair specifications for Hualālai have been reviewed and already has been bid. The others yet to be done are listed. When it comes time to repair the well, they help the Department review the specifications being put out to help implement these recommendations. He recommended that the power quality data still needs to be collected and analyzed. He asked if there were any questions.

Mr. Boswell stated that his questions were answered by this presentation and that this is a work in progress. They have engaged in some critical areas; but if he understood correctly, there is another level that still could be taken.

Mr. Kimball replied there could be, depending on well performance after the wells have been repaired. These recommendations are designed to promote reliability and increase useful service life of the submersible pumps at each one of these well sites. If they perform well and are achieving their useful service life, that would put it in a good position. However, if they are installed and getting half the useful service life, you could say something is still going on and needs to be looked at. As the Department goes through this repair/replace process, it should see an increase in reliability and up-time for the wells.

Mr. Boswell asked where it would end up if a gyroscopic alignment review is done on a repair and it is not satisfactory.

Mr. Kimball replied it may require looking at alternate motor and pump selection because if it is too much deviation, you could either change its location in the well casing or decrease the outside diameter of the motor and pump to have more room.

Mr. De Luz asked if he was correct in his understanding that each well is dynamic in regard to well casing drift and even the capacity of how much the well was originally designed to pump, versus when it fails, if you need to re-assess or start from scratch, you must ensure you are not putting something back in the hole without looking at all of the possibilities first. Each pump and motor configuration is unique to that particular well so the dynamics can be difficult on a repair because it may mean reassessment of the pump and motor. It may be more difficult in regard to planning, but what he is hearing is that these are the control variables that have the capacity to be managed to hopefully give enough data before the well has to be shut down.

The Manager-Chief Engineer replied that was correct. Each well is individual in the fact that it is a different size, depth, casing diameter, plumbness and alignment; but those are

the givens the Department has to deal with. Now the variables that can be controlled are the pump and motor diameter to give the best chance of success and longer life than has been experienced. If we do not know any better, we will try to put a slimmer pump down the hole. Capacity may be reduced, but 700 gpm is better than zero. What Brown and Caldwell is suggesting, and the Department is following already, is as much monitoring as can be put down the hole that the manufacturer will be able to provide because not every manufacturer has the same kind of sensors. The Department will spec out to put those monitors in to get more information.

Mr. Elarionoff wondered why, all the more, these four wells quit at the same time, given the fact that every well has different measurements.

The Manager-Chief Engineer replied that if it were known, it would have been fixed. The Department is equally frustrated and does not want to be in this situation. The problem is there is no single known cause for the failure. Overheating is a symptom but not the root cause.

Mr. De Luz asked if the Department is looking to design a contingency also, which may not have been as critical in the past.

The Manager-Chief Engineer replied that was correct and would include mid- and longer-range planning too.

Brown and Caldwell's presentation concluded at 10:58 a.m.

RECESS: Ms. Wilson moved that the Board take a five-minute recess; seconded by Mr. Sugai and carried unanimously by voice vote. (RECESS: 10:58 a.m. to 11:08 a.m.)

6) SOUTH HILO:

**A. DISCUSSION AND REQUEST FOR EXECUTIVE SESSION PERTAINING TO FILING OF FIRST AMENDED COMPLAINT IN *HAWAI'I CONFERENCE OF THE UNITED CHURCH OF CHRIST v. WATER BOARD OF THE COUNTY OF HAWAI'I*, Civ. No. 18-1-111 AND REQUEST TO HIRE SPECIAL COUNSEL FOR THE WATER BOARD:**

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Plaintiff Hawai'i Conference of the United Church of Christ ("HCUCC") filed its first amended complaint against the Water Board on May 18, 2018 alleging breach of a lease agreement between the Water Board and HCUCC entered into on January 7, 1977. The Department would like to advise the Board of its option to retain outside counsel for this matter.

The Water Board anticipates convening an executive meeting, closed to the public, pursuant to Hawai'i Revised Statutes, Sections 92-4 and 92-5(a)(4), for the purpose of consulting with the Water Board's attorney on questions and issues pertaining to the

Water Board's powers, duties, privileges, immunities and liabilities with regards to the civil suit filed above, and its ability to hire or retain outside counsel for the matter.

ACTION: Mr. Elarionoff moved to enter into Executive Session; seconded by Mr. Sugai and carried unanimously by voice vote.

(Executive Session began at 11:09 a.m. and ended at 11:34 a.m.)

Vice-Chairperson Boswell asked if there was a Motion to approve the recommendations from Corporation Counsel and from the Department of Water Supply regarding the complaint filed on behalf of Hawai'i Conference of the United Church of Christ against the Water Board.

ACTION: Ms. Wilson so moved; seconded by Mr. De Luz and carried unanimously by voice vote.

7) SOUTH KOHALA:

A. **WATER TREATMENT PROPOSAL NO. 2018-08, FURNISHING AND DELIVERING COAGULANTS TO THE WAIMEA WATER TREATMENT PLANT:**

Bids were opened on June 7, 2018, at 2:00 p.m.; and following are the bid results:

<b>Bidder</b>	<b>Bid Amount</b>
Pural Water Specialty Co., Inc.	\$250,800.00
Phoenix V LLC dba BEI Hawai'i	\$281,853.00

<u>Bidder</u>	<u>Amount</u>
1) Pural Water Specialty Co., Inc.	\$250,800.00
2) Contingency	<u>149,200.00</u>
<b>TOTAL CONTRACT PRICE</b>	<b>\$400,000.00</b>

The reason for the high contingency is that as the source water's turbidity increases during the year due to unstable weather conditions, more coagulants are used to meet the water quality requirements of the State of Hawai'i, Department of Health.

The Manager-Chief Engineer recommended that the Board award the contract for WATER TREATMENT PROPOSAL NO. 2018-08, FURNISHING AND DELIVERING COAGULANTS TO THE WAIMEA WATER TREATMENT PLANT, to Pural Water Specialty Co., Inc., for the bid price of \$250,800.00 plus \$149,200.00 in contingency, for a total contract price of \$400,000.00 and that either the Chairperson or the Vice-Chairperson be authorized to sign the contract, subject to review as to form and legality of the contract by Corporation Counsel. The contract period shall be from July 1, 2018, to June 30, 2020.

MOTION: Mr. Elarionoff moved for approval of the recommendation; seconded by Ms. Wilson.

Mr. Ikeda explained that normally, the Department puts out a bid for polymers; but with the Waimea Water Treatment Plant changing to the membrane system, the use of polymers is no longer needed and is replaced by coagulants. He added the high contingency because in the past, it was seen that the water quality changes so much, for example, if it is a rainy period, more chemicals are needed and sometimes the Department had to come back to the Board for additional funds. This higher contingency is only as needed and if not used, the money goes back.

ACTION: Motion was carried unanimously by voice vote.

B. **STATUS UPDATE FOR LĀLĀMILO WIND COMPANY OPERATIONS:**

Lālāmilo Wind Company LLC was present to provide an update on its windfarm operations. (The following is transcribed verbatim.)

R. Hardin: Thank you for letting us appear and be on the Board agenda. My name is Richard Hardin. I am one of the three members of Lālāmilo Wind Company that operates the windfarm at the Lālāmilo and Parker Wells. With me is Richard Horn. Mr. Horn is one of the other two members of the LLC and he is the technical director for us. He is also the president of Site Constructors and they are our sister company that built the project and so he is familiar with all of the technical aspects of the wind farm and its interconnection to the Lālāmilo well site. I also asked Will Rolston who was the County Energy Coordinator during all times of the RFP process and throughout a significant portion of the construction time to be here and address you. Will agreed to do that of his own volition. A significant amount of his energy and his life was spent in this project. He feels the importance of it and that he wanted to make himself available. I also thought that he would give you a vantage point from the County side rather than our side of the events that have occurred at and involving the project. The primary reason for our appearing here today is to attempt to resolve a circumstance that has brewed and occurred that is risking the viability and future of the project in its entirety. These efforts that we are engaging in today are directed to try to resolve this. I am not going to speak today about legal theories and that kind of thing of why we feel DWS is legally responsible. If we are unable to resolve this, then that's the subject of a later time. If I'm asked to, I will speak to those issues but it is not part of my presentation. To get started, I have some exhibits to share with you; and the bad news is they are a bit out of order or missing exhibits and the good news, that means my presentation has been shortened and you won't have to listen to me for that length of time. (Mr. Hardin handed out his exhibits to the Board.)

The problem we are experiencing is there is a significant gap between the amount of energy that we are making available at the delivery point of the project to DWS and the electricity that DWS is actually utilizing. With that in mind, and for those of you who have not been involved in this since back to its inception, in the mid 1980's to 2010,

there was a windfarm located at Lālāmilo and DWS drew energy from that site. In 2011/2012, it was decided after some research, and Mr. Rolston can certainly advise you better, he was directly involved with that early process; and he was on a three-person committee that was in charge of the RFP process, put it together, sent it out for bidding by contactors, overviewed it, and eventually that committee was the one that accepted our bid to proceed. The project was represented to be a repower of the former project that had operated there since the mid 80's to 2010. The bidders were advised that we were to build a windfarm that would be the primary source of electricity at the site, looking to generally replace utility energy with alternative clean energy. We were provided with a significant amount of data. The data pertained to wind history that had been collected at the site. The data consisted of energy usage over a number of years so we were made aware of information, allowed us to make decisions about our power generation capability and the ability of the DWS to use that energy based on their history of usage. Also, the fact that they had been the recipients of wind energy for a couple of decades was important to us because that meant that under a two-party energy system, we're dependent on our customer, if you will, to buy. They don't buy, we don't sell. We don't sell, we can't keep the project going. So, the fact that they had this history of utilization of wind energy was important to us. The basic difference between wind energy and standard utility energy, it doesn't take a scientist to figure out--when the wind blows, you get energy. When the wind doesn't blow, you don't so the name of the game is you run your pumps when you have the wind, you fill your reservoirs with it; when the wind quits, you utilize the water that you have stored until you get wind again. It's a balancing act and a managerial matter that must be dealt with. We took the data that was given us about wind and data that was given us about the history of usage and shared it with American Savings Bank, our lender of choice, as we have worked with them before on another project. We jointly, with the engineers, designed a plan for a 3.3-megawatt project to be installed at Lālāmilo. We presented that project to the three-person committee. A lot of communication back and forth, a lot of meetings, a lot of discussions; and it was ultimately determined that our bid would be accepted. I later heard it was unanimous and I'm glad to hear that. And based upon that, a basic understanding was reached; and eventually, a Power Purchase Agreement was signed. But the basic understanding that was reached, the eye ball to eye ball, hand shake to hand shake, this is what we're gonna do, is contained in the first document I have given you, which is "Exhibit C Pricing." That Exhibit C is an exhibit to the, what was eventually entered into, a Power Purchase Agreement between the two parties, with us as providers and you as purchasers. Looking at Exhibit C -- "The windfarm is expected to produce an annual average energy production of approximately 13,100 megawatt-hours. Based on detailed analysis of the wind resources and the existing pump load data, it is expected that a minimum of 8,000 megawatt hours of this total to be consumed by the eight Lālāmilo and Parker Wells." There is a lot of information there in just a short paragraph. We are agreeing to provide a windfarm that will have those production levels. We are jointly agreeing that the site has the capability, based on the data that is provided, of reaching those production levels; and the DWS is stating unequivocally that it will consume that energy, which means they will purchase it. The contract period is for 20 years. The energy cost for the first five years was agreed to be 24 cents and there was an annual escalator. What I'm saying to

you is this is the heart of the transaction. If we had no other contract, this was the agreement. The DWS is telling us you build us a wind project that produces 8,000 megawatt hours a year minimum, 13,100 a year average, and we will buy that energy. And so we did. And the windfarm is state of the art and complies in every respect with these production capabilities. It is controlled by a SCADA computer monitoring system and is a Swiss Watch in the windfarm business and has all these production capabilities. What I want to further explain to you is that beyond the delivery point between the windfarm and the Lālāmilo and Parker Wells, we were not required, nor did we submit, any plans or specifications for modifications to infrastructure of the DWS operations there. The only plans and specs and modifications that occurred there related to interconnection to make us available so that they could receive the energy and also to interconnect with the utility company because it was important that we would be the primary source but wind energy was to be utilized first; we had to have the backup of the utility company energy. First of all, it was not our responsibility to change infrastructure of DWS' property. Secondly, we do not have any operational control over the DWS pumps and their operations on that site. We are actually prohibited by law from doing that because it is a clean water drinkable water project. Our effect on that side of the operation is strictly limited to recommendations we may make or suggestions we may make that are adopted or not adopted by the DWS; but they run the water company; we run the wind company. And we are available and have been available and will assist when asked to. And we have made recommendations and we have made suggestions, some of which have been adopted; some of which have been rejected; but we don't run that part of the aspect of the operation. And so we look at this project as though it is our responsibility to produce this energy, and it is your responsibility to utilize that energy; and if we both do our jobs, this thing is a ringing success. I want to dispel any ideas that the RFP called for us to be a part-time operation or provide just part of the energy out there, rather than being the primary source. In doing so, I want you to realize and maybe reflect that during this timeframe, there was a slogan at DWS. The slogan was the Lālāmilo is going to save our customers \$1.0 million a year for 20 years. I heard that from staff members, I heard it from the Mayor, I heard it from the Mayor's staff. I heard it so much, I started saying it.

