United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

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Ms. Catherine A. McMullen
Chief, Disclosure Unit
U.S. Office of Special Counsel
1730 M Street, NW, Suite 300
Washington, DC 20036

Re: OSC File No. DI-14-5128

Dear Ms. McMullen:

With this letter, the Department of the Interior (DOI) is providing its response to the OSC File No. DI-14-5128, in which a National Park Service (NPS) employee made allegations regarding what he believes to be the NPS' slow response to correct deficiencies in the Hawaii Volcanoes National Park (HAVO) water system identified in a 2013 Environmental Health Survey Report (Health Survey) conducted by the U.S. Public Health Service (PHS).

Background and summary.

This letter is intended to discharge the Secretary of the Interior's (Secretary) obligation under 5 U.S.C. 1213(d).

The Secretary has delegated authority to sign this response to the Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

The Secretary received the OSC Referral on February 6, 2015 and designated the DOI Office of the Inspector General (OIG) to investigate the allegations on February 23, 2015. The OIG final report is dated March 31, 2015, and an unredacted CD version of that report is included with this response letter.

In addition to the OIG investigation, on April 3, 2015, NPS Deputy Director for Operations Peggy O'Dell traveled to HAVO and met with park superintendent Cindy Orlando regarding the condition of the water system and HAVO's response to the findings of the 2013 Health Survey.

In March 2015, the PHS conducted another Health Survey of the HAVO water system, after which the PHS inspector noted some deficiencies and recommended some improvements but concluded that overall HAVO water system operations were "good."

The OIG concluded that there are several issues regarding HAVO water system maintenance, that HAVO and NPS officials are aware of the issues, and that neither HAVO nor NPS officials are "... acting with a sense of urgency to correct the deficiencies and reduce risk."

The NPS is diligently addressing, within the relevant budget limitations, the findings of the 2013 and 2015 Health Surveys and the OIG Investigation. No administrative, disciplinary, or criminal referral action is warranted regarding any NPS employee as a result of the Health Survey, the OSC Referral, or the OIG Investigation.

Summary of information with respect to which the investigation was initiated.

In its referral, OSC detailed allegations by NPS HAVO employee Mr. Matthew Duryea, who alleged that NPS employees have not performed appropriate maintenance of the Park's water system. Specifically, Mr. Duryea alleges that a December 2013 Health Survey conducted by the PHS identified a number of conditions in HAVO's water supply system that violate NPS regulations that have remained uncorrected and present a danger to public health, including:

- failure to have park-wide backflow prevention assemblies tested by a certified inspector on an annual basis;

- failure to maintain on staff a certified wastewater operator;

- failure to maintain a locked security gate around the perimeter of the Park's water collection and storage system;

- numerous breaks in the Park's water supply system;

- insufficient height of the berms surrounding the Park's water system catchment ponds;

- lack of a backflow device on the Park's museum fire sprinkler system;

- oxidation and corrosion on the Park's water storage tanks;

- overdue cleaning of the park's water storage tanks; and

- general disrepair of the liners, paint, and roofs of various structures.

Description of the conduct of the investigation.

In conducting its investigation, the OIG visited HAVO and interviewed 10 current and former DOI employees. The OIG investigators spoke with HAVO's superintendent, officials with the State of Hawaii's Department of Health who had oversight responsibilities related to HAVO's potable water system, and employees with NPS' Office of Public Health. Further, OIG reviewed relevant NPS policies, historical records and inspections, emails, and conducted a site visit of HAVO's water system. The OIG focused its investigation on the overall deterioration of the water system, problems with the installation and maintenance of equipment used to prevent drinking water contamination, and the insufficient number of HAVO staff members certified in water treatment.

The OIG also interviewed PHS Commander Craig Ungerecht, the officer who conducted the 2013 Health Survey, and accompanied Captain John Leffel, also of the PHS, as he conducted HAVO's 2015 Health Survey.

Summary of evidence obtained from the investigation, and violations of law, rule or regulation.

The OIG found that deficiencies pertaining to HAVO's water system, some of which were highlighted in the Health Survey, had not been corrected at the time of the investigation. Based on the statements of the two PHS officers who conducted the 2013 and 2015 Health Surveys, OIG concluded that, while there does not appear to be an immediate threat to public and employee health, the OSC whistleblower raised credible concerns regarding the long-term safety of the water system (mainly due to age and natural deterioration) and certain violations of NPS Manuals.

Persons interviewed by the OIG indicated that the water system at HAVO is old, but that aging water systems are present at many National Parks. The HAVO water system is under additional stress because of the caustic nature of discharges from the volcano and from frequent earthquakes in the area.

Specific OIG findings include:

- Backflow preventers: the HAVO museum and the Volcano Observatory's laboratory do not have backflow prevention devices, a condition not in compliance with NPS Reference Manual 83A2;

- Backflow preventer inspections: HAVO backflow preventers are not being inspected annually, a condition not in compliance with NPS Reference Manual 83A2;

- Water site security gate: HAVO does not have a locked security gate to prevent access to the water collection and storage facility;

- Water Treatment Certifications: HAVO has met all water related certification requirements imposed by the State of Hawaii;

- Water tank hatches: water tank hatches at HAVO were not properly sealed, creating the possibility for introduction of foreign materials into stored water;

- Wastewater system operator: the PHS does not believe that HAVO is required under state law to have a staff member certified in wastewater collection;

- Raw water pond berms: the raw water pond berm height is not sufficient to prevent intrusion of unwanted water, a condition that might require more chemicals to be used to treat the water.

Actions taken or planned as a result of the investigation.

The NPS has prepared a comprehensive Status Report on the HAVO water system which addresses the findings of the 2013 and 2015 Health Surveys, and the substance of Mr. Duryea's complaint to the OSC. The Status Report is included with this letter at Attachment 1.

Among other issues addressed, the Status Report addresses the following HAVO water system issues:

- Museum backflow preventer: a testable backflow preventer will be installed during the summer of 2015;

- Volcano Observatory backflow preventer: a testable backflow preventer will be installed during the summer of 2015;

- Catchment pond berms: higher berms and a new pond liner will be installed during the summer of 2015;

- State of Hawaii backflow testing certification: a HAVO employee obtained state certification to test backflow devices in August, 2014;

- Repaint exterior water storage tanks: contract for this repair is being developed during the summer of 2015;

- Clean water storage tanks: one tank was cleaned as a part of the 2015 painting contract and the other will be cleaned when it is repainted.

The NPS has concluded that no administrative, disciplinary, or criminal referral action is warranted as a result of the investigation.

Sincerely,

Michael J Bean

Michael Bean
Principal Deputy Assistant Secretary for
Fish and Wildlife and Parks

Report of Investigation
HAVO Water
Distribution System

OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

REPORT OF INVESTIGATION

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity**	**Report Date** **March 31, 2015**
Report Subject **Report of Investigation**	

SYNOPSIS

At the request of the Secretary of the Interior, we investigated several allegations related to the potable water system at Hawaii Volcanoes National Park (HAVO), located on the island of Hawaii. The Secretary received a letter from the Office of Special Counsel (OSC), dated February 5, 2015, outlining concerns from a whistleblower that HAVO officials did not act on deficiencies noted in a December 2013 National Park Service (NPS) environmental health survey of the park and its water system, and that their inaction potentially presented a danger to public health.

We visited HAVO and interviewed 10 current and former park employees, most of whom worked for the Maintenance Division. We also spoke with HAVO's superintendent, officials with the State of Hawaii's Department of Health who had oversight responsibilities related to HAVO's potable water system, and employees with NPS' Office of Public Health. Further, we reviewed relevant NPS policies, historical records and inspections, and emails, and we conducted a site visit of HAVO's water system. We focused our investigation on the overall deterioration of the water system, problems with the installation and maintenance of equipment used to prevent drinking water contamination, and the insufficient number of HAVO staff members certified in water treatment.

We found that deficiencies pertaining to HAVO's water system, some of which were highlighted in the December 2013 survey, were still uncorrected. Although, based on our interviews, there does not appear to be an immediate threat to public and employee health, our investigation established that the OSC whistleblower raised credible concerns regarding the long-term safety of the water system and certain violations of NPS regulations and policies. We found that the issues raised by the complainant have been longstanding, and NPS management and health officials are aware of them. It appears, however, that neither HAVO officials nor NPS are acting with a sense of urgency to correct the deficiencies and reduce the risks.

Reporting Official/Title Katie Balestra/Special Agent	Signature Digitally signed.
Approving Official/Title Ted Baugh/ASAC	Signature Digitally signed.

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We are providing a copy of this report to the Secretary of the Interior for any action deemed appropriate.

DETAILS OF INVESTIGATION

We initiated this investigation on February 25, 2015, after receiving a memorandum from U.S. Department of the Interior Chief of Staff Tommy Beaudreau (**Attachment 1**). The memorandum, dated February 23, 2015, forwarded allegations from the U.S. Office of Special Counsel (OSC) that Hawaii Volcanoes National Park (HAVO) officials may have violated laws, rules, or regulations and engaged in gross mismanagement, resulting in a danger to the public's health (**Attachment 2**).

A February 5, 2015 letter from OSC to Secretary of the Interior Sally Jewell explained that a December 2013 environmental health survey, conducted by the National Park Service's (NPS) Office of Public Health, identified serious deterioration, requiring repairs and maintenance, in HAVO's water supply system. The letter stated that, according to a whistleblower, the deficiencies outlined in the survey had gone uncorrected, presenting a danger to the health of the park's visitors, which number 1.5 million in an average year.

The OSC letter outlined the following concerns related to the potable water system at HAVO:

- The water supply system had recently suffered a number of major breaks, potentially attributable to the system's age. Water storage tanks were also showing signs of corrosion.
- Backflow preventers—components of the drinking water supply system that are needed to prevent contamination—were allegedly either missing or in disrepair, and were not being tested annually by a certified inspector.
- Individuals listed as certified in water treatment and distribution in the December 2013 survey actually did not have valid licenses at the time of the inspection.

During our investigation, we heard from numerous sources about the seriousness of these issues. We therefore focused our investigation on the overall deterioration of the water system, the issues with backflow preventers, and the insufficient number of HAVO staff members certified in water treatment.

The OSC letter also highlighted other issues of concern from the survey's observations, including HAVO's water collection and storage site not having a locked security gate, and berms around HAVO's water catchment ponds not being high enough to prevent runoff from a nearby road. We examined these concerns, as well as others brought to our attention during interviews.

Deteriorated Water System

HAVO, located on the island of Hawaii, has a rain shed water collection system that was first constructed in 1924, 8 years after the park was created (**Attachments 3 and 4**). The system originally relied solely on a roof catchment system where water drained from the roofs of rain sheds into redwood storage tanks. Between the 1930s and the 1950s, the park added an underground concrete reservoir, a pumphouse, and pipelines. Steel water tanks, a chlorination unit, a ground catchment pond, and a new rain shed were later installed.

The NPS Office of Public Health conducts yearly surveys of the drinking water at HAVO as well as other national parks (**Attachment 5**). The program is primarily staffed by commissioned officers detailed to NPS from the U.S. Public Health Service.

On December 2, 2013, Public Health Service Commander Craig Ungerecht conducted an environmental health survey at HAVO (see Attachment 3). As part of his survey, he examined the park's water systems, wastewater systems, and food safety. His survey report highlighted numerous issues with HAVO's water systems, one of which was that the distribution system had recently experienced several major breaks, potentially due to its age. The survey report stated that HAVO needed to consider replacing the distribution system to prevent future breaks and save water, and that HAVO's water storage tanks had corrosion.

As outlined in NPS Director's Order 83, NPS managers are required to "reduce the risk of waterborne disease and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, monitored, and deficiencies promptly corrected" (**Attachment 6**).

We interviewed the OSC whistleblower about the state of HAVO's water system (**Attachment 7**). He stated that overall the system's infrastructure was "very dilapidated." The water system had distribution and pressure pumps that were critical to the system, he said, but they were failing and past their life expectancy. New high-density polyethylene (HDPE) pipes had also been purchased years before to replace existing pipes, but had never been installed, he said. The whistleblower said that HAVO Superintendent Cindy Orlando was aware of the water system issues but instead chose to fund issues of cultural or "natural" concern, such as endangered species.

We interviewed Ungerecht, who conducted environmental health surveys at HAVO in February and December 2013 (**Attachment 8**). During the December 2013 visit, he said, HAVO Civil Engineer and Safety Manager Steve Brum hosted him. When asked about his finding that HAVO's water distribution system had experienced recent major breaks and needed replacement, Ungerecht said that waterline breaks were common in older water systems like the one at HAVO. He explained that if not repaired, these breaks could have a negative impact on the water supply, such as the introduction of dirt and contaminants. At the time of his survey, he said, HAVO staff indicated that replacing the distribution system had been discussed, but he did not know if further action had been taken.

Ungerecht acknowledged that he had found corrosion on the outsides of the water storage tanks (Figure 1) and that the tanks had not been cleaned in recent years. He said that some of the water tanks at HAVO were being repainted at the time of his survey, and HAVO was planning to repaint the others. He said he also saw sediment buildup in the tanks, which was more of a maintenance issue than a health issue, and that this was common throughout the national park system.

Figure 1. Corrosion on the exterior of a water storage tank. Source: Office of Inspector General (OIG).

According to Ungerecht, he found nothing specific during his survey that would result in a risk to public health, but he added that there were "always chances" that something could occur in a water system. Ungerecht said that HAVO's water distribution system needed to be upgraded and a few other issues corrected, but he routinely observed similar conditions in water systems among the parks he visited and surveyed.

On March 2, 2015, we accompanied Brum as he hosted Captain John Leffel, U.S. Public Health Service, on the Office of Public Health's most recent environmental health survey at HAVO (**Attachment 9**). During his survey, Leffel noted some deficiencies and recommended improvements but stated that overall HAVO's water system operations were good.

During our investigation, we interviewed 10 current and former HAVO employees and officials, who either worked in the park's Maintenance Division or were responsible for overseeing that division's employees, regarding the state of the park's water system (**Attachments 10 through 20**). Many described the water distribution system as old, deteriorated, and in need of replacement. Employees also confirmed the OSC whistleblower's statement that replacement pipes had been purchased years ago but never installed.

We interviewed Brum, who, in addition to being HAVO's safety manager, is a commissioned officer in the Public Health Service (see Attachment 17). He said that he served as the technical expert on HAVO's water system and prioritized projects involving the infrastructure. Brum explained that the main water-related problem that HAVO needed to address was the replacement of the failing distribution system. The system was 30 years old, he said, and was stressed further by the caustic environment created by the park's volcano. Efforts to adjust the water's pH had damaged the inside of the system's pipes, and they were heavily tuberculated (filled with iron scale) (Figure 2). In addition, because the pipes were aboveground, many of the joints and valves were failing, he said.