The second exhibit I have given you is a July 2014 Lālāmilo information sheet. I bring this to your attention because what this reflects is that, besides the slogan, the effects of this windfarm and the intentions of this being the primary utility source was not only represented to us, it was represented to the citizens of the island. Through the process, as it proceeded, we had an Environmental Assessment meeting in Waimea. We appeared from the windfarm and Keith and some other members of DWS appeared and this was an opportunity for the general public to come in and be informed about the windfarm, get information, and ask questions. In the second paragraph, you will see it read "DWS's mission is to provide affordable water service to the people of Hawai'i Island. In April 2011, DWS established an energy policy to reduce energy use and its associated costs and environmental impacts. The Lālāmilo windfarm is consistent with this policy and is expected to save DWS customers more than \$1.0 million per year in energy costs over the next 20 years." What does that mean in relation to the representations to us? How do you save a million dollars a year? The savings comes

between the difference in what we charge, which was then to be 24 and has been adjusted to 27 for some other expenses...the difference between what we charge and what HELCO charges. So let's say as it is now, our rate is 27 cents and HELCO's is, say 37. I think it's probably higher, but let's say 37. You are saving a dime a kilowatt. In order to save a million dollars a year, you must buy from the Lālāmilo windfarm, three million dollars' worth of electricity. Three million of electricity fits right into the scheme of 8,000 megawatt hours a year minimum, 13,100 megawatt hours a year, so we weren't the only ones who were expecting this project to be the primary source of energy. What is the dilemma, what has happened, what is our problem? The problem is that we went into full-time production in Sept of 2017 and we saw that our sales are not there. The Department is not purchasing the energy agreed upon under the circumstances we described. Initially we were thinking we were in a very poor wind venue. At that time, we were just having extraordinarily poor winds and so for a little while, we wrote it off to that; but it continued on. It continued that about half the energy we expected to be used was being purchased. We went to the SCADA solutions folks that have the monitoring system on the windfarm and we asked them to look into this for us and we asked them if they could please run a program to determine the amount of energy that was available at the delivery point but was not being used by the DWS and calculate that. They did that and from other related information, we prepared this chart that I am giving you that has a "5" marking on it. You'll see that it runs from the months of September 2017 through March of 2018. The second column is HECO Produced kWh. What that means is there was 3,812,400 kilowatts of utility energy purchased by DWS during those months. If you go over to column five, you will see the corresponding windfarm produced kilowatts during that timeframe. If you go month by month, you will notice that generally speaking, more utility company energy is getting used than windfarm energy to where when you finally get down to the bottom, 3,812,400 kilowatts were used from the utility company versus 2,067,747 kilowatts used from the windfarm--almost double. If you go over eight columns, you will see Unused Kilowatts. There, 1,929,035 available kilowatts from the windfarm that were not utilized during that timeframe. What is the problem and what is the effect of all of this? The effect on the rate payers is pretty clear. The rate payers are not getting their \$1.0 million a year savings because DWS is not using the windfarm energy to the available capacity by any means. The rate payers and the citizens of the island are not getting the ecological benefits. The windfarm, in our environmental studies, when it is running the way it is supposed to run and we are producing the energy we are supposed to produce, it eliminates 11 million cubic yards of carbon waste annually so we are not getting those benefits. Generally speaking, at this point in time until we get this straightened out, all the rate payers are getting is the fact that they have paid the DWS expenses for this project since its inception back when we started the LLP process. They are just not getting their benefits.

What is the effect on us? We built a windfarm for these specific capacities. That means we spent the money to build a windfarm to these capacities. If someone had said to us we are only going to use about half of that, we would have only built you half a windfarm or we would have passed on the bid. But we wouldn't have spent \$15 million for the kind of production we are getting, nor would the bank have loaned



us the money because they have to look out for their depositors' funds. So, from our standpoint, what's going on is the project, at these rates of sales, does not cover its basic cost, let alone the three members here who have invested the money. We are not getting any return on our investment, or even return of the principle of our investment. Instead, we are putting up money on a regular basis to cover the shortfalls. We think we have lived up to our side of the bargain. What we need is for this energy to be paid for so that we aren't making those shortfall payments. The other thing that it has done to us is we are making the payments to American Savings Bank with our own money to cover the shortfall. Nonetheless, we are still in default on our loan. We are in default because commercial loans have covenants that require income and expense ratios to be positive. They want to know that we're not just putting up the money. They want to know that they have invested in a viable project that is sustainable. And so we are in default. And when you are in default, you can get the call any day. And that is why I'm telling you, this project is in critical danger. What do we do? First, why don't we discuss the importance of the project. This is truly a revolutionary landmark project. To our knowledge and to the Department's knowledge, during construction, when we discussed these matters, we know of no other project like this in the United States. Secondly, it is a national Mayor's award winning environmental energy project. Other entities and people in the nation have recognized the importance of the project. Frankly, it is very close to reaching those goals. It would be a crying shame for it to fall into despair at this point in time. It is also extraordinarily timely in light of the State's endeavors and legislation to have the State of Hawai'i be energy independent. We could not have done this at a better time. It's really essential that the windfarm situation be saved and that it comes to its fruition, and it is fully capable of doing that. We do not want this to become a rusted monument sitting on a mountain that is a great idea and a failure. We don't want this to fall into a situation where we go in default and the windfarm sitting there and now we have the \$15 million lawsuit. Nobody wants that. And I have been a lawyer for 40 years and one place I want to stay out of is the courthouse. So we need to do things together to make this work. And this is what we propose:

The DWS staff will expedite operation modifications to maximize wind energy utilization. This process has already started. Kurt Inaba is on this. We are working with him. We are offering our suggestions and ideas. We have made the SCADA folks available to their utilization. And so between those efforts, DWS calls all the final shots, there is a plan for maximization of the operations. That is currently commencing. We have already seen, from some of the more general ideas, we have seen some success. The last two months of purchase have increased about 20% to 40%. Things are looking better already. We don't know the total effect of that but see there is hope for closing this gap. Can we close it all by the modifications or not? We don't know. The sure-fire cure here is water storage. Infrastructure modification, additional storage. If you have enough reservoir storage, you solve the problem because you can run and fill reservoirs until you have so much water that you can survive any gap in time. But those things are ongoing and happening right now. But what we need and why we are here is we need the DWS to live up to the financial obligation. What we are proposing is that we will accept the minimum amount called for under this

arrangement that between what you purchase from what you utilize and what is available that you are not purchasing, you live up to the responsibility of paying for 8,000 megawatt hours in a running 12 months. If I have that assurance and I have that arrangement, I can go to my bank and say we're gonna meet those minimum levels and that is going to take us out of this situation we are in of being in default. In the meantime, we do these other things and we bring this process up to speed. What that means for you is that on a short term, it is not what was anticipated or expected. It's gonna cost something. On a long term, the project is going to survive. The project is ultimately going to come to pass to be what it was anticipated and expected. We are on a short string here. We have been suffering this since last September, and I don't know how long the bank can hold out. I know this--we cannot continue to pay the shortfalls. It is a critical situation that has to be resolved now.

The last exhibit I gave you is a February 26, 2015, modification to the existing Power Purchase Agreement. Why this is important for you to understand how imperative it is that we receive at least this minimum flow of revenue? In 2015, we went back to the then Board and we told them that we were being pressured significantly and substantially by the United States Fish & Wildlife Service and the State Department of Fish and Wildlife to get a Habitat Conservation Plan and Incidental Take Permit on this project. We have no habitat on this project. If you have been to Lālāmilo, it is almost a moon scape. But the possibility exists that endangered species may fly in here and find themselves in a turbine. And the department has threatened all kinds of punitive effects of that and so we came to the Board at that time and said we are willing to run this project without it and we're willing to assume the risk because we're the operators. But if you want the insurance policy of a Habitat Conservation Plan and Incidental Take Permit, we will proceed with that. The two items that are of greatest possibility are the Hoary Bat gets hit or a Shearwater [Hawaiian] Petrel gets hit. In that time, in 2015, it was agreed to modify the Power Purchase Agreement, increase the cost to the Department by three cents, and we would take care of the project. If you look at the fifth page of this exhibit, first of all, it comes with a cover letter from Quirino Antonio, the Department head at that time, and he is basically certifying again and making the representations that are contained in this amendment. It was also signed by Mr. Takamine. You go five pages into this and you find the new Exhibit C and the first paragraph, three years later, reconfirming the windfarm is expected to produce an average 13,100, a minimum of 8,000 will be consumed by the eight Lālāmilo and Parker Wells. It is specifically in conjunction with this adjusted rate, which tells you, obviously, that is where the money is going to come from. If we don't have the money from the sales of 8,000 megawatt hours a year, we cannot complete the Habitat Conservation Plan and Incidental Take Permit. As it happens, we have gone through a painstaking process. I can't tell you how many drafts of this have been submitted to the two agencies which they continually modify and send back and then we redraft based on the requested modifications, and then they ask for additional modifications, some of which were included in the earlier...but through all this, we are now in the 11<sup>th</sup> hour at which point we were requested to do an additional Environmental Assessment. And the pressing issue in this Environmental Assessment is will the environmental things being done under the HCPITP actually have an environmental adverse effect? Can you

believe it? That's what we're doing right now; but we're right now ready to finish that process and get that done, but we can't pay for it and complete that because we are not getting the revenue that was agreed upon. That is where we are and that is why we are in a critical circumstance. And that is why we need to take these measures in order to save what is otherwise an extraordinary project that has an extraordinary future. Will do you have anything to add?

W. Rolston: If the Board has questions on the process, I would be happy to answer them. I was energy coordinator at that time, working with Julie Myhre, the Energy Analyst, and Clyde Young, who was also on the evaluation committee; and we presented those recommendations to the Water Board in April 2013 at its meeting which can be found in the Minutes; and it was a unanimous vote on the Water Board to take the evaluation and recommendations which, if you have questions, I can tell you the internal process on how we got to pick Site Constructors and why they were the best one for this job.

L. Elarionoff: I have no questions, but I would like to hear the other of the story. Obviously, there is a conflict between the two of you so I would like to hear the Water Department's side.

K. Wilson: I have a question. I am curious to know how was the minimum of the 8,000-megawatt hours determined?

W. Rolston: The National Renewable Energy Lab was contacted in 2009. The Hawai'i Clean Energy Initiative was kicked off in 2008. That was the Department of Energy coming to the State of Hawai'i to say we are going to be, at the time, I believe it was 70% by 2045; 70% renewable across the State; and HELCO obviously had PGV (Puna Geothermal Venture) as the backbone to help us get to 20% by this day, 40% by this day. National Renewable Energy Lab came and looked at the existing wind reading, did calculations, worked with the Department of Water Supply Energy Analyst, looked at the energy bills; and it showed how much energy was at that site and how much the pumps were using. They did the calculations based upon the most credible energy lab to determine what the wind could produce and what the pumps needed. Those numbers were put into a report so there is a National Renewable Energy Lab report and they presented it to the Water Board. And then Julie Myhre took the energy bills and made her calculations with the help of National Renewable Energy Lab, and presented it to the Water Board on whether it wanted to go forward with the RFP process. That is where those numbers came from. In my opinion, the most credible analyst from National Renewable Energy Lab went to Hawai'i to see what this wind reading could do, what the water pumps could take, and what the economics were. That was in 2009. The RFP process started after the Water Board said go for it and then we worked for two years on creating an RFP which hatched a request for bidders' qualification in 2012, I believe, and the RFP was put out. If I'm allowed to say, we had multiple bidders, but only three made the short list of which Site Constructors, which became Lālamilo Windfarm Company, was one of the three. Everybody was bidding to those numbers. When you go back in history, you will see that those numbers were the basis

of the request for proposals and also the basis for the Power Purchase Agreement. And in general, I have been in the energy business for 33 years and you do not overbuild something. And Richard could also tell you why you do not do that. You just lose money. We did the West Hawai'i Civic Center when I was here, and we have done other projects; and when you put out an RFP, you are pretty sure what you need in energy, or you better be.

K. Wilson: Is there another existing power purchase agreement with the utility company, with HELCO?

W. Rolston: That exists in the County?

K. Wilson: Yes.

Rolston: There is feed-in tariff, the first one on this island, at the West Hawai'i Civic Center, so any excess that the West Hawai'i Civic Center does not use, the utility gives us a check.

K. Wilson: Is that something similar that Lālanilo has?

W. Rolston: No, in that there is no deal with HELCO. The deal with HELCO at this site was there would be no excess energy sent to the HELCO grid unless there was a meeting of the minds between DWS that the site could export energy to HELCO. But this is why the windfarm is so sophisticated. It does not interact with the grid, causing harmonics, things Richard can talk about; but it does not affect the grid. It is kind of handling or is as close as you can get to a micro-grid without totally isolating it. It is the most sophisticated windfarm water pumping system in the United States and it did win that award in 2017.

R. Hardin: I will mention, too, that we are willing to do whatever we can reasonably do to soften the blow of this, what we hope to be a temporary shortfall. We are willing to go to HELCO and get an excess energy contract, if we can get it, and that would require DWS to get consent from DLNR for that excess energy contract. By doing that, we will work and arrange it with you folks to give you credit for the kilowatts that you are paying for that you are not actually utilizing to soften the blow. We are willing to do whatever we think is reasonably necessary to do in order for this project to survive. But we do not have that at this point. You are our only customer. We cannot sell to anybody else. You don't buy, we don't make revenue. We don't make revenue, we cannot pay the bills.

J. Yeh: I just want to say that at this point, because this is agendized as a presentation, I am not going to recommend that you take any action on this today. You are here to hear what they have to present; and if you want to hear the Department's side, you are more than welcome to do that; but my recommendation is don't take any action today.

B. Boswell: Do we need a motion to complete this conversation?

J. Yeh: You can move on unless you want to hear from the Department or the Department would like to elaborate on anything.

Manager-Chief Engineer: From the get-go, this is a project that we wanted to succeed. We put out the RFP and we went through the process. Kurt has a lot of the details but there is quite a bit of information that Richard provided that we don't agree with, which is why we are here. I don't think going at it point by point at this particular junction--again; but at the same time, we cannot pay for power that we don't use. That results in additional costs to our customers; not any savings. So, if we pay HELCO and we pay Lālamilo Windfarm, we are paying twice. We do have these agreements. We all are in agreement that this is a great project. We are trying to buy as much as we can. We would rather buy cheaper power; that is a no-brainer. But we can only buy what we can utilize at this point. Like what was mentioned, we are trying to work, giving the green light to make modifications to the operations of our system to try and utilize more wind power if it is possible. That is what we have been trying to work on. Other than that, I think it would be easier if we detail our responses and get that to you item by item so you can see exactly our interpretation versus what was mentioned today.

L. Elarionoff: Mr. Chairman, I think we should table this and ask the Department to present their side.

Manager-Chief Engineer: We will make it available in some kind of correspondence in advance.

B. Boswell: Yeah, it was a long presentation and I appreciated it. There is a lot of information there. But there was no rebuttal through the entire presentation so it is kind of hard to keep track of everything that was said. So, by looking at these Minutes, we would be able to see the response from them, I think that would be good for us.

R. Horn: If I can say something.

B. Boswell: Yes please.

R. Horn: I'm Richard Horn of Site Constructors and I am a member of this. I have worked with these guys for quite some time. We are working together; Kurt and I, specifically, work together a lot. And we are finding a number of places where we can improve the usage of the renewable energy in utilization to pump water. I think some of the things are very dramatic that we are suggesting in helping them implement in the impoundment of the water usage and electricity. And they are starting to be pretty significant and working well. We just have to get past this immediate hurdle and so I think it is important that in the rebuttal that you have Kurt demonstrate what we are doing to modify the systems to enable the increased usage of the renewable energy. That's just a suggestion.

B. Boswell: I appreciate that.

L. Elarionoff: When you consider what is going on in Puna, HELCO might be more willing to be involved too, with the loss of the PGV. So, do we make a motion to hold off on this until next...?

B. Boswell: No, there is no motion. We just go to the next Agenda item.

J. Yeh: You can just close the presentation; and for next month, if you want to hear from the Department, you can agendize it.

D. De Luz: Mr. Chair, if I could...I think there is urgency to, at the next meeting, have the Department offer their opportunity to give their side and having Lālāmilo present as well and perhaps; and again, I think the caution would be, as Jessica indicated, how we agendize the item is going to be critical. So, if it is a presentation to be able to offer the opportunity to digest the information, I think that should be clear to Lālāmilo as well so there isn't an unmet expectation of what that meeting would be. Again, that is just consideration when you are agendizing the item.

B. Boswell: The preference, on my part, would be able to digest it on my own.

D. De Luz: Right, and I that's why I think it is going to take at least another meeting after that.

J. Yeh: Yeah, because the Department, we can already tell at this point, probably the Department's recommendation, they are not going to have one next month that is going to be in line with what Lālāmilo is requesting of the Water Board right now. So, I would just agendize it as a presentation unless you want to take and agendize Mr. Hardin's request for next meeting or you are actually going to feel like you want to decide on his request at the next meeting.

D. De Luz: That is why I believe the Chair and the Vice-Chair need communication with Keith to understand what that would be and appropriately agendize. Is that okay?

B. Boswell: I agree.

R. Hardin: So I understand that there is another alternative and that is to appoint a specific committee that immediately looks into this or investigates or makes recommendations to vote on?

B. Boswell: It won't be quicker.

R. Hardin: It wouldn't be quicker? Then you understand why another month and another month...we don't have another month.

B. Boswell: Right. I saw the look on your face, and I understand. If I could ask a question maybe a little out of order. You are asking us to compensate in arrears? That is what this is all about?

R. Hardin: Twelve months and hopefully we put an end to it, with what Mr. Horn and Keith and Kurt are working on.

B. Boswell: Right, but the solution is potentially...

R. Hardin: Yes. We are hoping that the shortfall situation gets eliminated.

B. Boswell: But your problem with your bank is that you are in default.

R. Hardin: Yeah, we are in default. And that's a problem for us too because we are fronting the money. That's a real problem.

B. Boswell: Right. Well on our part, I think we would do everything we can to expedite it but the first thing would be for us to start getting the Department's reply to your comments today.

D. De Luz: I think if we could, Mr. Chair, is we understand the urgency; but due to the process of protocol, that we are not taking this lightly; and as such, the Minutes hopefully can be used for your financial institution to understand that we are sincere...

R. Hardin: That would be very helpful.

D. De Luz: but we also do have to adjudicate and have the Department...and at that point, I think at that point, I think with that information, we can hopefully see how it takes its course.

B. Boswell: And then allow it to move.

D. De Luz: Right.

(Messrs. Hardin and Horn thanked the Board. The Board thanked Lālāmilo Wind Company for their presentation. Messrs. Hardin, Horn, and Rolston left the meeting at 12:30 p.m.)

8) MISCELLANEOUS:

A. **DEDICATIONS:**

The Department received the following documents for action by the Water Board. The water systems have been constructed in accordance with the Department's standards and are in acceptable condition for dedication.

**1. Grant of Easement and Bill of Sale**

Ola Hou Estates, Phase 2

Subdivision No. 95-119

Grantor: Graphic Images Hawaii Inc.

Tax Map Key: (3) 1-6-003: 010 (portion)

Facilities Charge: \$99,000.00 Date Paid: June 12, 2018

Final Inspection Date: 5/12/2018

Water System Cost: \$378,800.00

The Manager-Chief Engineer recommended that the Water Board accept these documents subject to the approval of the Corporation Counsel and that either the Chairperson or the Vice-Chairperson be authorized to sign the documents.

ACTION: Mr. Elarionoff moved for approval of the recommendation; seconded by Ms. Wilson and carried unanimously by voice vote.

**B. MATERIAL BID NO. 2018-06, FURNISH BASE COURSE, SAND, COLD MIX, HOT MIX, AND NO. 3F ROCK TO THE DEPARTMENT OF WATER SUPPLY**

At the May 22, 2018, Water Board Meeting, the Water Board voted to defer awarding Parts 2A, 2B, 2C, and 2D for District II.

<b>DISTRICT II</b>	Edwin Deluz Trucking & Gravel, LLC	WHC LTD dba West Hawai'i Concrete
Part 2A – 3/4-Inch Base Course (cost per ton)	Non-responsive	\$15.44
Part 2B – 1½-Inch Base Course (cost per ton)	Non-responsive	\$13.98
Part 2C – No. 3F Rock (cost per ton)	Non-responsive	\$24.33
Part 2D - #4 Sand (cost per ton)	Non-responsive	\$27.49

The Manager-Chief Engineer recommended that the Board award the contract for MATERIAL BID NO. 2018-06, FURNISH BASE COURSE, SAND, COLD MIX, AND NO. 3F ROCK TO THE DEPARTMENT OF WATER SUPPLY, District II – Parts 2A, 2B, 2C, and 2D to the lowest responsive, responsible bidder, WHC LTD dba West Hawai'i Concrete, for the amounts shown above, and that either the Chairperson or the Vice-Chairperson be authorized to sign the contract, subject to review as to form and legality of the contract by Corporation Counsel. The contract period shall be from July 1, 2018, to June 30, 2019.

MOTION: Ms. Wilson moved for approval of the recommendation; seconded by Mr. Sugai.

Mr. De Luz asked for clarification if it was non-responsive or non-responsible.



The Manager-Chief Engineer replied that they confirmed with Corporation Counsel, and it is non-responsive, which is a term that is used after the bid opening. If it was prior to the bid opening, it would be non-responsive. If you do not provide all of the information prior to bid opening, you may be deemed non-responsive, and the bid would not be opened if the shortcomings were known. The shortcomings for this particular bid were found after the fact so the bid prices are not listed.

ACTION: Motion was carried unanimously by voice vote.

**C. SERVICE BID NO. 2016-07, PROVIDE HIGH SPEED WIDE AREA NETWORK CONNECTIVITY BETWEEN FIVE OFFICE LOCATIONS, DEPARTMENT OF WATER SUPPLY, ISLAND WIDE:**

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The Department requested the contractor, Oceanic Time Warner Cable, LLC, to provide a proposal for increased high-speed internet services at five office locations island wide.

Our current Wide Area Network (WAN) includes bandwidth speeds of 5Mbps (Ka'u), 10Mbps (Kona), 20Mbps (Waimea & Hilo Baseyard) and 20Mbps (Hilo Main office) with a 20Mbps connection to the Internet. The proposed revised services include no change to Ka'u, upgrade to 20Mbps for Kona, upgrade to 50Mbps for Waimea and Hilo Baseyard, and upgrade to 100Mbps for Hilo Main office.

The increase in bandwidth speeds are required to support technology which necessitates additional resources through the Internet connection for Internet services, cyber security, email, and email archival services. The increase in speeds to our WAN connections will increase productivity while utilizing applications such as geographic information systems (GIS), document management (Laserfiche), daily backup replications, and all other applications since our data is stored on servers.