Figure 2. An example of a tuberculated pipe at the park, although this particular pipe was not in use. Source: OIG.

The water storage tanks at HAVO were also problematic, Brum said, because they had exceeded their life expectancy. A project to repair and repaint the tanks was underway, but would not be completed until approximately 2020.

In 2013, Brum said, two leaks occurred after pipes in the system cracked. He explained that this was a problem because of the potential for cross-contamination. Because the system lost pressure when these cracks occurred, adjacent groundwater with bacteriological components could have entered the system through the cracks. Before he arrived at HAVO in 2011, Brum said, his predecessor had replaced a portion of the water supply system; approximately 3,000 feet of pipe between the housing area and the research area was replaced with buried HDPE pipe. HDPE pipes left over from this project were stacked near the rain shed (Figure 3).

Figure 3. Stacks of unused pipes. Source: OIG.

Brum stated that while the water system clearly needed repairs, it did not pose an imminent danger to health and safety. He noted that HAVO was competing with many other NPS facilities for funding. Given that any repairs to the distribution system would be made in phases, it would be many years before the entire system could be replaced. The next phase might be funded in 2017, he said. Brum estimated that replacing the entire system all at once would cost approximately $4 million.

Brum stated that HAVO's facilities manager was responsible for ensuring that water system deficiencies were corrected; this position had been vacant for 18 months and was being temporarily filled by acting managers, but a new hire for the position was set to start work in April 2015. Brum believed that the duration of the position vacancy had exacerbated problems with the water system.

We interviewed HAVO Maintenance Mechanic Philip Gagorik, the lead operator of the park's water treatment and distribution systems (see Attachment 13). Gagorik explained that the biggest issue with HAVO's water system was that much of the galvanized steel piping was very old and subject to corrosion inside. He said that it was also difficult to keep the necessary amount of chlorine, known as the "residual," in the tanks to prevent bacteria growth. He explained that he had to add a good deal of chlorine at the top of the water tanks in order for the bottom to have enough chlorine, which was problematic because chlorine tended to react with the metal in the pipes.

Gagorik confirmed that due to the age of the system, breaks were occurring in the water lines, causing water to be lost. He said that HAVO employees fixed breaks as the breaks were discovered. Another problem, he said, was potential damage to the larger 8-inch pipes when earthquakes occurred. During earthquakes, he said, it was possible for the shaking to cause pipes to pull out of their sleeves and for bolts to break.

Gagorik said that replacing the piping system would be an expensive endeavor. He also mentioned the HDPE piping and valves HAVO had purchased, saying that they were never installed due to funding issues and the need for permission to dig in the park.

We interviewed Gagorik's supervisor, Buildings and Utilities Supervisor Wendall "Tom" Foster, who had recently become the acting facilities manager (see Attachment 15). According to Foster, the aging pipeline was the most severe problem with HAVO's drinking water. "It is to the point where we're just one big earthquake away from having a catastrophic failure on our pipelines because it hasn't been maintained," he said. Foster said that earthquakes happened at HAVO every day, and one with a magnitude of around 7 could severely damage the water system. According to Foster, the last major break or leak in the water system occurred in approximately 2013.

Like Brum, Foster stated that not having a permanent facilities manager to serve as an advocate for getting funding for necessary projects was detrimental to his division. Foster said that there had been a "huge gap in leadership." He said that since Ronald Borne, the former facilities manager, left, others had filled the position in an acting capacity, including Joanna Dixon and himself.

We interviewed Dixon, currently the facility management program coordinator of NPS' Pacific West Region, who served at HAVO on detail as the acting facilities manager between October 2014 and February 2015 (see Attachment 16). She opined that the water system at HAVO was in a similar state of repair as those of other parks in the Region. In general, she said, national parks' water systems were very old, required maintenance often, and were very expensive to replace.

We also interviewed Borne, who was the HAVO facilities manager from October 2008 to July 2014 (see Attachment 19). He said that water system corrosion and deterioration had always been an issue at the park. Borne, who had left HAVO to work as the chief of facility engineering at Yosemite National Park, said that NPS had a system-wide problem of antiquated water systems in its parks and that the HAVO water system was comparable to those of other parks.

Borne recalled that HAVO purchased a large quantity of HDPE pipes prior to the Federal Government sequestration in 2011 to have ready in case project funds for pipe replacement became available over time. HAVO was able to replace one critical area of pipe, but most of the pipes had been sitting unused due to an absence of funding. Borne said that he believed Orlando knew about the unused pipes because she had seen staff moving them.

Orlando stated that the quality of the park's water was good and that she was not aware of any problems regarding the water system (see Attachments 10 and 11). She acknowledged that HAVO did have older pipes but said that the steel tanks were in good shape, other than occasional corrosion. She said that she was not aware of any new pipes that had been purchased but not installed. According to Orlando, HAVO had replaced some of the piping at one point, and it had submitted a work order to replace the rest in four phases. She said that the second phase of the pipe replacement, which was considered a "big-ticket item," was slotted to receive national funding from NPS between 2017 and 2021. Orlando explained that she had no control over the funding for such projects because they were funded outside HAVO, adding that the NPS regional and national offices prioritized these projects and decided how to distribute funds.

When asked if she could have done anything to ensure that the pipe replacement project was funded faster, Orlando stated that, short of a catastrophic failure of the water system, there was nothing she

could have done to make the project a higher priority. She also stated that if a determination was ever made that HAVO needed to replace the entire water system at one time, the cost would be substantial. Orlando said that she would have received a copy of the December 2013 Office of Public Health survey report after it was issued, stating that the Maintenance Division normally addressed the issues identified in these surveys. Although the Office of Public Health did not check progress on its survey observations until the next survey, she said, the park continued to monitor issues and take corrective actions. She said that all of the issues identified in the December 2013 survey were being addressed in some way, whether the project had been identified and developed or had actually obtained funding.

Orlando stated that HAVO's Maintenance Division was severely underfunded with regard to personnel operating costs, which she said was not unique to HAVO. She said that after sequestration began in 2011, all budget requests for base increases, which would have been applied to staffing levels, were cut. Since this time, she said, funding the Maintenance Division had been HAVO's highest priority. She stated that HAVO was set to receive a $300,000 base increase this year, and the money had been earmarked for hiring seasonal staff.

Orlando provided the following information outlining the appropriated funding that HAVO has received, and the Maintenance Division portion, from fiscal years (FYs) 2012 to 2015 (Figure 4). She said that in addition to this money, the Maintenance Division normally received another $1 million from other funding sources each year.

Funding Category	FY 2012	FY 2013	FY 2014	FY 2015
HAVO Total	$7,407,600	$6,886,145	$7,156,440	$7,422,487
Maintenance Division's Portion	$2,064,795	$1,833,773	$2,039,296	$2,113,700

Figure 4. HAVO's appropriated funding, FYs 2012 to 2015.

Orlando denied favoring cultural or natural projects at HAVO over maintenance projects. She said that HAVO had some discretion over which projects to propose for funding from fees collected by the park, which had to be approved at the NPS regional and national level. She acknowledged that maintenance projects were not often funded with this money because the Maintenance Division had access to funds that other programs did not. She said that museum exhibits and trails projects were examples of project types that had received money from park fee collection.

Backflow Preventers

According to NPS Reference Manual 83A2, piping systems with "cross connections"—that is, piping arrangements where potable and nonpotable water may connect—could create "backflow" (**Attachment 21**). Backflow in a water system occurs when a loss of pressure in the system causes the reversal of the water's flow; in pipe systems where potable and nonpotable waters may connect, backflow can cause contaminated or nonpotable water to be drawn into drinking water. NPS's policy states that water service to any premises must be discontinued if a backflow prevention assembly is not in place where required, and backflow preventers must be inspected at least once a year by a certified inspector. According to the OSC whistleblower, HAVO's water system did not have backflow preventers, and no one at the park was trained in backflow prevention (see Attachment 7).

The NPS Office of Public Health's December 2013 survey noted that HAVO's backflow preventers were not being tested annually by a certified inspector (see Attachment 3). The survey also noted that the sprinkler system at HAVO's Jaggar Museum did not have a backflow preventer, and the park's Volcano Observatory did not have the specific type of backflow preventer required for the facility.

Ungerecht stated that at the time of the survey, HAVO did have backflow preventers (Figure 5), but no one on staff was certified to inspect them annually (see Attachment 8). In addition, HAVO had no documentation to show that the assemblies were being inspected. He explained that most parks did not have staff certified for backflow systems, so they contracted out the annual inspections. Ungerecht said that to the best of his knowledge, all locations at HAVO that required backflow assemblies had them in place, aside from the museum, which needed one to keep stagnant water from the sprinkler system from getting into the drinking water.

Figure 5. An example of the backflow preventers at HAVO. Source: OIG.

During our interviews with HAVO facilities and maintenance staff, we were informed that the park did, in fact, have the required backflow preventers in all areas but two—the sprinkler system at the Jaggar Museum and at the Volcano Observatory (see Attachments 13, 15, 17, and 19). In addition, we were informed that there had been at least a 1-year period between when the previous backflow preventer inspector left the park and when Gagorik became certified to do the work. While not all staff believed these issues constituted a safety hazard, the consensus was that the devices needed to be installed and inspected.

During his interview, Gagorik explained that HAVO had 11 reduced-pressure backflow preventers and a double-check valve (another type of backflow prevention device) installed at various points in its water system (see Attachment 13). He confirmed that HAVO's Jaggar Museum did not have the required backflow preventer. He said that this was not an imminent safety threat to the public, but it would be "bad PR" for HAVO if a drinking fountain at the park were to begin "putting out black water."

Gagorik also mentioned the Volcano Observatory's laboratory. He said that the potential for chemical contamination existed there because, although the faucets themselves had siphon breaks to prevent backflow, the lab did not have the reduced-pressure backflow preventer that the Environmental Protection Agency (EPA) required. Again, he said, this did not necessarily represent an imminent threat to public health, but there was a potential risk to users of the water.

Gagorik did not know who was testing the backflow preventers before he started doing so in 2014, nor did he know where the records of such tests would be kept. He said that when he tested the backflow preventers, they were in good condition.

During his interview, Brum acknowledged that the 2013 survey observation about backflow preventers had taken a long time for the park to address (see Attachment 17). He agreed that it was a requirement that backflow preventers be in place, and it was a "failure" for HAVO not to have one. He stated, however, that the backflow issues were "not a grave concern" because the water was tested continually for bacteria.

Brum also acknowledged that HAVO did not have any records of annual backflow inspections that occurred before Gagorik was certified to do them. Brum said that HAVO was currently adopting a cross-connection control program, which would list all of the backflow preventers and identify their annual inspection requirements as required by NPS Reference Manual 83A1. He also stated that the backflow preventer issues at the observatory and museum would be addressed by July 2015.

Foster confirmed that HAVO was "written up" in the December 2013 survey for the backflow preventer issue (see Attachment 15). He believed that a former HAVO employee named Dana Kuffer had held a backflow certification, but Kuffer retired the year before Gagorik obtained his certification in 2014. According to Foster, HAVO had no records that Kuffer had conducted the annual reviews of backflow preventers. The period of time that elapsed between Kuffer leaving and Gagorik being certified may have been about a year to a year and a half, Foster stated.

According to Foster, samples of the park's water went to the State of Hawaii Department of Health twice a month for bacteria testing. He recalled one sample from HAVO that was "suspect," so another sample was taken, which came back clear. Foster believed the first sample may have been contaminated from dust in the air.

Borne stated that when he was the facilities manager at HAVO, he knew that the absence of a backflow preventer could potentially be a safety issue (see Attachment 19). He said that the need for a backflow preventer at the observatory was a high enough priority that a project was initiated for it. He stated, however, that the issue was never brought up to him as a major public health and safety concern, nor was he told that the installation had to happen immediately. Regarding the lapse in backflow preventer testing between Kuffer's retirement and Gagorik's certification, he acknowledged that HAVO had not met this requirement.

We asked Orlando why the backflow preventer issues highlighted in the December 2013 survey had not been addressed (see Attachment 11). Orlando said she had been told that the equipment to fix the problem had been ordered, but she was not sure when this occurred. She explained that other projects outlined in the survey were deemed a higher priority than the backflow preventers, including painting the water tanks to prevent corrosion and replacing the distribution system pipes. She said that no one had brought up the backflow preventer issues as a major safety problem that needed to be immediately

addressed, aside from it appearing in the survey. She said that if the issues had to be fixed right away and the Office of Public Health had communicated this, the park would have made them a higher priority.

We interviewed Theresa McGeehan-Takiue, an environmental health specialist with the State of Hawaii Department of Health, who assisted the park with its bimonthly testing for bacteria (**Attachment 22**). She said that since she began working at the Department of Health in 2003, the test results for HAVO had never come back positive for any bacteria.

Insufficient Water Treatment Certifications

According to NPS Reference Manual 83A1, all parks that operate public drinking water systems must have certified operators as required by the parks' primacy agency (**Attachment 23**). Parks must also designate backup operators who have adequate training and skills to operate the system when the primary operator is not available. The manual also recommends equivalent backup operator certification and training, and equivalent certification of backups may be required by primacy agencies.

Four levels of certification, with progressively higher degrees of responsibility, are attainable for operators of water treatment systems and water distribution systems. While the NPS Office of Public Health December 2013 survey did not reference any issues with HAVO water system operators' certifications, the OSC whistleblower stated that individuals listed on the survey as having specific certifications to operate the water treatment and water distribution systems did not hold those certificates (see Attachments 2, 3, and 7). The whistleblower also stated that Gagorik was HAVO's only water treatment plant operator with a Level 2 certification, which was the minimum certification needed to adjust the water's chlorine levels. He said that Gagorik had no backup when he was off duty.

The December 2013 survey listed the following HAVO employees as having water system certifications:

- Alvin Asato: Water Treatment Level 1
- Danny Ortiz: Water Treatment Level 1
- Jeff Thacher: Water Treatment Level 1, Water Distribution Level 1
- Phil Gagorik: Water Treatment Level 2, Water Distribution Level 4
- Tom Foster: Water Treatment Level 1

According to HAVO staff, water treatment plant operators with a Level 1 certification are authorized to test chlorine residuals, and those with a Level 2 certification can test the residuals and also adjust the chlorine levels in the water through a meter (see Attachments 12, 13, and 17). We were informed that although the State only required one HAVO employee to have a Level 2 water treatment plant operator certification, HAVO has had problems ensuring the drinking water is being tested and treated every day without having another Level 2-certified employee, as well as more employees with Level 1 certifications. Numerous staff members informed us about a 2013 incident in which a scheduling miscommunication caused 8 nonconsecutive days to go by without anyone testing and adjusting the water's chlorine levels to ensure that the water was safe to drink (**Attachment 24,** and see Attachments 12, 13, 15, 17, 18, and 20). We were not informed of any problems with HAVO having enough staff with water distribution system certifications.

During our investigation, HAVO facilities and maintenance staff, as well as officials with the State of Hawaii Department of Health, also confirmed that Asato, Ortiz, and Foster did not have water treatment certifications (**Attachment 25,** and see Attachments 12 through 15, 17). We asked park staff, including Orlando, why these names were included on the survey as having certifications, but it remains unclear how Ungerecht obtained this information.

Jodi Yamami, a compliance engineer with the Safe Drinking Water Branch of the Hawaii State Department of Health (HAVO's primacy agency for water issues), explained that the water treatment plant at HAVO was classified as a Class 2 plant and the water distribution system as a Class 2 system (see Attachment 25). Based on these characteristics, HAVO was required by the State to have at least one water treatment plant operator with a Level 2 certification and one Level 2 distribution system operator. Yamami provided a position paper from the Department of Health supporting this (**Attachment 26**).

Yamami said that Gagorik was directly responsible for managing HAVO's water system, and she confirmed that he held a current Level 2 certification in water treatment plant operations and a Level 4 in water distribution system operations (**Attachment 27**). Yamami also said that Vehicle Operator Jeff Thacher and another HAVO employee, Daniel Patao, held Level 1 water treatment plant operator certifications, and that Thacher held a Level 1 distribution system operator certification (**Attachments 28 and 29**).

Yamami said that HAVO met all water-related certification requirements imposed by the State. She further explained that the State did not require additional certifications for employees acting in a "backup" capacity, and that as long as Gagorik remained in the State of Hawaii, other operators, such as Thacher, could manage and operate the water system under Gagorik's direction. If Gagorik left the State for any period of time, however, HAVO needed to have a backup with a Level 2 certification in water treatment plant operations. Yamami said that, based on his certifications, Thacher was permitted to make daily process-control decisions related to the water system.

During his interview, Brum acknowledged that Asato, Ortiz, and Foster did not hold Level 1 water treatment certifications, although the survey reported that they did (see Attachment 17). He did not know how these names came to be included in the survey. He said that those individuals had attended training that qualified them to take an examination for the Level 1 certification, but at the time of the survey, none had passed the actual exam.

Brum stated that Gagorik, as a Level 2 water treatment plant operator, could adjust the chemical injection pump that chlorinated the water, but Thacher, who only had a Level 1 certification, could not. Brum felt that Gagorik and Thacher were doing a good job producing potable water at the park; however, the incident in 2013 where the chlorine testing was not being done was a "red flag." Brum stated that during this incident, the chlorine residual level was unknown, and if the residual got too low, the bacteria in the water would not be destroyed. He said that although he did not believe the incident created a major health issue due to the general quality of the water at HAVO, the gap in testing was cause for concern. He said there was a "clear indication" that something was not being managed correctly.

We also interviewed Michael Miyahira, the supervisor of the Engineering Section, Safe Drinking Water Branch, Hawaii State Department of Health (**Attachment 30**). He said that he was aware of the 2013 gap in the daily water testing at HAVO. He explained that the risk of a water-testing gap was that

a contaminant could possibly enter the water system undetected. In response to the 2013 incident, Miyahira said, he reviewed HAVO's water data both before and after the gap and determined that it did not result in any harm to the park's water supply. He said that he notified HAVO of his finding and that he considered the matter closed.

Gagorik stated that he and Thacher were licensed to mix the chlorine and test residuals (see Attachment 13). Gagorik explained that he had a chart for Thacher to follow, so Thacher could do what was needed even if Gagorik was not available to help him. He explained that he lived 5 minutes from HAVO and Thacher had his cell phone number if the readings showed problems with the water.

We asked Gagorik if he had ever been far away from work or unavailable to supervise the water treatment. He explained the 2013 gap in testing, stating that in August or September 2013, he had gone to a wedding on the U.S. mainland and then had gotten sick, so he was unexpectedly away from work for 2 weeks. During that time, he said, there were periods where no chlorine readings were taken, nobody was testing the water's turbidity (that is, the amount of particles in the water), and the system was running automatically with nobody monitoring it (**Attachment 31**). Gagorik stated, however, that enough residual chlorine was in the water system during this time for the water to still be drinkable.

Gagorik said that after these scheduling issues occurred, the Maintenance Division created a schedule where employees would note their leave and availability (see Attachment 13). Nevertheless, he said, if there were a medical emergency and he and Thacher were both out for an extended period, the park would be "screwed." Gagorik said that he had asked for more certified operators who could step in as backups, but other HAVO employees did not want to obtain the certifications because doing so would require a great amount of effort but yield no additional compensation.

We interviewed Thacher, who stated that he normally conducted work related to the park's water operations on weekends and holidays, when Gagorik was off (see Attachment 12). According to Thacher, the only difference between Gagorik and him was that Gagorik could adjust the chlorine solution meter, and he could not. Thacher stated, however, that he sometimes prepared the solution. When asked what he did when Gagorik was away and the meter had to be adjusted, Thacher said that normally Gagorik had everything ready for him, so he had no need to touch the meter.

Thacher believed that not enough people at the park were certified to treat and operate HAVO's water system, and he believed that more park staff would be interested in obtaining certifications if they received an increase in pay. He stated that the certification exam was not easy.

When asked about the 2013 gap in chlorine residual testing, Thacher said that he actually found the gaps in the logbook when Gagorik was out sick. He believed that Foster was responsible for the scheduling incident, explaining that Foster had never informed anyone that Gagorik was sick.

Foster acknowledged that in 2013, HAVO had to report to the State that it did not have water operator coverage for a period of time (see Attachment 15). He said that the gap occurred because of a miscommunication about which of the operators would be unavailable. According to Foster, if the park had to treat water and Gagorik was not available or there was an emergency, HAVO would be able to contract the work out, but the park had enough water storage capacity to keep going for up to 30 days.

Foster also stated that the exam to become a certified operator was difficult to pass. He said that HAVO was sending staff to refresher classes and offering practical experience so that staff could take

and pass the exam, but at that time, none had been able to pass it. Foster said that he had not considered obtaining the certifications himself because he was close to retirement age.
Thacher and Foster both stated that, in addition to the incident in 2013, other gaps in testing had occurred. When we first spoke to Thacher, he said that he had been asked to fill in false numbers on the chlorine residual logs for a missed day, when no test had actually been performed. He initially declined to name who asked him to do this, fearing "backlash." When we contacted him again about this issue, he stated that Foster had occasionally asked him to "write something in" in the logbook when a test had not been performed, but he always refused.

During his interview, Foster denied directing anyone to write in a test result when no test had been taken, stating that this would be considered "falsification of records" (see Attachment 15). He said that there was no reason to falsify test results because if a gap occurred, the park would "just report it" to the State.

We also asked Gagorik if he had ever been asked to falsify a logbook entry, and he said he had not (see Attachment 13). He acknowledged that he had seen blank entries in the logbook upon returning from leave, which indicated a gap in testing, but he had never heard of anyone being asked to falsify test data in the logbook.

Other Water Issues

In addition to the deterioration of the water system, the backflow preventer issues, and the certification issues, the following problems were brought to our attention during our investigation.

Water Tank Hatch Issues

During his interview, the OSC whistleblower stated that he had seen pictures of open or improperly sealed hatches on the tops of potable water tanks (see Attachment 7). He believed that this left the tanks vulnerable to rats getting in. HAVO staff later informed us that when the hatches were fixed, they were sealed improperly with silicone (see Attachments 12 and 13).

According to Gagorik, when new hatches were being installed on one of the tanks, the contractor did not install gaskets in the hatches, which left the tanks vulnerable to contamination—a condition, he said, that lasted approximately 9 months (see Attachment 13). He said that he reported this issue to Brum, who was overseeing the contractor, but Brum wanted to use the issue as "leverage" with the contractor. Eventually, he said, the contractor returned and repaired the hatches, but the hatches were sealed with silicone, which was not approved for that purpose (Figure 6). He explained that silicone could also contaminate the water in the tanks.

Figure 6. An access hatch sealed with silicone (visible on the lower right edge of the hatch's frame). Source: OIG.

Brum said he knew that there were openings between the hatch frames and the top of the tank from November 2013 until August 2014, and explained that a contractor had not installed gaskets in the hatches (see Attachment 17). He explained that disputes arose with the contractor over a change order, the contractor walked off the job, and the improperly installed hatches did not get fixed. Brum did not believe that the issue was serious because the park's rainwater, which was known to have zero bacteriological component, could only enter the openings in small quantities. He said the openings themselves were small—perhaps big enough for mice or insects to get through. When we asked Brum why the issue was not fixed right away, he stated: "It was not a concern." He said that when the State Department of Health found out about the issue, he was contacted, and he ensured that the openings were fixed within a day or two.

We asked Brum about the reports that the silicone used to seal the hatches was not safe, and he replied that silicone was not a contaminant, and using it as a temporary sealant was a nonissue. When asked, he acknowledged that he tried to use the hatch issue as leverage during disputes with the contractor, telling the contractor: "There is a serious concern here. . . . You need to get back on site and get this work done."

On July 17, 2014, the State of Hawaii Department of Health, Safe Drinking Water Branch, conducted a sanitary survey at HAVO and noted the openings between the hatch frame and the roof of the water tank (**Attachment 32**). Miyahira explained that these openings could allow the introduction of foreign materials into the stored water (see Attachment 30). When informed that HAVO reportedly used silicone to correct the deficiency, he said that he did not consider this to be a problem because the silicone was on top of the tank and thus was not in direct contact with the drinking water supply.

Water Site Security Gate

The February 5, 2015 letter from OSC to Secretary Jewell noted that the December 2013 Office of

Public Health survey found that HAVO's water collection and storage site had no locked security gate around it (see Attachment 2).

Ungerecht stated that public health consultants always recommended that water collection and storage sites be secured, but he did not know whether security was required by regulations (see Attachment 8).

Brum stated that there was a lockable security gate around the water collection and storage site, but it was kept open during the day and was only locked at night (see Attachment 17). He said that he would prefer to have an automated security gate to keep unauthorized people out of the area, and explained that he asked Ungerecht to include that issue in the December 2013 survey because he wanted to obtain funding for the project.

Orlando said that an automated gate was set to be installed at the water collection site in FY 2015 (see Attachment 11).

Raw Water Ponds

The letter from OSC to Secretary Jewell noted that the December 2013 survey found that berms surrounding HAVO's water catchment ponds were not high enough to prevent runoff from a nearby road from entering the ponds (see Attachment 2).

Ungerecht stated that while driving around the water collection ponds at HAVO during his December 2013 survey, he noted that water from the road was splashing into the ponds (see Attachment 8). He did not know if these berms had a recommended or required height, but he said that water entering the ponds meant that more chemicals would be needed to treat the water before it could be distributed. His report recommended that HAVO raise the berms to a height that would prevent the introduction of water from the roadway.

During Leffel's survey in March 2015, Brum stated that the berms around the pond were now 6 inches high to address this concern (see Attachment 9). The pond's liner would be replaced in the next few months, he said, at which point 8-inch berms would be installed.

Wastewater System Operator

The letter from OSC to Secretary Jewell also noted that the December 2013 survey found that HAVO did not have a certified wastewater operator (see Attachment 2).

None of the people we asked about this matter believed that HAVO was required to have an employee certified in wastewater operations, given that the function was contracted out (see Attachments 15 and 17).

With regard to HAVO's wastewater collection and treatment requirements, Ungerecht said that the park did have wastewater collection systems, in the form of several small septic tanks, but did not have any wastewater treatment operations (**Attachment 33**). He explained that HAVO held a discharge permit for wastewater collection pursuant to the National Pollutant Discharge Elimination System and was therefore required to conform to any certifications required by the State of Hawaii (as EPA's primacy agency). He did not believe that the State of Hawaii required someone at HAVO to be certified in wastewater collection.

Ungerecht also referred to NPS Reference Manual 83B1, "Wastewater Systems," which he said required certifications in wastewater only when the State required one; in the absence of a State requirement, the manual recommended that someone be "adequately trained" to operate the system. He said that he interpreted this to mean that HAVO should have someone on staff who was generally knowledgeable of the park's wastewater systems; that is, someone who knew where the septic tanks were located, knew how to access them, and knew how to determine if they needed to be serviced. Ungerecht said that he believed HAVO met this recommendation because Brum had clearly demonstrated that he was knowledgeable about HAVO's septic systems.

DISPOSITION

We are providing a copy of this report to the Secretary of the Interior for any action deemed appropriate.

ATTACHMENTS

1. February 23, 2015 memorandum from Tommy Beaudreau to Mary Kendall.
2. February 5, 2015 letter from the Office of Special Counsel to Secretary Jewell.
3. December 2013 NPS Office of Public Health survey.
4. Historic American Engineering Record on HAVO water collection system.
5. NPS Office of Public Health website information page.
6. NPS Director's Order 83.
7. IAR – Interview of OSC whistleblower on February 23, 2015.
8. IAR – Interview of Ungerecht on February 25, 2015.
9. IAR – Site Visit of HAVO Water Distribution System on March 3, 2015.
10. IAR – Interview of Orlando on March 4, 2015.
11. IAR – Interview of Orlando on March 26, 2015.
12. IAR – Interview of Thacher on March 6, 2015.
13. IAR – Interview of Gagorik on March 4, 2015.
14. IAR – Interview of Daniel Ortiz-Calder on March 5, 2015.
15. IAR – Interview of Foster on March 6, 2015.
16. IAR – Interview of Dixon on March 10, 2015.
17. IAR – Interview of Brum on March 5, 2015.
18. IAR – Interview of Rodney McCollam on March 6, 2015.
19. IAR – Interview of Borne on March 10, 2015.
20. IAR – Interview of Asato on March 5, 2015.
21. NPS Reference Manual 83A2.
22. IAR – Interview of McGeehan-Takiue on March 9, 2015.
23. NPS Reference Manual 83A1.
24. Chlorine residual logbook entries showing gaps in testing.
25. IAR – Interview of Yamami on March 5, 2015.
26. Position paper from the Hawaii Department of Health.
27. Copy of Gagorik certifications.
28. Copy of Thacher certifications.
29. Copy of Patao certifications.
30. IAR – Interview of Miyahira on March 5, 2015.
31. IAR – Site Visit of HAVO Water Distribution System on March 9, 2015.
32. July 17, 2014 Hawaii Department of Health sanitary survey.
33. IAR – Interview of Ungerecht on March 24, 2015.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

FEB 23 2015

Memorandum

To: Deputy Inspector General

From: Chief of Staff

Subject: OSC File No. DI-14-5128

On February 5, 2015, the Office of Special Counsel referred to my office a whistleblower disclosure alleging that officials of the National Park Service, Hawaii Volcanoes National Park, "may have engaged in actions that constitute a violation of law, rule, or regulation; gross mismanagement; and a substantial and specific danger to public health." The referral, OSC File No. DI-14-5128, was based on the Special Counsel's determination that there is a substantial likelihood that one of the conditions quoted above exists at the Volcanoes National Park.