The increased bandwidth will revise our current monthly recurring charges from \$2,909.30 to \$4,603.04 for the remaining 36 months of the contract.

Original Contract Amount: \$ 175,703.83

1<sup>st</sup> Contingency request: \$ 60,974.64 (\$1,693.74 increase per month x 36 months)

**Total Revised Contract Amount: \$236,678.47**

Funding will be from the Department's FY2018-2019 Operating Budget.

The Manager-Chief Engineer recommended that the Board approve an increase in contingency of \$60,974.64 for a total contract amount of \$236,678.47, to Oceanic Time Warner Cable, LLC, for SERVICE BID NO. 2016-07, PROVIDE HIGH SPEED WIDE AREA NETWORK CONNECTIVITY BETWEEN FIVE OFFICE LOCATIONS, DEPARTMENT OF WATER SUPPLY, ISLAND WIDE. It is further

recommended that either the Chairperson or the Vice-Chairperson be authorized to sign the contract, subject to review as to form and legality of the contract by Corporation Counsel.

MOTION: Ms. Wilson moved for approval of the recommendation; seconded by Mr. Elarionoff.

Mr. De Luz asked if they are providing redundancy as a back-up, meaning they could give access but with limited speed in case there is an issue, and what priority they are giving the Department in that network.

Mr. Uyehara replied there are specifications to provide up-time of 99%. In the past, if the Department experienced transmission issues, they have been very responsive. In answer to Mr. De Luz's question of whether they have put in an efficiency guarantee, he indicated he would check on it, but he was sure there was something in there.

Mr. De Luz commented that the competition is more fierce today so the level of service is more predominantly going into contracts, especially commercial. He also asked if the Department is subscribing to cloud service for storage.

Mr. Uyehara replied that the Department physically backs its servers up daily by transmitting through fiber optics to its Waimea Office, plus stores it at its main office in Hilo.

Mr. De Luz noted then that everything ends up on the ethernet side with the Department and asked if the Department is responsible for all of the hardware, the UPS, etc.

Mr. Uyehara asked if that included the servers, etc., and Mr. De Luz replied yes.

Mr. Uyehara stated that when the Department put out this contract a couple of years ago, the cost seen here was for those basic services; and as technology increased, with files getting larger, more data to manage, being able to remotely access certain programs like GIS, Word Processing, or other Office programs, the Department has evolved along with the County, into cloud-based storage but it all comes back to its servers.

Mr. De Luz asked if they are offering wi-fi service as well to the Administrative Office.

Mr. Uyehara did not think they were.

Mr. De Luz stated the only reason that this may be something to look into is that, from his understanding, there is capacity now for more security; but for vendors and other parties coming to your main office, that might be a more secure way of accessing files, especially when the Department is downloading files and attempting to access them. Again, it is more of accessing the technology.

ACTION: Motion was carried unanimously by voice vote.

**D. MONTHLY PROGRESS REPORT:**

Vice-Chairperson Boswell asked about the Waimea Water Treatment Plant fire sprinkler monitoring.

Mr. Uyehara replied that after getting the building permit, the Department learned that a fire sprinkler had to be added. As of late last week, the Fire Department signed off on the sprinklers and is almost complete for the Certificate of Occupancy. The Plant has been running with the membrane filtration since May 8. It is a new process and staff is working hard to learn this new treatment process and SCADA system. The contractor is still helping the Department to troubleshoot the system.

Vice-Chairperson also asked about the Wai‘aha Water System Improvements – Transmission. He suggested that next month, the Board get an update on the project, what the effects are, and what the benefits are.

Mr. Inaba gave a brief update on the project in the meantime. On the upper highway in Kona is the existing source and tank which is currently under repair; but there was also an 8-inch transmission main on that highway and the Department is developing plans to see where a second source and storage can be placed to improve transmission capabilities. The Department also had a development agreement with Mr. Bolton which utilized a corridor to bring water from mauka to makai where most of it is going to be used. Part of this project is to improve the transmission up on that highway to move water north as well as down to the corridor. Pressure is getting impacted in the smaller lines so the Department is doing some other improvements to transfer customers on the lower pressures to the existing line with higher pressure; therefore, besides transmission, it will improve service to existing customers on the highway as well.

Mr. Boswell asked if the bid would be going out in the third quarter for a new pipeline.

Mr. Inaba replied that the final Environmental Assessment is out there, and the Department just signed some National Pollutant Discharge Elimination System documents so that portion is complete. It should be pretty close.

Mr. De Luz noted that this report covers the Department’s current projects; and one of the important things for the public to understand is that the Department manages most or all of its projects internally. He would think with the demand of the projects and management of them places a particular strain on the Department’s professional engineers.

Mr. Inaba stated that the projects are managed in-house, except there are also professional service contracts and consultants that handle the design.

Mr. De Luz stated that they still have to be managed.

Mr. Inaba replied that was correct. They are coordinated in-house.

Mr. Boswell stated that the Board recently reviewed the staffing a couple months ago.

Mr. De Luz noted that these are current, but there is that other segment to it.

Mr. Inaba stated that some projects still have to be closed out.

Mr. De Luz gave a good example of the Pa'auilo bridge which began seven years ago. He was aware the DWS had signed off on the project, but the Department of Transportation has not done its dedication yet. The amount of administrative overlay, especially when dealing with other agencies, is tremendous to manage. Some people may not understand the enormity and complexity of managing all these moving parts.

Mr. Inaba agreed. Each project has to go through various agencies so timing depends on each agency.

Mr. De Luz stated that it is very diverse.

The Manager-Chief Engineer thanked Mr. De Luz for acknowledging that.

**E. REVIEW OF MONTHLY FINANCIAL STATEMENTS:**

Mr. De Luz observed that the Department of Water Supply is one of the few government agencies that sort of runs atypical of a full profit--in other words, it has revenue and expenses and a lot of its balance sheet contents is very comparable in that regard. The one thing he had a hard time with was the prepaid entry for the pension fund [deferred outflow]. For the lay person, it might be good to put a footnote on it because it is an anomaly. He has seen such representation made in prepaid insurance, but he understands this Department recognizes it on the balance sheet. He asked if the Department is representing its accounting on a cash basis or on accrual.

Ms. Gray replied it is on an accrual basis.

Mr. De Luz stated that in that case, it makes sense. That was the only anomaly he had seen. The other that does help, from the perspective of cash management, is because the depreciation is more of a use of facilities as opposed to true depreciation, meaning it has a lifespan, as opposed to a tax type of representation, the key to it is having a clear understanding of the cash availability in regard to operation and other restricted accounts. It makes it a little like running a check book. His goal has always been that an average person could make heads or tails of a report so there is transparency--more of a debit/credit kind of concept. He added those were just suggestions and was not suggesting it be changed.

The Manager-Chief Engineer agreed that, basically this report is so the Board can understand the Department's financial situation. Part of the reason it is done a certain way is because the annual audits kind of direct the Department to do it that way.

Mr. De Luz also added that the management letter will give clarification to some of it within the audit and it gives an opportunity for the Department to comment. He reiterated that his comments were more from an understanding perspective because at the end of the day, what really matters is how much cash you have for all the things you have to do.

F. **POWER COST CHARGE:**

Departmental power costs have increased as a result of Hawai'i Electric Light Company, Inc. (HELCO), billings. The Department proposes to increase the Power Cost Charge from \$1.88 to \$1.94 per thousand gallons to reflect this increase. In order to accept public testimony on this change, a Public Hearing should be scheduled before the Power Cost Charge is increased.

The Manager-Chief Engineer recommended that the Board approve holding a Public Hearing on July 24, 2018, at 9:45 a.m., to receive testimony on increasing the Power Cost Charge from \$1.88 to \$1.94, effective August 1, 2018.

MOTION: Ms. Wilson moved for approval of the recommendation; seconded by Mr. Elarionoff.

Mr. Elarionoff asked if this increase was due to the loss of Puna Geothermal Venture (PGV).

The Manager-Chief Engineer replied it is not. This increase is tied to or based on historical data. He asked Mr. Ching, Energy Analyst, to expand on that.

Mr. Ching stated that it is probably still too soon to feel the effects of the loss of PGV, although that is not saying it is not going to come. It takes a while to compile the Department's recovery and make recommendations for changes.

Mr. De Luz felt that it is important to stress, when going into public hearing, that this is a recovery charge. Essentially, the Department looks at the trend and then scrutinizes what it needs to adjust. It is important for the public to have clarity and understanding that the Department is not benefiting from this, other than attempting to recover the costs it has expended. His second comment was about the Public Utilities Commission's (PUC) ruling with regards to the tax credits. The Department of Water Supply is single largest power consumer and he would hope there are conversations related to what Mr. Elarionoff said with regards to PGV, at least internally, to have more forward planning to anticipate what will impact the Department's cash position.

Mr. Ching stated that this power cost charge is always, in a sense, a step behind what is occurring in real time. The Waterworks Controller makes the determination at what point the Department needs to adjust this charge. Speaking to the reference of the tax credits, the Department already saw an effect at the beginning of May. HELCO had a 2016 interim increase and they reduced that percentage to reflect the amount of tax credits they passed along to the customers. With regards to PGV, the PUC issued a notice acknowledging that PGV is not operational. They explained it had been about one quarter of the amount of generation on Hawai‘i and more than half the amount of renewable energy for the island, and their statement eluded to electricity prices going up. Essentially, they are burning more fossil fuel, which will raise the electricity prices for the customers.

Mr. De Luz stated that he has a problem with how the PUC manages the public benefit fund. As a utility, he thinks the Department of Water Supply should be exempted, or if it is collected, it should be specifically used for Department of Water Supply purposes. This is something for future discussion to have the PUC reconsider because the Department does not get its fair share in equity on that public benefit fund. That is the reason he has a problem with it.

The Manager-Chief Engineer stated that the Department is using Hawai‘i Energy as much as possible.

Mr. De Luz stated that he would think, as a utility, there might be a special case for an exemption; and again, the utility, meaning DWS, would still have to be accountable to the PUC, but those funds could be specifically used only for DWS application. That is something maybe we could discuss with our policy makers, we could talk to them but DWS is different from the County. They are not a utility but DWS is a utility and to him, it is like they are double dipping the consumer, especially one that is a large energy user, only because of the nature of the Department’s operations. The other concern he had was on the tariffs on the demand charges. In his opinion, being a utility, that should also be something the PUC needs to look more at for DWS because those demand charges have a significant impact on what the Department pays and he thinks it is erroneous on how it is done anyway.

The Manager-Chief Engineer appreciated those comments.

ACTION: Motion to approve holding a Public Hearing on July 24, 2018, at 9:45 a.m. was carried unanimously by voice vote.

G. **MANAGER-CHIEF ENGINEER’S REPORT:**

The Manager-Chief Engineer reported on the following:

1. North Kona Wells – The Manager-Chief Engineer reported that ten out of fourteen wells are operational. The area remains under 10% water conservation, and the Department monitors tank level information daily. Out of service are: Honokōhau, Wai‘aha, Palani, and Hualālai wells. They are in various states of

repair. The first well hoped to be back on line is Honokōhau. The Department had put out an RFP for a spare pump and motor and awaits the set to come in. An award was made to a contractor to do the installation. For Palani Well, before jumping in and changing it, the Department would like to take a look at the Permitted Interaction Group and Brown and Caldwell recommendations. It was an 1,100-gpm pump, but the Department may go with its strategy and put in a smaller 700-gpm/400 horsepower unit along with down-hole monitoring. For Hualālai Well, the gyroscopic alignment test has been completed. This is the shallowest high-level well so one thought was whether there is a slim possibility of converting it to a line shaft, and that resulted in additional time and effort to do this test. It may still be unlikely for a line shaft because of the weight of the pipe column, shaft, and bearings, etc. For Wai‘aha, the Department is still in discussions with the contractor. It appears they have extracted whatever they could and it might not be good to have them extract any more because of the potential to be worse off and damage the casing. In response to Vice-Chairperson Boswell’s question of whether the Department was still looking at the option of abandoning the pump and motor in place, the Manager-Chief Engineer replied that was correct.