Under the relevant statute, 5 U.S.C. Section 1213(c), the "agency head" is required to conduct an investigation into the allegations and submit a written report to the Special Counsel within 60 days of my receipt of the referral letter. With this Memorandum, I am tasking the Interior Office of the Inspector General to conduct the investigation and return a report to me no later than March 15, 2015.

The referral letter from the Special Counsel is attached. Please direct all questions and requests for extensions of time to complete this tasking to Ms. Elizabeth Washburn, Chief of Staff for the Deputy Secretary of the Interior, at (202) 219-7499.

Attachment

U.S. OFFICE OF SPECIAL COUNSEL
1730 M Street, N.W., Suite 300
Washington, D.C. 20036-4505

RECEIVED
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OFFICE OF THE
EXECUTIVE SECRETARIAT

The Special Counsel

February 5, 2015

The Honorable Sally Jewell
Secretary
Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Re: OSC File No. DI-14-5128

Dear Madam Secretary:

Pursuant to my responsibilities as Special Counsel, I am sending to you a whistleblower disclosure that officials at the Department of the Interior (DOI), National Park Service (NPS), Hawaii Volcanoes National Park (the park), Hilo, Hawaii, may have engaged in actions that constitute a violation of law, rule, or regulation; gross mismanagement; and a substantial and specific danger to public health.

The whistleblower, Matthew Duryea, a program assistant who consented to the disclosure of his name, alleged that agency officials have not performed appropriate maintenance on the park's potable water system. The allegations to be investigated are as follows:

- An 2013 Environmental Health Survey identified a number of conditions in the park's water supply system that violate NPS regulations, plus serious deterioration in the water supply system requiring repairs and maintenance;

- To date these violations are uncorrected and necessary repairs have not been performed; and

- These violations present a danger to public health, as employees and visitors are at higher risk for contracting waterborne illnesses.

Hawaii Volcanoes National Park encompasses over 300,000 square acres and receives approximately 1.5 million visitors per year. The park has a number of buildings, including visitor centers, museums, hotels, and restaurants, plus administrative and maintenance structures. Visitors and employees may obtain drinking water, supplied via the park's water supply system, at all of these sites.

Failure to Correct Drinking Water System Deficiencies

NPS policy mandates that the agency will "protect the health and well-being of NPS employees and park visitors through the elimination or control of disease agents and the various modes of their transmission." *See* NPS Directors Order #83: Public Health § III. NPS unit managers must "reduce the risk of waterborne disease and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, monitored, and deficiencies promptly corrected." *See* Ibid at § IV (A). Further: "All parks that operate public drinking water systems will have certified operators." *See* Ibid at § IV (A)(1). With respect to wastewater systems, NPS policy requires that NPS unit mangers designate waste water system operators in writing and ensure that operators are "adequately trained and certified." *See* RM 83B1 § (A)(1).

NPS maintains a policy specific to Backflows and Cross-Connections. *See* NPS RM 83A2. The term "backflow" describes the undesirable reversal of a liquid's flow into a potable water supply. When this occurs, untreated or contaminated water may be drawn into sections of the water supply system that provides drinking water. Cross connections are actual or potential connections between potable water supplies and a non-potable water sources. The policy promotes the elimination of cross connections between potable and non-potable water systems, and provides for the ongoing maintenance of backflow preventers to stop the contamination or pollution of NPS water systems. The policy specifically states: "Service of water to any premises shall be discontinued by the National Park Service if a backflow prevention assembly required by [this policy] is not installed, tested, and maintained." See NPS RM 832A2 § 3.2.1. In addition, the policy states: "It shall be the duty of the building owner at any premises where backflow prevention assemblies are installed to have certified inspections and operational tests made upon installation and at least once per year." *See* Ibid at § 3.2.6.

Mr. Duryea asserted that an Environmental Health Survey conduct by the NPS Public Health Program in December 2013 identified a number of violations and deficiencies in the park's water system. *See* Enclosure A. The report noted that "[park-wide] backflow prevention assemblies are not being tested by a certified inspector on an annual basis" and acknowledged that this constituted both an EPA and NPS violation. In addition, the survey noted that the park does not currently have a certified wastewater operator.

Beyond these specific violations, the survey made a number of observations and recommendations. Specifically, it explained that the park's water collection and storage site had no locked security gate around its perimeter, and that the water supply system has recently suffered a number of major breaks potentially attributable to the age of the system. The survey recommended installing security equipment and replacing the water distribution system to remedy these problems.

The survey also assessed the park's drinking water system, which services all visitor and staff facilities in the Volcano Rim section of the park. The following observations were made:

- Berms surrounding the park's water system catchment ponds were not high enough to prevent water runoff from a nearby road to enter the ponds;
- Activities in the Hawaii Volcano Observatory (HVO) area could possibly contaminate the water system in the event of a backflow condition;
- The fire sprinkler system at the Jaggar Museum is not equipped with a backflow device;
- The HVO water storage tanks showed signs of oxidation and corrosion;
- The water storage tanks have not been cleaned in recent years; and
- Liners, paint, and roofs on various structures are in varying states of disrepair.

Mr. Duryea provided email correspondence, dated April 30, 2014, in reference to these identified deficiencies, in which park superintendent, Ronald Borne, expressed the need to address these issues. Mr. Duryea explained that as of the date of this referral no work orders had been placed to correct these deficiencies; none of these recommendations had been acted upon; and the park was still in violation of the agency regulations noted above. In addition, Mr. Duryea also asserted that the individuals listed as certified in water treatment and distribution in the survey did not have valid licenses at the time of the inspection, and have not obtained these certifications since the December 2013 inspection.

The park's water supply system provides water to drinking fountains, water bottle filling stations, and restaurants. These water sources are used by both employees and visitors. Mr. Duryea's allegations indicate that components of the drinking water supply system needed to prevent contamination are either missing or in a state of disrepair. These conditions present a danger to public health as they increase the possibility that non-potable, untreated water could cross over into components of the water supply used to provide drinking water.

*****

The Office of Special Counsel (OSC) is authorized by law to receive disclosures of information from federal employees alleging violations of law, rule, or regulation, gross mismanagement, a gross waste of funds, an abuse of authority, or a substantial and

specific danger to public health and safety. 5 U.S.C. § 1213(a) and (b). OSC does not have the authority to investigate a whistleblower's disclosure; rather, if I determine that there is a substantial likelihood that one of the aforementioned conditions exists, I am required to advise the appropriate agency head of my determination, and the agency head is required to conduct an investigation of the allegations and submit a written report *within 60 days after the date on which the information is transmitted*. 5 U.S.C. § 1213(c).

Upon receipt, I will review the agency report to determine whether it contains all of the information required by statute and that the findings of the head of the agency appear to be reasonable. 5 U.S.C. § 1213(e)(2). I will determine that the agency's investigative findings and conclusions appear reasonable if they are credible, consistent, and complete based upon the facts in the disclosure, the agency report, and the comments offered by the whistleblower under 5 U.S.C. § 1213(e)(1).

In this case, I have determined that there is a substantial likelihood that the information Mr. Duryea provided constitutes a violation of law, rule, or regulation; gross mismanagement; and a substantial and specific danger to public health. I am referring this information to you for an investigation of these allegations and a report of your findings within 60 days after the date on which the information is transmitted. OSC will not routinely grant an extension of time to an agency in conducting a whistleblower disclosure investigation. However, OSC will consider an extension request where an agency concretely evidences that it is conducting a good faith investigation that will require more time to successfully complete. By law, this report should be reviewed and signed by you personally. Nevertheless, should you delegate your authority to review and sign the report to the Inspector General, or other agency official, the delegation must be specifically stated and *must include the authority to take the actions necessary under 5 U.S.C. § 1213(d)(5)*. The requirements of the report are set forth at 5 U.S.C. § 1213(c) and (d). A summary of section 1213(d) is enclosed. Please note that where specific violations of law, rule, or regulation are identified, these references are not intended to be exclusive. As you conduct your review of these disclosures and prepare your report, OSC requests that you include information reflecting any dollar savings, or projected savings, and any management initiatives related to these cost savings, that may result from your review.

As a matter of policy, OSC also requires that your investigators interview Mr. Duryea during the agency investigation when, as in this case, the whistleblower consents to the disclosure of their name. As the originator of the complaint, Mr. Duryea can provide additional information and an explanation of his allegations, thereby streamlining the agency investigation. Please note that where specific violations of law, rule, or regulation are identified, these references are not intended to be exclusive.

Further, in some cases, whistleblowers who have made disclosures to OSC that are referred for investigation pursuant to 5 U.S.C. § 1213 also allege retaliation for

whistleblowing once the agency is on notice of their claims. I urge you to take all appropriate measures to ensure that those reporting wrongdoing are protected from such retaliation and from other prohibited personnel practices, including informing those charged with investigating Mr. Duryea's allegations that retaliation is unlawful and will not be tolerated.

At the outset, or during the course of your investigation, your investigative team may have questions regarding the statutorily mandated report you will deliver to OSC under 5 U.S.C. § 1213. OSC attorneys are available at any time in person or by telephone to discuss OSC's statutory process, expectations for credible, consistent, and complete reports, and for general assistance. Please contact Catherine A. McMullen, chief, Disclosure Unit, at (202) 254-3604 to initiate this process.

As required by 5 U.S.C. § 1213(e)(3), I will send copies of the report, along with any comments on the report from the whistleblower and any comments or recommendations from me, to the President and the appropriate oversight committees in the Senate and House of Representatives. Unless the report is classified or prohibited from release by law or by Executive Order requiring that information be kept secret in the interest of national defense or the conduct of foreign affairs, OSC will place a copy of the report in a public file in accordance with 5 U.S.C. § 1219(a). To prevent public disclosure of personally identifiable information (PII), OSC requests that you ensure that the report does not contain any sensitive PII, such as Social Security numbers, home addresses and phone numbers, personal e-mail addresses, dates and places of birth, and personal financial information. OSC does not consider names and titles to be sensitive PII requiring redaction. Agencies are requested not to redact such information in reports provided to OSC for the public file.

Please refer to our file number in any correspondence on this matter. If you need further information, please contact Ms. McMullen. I am also available for any questions you may have.

Sincerely,

Carolyn N. Lerner

Enclosures

cc: Mary L. Kendall, Deputy Inspector General

National Park Service
Public Health Program

Environmental Health Survey

Hawai'i Volcanoes National Park

An Environmental Health Survey was conducted at Hawai'i Volcanoes National Park between 12/2/2013 and 12/2/2013 by Craig Ungerecht. This report contains a description of observations, findings, and recommendations pursuant to Directors Order 83 - Public Health. Further information can be found at http://inside.nps.gov/publichealth/index.htm.

General Information

Hawai'i Volcanoes National Park, established in 1916, displays the results of 70 million years of volcanism, migration, and evolution -- processes that thrust a bare land from the sea and clothed it with complex and unique ecosystems and a distinct human culture. The park encompasses diverse environments that range from sea level to the summit of the earth's most massive volcano, Mauna Loa at 13,677 feet. Kilauea, the world's most active volcano, offers scientists insights on the birth of the Hawaiian Islands and visitors views of dramatic volcanic landscapes. Hawaii Volcanoes is located approximately 37 miles south of Hilo on the big island of Hawaii. There are several areas within the park that have water and/or wastewater facilities. These areas include the Rim, Hawaii Volcano Observatory, Kahuku Ranch, and Bird Park picnic area. Water and wastewater facilities are also provided at backcountry cabins and shelters at Pepeiao, Ka'ahu, Halape, Apua Point, and Pu'u'ula'ula Red Hill.

Operator Certification

Name	Water Treatment	Water Distribution	Wastewater Collection	Wastewater Treatment	Backflow	Certified Lab
Alvin Asato	1- HI - -	- - -	- - -	- - -	☐	☐
Danny Ortiz	1- HI - -	- - -	- - -	- - -	☐	☐
Jeff Thatcher	1- HI - -	1- HI - -	NA- - -	NA- - -	☐	☐
Phil Gagorik	2- HI - -	4- HI - -	- - -	- - -	☐	☐
Tom Foster	1- HI - -	- - -	- - -	- - -	☐	☐

Water Systems

Parkwide Water Observations & Recommendations

0 There is no locked security gate to the water collection and storage site.
- *The park has put in a project to secure the area.*

0 There have been several major breaks recently in the distribution system which could be due to the age of the system.
- *The park should consider replacing the distribution system to prevent future breaks and save water.*

0 The backflow prevention assemblies are not being tested by a certified inspector on an annual basis.

- *All backflow prevention assemblies are required to have a certified inspection and operational test upon installation and at least once per year. This can be accomplished by either having an employee certified or by contracting. Additional information can be found in RM83A2, Policy for the Control of Backflow and Cross-Connection.*

This is an EPA/Primacy Agency Violation

Specific System

HAVO Water System
VOLCANO RIM

FMSS # 22273 **PWSID** HI0000146
Classification Community Water System

The water serves all visitor and staff facilities at the Rim including the VC, Volcano House hotel and restaurant, administrative offices, maintenance area, resource management area, Thurston Lava Tube, Hawaii Volcanoes Observatory, USGS building, Jagger Museum, and Namakani campground. The system has facilities at the rainshed area and HVO. The facilities at the rainshed consists of two hypalon lined catchment ponds, roof rainwater catchment, five raw water storage tanks (2x750,000-gallon, 3x500,000-gallon), water treatment facilities (chemical injection for pH adjustment, three slow sand filters, clearwell, disinfection equipment), two finished water tanks, and a distribution pressurization system used to increase pressure within the distribution piping as well as a fire pump to provide additional flow during high demand events. Facilities at HVO include two water storage tanks (80,000-gallon, 20,000-gallon). Rainwater collected in the catchment ponds and roof collectors is treated to raise the pH before a booster pump delivers the water to the raw water storage tanks. The untreated water then flows by gravity to the treatment facilities where it passes through the slow sand filters and is collected in the clearwell. The filtered water is then disinfected with sodium hypochlorite before being pumped to the finished water tanks. Two booster pumps pressurize the water from the tanks into the distribution system piping where it flows to the Rim facilities, resources management, and Thurston Lava Tube. Booster pumps within HVO pressurize the water for the buildings at HVO. A small pump and hydropneumatic tank pressurize the water for use at Thurston Lava Tube comfort station.

Observations & Recommendations

0 The berms that surround the two catchment ponds were found not to be high enough to prevent water from the road from entering the ponds. While driving a vehicle around the ponds during the visit, water from the road was spashing into the collection ponds.