2. Hawaiian Ocean View Well – Mr. Young reported that the Department had hoped this well would be online by the end of June/early July, but it looks like there will be a three-week delay. The hope is to have it online in late July. The Manager-Chief Engineer added that with HOVE well, the Department is using similar recommendations as those in Kona with integrated pump and motor sets and monitors. Part of the challenge is also the incoming power quality. Mr. De Luz thought it is worth reiterating everything being done now with regard to the investigations is moving towards a more comprehensive plan moving forward, but there will be a three- to five-year implementation period. It will not happen overnight. The general public may need to be patient because all of the things being done now were not a matter of best practices within the Department prior to this. The Department is essentially redoing how the wells are managed on a consistent basis as opposed to just one or two. The Manager-Chief Engineer agreed and that Vice-Chairperson Boswell had also mentioned that a few months ago. Vice-Chairperson Boswell stated that the gyroscopic testing was also added lately; and from the demonstration today, there is a lot of information from it.
3. Department of Water Supply Energy Report – Mr. Ching asked the Board if they wanted to see anything specific on the reports to let him know. The Manager-Chief Engineer mentioned the Department’s Energy Policy and asked that the Secretary send it out to the Board. Mr. Ching continued that he will add to every report where the Department is in the major factoring in terms of energy. Of the projects he is working on, the one that is most immediate is putting photovoltaic panels on the Hilo Baseyard and the Main Office. The Department is looking at putting out an RFP (Request for Proposals) and a power purchase agreement during this coming fiscal year. Mr. De Luz asked if HELCO has given any indication of providing redundancy programs, for example, being more proactive to coming back to battery storage solutions. One of the challenges, and they know this to be true, is although their power generation will have more impact

without Puna Geothermal Venture and they have to run more fossil fuel, he thinks they are going to have to use their small 50-megawatt generators to be able to maintain peak hours, and that is when you get the surge. In his opinion, they should at least offer a solution, especially as it goes to some of the things the Department is doing on emergency preparedness, in redundancy and resiliency too because they get rated for that at PUC too. That rule should apply for water because water is one of the most critical resources needed in the event that the grid has an issue. The Department knows where its critical points are, and he hopes HELCO will initiate some kind of solution. Understanding they have to be accountable to the PUC; but DWS is a utility so it is almost to some degree a utility memorandum of understanding. The Manager-Chief Engineer stated that the Department will continue to try and engage HELCO. The Department had met with them back in May and would like to have twice yearly meetings with Mr. Ignacio and his staff. Currently, the Department is taking it upon itself to put generators where its critical facilities are, and HELCO has treated the Department like priority when they have downed transmission lines. Mr. De Luz commented that, even with generators, the biggest challenge is that fuel has a shelf life and that is a huge issue. Ms. Wilson asked if the Board could see more in the Energy Report about the Lālāmilo Windfarm because the intention was to save money with the energy costs. The presentation today came a little blindsided; but to have this as part of the energy use report would be very good because that was called out today. The Department still needs to celebrate this project because it still a good, viable project; and relationships with our partner are something we still want to make sure to keep informed on.

4. East Rift Zone Update – The Manager-Chief Engineer reported that the lava is still flowing; and, unfortunately, the Department tried what it could to maintain service to the makai area customers for as long as possible. The Department had a bypass line down to Pohoiki and was scrambling to reoutfit the Kapoho Well, but Madame Pele did what she did. Because access has been cut off to the area, there is really not much more that can be done. Just as a summary from impact standpoint to the Department, it has about 15½ miles of pipeline that is no longer useable. Although not all was directly inundated, it is in sections you cannot get to. There are two tanks that are probably still standing, but there is no way to access them. The Department also lost the Kapoho Well. Overall, the replacement cost value is about \$15 million. That will be reported to FEMA. Right now, the Department is in the damage assessment and recovery phase; but it depends on where the displaced community is going to be relocated. That is where the Department will have to see what is needed to provide water service to that particular area. It is doing its best, moving forward, to provide water to the temporary emergency shelters such as the one at Sacred Hearts Church. That was seen as the best option to get water for that particular project. The Department may come to the Board in the future for relief that some customers have been asking for. At the administration level, he cannot grant that. Mr. Sugai asked if there was an idea how much consumer demand destruction happened, like with Kapoho Beach Lots and Vacationland, because they are obviously not going to rebuild. He wondered how much revenue was generated out of that. The



Manager-Chief Engineer replied it was about 150,000 gallons per day in consumption. He did not have a dollar amount. Mr. Inaba added it is about 250 accounts, of which two were master meters serving Vacationland and Kapoho Beach Lots which had several hundred homes. Ms. Wilson asked if there are any customers without water at this point. The Manager-Chief Engineer replied there are some people that are able to access their homes that might be without water. There are about two dozen homes in Kapoho Beach Lots left; however, they are not accessible by vehicle and the waterline that feeds that area is covered. In response to Mr. Elarionoff's question about the service of water mentioned by the Manager-Chief Engineer and if it meant free water, he replied that no, it is not free water. In the initial phase of the eruption, while going out to the area to assess the damage, there were areas going down toward Kapoho where you would not know there was anything going on, so he could understand why some people still wanted to stay in their homes. The Department wanted to provide normal service to them through their meters for as long as possible. Mr. Elarionoff also asked for clarification on what type of relief the Department may be coming to the Board for--if it would be relief from paying their bills at all. The Manager-Chief Engineer replied yes, they would be asking for relief from their bills because of the hardship they are going through. After the Department gets more clarity on what some customers are asking for, it may be brought to the Board at a future meeting. Mr. Elarionoff commented that is a hard thing because then it goes on someone else's bill; and if Pu'u O'o had been erupting for 35 years, now with this lower east rift zone eruption, there is no way to know how long this is going to last. The Manager-Chief Engineer acknowledged that is correct, no one knows how long it is going to last, even the scientists. Vice-Chairperson Boswell stated that it was interesting--the Department's granting relief could be a donation, so to speak, but on the PUC side, with HELCO, it is going to be mandatory. The price of electricity goes up and we all pay for it. The customers are not paying because they are not there. The Manager-Chief Engineer stated that was correct. It is a challenge.

#### **H. CHAIRPERSON'S REPORT:**

Vice-Chairperson Boswell deferred items under the Chairperson's report until next month, Chairperson Takamine returns. He commented that the Brown and Caldwell presentation was great and asked for permission to send it out to people who he deals with. It is good information for people to digest. These are the answers that we have right now, so it would be good to share it. The Manager-Chief Engineer agreed that it was a good and concise presentation, and that the Department will be receiving technical reports. Mr. Kimball added that they are much more in-depth, about 65 pages each. After Ms. Wilson's question of whether it could be made available on the website, he replied it would be part of the Minutes once approved next month and can be placed, internally, on the Department's website.

9) ANNOUNCEMENTS:

1. **Next Regular Meeting:**

The next meeting of the Water Board will be July 24, 2018, 10:00 a.m., at the Department of Water Supply, Hilo Operations Center Conference Room; 889 Leilani Street, Hilo, Hawai‘i.

2. **Following Meeting:**

The following meeting of the Water Board will be August 28, 2018, 10:00 a.m. at the West Hawai‘i Civic Center, **Liquor Control Conference Room (Building B)**; 74-5044 Ane Keohokalole Highway, Kailua-Kona, Hawai‘i.

9) ADJOURNMENT

ACTION: Ms. Wilson moved to adjourn the meeting; seconded by Mr. De Luz and carried unanimously by voice vote.

(Meeting adjourned at 1:22 p.m.)

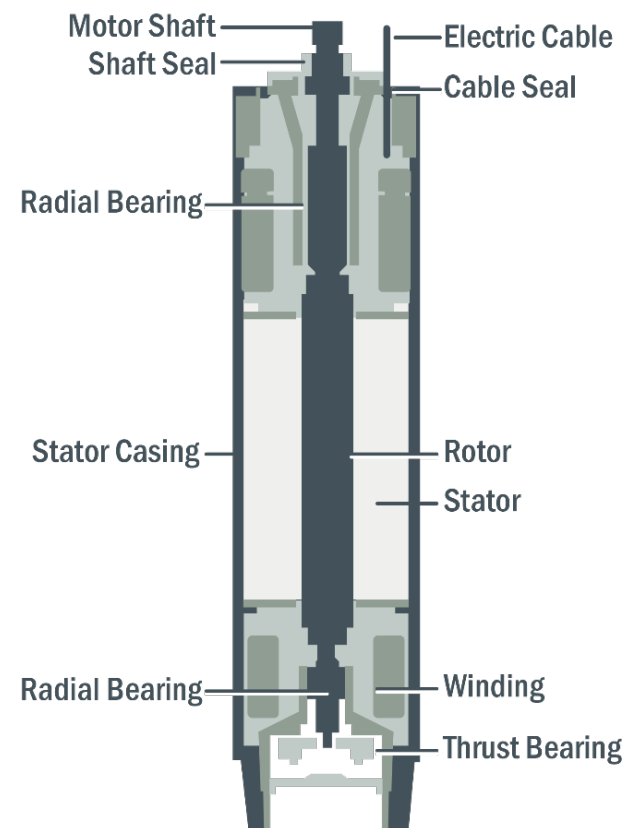
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Recording Secretary

County of Hawaii

# Department of Water Supply Kona Wells

June | 2018



# Agenda

Introduction

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Scope of Services

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Mechanical Failure Modes

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Electrical Failure Modes

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Likely Causes of Failure by Well Site

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Conclusions

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Status and Next Steps

# Introduction

## **Kelly Kimball, PE**

Project Manager / Portland

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## **Steve Hinman, PE**

Electrical Subject Matter Expert (SME) / Denver

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## **Ken Worster**

National Subject Matter Expert (SME) Submersible Pumps

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## **Technical Advisors**

Michele Sorensen, PE / Kona

Dean Nakano / Honolulu

Peter Ono, PE / Honolulu

# Scope of Services

## Base Contract

Power System  
Studies/Electrical Safety

## Amendment 1

Electrical Failure Modes

## Amendment 2

Mechanical Failure Modes

## Deliverable

Technical Memorandum –  
one per well site

# Scope of Services (continued)

## Four sites

- Honokohau
- Hualalai
- Keopu
- QLT (Keahuolu)

## Evaluation

- Recommendations based on *likely causes of failure*
- Expected outcome:
  - Address likely causes of failure to promote increased equipment service life and reliability.
  - Iterative process of elimination and improvement.