- *The berms should be raised when the liners are replaced to prevent water from the road from enetring the catchment ponds.*

0 There are several activities in the HVO that may contaminate the water system in the event of a backflow condition

- *Install an RP backflow preventer on the service line to HVO.*

0 The fire sprinkler system at the Jaggar Museum is not equipped with a backflow device.

- *Install a double check valve assembly on the Jaggar Museum fire sprinkler system.*

0 The exterior of the HVO water storage tanks showed signs of oxidation and corrosion.

- *Schedule repainting the exterior of the HVO water storage tanks.*

PMIS 164477

0 At the TLT comfort station the inline booster pump pressurizes the hydropneumatic tank for comfort station use. The existing redwood storage tank is no longer on line. No additional storage is provided.
- *Install the 500-gallon polyethylene tank at the comfort station or inside the redwood tank to provide storage.*

0 The water storage tanks have not been cleaned in recent years. Sediment can accumulate and increase chlorine demand, reducing available disinfectant for the distribution system.
- *Inspect the interior of the water storage tanks. Schedule cleaning and inspection if needed. Cleaning should be done on a regular basis as part of an overall preventive maintenance program.*

0 The lagoon liners for rain catchment are blistering and delaminating in several places. The cause is unknown. These liners are over 20 years old and may be reaching the end of their life expectancy.
- *Evaluate the cause of the delamination. Consider replacing the liner.*

PMIS 150327

0 Exterior paint on the slow sand filters is oxidizing.
- *Schedule repainting the SSF's.*

0 The water storage tanks exterior paint at the rainshed area is peeling.
- *Schedule repainting the exterior of the water storage tanks at the rainshed.*

PMIS 164477

1 The rainshed roof is in very poor condition. If not repaired or replaced in the very near future, failure could result and there would be a significant loss in rainwater collection.
- *The rainshed roof requires extensive repairs or complete replacement.*

Wastewater Systems

Parkwide Wastewater Observations & Recommendations

0 The park currently does not have a Certified Wastewater Operator
-

Specific Systems

KVC Septic Sewage System **FMSS#** 22278
Kilauea

This system consists of of two septic tanks and a drain field and serves the Kilauea Visitor Center and HQ offices.

Observations & Recommendations

0 There was no evidence or reports of problems with this system.
- *No corrective action required.*

FMSS# 0
Thurston Lava Tube

This system consists of a septic tank and drain field and serves the comfort station.

Observations & Recommendations

0 The effluent from the septic tank at Thurston Lava Tube discharges to an open crack.

- *Determine State of Hawaii requirements for discharge of septic tank effluent into a crack.*

FMSS# 0

Namakanipaio Campgroud

This system consists of a septic tank and a leachfield and services the comfort station.

Observations & Recommendations

0 There was no evidence or reports of problems with this system.

- *No corrective action required.*

Vectorborne and Zoonotic Disease

Food Safety

The Volcano House was inspected and received a satisfactory score. The inspection report was sent under separate cover.

Backcountry

There are several backcountry cabins and shelters throughout the park, including Pepeiao, Ka'ahu, Halape, Apua Point, and Pu'u'ula'ula Red Hill. These sites provide campers with non-potable water and composting toilet facilities.

This is the End of the Report

HISTORIC AMERICAN ENGINEERING RECORD

HAWAII VOLCANOES NATIONAL PARK WATER COLLECTION SYSTEM

HAER HI-76

Location: Hawaii Volcanoes National Park, Volcano vicinity, Hawaii County, HI

Present Owner: Hawaii Volcanoes National Park

Present Use: Water collection system, some components of which are no longer in use

Significance: The Hawaii Volcanoes National Park Water Collection System is significant as an example of a system designed to provide water in an area where wells are not commonly used and represents changes in water collection technology in the twentieth century. In addition, the establishment of the water collection system supported the development of the park.

Historian(s): Justine Christianson, HAER Historian, 2008

Project Information: The Historic American Engineering Record (HAER) is a long-range program that documents and interprets historically significant engineering sites and structures throughout the United States. HAER is part of Heritage Documentation Programs (Richard O'Connor, Manager), a division of the National Park Service, United States Department of the Interior. Laura C. Schuster, Chief, Cultural Resources Division, at Hawaii Volcanoes National Park facilitated the project. Todd Croteau, HAER, served as project leader, architect and photographer. Justine Christianson, HAER, produced the report.

source: Cindy Orlando, HAVO Superintendent

Part I. Historical Information

A. Physical History:

This report focuses on the water collection system that developed on the former Volcano House grounds in the park's headquarters area. Originally, the park's water collection system was located in the "Utility Area" near the park employee residences. The Volcano House hotel had a separate system to support its facilities.

1. Dates of Construction:

The old rain shed, Building No. 43, was built in 1924 by the Volcano House hotel.[1]

Six redwood tanks (Tank Nos. 7-12) had been erected next to the old rain shed by October 1947.[2]

Wood water tanks of various sizes were relocated from "Tank Hill" (located near the former Volcano House hotel) and the Civilian Conservation Corps (CCC) camp to the vicinity of the old rain shed from 1949 to 1950.[3]

Three 500,000 gallon steel tanks and one 23,500 steel filter tank were in place by November 1957. An additional 500,000 gallon tank was erected the following year.[4] 2 m gallon

A pump house containing the electric water pump, chlorination unit, and electric control system was constructed in 1957 with a sand trap located between it and the nearby filter tank.[5]

The new rain shed (Building No. 241) and trestles were completed in November 1957.[6]

Another slow sand filter tank was added sometime after 1980, as well as a clear well.[7]

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[1] Information from Form 16-54522-2 on Building 43, prepared by I.J. Castro, Assistant Superintendent, in Hawaii Volcanoes National Park Archives (hereafter referred to as HAVO Archives).

[2] Superintendent Monthly Report, October 1947, p. 1. All the superintendent reports are available in the HAVO Archives.

[3] Superintendent Monthly Reports, September 1949, p. 3; October 1949, p. 2; January 1950, p. 3; and February 1950, p. 3.

[4] Superintendent Monthly Reports, November 1957, p. 1; November 1958, p. 9; Memorandum from Park Engineer to Superintendent, Subject: Engineering Report for November 1958, December 3, 1958, p. 4 in November 1958 Monthly Report.

[5] Superintendent Monthly Report, November 1957, p. 13.

[6] Superintendent Monthly Report, November 1957, p. 12.

[7] San Juan Construction, Inc., As Constructed Drawings, Rehabilitate Park Water System, Headquarters Area, "Tank Farm and Rainsheds," June 1993, Sheet 4 of 35.

The larger ground catchment (128,878 square feet in size) dates to the early 1970s, while the smaller one (51,000 square feet in size) dates to ca. 1993.[8] Pond

Two 750,000 gallon were erected ca. 1993 to replace eight of the original redwood tanks. A fifth steel tank with a 500,000 gallon capacity was also built ca. 1993.[9] 2mg

2. **Architect/Engineer:**
The engineers of the National Park Service's (NPS) Western Office's Division of Design and Construction and the Office of the Chief Engineer located in San Francisco, California designed the 1930s era system with input from park personnel. The NPS Regional Office provided guidance for the design of the 1950s era system.

3. **Builder/Contractor/Supplier:**
The Volcano House hotel concessioner built the old rain shed.[10]

Terminal Steel Company, Ltd. of Honolulu won the contract to build four steel tanks, including three 500,000 gallon and one 23,500 gallon.[11] The pipes and fittings for the tanks were ordered through the General Services Administration from the Grinnell Company.[12] Pittsburg-Des Moines Steel Company of Santa Clara, California won the contract to build the fourth 500,000 gallon steel tank.[13]

H. Sonomura of Hilo, Hawaii built the new rain shed and trestle. The pipe work was subcontracted to P.E. Pell Company of Honolulu.[14]

San Juan Construction, Inc. of Aiea, Hawaii erected the two 750,000 gallon capacity tanks and the last 500,000 gallon capacity tank. They also constructed the smaller ground catchment.

4. **Original Plans:**
Plans from 1937 and 1938 show the Volcano House hotel system, consisting of a rain shed (now Building No. 43) and an assortment of various sized water tanks located behind the hotel. The park's system consisted of a 54,000 gallon underground concrete reservoir and pump house in the "Utility Area" of the park with tanks located at nearly all the residences and buildings. A 4,500 gallon high

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[8] San Juan Construction Inc., "Site Plan," June 1993, Sheets 4, 5 and 11 of 35.
[9] San Juan Construction, Inc., "Tank Farm and Rainsheds," June 1993, Sheet 11 of 35.
[10] Form 16-54522-2, Building 43.
[11] Superintendent Monthly Reports, February 1957, p. 10; March 1957, p. 2.
[12] Superintendent Monthly Report, May 1957, p. 12.
[13] Superintendent Monthly Reports, May 1958, p. 11; June 1958, p. 9.
[14] Superintendent Monthly Reports, February 1957, p. 10; March 1957, pp. 2, 12; April 1957, p. 10. Sonomura's bid was totaled $43,809.

tank was located among the park residences. The park's Fire House is now located adjacent to the reservoir, which remains in use.[15]

Plans dating to 1953 show the removal and consolidation of the tanks formerly used by the Volcano House hotel. A battery of fourteen tanks was located behind the rain shed, with plans to add six more. Fourteen more tanks of various sizes were located under the rain shed, and another was outside the rain shed at its southern corner. In addition, another collection system was still maintained at the Utility Area, consisting of a reservoir and pump house with tanks scattered at various locations. The high tank had been removed.[16]

By 1958, the water collection system had been centralized at the park's headquarters area on the site of the former Volcano House hotel system. A new rain shed supplemented the old one. Four 500,000 gallon tanks augmented the fourteen wood tanks to the rear of the old rain shed. A filter tank connected to a pump house and a chlorinator with a sand trap between them was located to the north of the tanks and rain sheds.[17]

5. **Alterations and Additions:**
The old rain shed has undergone the greatest number of alterations. After the installation of redwood tanks under the rain shed in 1947, the roof had to be raised. Two years later, the rain shed was further altered with a 160' extension project from 1949 to 1950. The windward end of the rain shed was completely clad in 1955. That same year, a September cyclone damaged the building, necessitating additional repairs. In 1958, the removal of the redwood tanks housed in the rain shed caused additional alterations to be made to the roof, including the construction of new supports. A storm in January 1959 caused some structural damage by collapsing the roof and walls. This event required further alteration to the building.[18]

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[15] U.S. Department of the Interior, National Park Service, Hawaii National Park Headquarters Area, "Map Showing Existing & Proposed Water Lines to Accompany Report by W.E. Robertson, Assoc. Eng.," Office of the Chief Engineer, San Francisco, CA, October 1937; U.S. Department of the Interior, National Park Service, Branch of Engineering, Prepared by Regional Office, "Prop. Location Plan for Water System Improvement, Headquarters Area, Hawaii National Park," ca. 1938, Sheet 1 of 3.

[16] "Water Collection & Sewer System," and "Water Distribution, Kilauea Headquarters," March 1953, Sheets 1 and 2 of 2.

[17] U.S. Department of the Interior, National Park Service, Engineering Branch, Prepared by WODC, "Water Distribution System, Kilauea Headquarters, Hawaii National Park," As Constructed Drawing, January 1958, Sheet 1 of 4.

[18] Superintendent Monthly Reports, May 1947, p. 3; June 1947, p. 3; November 1947, photograph caption; November 1949, p. 3; January 1950, p. 3; February 1950, p. 3; March 1950, p. 3; April 1950, p. 4; May 1950, p. 4; July 1950, p. 4; August 1955, p. 4; July 1958, p. 10; January 1959, pp. 10-12; Memorandum from Supervisor, Construction and Maintenance to Park Engineer, Subject: Monthly Report for the Month of September 1955, October 3, 1955, in September 1955 Monthly Report.

The redwood water storage tanks were rebuilt beginning in 1957 after the bases were found to be failing.[19]

B. Historical Context:

The lack of wells and running streams within Hawaii Volcanoes National Park necessitated the construction of a water collection system to supply the residences of the park's employees, as well as the buildings and structures used for visitor services and park administration.[20] Originally, the park relied solely upon a roof catchment system at each building in which rain water drained directly from the building's roof into a redwood tank. It soon became apparent that a larger storage system was necessary to supplement the twenty-three redwood tanks with a total capacity of 74,000 gallons in place in the early 1930s so ample water would be available during periods of drought and to support the park's growth.[21] The first phase of development of the park's collection system occurred in the early 1930s, with the construction of an underground concrete reservoir and pump house, a high tank, and the requisite pipelines. The second major phase of construction occurred in the 1950s, as the center of the collection system shifted from the Utility Area to the former Volcano House hotel's system. The work included expansion of the old rain shed, relocation of existing storage tanks and erection of new 500,000 gallon steel tanks, and construction of a new rain shed, as well as the completion of a water main distribution project. Additions have been made to the system, including the removal and replacement of eight of the redwood tanks with two 750,000 gallon steel tanks, addition of another 500,000 gallon steel tank and filter tank, and construction of two catchments and a clear well. The bulk of this work took place around 1993.

It is unknown what constituted the original catchment system servicing the Volcano House hotel or when it was constructed. By 1924, a rain shed (now known as the old rain shed or Building No. 43) was in place, built by the Volcano House hotel concessioner at a cost of $10,000. The exterior walls and roof were clad in galvanized iron, and the floor was dirt.[22] The use of galvanized iron for the roof was undoubtedly a deliberate choice since it was considered the ideal material for collecting the maximum amount of water. A discussion of the design of the Thurston Lava Tube comfort station in 1933 reveals the reason for the preference for metal roofing in the park. E.P. Leavitt, Superintendent, wrote to Thomas C. Vint of the National Park Service's Branch of Plans and Design in favor of outfitting the

[19] Superintendent Monthly Report, March 1957, p. 2; Frances C. Jackson, *An Administrative History of Hawaii Volcanoes National Park, Haleakala National Park* (Honolulu, HI, 1972), pp. 161.

[20] Hawaii Volcanoes National Park was originally known as Hawaii National Park after its 1916 establishment. At the time of its creation, it encompassed lands on both the Island of Hawaii as well as on Maui. Congress authorized the division of Hawaii National Park into two parks in 1961, with the park section on Hawaii becoming Hawaii Volcanoes National Park and that on Maui becoming Haleakala National Park. In this report, the park will simply be referred to by its current name: Hawaii Volcanoes National Park.

[21] Jackson, pp. 154-155.