# Failure Modes

Mechanical



# Mechanical Failure Causes

**Bearings**

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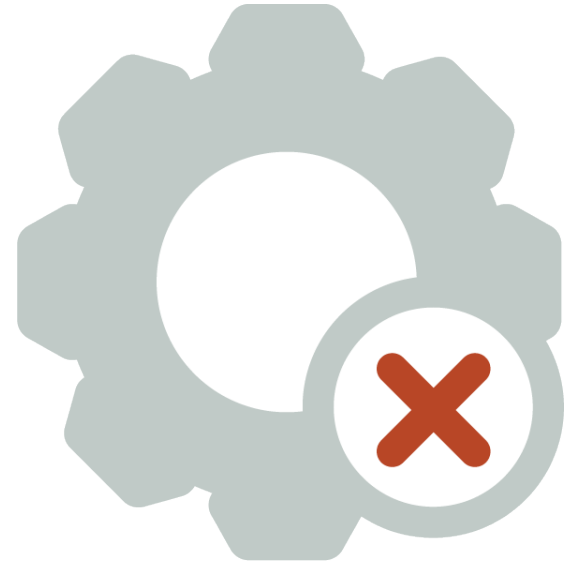
**Seals**

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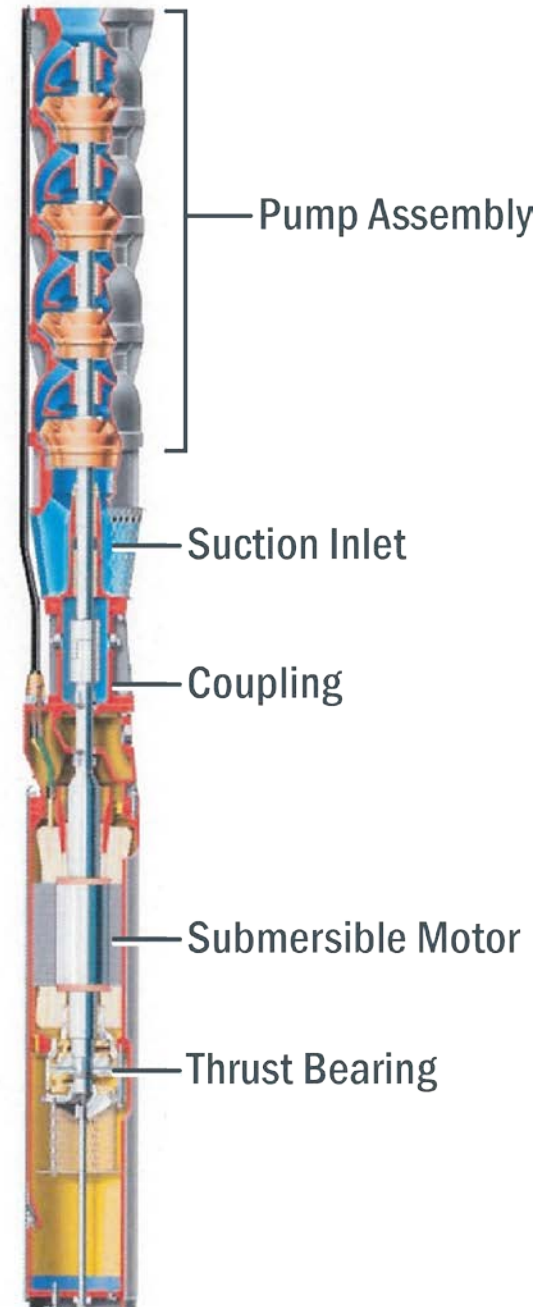
**Hydraulic Transients**

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**Well Casing Drift**

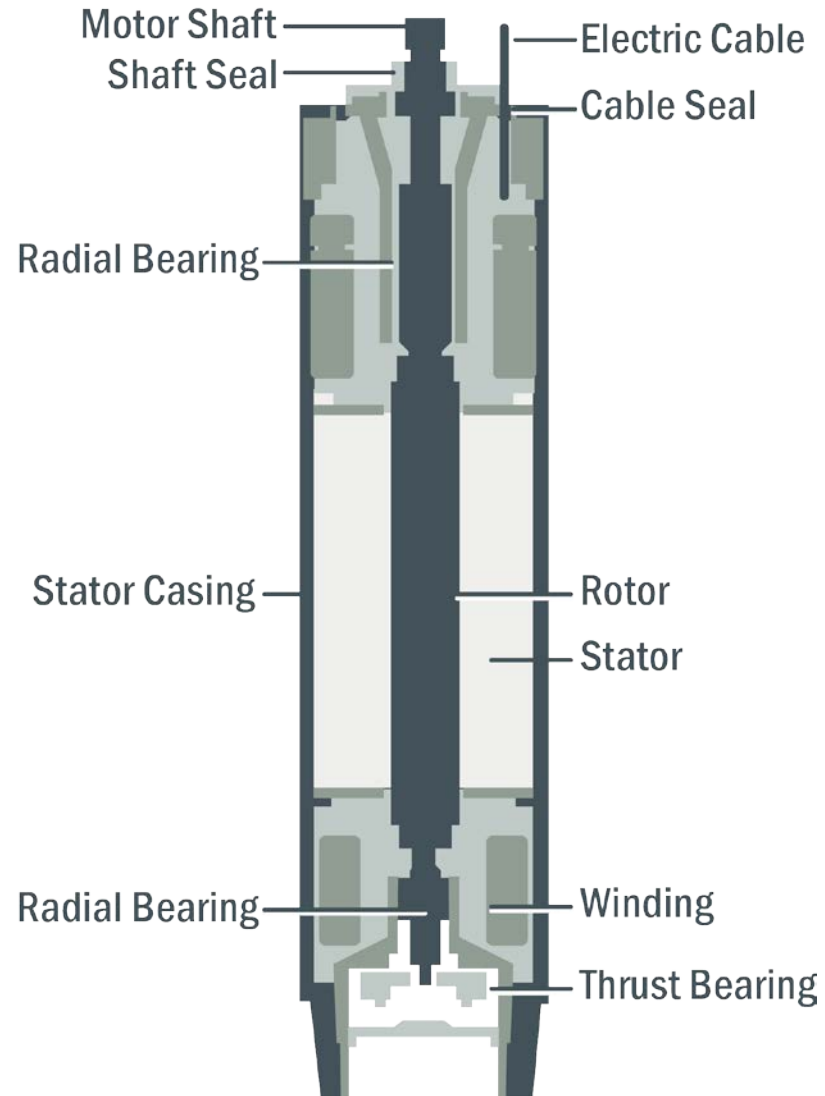


# Basic Submersible Pump and Motor Configuration



# Major Mechanical Failure Points

- Thrust bearing
- Seals
- Radial bearings



# Kingsbury-Type Thrust Bearings

Carbon disk

Fluid film

Tilting pads



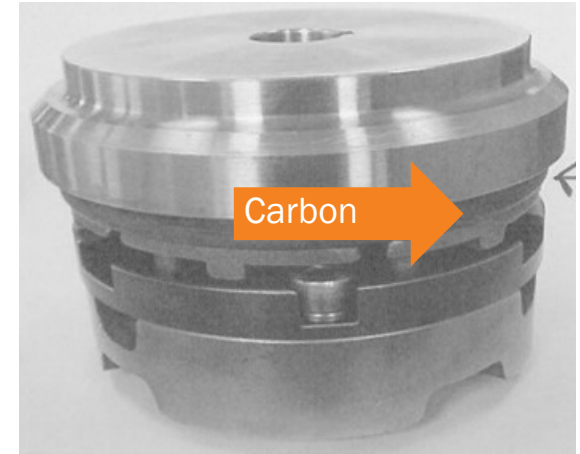
Hualalai Thrust Assembly Bearing

Source: SME TDI Report, Sept. 2016



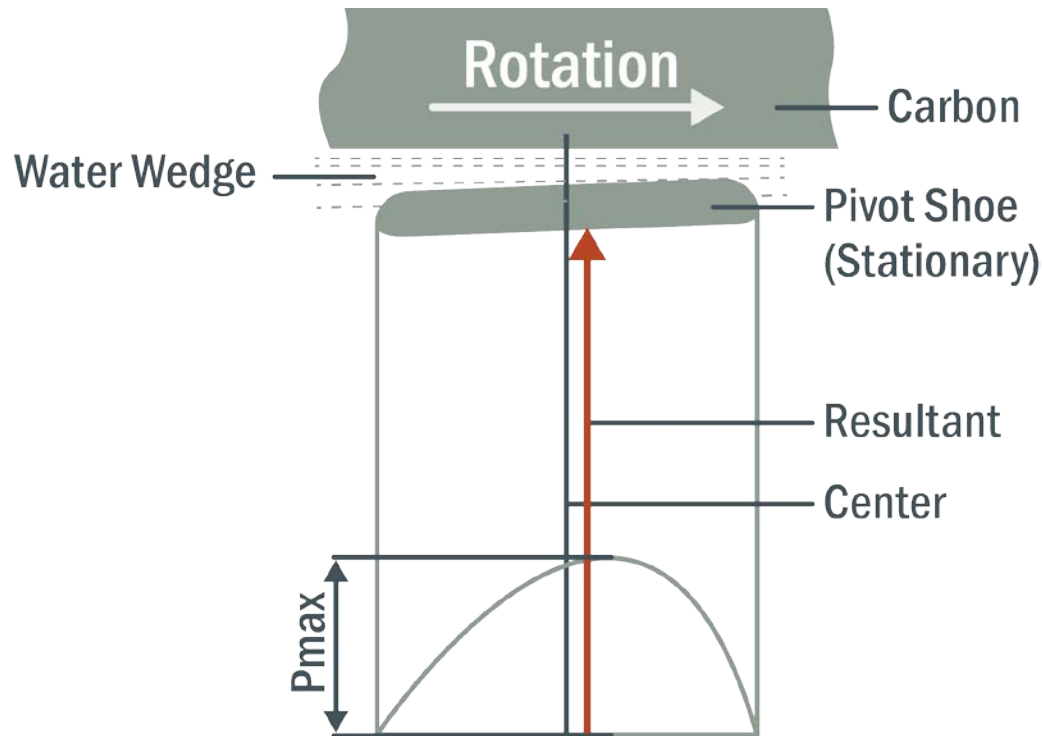
Pivot Bearing Assembly

Source: Kingsbury.com



Typical thrust bearing assembly

# Thrust Bearing Failure



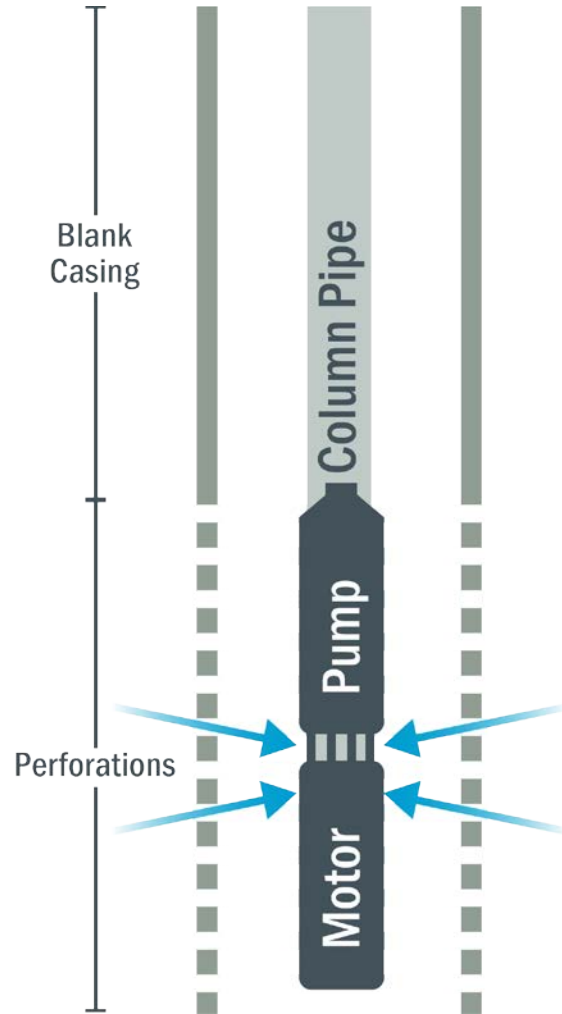
## Hydroplaning

- Cannot run in reverse
- Must come up to speed quickly and ramp down quickly

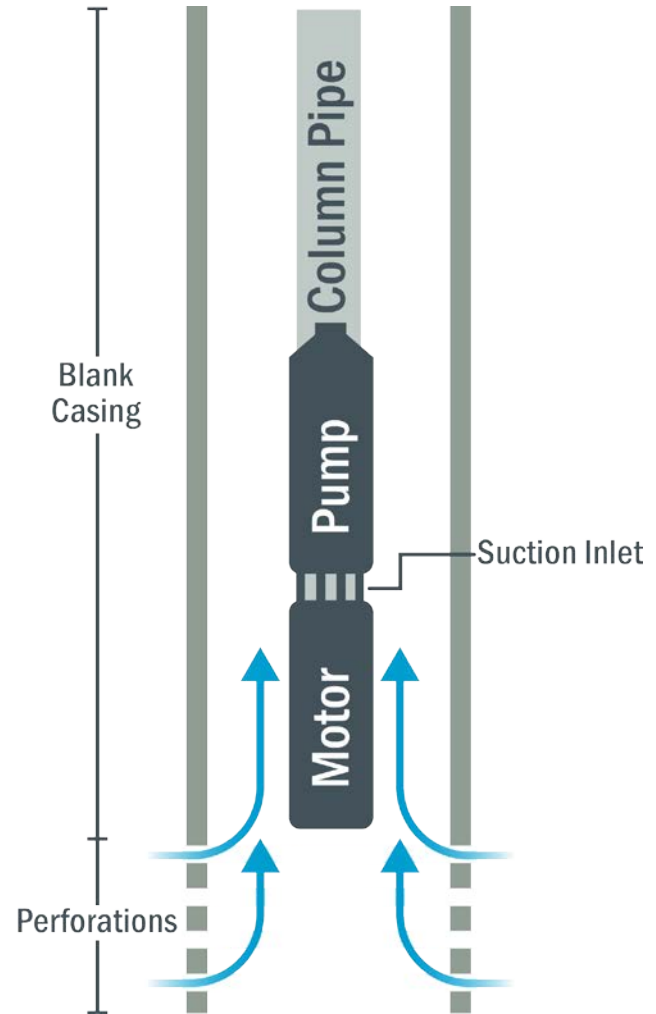
## Overheating

- Primary reason thrust bearings fail:
  - Too low, or too high external cooling flow results in the loss of fluid lubricity--boiling of the water wedge

# Motor Overheating

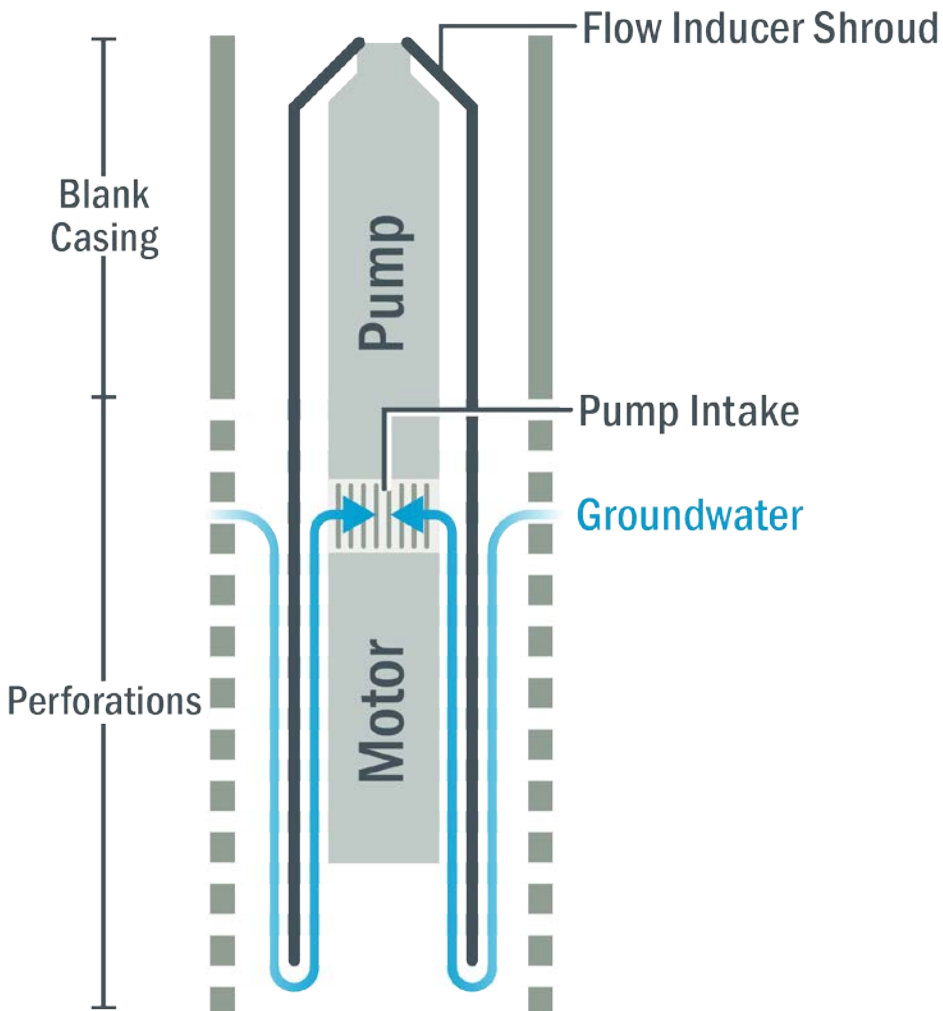


Poor Cooling



Correct Cooling

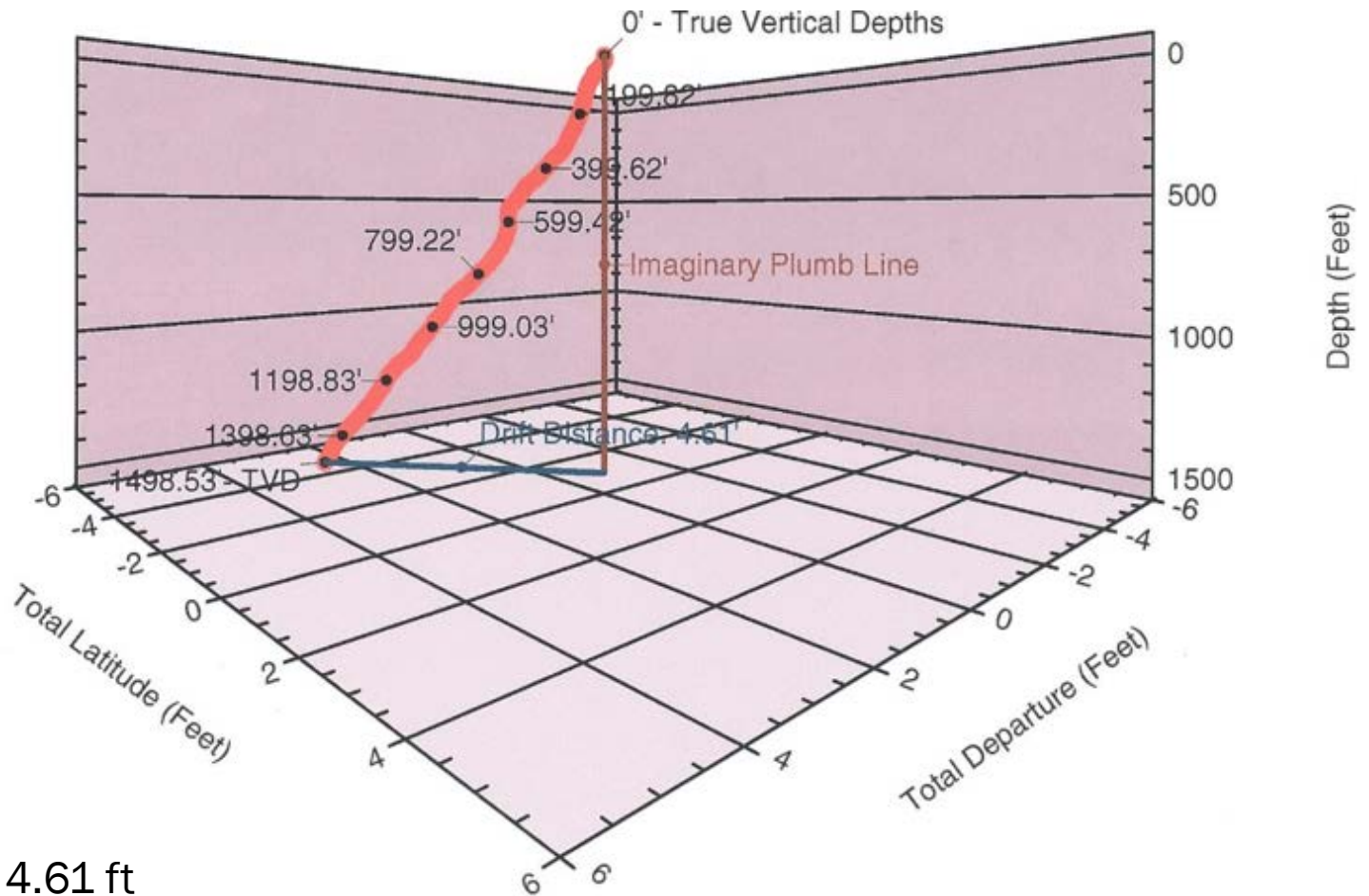
# Motor Overheating (continued)



## Flow Inducer Shroud Benefits

- Creates a uniform cooling flow traveling at the manufacturer-specified velocity past the motor.
- Provides motor exterior protection during installation, operation, and removal.
- Allows the submersible motor to be installed in the well perforations of the casing, if necessary, as it forces cooling water to flow past the motor.