[22] Form 16-54522-2, Building 43. A search of the 1924 Superintendent Monthly Reports did not reveal any information about its construction, probably because it was built by a concessioner and not the park.

proposed comfort station with a galvanized iron roof, arguing it "collects and saves almost every drop of rain that falls." This was a desirable feature in an area where "the only water supply is that gathered from rain on roofs." Wood shake or shingle roofs, Leavitt noted, did "not have the power of condensation that metal has, and what little is condensed is absorbed by the wood." The condensing power of galvanized iron meant that even on foggy and misty days, water could be collected from an iron roof. On the other hand, only heavy rains produced enough runoff for collection from a wood roof.[23]

The first phase of construction of a park wide collection system to augment the already existing practice of collecting water at individual structures occurred in the early 1930s. This building campaign was in response to a drought lasting from 1930 to 1931 that emphasized the need for a centralized storage reservoir from which water could be pumped and transported to various points in the park. With assistance from John B. Wosky, a landscape architect with the National Park Service's Landscape Division in San Francisco, park personnel surveyed the headquarters area to determine the best location for a centralized system. They settled on a site east of the headquarters area that had a higher elevation than the surrounding area so it could support a gravity feed system. In addition, the chosen location was in a "rain belt producing more water than any other area near headquarters." In order to utilize the site, the heavy undergrowth and timber stands would have to be cleared and an access road built.[24]

When H.B. Hommon, a Sanitary Engineer with the U.S. Public Health Service, was consulted about the proposed site, he voiced some reservations. First, he noted that the dense vegetation in the vicinity of the catchment system would produce a great deal of detritus that had the potential to periodically clog the system. In addition, the $6,000 fund for construction, of which the San Francisco Branch of Plans and Designs took 10 percent, would probably not be sufficient. Instead, Hommon believed it would be "more practicable to collect water from the roofs of the buildings already in place and to plan for additional roof surfaces when new buildings are constructed." The collected water could be stored in a 20,000 gallon capacity underground reservoir, which would be covered. The reservoir would be divided into two sections that would operate independently since they would each be equipped with their own inlet pipes and drains. Next to the reservoir, a gasoline engine driven pump with a 100 gallon/minute capability and a pressure of 100 pounds per square inch (psi) would be connected to suction lines extending to each half of the reservoir. The pump would draw water from the reservoir to an elevated steel tank, which would provide "ample pressure" for fire protection as well as for supplying individual

[23] Letter from E.P. Leavitt, Superintendent to Thos. C. Vint, Chief, Branch of Plans & Designs, National Park Service, San Francisco, CA, August 23, 1933, in Folder 618, Box 1178, Record Group 79, National Park Service (hereafter cited as RG79), in National Archives and Records Administration, College Park (hereafter referred to as NARA-College Park).

[24] "Report on Water Supply System for Hawaii National Park, Hawaii," by Sanitary Engineer H.B. Hommon, U.S. Public Health Service, May 14, 1932, p. 1, in File No. 660-05, Box 1180, RG 79, NARA-College Park.

water tanks during periods of drought. The twelve storage tanks already in place at the headquarters area, Hommon argued, were in good condition with "no odor or color resulting from storing water" in them. Hommon's proposal included running a 3" line from the new administration building to Residence 3 and then a 4" line to a collecting tank in the Utility Area. In addition to the 3" and 4" main lines, 2" branch lines would be installed connecting the main line with the overflow of the storage tanks. Hommon estimated the system would cost $5,170.[25]

In response to Hommon's suggestions, the park made some modifications to the original plans. One modification was using gravity lines to drain the reservoir. Superintendent Leavitt also suggested making the reservoir larger with a 60,000 gallon capacity rather than the proposed 20,000 gallon size.[26] A February 1933 press release by Superintendent E.P. Leavitt described the planned collection system.

> A reinforced concrete water tank 20 by 40 feet in size, to hold 60,000 gallons, is under construction in the park....It will serve as a collection basin for the surplus water gathered from the roofs of the buildings in the park during the rainy season, which will be distributed as needed during the seasons of light rainfall. The plans call for a pipe line to be connected at the top of each wooden tank serving each building, which will convey the surplus water to the concrete tank. The supply pipes will be used as a distributing system by pumping the water back through them to the tanks where needed. A gasoline pump and pump house will be part of the system. There are no springs, wells or running streams in the park area, so all the water used must be gathered from roofs of buildings and stored.[27]

The park's collection system was finally located at the "Utility Area," a section of the park located to the northeast of Kilauea crater and east of the Volcano House. The Utility Area also contained the mess hall, bunk, nursery, machine shop, warehouse, and fire equipment shed. Construction of the system began in 1932 on the reservoir. By January 1933, the excavation of the 20' x 40' concrete reservoir had been completed, so crews could begin installing the formwork and reinforcing steel. The County of Hawaii's road department loaned the park its concrete mixer, and the park next poured the reservoir's walls, floor and top in separate sections. The valves that drained the reservoir were enclosed in square boxes. Next, the park lay 2,950 linear feet of galvanized iron pipe, which connected the gutters of the Administration Building and Park Naturalist's quarters (Building No. 2) to the reservoir, since these were the only buildings in the park without water storage tanks directly connected to them. The redwood tanks already in place at the headquarters area were also

[25] Hommon, "Report on Water Supply System," pp. 2-3.
[26] Letter from Superintendent E.P. Leavitt to Sanitary Engineer H. B. Hommon, September 22, 1932 and letter from Superintendent E.P. Leavitt to Director, National Park Service, January 25, 1933, both in File No. 660-05, Box 1180, RG 79, NARA-College Park.
[27] Memorandum for the Press by E.P. Leavitt, Superintendent, February 23, 1933, included in Superintendent Monthly Report, February 1933.

connected to the reservoir. The final phase of construction was the building of the pump house and installation of the pump in May 1933. Located next to the reservoir, the 10' x 20' pump house sat on a concrete pad and sheltered a 1933 American-Marsh two-stage turbine driven by a four cylinder, 6 hp gasoline engine.[28] The pump delivered water to the 5,000 gallon high tank, constructed in 1933 and located behind Quarters No. 3 on a 14' tall tower. This pump house (designated Building No. 159) was taken out of service in April 1959, and the building moved to a site near the junction of the Chain of Craters Road and the Kalapana Trail. The building was later converted for use as an animal feed storage and equipment building for the Protection Division. The reservoir is still in use, as is the pump, which is located in the firehouse.[29]

Despite the improvements, the park was still concerned about the lack of water storage facilities. The 5,000 gallon high tank had to be pumped full once a week. In addition, the total water storage capacity of 66,000 gallons could only last two months according to Superintendent Leavitt.[30] To address the continuing issue of storage, Superintendent Edward G. Wingate sent a proposal detailing another construction campaign to the Director of the National Park Service (NPS) in February 1934. The proposal included a request for $6,000 to fund construction of another concrete reservoir next to the already existing one. According to Wingate, the addition was necessary because "the present system and plant are inadequate."[31] When nothing came of the proposal, the park sent another detailing a "Water Supply System Addition" to the NPS director. Once again, the park requested funds (this time the amount was reduced to $4,700) to build an identical concrete reservoir. The proposal was justified on the grounds that the system as completed in June 1933 was "lacking only in storage capacity." The reservoir was too small, resulting in a "serious fire hazard" during extended periods of dry weather.[32]

Plans of the headquarters area dating to 1937 and 1938 depict the early water collection system and its proposed changes. The Volcano House Hotel Company had a collection of tanks with capacities ranging from 4,000 to 80,000 gallons scattered behind the hotel, as well as a rain shed and pump house to supply the hotel with

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[28] Jackson, p. 155; Superintendent Monthly Reports, December 1932, p. 5; January 1933; February 1933, p. 7; March 1933, p. 6; April 1933, p. 5; May 1933, p. 3. Of the pipe laid, 1,700' was comprised of 4" pipe, 450' was comprised of 3" pipe, and 800' was comprised of 2" pipe, according to the Superintendent Monthly Report, March 1933, p. 6.

[29] Memorandum from Park Engineer to Superintendent, Subject: Maintenance Report for the Kilauea Section, March 1959, April 6, 1959, p. 3 in Superintendent Monthly Report, March 1959; Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," September 1, 1948, p. 6 in Folder 660-05, Box 785, RG 79, NARA-College Park.

[30] Letter from E.P. Leavitt, Superintendent to Director, National Park Service, Washington, DC, July 15, 1933 in Folder 618, Box 1178, RG 79, NARA-College Park.

[31] "Proposed Public Works Projects by Superintendent Edward G. Wingate," submitted to the Director, Office of National Parks, Buildings, Reservations, Washington, DC, February 3, 1934 in Folder 618, Box No. 1178, RG 79, NARA-College Park.

[32] Letter from Edward G. Wingate, Superintendent, to Director, National Park Service, Washington, DC, January 17, 1935 in Folder 618, Box 1178, RG 79, NARA-College Park.

water. The park's water collection system consisted of tanks associated with individual park structures, ranging in size from 1,470 to 5,300 gallons, the reservoir, and high tank (indicated as having a 4,500 gallon capacity). Proposed improvements to the system included a reservoir addition, as well as a galvanized iron 6" main. The main would run west from the reservoir to the park headquarters and continue to the Volcano House hotel where it would form a loop around the hotel. Spurs would service buildings without individual tanks as well as proposed fire hydrants. The high tank, located to the southwest of the Utility Area closer to the Kilauea Crater rim was connected to the main distribution line by a 6" pipe, and there were plans to replace it with a 25,000 gallon tank. As more buildings were constructed in the area from 1937-41, the line was tapped into at additional points.[33]

The park's plans for increasing the system's capacity were not implemented. Despite the concerns of the park, the requested additional reservoir was not constructed. In 1938, a 10,000 gallon tank was erected next to the 5,000 gallon high tank using Public Works Administration (PWA) funds. Additional storage was also provided from 1939-44 with the erection of four 5,000 gallon tanks behind the repair shop and two 10,000 gallon tanks next to the wood shed in the Utility Area that could drain into the reservoir.[34]

With no substantial improvements being made to the water collection system and increasing development within the park, it was not long before there were renewed concerns about storage capacities. These concerns were fueled by another period of protracted drought in the early 1940s. By 1943, there were only 180,000 gallons of water available for use but still no expansion had been approved. In September 1946, Superintendent Frank Oberhansley attempted to ameliorate the critical situation by tying the former system used by the Civilian Conservation Camp (CCC) with the park's reservoir using 3,000' of 2 ½" pipe he obtained as surplus from the Naval Air Station in Hilo. The CCC's system, dating to ca. 1938, consisted of sixteen 10,000 gallon wood water tanks connected to a 2 ½" manifold suction line and pump. The water was delivered via a 2 ½" discharge line to a smaller grouping of tanks located above the camp. Total capacity at the camp was 40,000 gallons.[35]

Even more attention was focused on the water situation after the December 1946 collapse of a 400,000 gallon capacity wood storage tank owned by the Volcano House Hotel. The event spurred the park to inspect its own collection of wood tanks, leading to the discovery that half of the tanks were in danger of collapse "due to

[33] U.S. Department of the Interior, National Park Service, Hawaii National Park, Headquarters Area, "Map Showing Existing & Proposed Water Lines, To Accompany Report by W.E. Robertson, Assoc. Eng., Office of the Chief Engineer, San Francisco, CA," October 1937; U.S. Department of the Interior, National Park Service, Branch of Engineering, Prepared by Regional Office, "Proposed Location Plan for Water System Improvement, Headquarters Area, Hawaii National Park," 1938; Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," September 1, 1948, p. 6, in Folder 660-05, Box 785, RG 79, NARA-College Park.
[34] Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," pp. 3-4.
[35] Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," pp. 4-5; Jackson, pp. 156-157.

decaying supports." In addition, almost all of the tanks lacked a protective covering to keep rodents, birds and debris from entering them.[36] Superintendent Oberhansley requested emergency funding from the NPS Region Four office to build concrete storage reservoirs as replacements to the numerous aging tanks then in use, stating that the reservoirs would "dispose of the entire mess of assorted unsightly tanks of ancient vintage now dotting the landscape adjacent to park headquarters."[37] The proposal generated discussion between the regional office and the park. O.A. Tomlinson, the Regional Director, voiced concerns about building reservoirs, noting the head would not be "sufficient" and that they would be prone to earthquake damage. He recommended instead that the park purchase a new or salvaged tank to replace the collapsed one. Oberhansley pressed the point, stating that the Army and Navy had been building 500,000 gallon reinforced concrete tanks on the island since 1941. Furthermore, he argued, the reservoir would sit on a sand base, not bedrock as conventional design dictated. He concluded, "We cannot recommend too strongly against temporizing with wood tanks as such things have a vicious way of becoming more or less permanent. Wood tanks of this capacity are as obsolete as the horse and buggy." Despite the park's persuasive arguments, the Acting Director of the National Park Service, Hillory A. Tolson, firmly relayed to the Region Four office that no reservoir at the park would be funded due to questions about the estimate (deemed too low) and a lack of funding. Tolson also questioned the ethics of the federal government spending federal funds to repair a system owned and operated by a concessioner.[38]

The park assumed authority over the Volcano House hotel's water system after the tank collapsed and lowered its water rates to 3 cents/gallon as a courtesy to the hotel. With the takeover complete, the park moved its main collection system to the headquarters area.[39] With the question of reservoir or tank construction definitively settled in favor of tanks, park personnel searched for surplus tanks to purchase to boost the park's storage capacity. Superintendent Oberhansley reported to the NPS Regional Director that he thought he could obtain six to eight 50,000 gallon tanks from the Wartime Assets Administration (WAA) or Army-Navy surplus, to which Acting Director Hillory Tolson remarked in the margin of the memo: "Whole area littered with tanks!"[40] The park's expansion plans involved moving the concessioner's tanks behind the rain shed so they would not be visible; installing a gravity feed system, and extending the rain shed to create additional storage space

[36] Superintendent Monthly Report, December 1946, p. 3.
[37] Memo from Frank Oberhansley, Superintendent, to Regional Director, Region Four, December 19, 1946, in File No. 660-05, Box 1180, RG 79, NARA-College Park. This quote also appears in Jackson, p. 157.
[38] Memo from O.A. Tomlinson, Regional Director, to Superintendent, December 23, 1946; Memo from Oberhansley to Regional Director, Region Four, December 30, 1946; Memo from Hillory A. Tolson, Acting Director, to Regional Director, Region Four, January 16, 1947, all in File No. 660-05, Box 1180, RG 79, NARA-College Park.
[39] Jackson states that the takeover of the Volcano House tanks resulted in capacities of 1,650,000 gallons at the shed, 360,000 in the utility area, and 200,000 in the CCC area, for a total of 2,120,000 gallons (Jackson, p. 160).
[40] Memo from Frank Oberhansley, Superintendent, to Regional Director, Region Four, July 8, 1947, in File No. 660-05, Box 1180, RG 79, NARA-College Park.

and surface area. The park estimated these alterations would result in an estimated 165 million gallons of storage capacity.[41]

The park was able to obtain twelve 100,000 gallon surplus redwood tanks from the Wartime Assets Administration (WAA), reportedly from Fort Armstrong in Honolulu, in January 1947. They were purchased for $1,920 apiece under Public Law 478 using a $10,600 allocation. Originally, the park planned to place nine of the tanks under the concessioner's rain shed. Of the remaining three, one would be erected at the former CCC camp, and two would be installed at the Utility Area next to the concrete reservoir. Park Superintendent Oberhansley was hopeful that the acquisition of these tanks would facilitate the removal of the "eye sores on tank hill."[42] Unfortunately, the tanks had been in storage for five years and had consequently sustained termite and borer bee damage as well as dry rot, so only eight of the twelve were usable. The park consequently changed its installation plans.[43]

By May 1947, two of the eight surplus tanks had been erected and fitted at the Utility Area. That same month, the park borrowed Army equipment to excavate a 40' wide x 220' long strip along the northwest side of the old rain shed where the remaining six surplus tanks were to be grouped in a battery.[44] Throughout the summer and fall of 1947, work continued on erecting the redwood tanks, which sat on concrete foundations. Photographs depicting the construction show the area was first excavated and then graded. Circular wood forms were next laid out and a reinforced mesh was placed within the formwork. The concrete was poured into the form. A wood frame foundation on which the tank would sit was then constructed on the concrete pad. The wood staves forming the tank were then erected, and kept in place by bands tightened via air driven wrenches. The use of the wrench was found to save "approximately 8 ½ man days in erection of one tank." The tanks were in place next to the rain shed by October 1947. One of the redwood tanks sits on a stone foundation; the monthly reports do not indicate the reason for this different foundation.[45]

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[41] Memo from Frank Oberhansley, Superintendent, to Regional Director, Region Four, August 19, 1947, in File No. 660-05, Box 1180, RG 79, NARA-College Park.