# Well Casing Drift



Drift distance = 4.61 ft

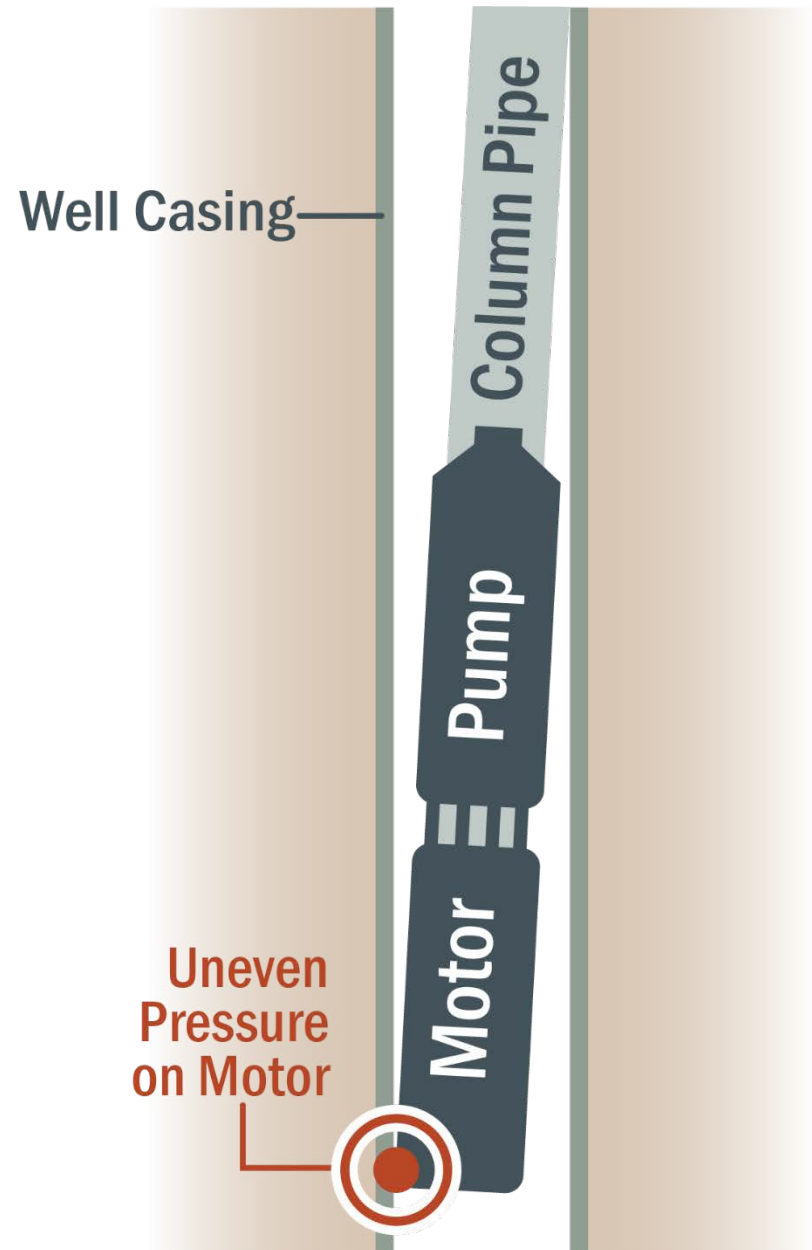
Drift bearing = 140.7 degrees

True vertical depth = 1,498.53 ft

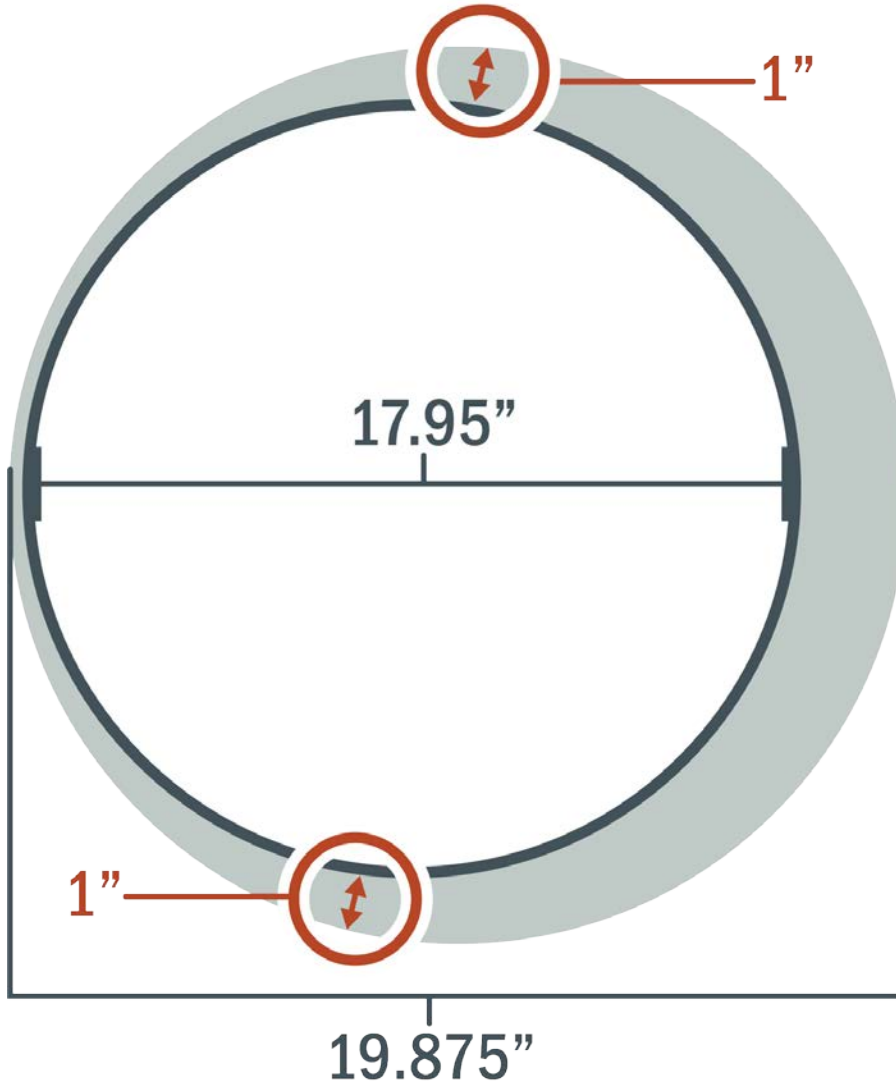


# Motor Alignment

An off-center motor can cause motor rotating component binding and lead to radial bearing failure.



# Well and Motor Dimensions



(Honokohau dimensions shown)

- Insufficient cooling flow area
- Convection requires surface area

# Other Reasons for Mechanical Failures

## Radial Bearings

Binding

## Seals

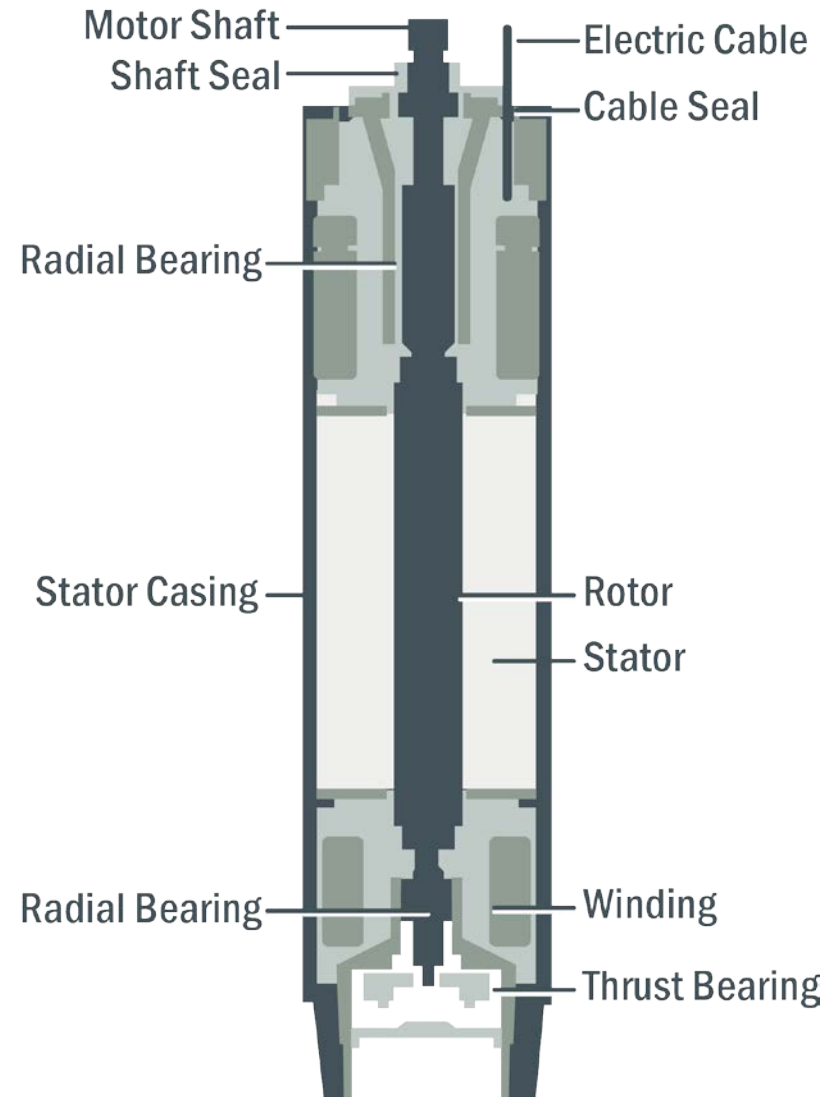
Wear

## Water Hammer

Conduct transient analysis

## Check Valves

Abrupt changes in fluid movement exert extreme pressures on the equipment. Check valves compensate for this issue.



# Failure Modes

Electrical

# Electrical Failures

**Motor Overheating**

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**Grounding**

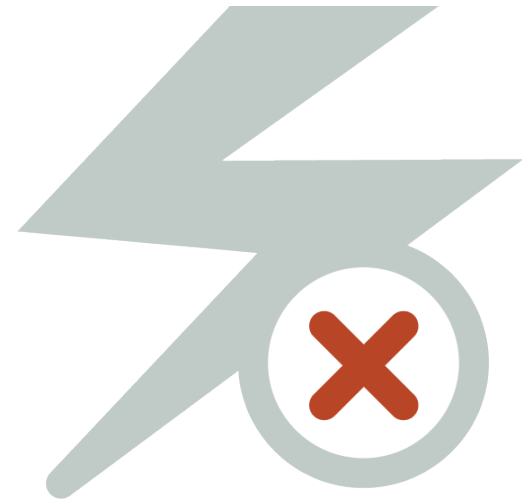
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**Electrical System Settings**

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**Poor Power Quality**

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# Motor Overheating

- Insufficient cooling due to inadequate cool water flow can lead to motor burnout, melting of motor windings
- Motor binding (misalignment in casing)
  - Higher Full Load Amps (FLA) at running condition
- Poor power quality, i.e., voltage sags, phase unbalances and other factors
  - As voltage decreases the current increases at the same rate to maintain the same power output.
  - Electrical systems settings should protect equipment in these events.
- Down hole thermal sensors can provide early warnings



Melted motor windings at Hualalai  
Source: SME TDI Report, Sept. 2016

# Grounding

## Transformer configurations

- Improvements suggested

## Cable types

- Replace with isolated ground wire

## Review up hole ground fault settings

- Minor modifications to settings



# Electrical System Settings

Typically the Overload Setting (FLA) has been set slightly higher than recommended by the manufacturer

- During testing and start-up = Higher FLA required to drive pump – motor binding or poor motor cooling

Ramp down and ramp up time – relates to thrust bearing performance

- Ramp up time = **ok**
- Ramp down time = **ok**

Other settings

- Only minor adjustments



# Power Quality Information

- Information gathered, to date, does not show poor enough power quality that would affect equipment life.
- Additional information needs to be gathered and analyzed.

# Instrumentation Recommendations

- Install maximum amount of down hole sensors to give early warning of pump/motor failure
  - Resistance Temperature Detectors (RTDs), pressure sensors, and other instrumentation available
- SCADA system alarm call-outs
  - Increase level of remote monitoring in conjunction with the use of more sensors
- Will not be able to predict all failures
  - Palani RTDs: No early indication
  - Honokohau: Indicated well was trending toward failure – overheating

# Recommendations

By Well Site

# Recommendations: QLT (Keahuolu)

- Most recent failure: Thrust bearing failure
- Second to last failure: Not determined

Item	Reason for Failure	Recommended Corrective Actions
1	Motor and pump overheating	Install smaller diameter pump and motor and use flow inducer shroud. Ensure proper unit responsibility is in place protecting DWS when pump/motors fail.
2	Water hammer	Perform a transient pressure analysis to determine proper selection of pump and type and location of the check valves.
3	Power quality from HELCO	Unknown, power quality data is still being gathered.
4	Electrical settings adjustments	Modify electrical system settings to better protect the mechanical systems in place.

# Recommendations: Honokohau

- Most recent failure: Not determined
- Second to last failure: Thrust bearing failure

Item	Reason for Failure	Recommended Corrective Actions
1	Motor and pump overheating	Install smaller diameter pump and motor and use flow inducer shroud. Ensure proper unit responsibility is in place protecting DWS when pump/motors fail.
2	Water hammer	Perform a transient pressure analysis to determine proper selection of pump and type and location of the check valves.
3	Power quality from HELCO	Unknown, power quality data is still being gathered.
4	Electrical settings adjustments	Modify electrical system settings to better protect the mechanical systems in place.

# Recommendations: Hualalai

- Most recent failure: Air pocket in motor caused breakdown of insulation resulting in a short and blowout of motor
- Second to last failure: Overheating caused breakdown of winding insulation

Item	Reason for Failure	Recommended Corrective Actions
1	Motor and pump overheating	Install smaller diameter pump and motor and use flow inducer shroud. Ensure proper unit responsibility is in place protecting DWS when pump/motors fail.
2	Water hammer	Perform a transient pressure analysis to determine proper selection of pump and type and location of the check valves.
3	Power quality from HELCO	Unknown, power quality data is still being gathered.
4	Electrical settings adjustments	Modify electrical system settings to better protect the mechanical systems in place.

# Recommendations: Keopu

- Most recent failure: No teardown report available
- Second to last failure: Motor defect

Item	Reason for Failure	Recommended Corrective Actions
1	Motor and pump overheating	Install smaller diameter pump and motor and use flow inducer shroud. Ensure proper unit responsibility is in place protecting DWS when pump/motors fail.
2	Water hammer	Perform a transient pressure analysis to determine proper selection of pump and type and location of the check valves.
3	Power quality from HELCO	Unknown, power quality data is still being gathered.
4	Electrical settings adjustments	Modify electrical system settings to better protect the mechanical systems in place.

# Conclusions

- Address insufficient water flow resulting in inadequate motor cooling.
  - Greater difference between motor diameter and well diameter (“slim line motors”)
  - Utilize flow inducer shroud with slim line motors
- Specifications should include unit responsibility clause – single responsible party.
- Perform transient analysis (water hammer)–check valve quantity and placement.
- Modify electrical system settings now, and modify electrical equipment when well is repaired.



# Status and Next Steps

- QLT, Honokohau, Hualalai, and Keopu TMs complete and in draft format
- Waiaha, Kalaoa, and Palani yet to be analyzed
  - Not full TMs – single sheet recommendations only
- Repair specifications started
  - Hualalai reviewed by BC and bid
  - Others not yet done
- Power quality data still needs to be collected and analyzed
  - Limited number of operational well sites is the current constraint

# MAHALO

## Discussion and Questions



it's about connecting



essential ingredients®