[42] Memo from Frank Oberhansley, Superintendent, to Regional Director, Region Four, January 31, 1947, in File No. 660-05, Box 1180, RG 79, NARA-College Park; Jackson, p. 157; Superintendent Monthly Report, February 1947, p. 1.

[43] Superintendent Monthly Reports, February 1947, p. 1; April 1947, p. 3; May 1947, pp. 3, 5; Monthly Report of Assistant to Superintendent and Acting Park Engineer B.F. Moomaw for March 1947 in Superintendent Monthly Report, March 1947; Jackson, p. 157-158.

[44] Superintendent Monthly Report, May 1947, pp. 3, 5.

[45] Superintendent Monthly Reports, June 1947, p. 3; July 1947, p. 3; September 1947, p. 2; October 1947, p. 1. Photographs available in the HAVO Archives show the construction, see Photos D50, 060 through 071, identification caption: "Construction of water system-rainshed area, F.R. Oberhansley, 1940s or 50s"; Photos D50 148 and 149, identification caption: "Water system improvement, year unknown, circa 1947"; and Photos D50 150 and 151, identification caption: "Erection of 8 new 100,000 gal. tanks was completed, October 1947."

The installation of the tanks next to the rain shed necessitated alterations to its roof to bring it in line with the tops of the tanks. The rain shed's eaves were raised by hoisting the trusses so a 27' auxiliary rafter could be inserted. The east side of the roof was raised from May to June 1947, and the west side was completed during a "Hukipau" the weekend of November 8-9, 1947 to avoid a forecasted rainstorm. A Quick-Way crane was used for the job. Water collected from the roof of the rain shed drained into the collection tanks via a "transverse flume alongside the center truss of the shed." Water from the northeast side drained into the first three tanks, while water from the southwest side drained into the other three. The rain shed was 108' x 114' and contained a "large storage room and equipment storage stalls" that created "much needed shelter and security for supplies and equipment."[46]

The installation of tanks and new mains (including a 6" main connecting the pump house at the Utility Area with a main to the Volcano Observatory, a 6" main from the pump house to the new tanks, and a 6" cast iron pipe from the CCC camp to the Volcano House) required a new pump. The park obtained it from the Navy. The new pump was "coupled directly to the 500 GPM 289' head pump from the Volcano House system" and powered by a "Blue Streak" 110 hp engine.[47] By November 1947, the final connections had been made to six of the new 100,000 gallon tanks and pumping tests were completed. Park personnel discovered that the "pump developed an average discharge into these tanks in excess of 12,000 gallons per hour with a gasoline consumption of about 6 gallons per hour." The park's old pump was rebuilt and repowered with a new 55 hp Waukesha engine. Testing determined it could discharge 6,750 gallons an hour at 1,200 rpm.[48]

The completed updates to the collection system ultimately included the alteration of the Volcano House hotel's former rain shed, erection of additional water tanks and the moving and dismantling of others, and installation of a new pump and water mains. As reported in the September 1948 final report of the project, the rehabilitation cost $14,596.86.[49]

These additions to the water system alleviated the immediate issue of sufficient water storage after the collapse of the Volcano House Hotel's tank. The park realized an updated, modern system needed to be put in place rather than the piecemeal,

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[46] Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," pp. 24-25; Superintendent Monthly Reports, May 1947, p. 3; June 1947, p. 3; November 1947, photograph caption; Memorandum for the Superintendent, Subject: Narrative Report for November 1947, Assistant to Superintendent and Acting Resident Engineer Moomaw, December 9, 1947, in Superintendent Monthly Report, November 1947.

[47] Superintendent Monthly Reports, June 1947, p. 3; July 1947, p. 3; Memorandum for the Superintendent, Subject: Narrative Report for August 1947 of Assistant to Superintendent and Acting Park Engineer Benjamin F. Moomaw, in Superintendent Monthly Report, August 1947; Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," p. 7.

[48] Superintendent Monthly Report, August 1947; Memorandum from the Superintendent, Subject: Narrative Report for November 1947, of Assistant to Superintendent and Acting Resident Engineer Moomaw, December 9, 1947, in Superintendent Monthly Report, November 1947.

[49] Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," p. 1.

geographically disparate collection of tanks, pipelines, and associated structures then being utilized. A report on the water situation at the park issued in August 1947 by Regional Engineer Crawley encapsulates the park's strategy for administering its water resources. According to Frances Jackson's administrative history of the park, Crawley "pointed out that wooden tanks were not decorative but they were the safest, as pipes and reservoirs in earthquake areas were subject to damage." He recommended building additional water collection and storage facilities, noting that water sheds did not need to be "unsightly" or even painted red as had been done at Kilauea. He also suggested expending resources on finding a new source of water.[50] The NPS and the park explored potential sources of water other than simply collecting rainwater, including purchasing water from the Olaa Sugar Company, Ltd. The company had a reservoir at Mountain View, approximately 10 to 12 miles northwest from the park, and they were already supplying water to the Kilauea Military Camp for 3 cents a gallon. Another potential source was the Hawaiian Agricultural Company. Investigations were also made into tapping sources of groundwater within the park. Park personnel looked into "rumored springs and streams that might supply the Park" but turned up no potential sources.[51] The park instead chose to forge ahead with the expansion of its collection system as recommended by Crawley.

In 1949, the park embarked upon a water system project with multiple components: Project U-25, Rainshed Extension; Project U-26, Reconstruction of Water Tanks (also referred to Water Storage Tank Reconstruction); and Project U-27, Water Mains Reconstruction. Much of the materials were obtained from Army surplus.[52]

In November 1949, work began on a 160' extension project (Project U-25, Rainshed Extension) to the old rain shed. The project had originally been approved in the spring of 1949 but stalled due to inclement weather.[53] Once begun, work progressed rapidly in December 1949 and January 1950, with a 90 percent completion estimate given in the superintendent's monthly report for January. The project involved not only extending the shed but also raising the roof of the "old part of the rainshed" so that it would be "in line with the elevation of the extension." Costs were minimized by using salvaged materials from elsewhere in the park. For example, park personnel demolished a storage building at the former CCC camp and salvaged iron to use as the roofing material on the rain shed extension. By March 1950, the construction of the roof was complete, as was the painting. A completion report notes: "salvaged material for additional extension (16'). Completed additional extension. Total length completed 176'. Entire length of rainshed to be painted." The suggestion in the completion report of an "additional extension" seems to indicate that the plans were changed. This may explain why in April 1950, the project was noted as only 80

[50] Jackson, p. 159.
[51] See Memo from Hillory Tolson, Acting Director to Regional Director, Region Four, June 9, 1947, in File No. 660-05, Box 1180, RG 79, NARA-College Park; Jackson, p. 158.
[52] Superintendent Monthly Report, October 1949, p. 2.
[53] Superintendent Monthly Reports, November 1949, p. 3; December 1949, p. 2.

percent complete when in January it had been at 90 percent. It was estimated that the extension and resulting increase of roof surface would allow the collection of 2,344,896 gallons a year, based on the "water collection formula of 59 gallons per square foot of shed per year."[54] Further work was undertaken on the building in July, when a windbreak was added at the northeast side of the building "to eliminate the possibility of damage to the building in the event of a severe windstorm and to provide better protection to the heavy equipment" stored within the building. Salvaged materials, this time from a dismantled barracks at the former CCC camp, were used in this project as well.[55]

Park personnel made minor repairs and alterations to the building in the 1950s, including riveting and soldering metal gutters, increasing the size of the downspouts, and installing side collection gutters onto 2" x 8" sills that were "slung below the rafter and joist" in 1954. The following year, the superintendent's monthly report noted the windward side of the building had been fully covered.[56]

Project U-26, Relocation of Water Tanks (also referred to as the Water Storage Tank Reconstruction Project) began on September 19, 1949. The work involved removing some of the numerous tanks operated by the Volcano House in the location of the former hotel and rain shed, an area known as "Tank Hill." The hotel's system as it existed at the time of the takeover included several redwood tanks that were more than thirty years old: one 400,000 gallon redwood tank, three 80,000 gallon redwood tanks, and three 50,000 gallon redwood tanks. There were also two 100,000 gallon tanks dating to 1944 and ten 5,000-10,000 gallon tanks of various ages. No specific information has been found detailing the plan to dismantle the tanks and the proposed layout of the relocated tanks. One source states that of the hotel's tanks, the park kept the 100,000 gallon, 80,000 gallon, and 50,000 gallon sizes. Eight of the smaller 5,000 to 10,000 gallon sized tanks were dismantled and rebuilt on "Tank Hill."[57] The superintendent monthly reports note that four tanks were removed from "Tank Hill" to the "approved site at the rainshed." A photograph in the October 1949 monthly report shows the removal of the tanks from Tank Hill and notes that one 100,000 gallon tank, three 80,000 gallon tanks, one 50,000 gallon tank, and two 10,000 gallon tanks were slated to be dismantled. Some of the tanks were in poor condition, as evidenced by a photograph depicting decaying chime joists in one tank that had been built over a steam vent.[58] In addition to adding some of the Volcano House hotel's former tanks to the system, the park also incorporated the 10,000 gallon tanks formerly in use at the CCC camp. In January and February of 1950 eleven tanks were

[54] Superintendent Monthly Reports, January 1950, p. 3; February 1950, p. 3; March 1950, p. 3; April 1950, p. 4; National Park Service, Monthly Progress Report on Physical Improvement in March 1950 Superintendent Monthly Report.
[55] Superintendent Monthly Reports, July 1950, p. 4; August 1950, photograph accompanying report.
[56] Form 16-54522-2, Building 43. A handwritten note details the February 1954 completion report and work.
[57] Final Report, "Rehabilitation of Water System Kilauea Section Headquarters Area," pp. 11-12; Jackson, p. 160.
[58] Superintendent Monthly Reports, September 1949, p. 3; October 1949, p. 2 and photographs accompanying report.

moved from the CCC camp and installed under the rain shed at the headquarters area.[59] By 1953, there were fourteen tanks located under the rain shed with one outside the southwest corner. To the rear of the rain shed and shielded from visitor's eyes was a collection of fourteen redwood tanks grouped in two rows, with plans to locate an additional six tanks at the end of the battery.[60]

The final component of the project was Project U-27, Water Mains Reconstruction, which is outside the scope of this project. It consisted of connecting the 10,000 gallon tanks at the rain shed to the main collection line, as well as to the system in place at the Utility Area. The project extended the collection line through the headquarters area, park residential area, and Volcano House hotel, ultimately connecting the two collection systems. In addition, a chlorinator was installed on the main.[61]

Despite the work undertaken on the system, it was found to still be inadequate after a drought hit the park in 1952. The surplus redwood tanks required maintenance because of leakage problems. One of the 50,000 gallon tanks had rotted.[62] An earthquake on March 27, 1955 further damaged the system, including two of the 100,000 gallon tanks. The water lines were also broken at six locations, which alerted park officials to larger problems with the distribution system. The lines had become so corroded or clogged with organic matter that the interior diameter of the pipes had been greatly reduced, in some cases a ¾" pipe had been reduced to ¼".[63] The superintendent noted in his monthly report, "it is evident that revision of our water system is in order and a special memorandum will be written on that subject."[64] In May, F. Woo, an engineer with the Territory, came to the park to examine its system after a series of monthly water tests by the Public Health Service of the Territory yielded poor results. After determining that "the entire system needs revamping," he made recommendations regarding the filtering of water and improving the collection system. He also suggested constructing a new rain shed to take the place of the current practice of using individual building roofs to collect water, which he noted "contribute by far the greatest amount of leaves and other foreign matter."[65] The following month, Z.D. Harrison of the Public Health Service's

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[59] Superintendent Monthly Reports, January 1950, p. 3; February 1950, p. 3.

[60] "Water Collection and Sewer System," and "Water Distribution: Kilauea Headquarters," March 1953, Sheets 1 and 2.

[61] Superintendent Monthly Reports, February 1950, p. 3; March 1950, p. 2; September 1950, p. 4; October 1950, p. 2; November 1950, p. 3; National Park Service Monthly Progress Report on Physical Improvements, March 1950, in Superintendent Monthly Report, March 1950.

[62] Jackson, pp. 160-161.

[63] Superintendent Monthly Report, March 1955, p. 3; Memorandum to the Superintendent from the Park Engineer, Subject: Monthly Report for June 1955, in Superintendent Monthly Report, June 1955.

[64] Superintendent Monthly Report, March 1955, p. 3. Damage included a 6" main of cast iron pipe being pulled apart at its joints, two 4" galvanized iron collection lines pulled apart at the joints, and 2 ½" and 1" galvanized iron pipes being pulled apart at the joints.

[65] Memorandum to the Superintendent from the Park Engineer, Subject: Monthly Report for May 1955, in Superintendent Monthly Report, May 1955.

San Francisco office, as well as engineers from the Territorial Public Health Service made another visit. The park's engineer detailed the group's recommendations.

> For Kilauea it was recommended that the entire water system, collection and distribution pipe lines and all piping in the houses are to be replaced as quickly as possible as corrosion and sedimentation have reduced the available waterway in the lines by as much as 60%. In addition an excessive amount of chlorine is necessary to produce even a trace of residual halfway down the system. Increasing amounts of chlorine are being tried in an attempt to get residual chlorine at the lower end of the line, but with indifferent results, which indicate an excessive amount of vegetable matter in the pipes caused by leaves in the collection system or by bacteria.[66]

There was interest in using plastic pipe to replace the system's collection of iron pipes as it was thought that plastic would better withstand earthquake damage and be easier to replace.[67]

The park embarked upon a comprehensive improvement project from August 1955 to December 1958 after Superintendent John B. Wosky's pleas for an updated system were heard. The construction centered at the headquarters area, although in January 1955, a centrifugal pump and raw chlorinator were installed in the Utility Area. At the headquarters area, a new rain shed and steel tanks with a 500,000 gallon capacity were built, as well as a 23,500 gallon filter tank. The water mains were also serviced. When complete, the new system consisted of the original structures (the old rain shed and fourteen redwood tanks with concrete bottoms for raw water storage as well as a wood tank for treated water system) with the addition of a new rain shed, conduit system connecting tanks, a sand filter tank, pump house, and four steel 500,000 gallon tanks for treated and chlorinated water storage.[68]

The redwood tanks, which served as raw water storage tanks, were rehabilitated over a period of two years, a project completed in February 1957. Water Storage Tank No. 30 in the Utility Area was the first to be rebuilt. It was dismantled, and a new concrete base poured. The ready-mix concrete came from Hilo in mixer trucks, which provided 26 yards of concrete. The park supplied an additional 2 yards with its own mixer. The specifications originally called for an 18" thick base, but a 10" base was poured instead with the justification that "since the concrete base on which the original mudsills and chime joists were laid is 6 inches thick, it is estimated that 10 inches of new concrete will be adequate." Originally the tanks rested on chime joists, but the new design called for building a wood ring that would sit on top of the concrete base with the staves leaning against it. Petrolastic cement was used as a

[66] Memorandum to the Superintendent from the Park Engineer, Subject: Monthly Report for June 1955, in Superintendent Monthly Report, June 1955.
[67] Memorandum, Subject: Monthly Report for June 1955.
[68] Jackson, p. 162; Superintendent Monthly Report, January 1955, p. 3.

sealant. The park engineer noted the "wooden ring around the bottom of tank fitted very well and the staves and hoops went up as though the floor was all wood."[69] After the completion of Tank No. 30, Tank No. 8 at the headquarters area was taken apart for inspection, and the crew found its condition very similar to that of No. 30. The monthly report stated the "center 10 feet of the foundation chime joists were rotten and had let the wooden bottom sag."[70] After Tank No. 8 was completed in April 1955, Tank No. 10 was repaired. The park engineer noted "this is the third tank of 10,000-gallon capacity to be torn down, a concrete bottom poured, and the staves and roof reassembled."[71] By January 1957, the project was 80 percent complete with eleven tanks rehabilitated and three more under construction.[72] The work "mothered the invention of a device for tightening tank straps which won its inventor an award."[73] Additional pipes and valves were installed on these raw water storage tanks in August 1958 so that they could be individually cleaned and operated.[74]

In 1957, the sites of the new rain shed and 500,000 gallon tanks were surveyed and plans developed for the installation and layout of pipes, taking into account the topography and integrating the existing structures. The proposed layout allowed the "gravity flow of untreated water from rehabilitated wood tanks to filter. Water will then be pumped through a chlorinator and into 500,000-gallon steel storage tanks."[75]

Bids were next solicited for the construction of two 500,000 gallon steel tanks and one 23,500 gallon steel filter tank in February 1957. Five bids were received, with the low bidder, Terminal Steel Company Ltd. of Honolulu, winning the contract.[76] The contract to construct a third storage tank was opened for bidding on April 26, 1957, and it was also awarded to Terminal Steel Company, Ltd., who had the lowest bid of $25,915.[77] Construction and fitting of the tanks (known as Tanks No. 2, 3, and

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[69] Superintendent Monthly Reports, January 1955, p 3; February 1955, p. 3; March 1955, p. 3; Memorandum to the Superintendent from the Park Engineer, Subject: February 1955 Monthly Report, March 7, 1955 in Superintendent Monthly Report, February 1955.

[70] Superintendent Monthly Reports, March 1955, p. 3; April 1955, p. 3.

[71] Memorandum to the Superintendent from the Park Engineer, Subject: Monthly Report for May 1955, in Superintendent Monthly Report, May 1955.

[72] Superintendent Monthly Report, January 1957, p. 2. A number of photos document the deterioration and reconstruction of the tanks. See Photos D50 208 and 209 for damage, showing the rotting support members of the foundation, identification caption: "Water tank repair, G.D. Smith, May 1955." Photos D50 264 through 267 show the dismantling of tanks, identification caption: "Water tanks and sheds, 40s or 50s." Finally photos D50 228 through 231, identification caption: "Building water tanks, D.H. Black, 1956" and photos D50 252 through 259, identification caption: "Pouring cement floor for water storage tank at rainshed, Kilauea section, Donald M. Black, October 29, 1956" depict the reconstruction process. All photos in HAVO archives.

[73] Jackson, p. 161.

[74] Superintendent Monthly Report, August 1958, p. 9.

[75] Superintendent Monthly Reports, February 1957, p. 10; March 1957, p. 11.

[76] Their bid was for $54,096 and won them Contract No. 14-10-418-14. Superintendent Monthly Reports, February 1957, p. 10; March 1957, p. 2.

[77] Kilauea Construction Company of Hilo bid $28,400 and Pittsburg-Des Moines of Santa Clara bid $31,900, Superintendent Monthly Report, April 1957, p. 10.

4 for the 500,000 gallon capacity tanks and Slow Sand Filter 1 for the filter tank) took place in the summer of 1957. They were in service by November.

The tanks were built on solid rock between the old rain shed and the proposed new one. The bases for the 500,000 gallon tanks consisted of a concrete retaining ring measuring 8" thick and 30" high. The interior of the ring base was filled to a height of 24" with crushed aa lava or gravel. The base required 14 yards of concrete and 350 yards of rock backfill, which was hauled by truck a distance of 12 miles. A 4" thick sand pad finished the base. The filter tank base measured 8" thick, 22" high and had an interior diameter of 22". The bases were finished with a sloping layer of hot mix to promote drainage. By May, the bases of the rings had been completed so installation of the tanks could begin.[78] The pipes and fittings for the tanks were ordered from the Grinnell Company through the General Services Administration.[79] Tank Nos. 2, 3, and 4 were in service by November 1957 and served as supply tanks.[80]

In May 1958, bids were opened for construction of a fourth 500,000 gallon steel tank, known as Tank No. 1, and seven were received. Pittsburg-Des Moines Steel Company of Santa Clara, California had the low bid of $26,533 and was awarded the contract to build the tank in June.[81] A temporary park crew of four was employed in constructing the tank's foundation, which was similar to those already built. The center of the fourth tank was moved an extra 12" to allow for more clearance of the connection from the outlet to the existing 6" supply line, a modification made by the Contracting Officer. By November 1958, the foundation of Tank No. 1 had been nearly completed. At this tank, the base was sealed with a pre-mix of gravel and bitumuls, and a surface coat applied of pre-mixed sand and bitumuls. This surface coat was also applied to the bases of Tank Nos. 2, 3, and 4. The construction of Tank No. 1 was delayed until September 1958 when materials finally arrived and the walls

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[78] Superintendent Monthly Reports, March 1957, p. 11 and photographs accompanying report; April 1957, p. 10 and photographs accompanying report; September 1957, p. 10; Memorandum to Assistant Superintendent from Supervisor, Construction and Maintenance, Subject: Report for Month of March 1957, in Superintendent Monthly Report, March 1957. Photographs documenting the construction of the bases include D50 092 through 097, identification caption: "Building of the forms for the base of the first of D50 39 program. These steel tanks will hold 500,000 gal. ea. J.C. Raftery, February1957"; D50 132 though 138, identification caption: "Water system improvements, year unknown circa 1957"; D50 085, identification caption: "Filter tank, Donald M. Black, October 14, 1957"; photo D50 198, identification caption: "Construction tank, J.A. Stites, July 1957"; photos D50 231 though 234, identification caption: "Utilities construction project, new water tank and filter pump set up. D.M. Black, February 1957." All in HAVO Archives.

[79] Superintendent Monthly Report, May 1957, p. 12.

[80] By June, Tank Nos. 1 and 2 had been almost finished (Superintendent Monthly Report, p. 10). By July, the tanks were all ready for cleaning, painting, sterilizing (Superintendent Monthly Report, p. 10). See also Superintendent Monthly Report, November 1957, p. 1. Additional photographs showing wall construction of the tanks include D50 238, identification caption: "J.A. Stites, 1957-59," in HAVO Archives.

[81] Superintendent Monthly Reports, May 1958, p. 11; June 1958, p. 9. Other bidders were Terminal Steel Company at $28,895; Graver Tank and Mfg. Co., Inc. at $32,138; Chicago Bridge and Iron Company at $34,575; Hawaii Welding Company at $39,358; Central Pacific Dollar Works, Ltd. at $42,900; and Hawaii Dredging and Construction Co. Ltd. at $59,449.80 (from May 1958 report, p. 11).

and roof could be erected. The joints were welded, and then the entire tank was painted. During shipment and construction, the prime (shop) coat of paint had been damaged. The interior and exterior surfaces of the tank were to be primed before the finish coat was applied. An inspection of the tank's interior the following month revealed unsatisfactory conditions.[82] Mr. Stanley I. Hara, a factory representative of the Themec Paint Company, came to the park to inspect the tanks, as did representatives of Honolulu Painting Company, who had been subcontracted by Terminal Steel Company to do the painting. The superintendent reported that "the unsatisfactory condition of the prime paint, applied as a shop coat, required extensive cleaning of rust and patch painting of the scratched and scraped areas." An additional coat of primer on the interior and exterior of the tanks had to be applied.[83]

There were a number of problems with the paint used on the tanks in the late 1950s and 1960. Curtis Richey, Senior Sanitary Engineer of the Department of Health, Education and Welfare, inspected Tank No. 4 in 1958 and found a "flakey crust which crumbled into small particles at a touch," indicating proper bonding between the prime and finish coats had not occurred. In still other sections, the bond was fine but rust protrusions could be seen bulging underneath the finish coat. The columns and beams comprising the internal framework of the tank were also rusting.[84] In February 1959, Tank No. 3 was found to have the same problems with its paint as Tank No. 4.[85] The park repainted the badly rusted steel roof plates of the water storage tanks and filter tank with aluminum roof paint the following month.[86] Tank Nos. 2 and 4 were sandblasted to the bare metal, and then repainted with "Inertol Primer No. 626" and sealed with two coats of "Inertol Thick Sealer No. 95" applied with a spray gun in the summer of 1960 by Modern Painting Company. A total of 84 gallons of primer and 260 gallons of sealer were used at a cost of $11,980.[87] Testing revealed that repainting the tanks negatively impacted the quality of water stored

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[82] Superintendent Monthly Reports, May 1958, pp. 11-12; September 1958, p. 10; October 1958, pp. 8, 11; November 1958, p. 2 and Memorandum from Park Engineer to Superintendent, Subject: Engineering Report for November 1958, December 3, 1958, p. 4. A number of photographs exist documenting the construction of Tank 1. See D50 028, identification caption: "Concrete retaining ring of tank #1, placing concrete in forms, May 1958"; D50 029, identification caption: "Concrete retaining ring of tank #1, starting placement of pre-mixed concrete in forms"; D 50 030, identification caption: "Foundation for water tank #1, setting forms to grade, erecting forms for concrete ring, May 1958"; D50 031, identification caption: "Clearing brush and small trees before resloping high cut bank in preparation of widening service road," all by J.A. Stites, June 1, 1958. Once the retaining ring had been poured, backfilling took place, see photo D50 032, identification caption: "Completed concrete ring for tank #1 before backfill, June 1958"; D50 033, identification caption: "Site of steel tank #1, erecting forms to grade for concrete retaining ring of foundation. Stockpile of backfill materials in center of tanks. May 1958"; and D50 034, identification caption: "Starting to widen service road along tank #1 before reshaping of high cut bank, June 1958," all in HAVO Archives. Painting of the completed tank can be seen in photo D50 158, identification caption: "Painting exterior of steel tank #1. Re priming of steel plates after welding of joints, and touch-up of scuffed and scratched areas before applying finish coat." All in HAVO Archives.

[83] Superintendent Monthly Report, August 1957, p. 10.

[84] Superintendent Monthly Report, December 1958, p. 11.

[85] Superintendent Monthly Report, February 1959, p. 8.

[86] Superintendent Monthly Report, March 1959, p. 9.

[87] Superintendent Monthly Reports, June 1960, p. 9; July 1960, p. 8.

within them. Samples were sent to Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio in an effort to determine the cause of the odor and flavor problems through a complete chemical analysis.[88]

The steel water tanks were outfitted with 4" drains in early 1959. A cross-connection "protected by a check-valve and gate valves" was made to the raw water storage system to "facilitate the interchange and recirculation of water." An automatic control system was installed to regulate the pumping of treated water into the steel storage tanks. The projects were completed in March 1959.[89]

The 23,500 gallon steel filter tank (Slow Sand Filter 1) connected to the raw water collection and settlement wood tanks by a 4" gravity supply line. At the bottom of the filter tank was a prefabricated pipe grid collection system. The filter tank contained sand (obtained from Oahu) and gravel, through which the raw water trickled. Park personnel used a motor crane with a clam bucket to move the sand into the tank. The tank's movable roof facilitated the process.[90] By May 1958, the flow of water though the filter had decreased "to the point of insufficient supply for maximum pumping operation." Once park personnel inspected the filter, the cause of the decreased flow became apparent. A thick layer of sediment had been deposited on the sand, indicating the filter had probably not been backwashed at regular intervals. Once ¼" to ½" of the top layer of the sand had been removed and backwashing completed, the filter's operation became much more efficient.[91]

The filter tank was connected to a new pump house, under construction in spring 1957. The base of the structure was 10' x 12' with a 6" thick floor. The building was sided in corrugated metal and had a shed roof.[92] The pump house contained the electric water pump, chlorination unit and electric control system.[93] A sand trap was located at the pipe connection between the filter tank and pump house. A photograph caption in the November 1957 monthly report detailed how it operated.

> By a proper placement of the two vertical baffle plates, velocity of the incoming water is reduced to a minimum, thus allowing deposit of any sand that may be moved from the filter tank. The sand trap is fitted with a water-tight cover over which is an air valve to bleed off trapped air. The drain hole in the bottom of the box is so piped that any sand may be easily flushed out the drain line while the pumping operation is continued.[94]

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[88] Superintendent Monthly Report, March 1963, p. 4.
[89] Superintendent Monthly Reports, January 1959, pp. 12-13, 16; March 1959, p. 11.
[90] Superintendent Monthly Report, November 1957, pp. 12-13.
[91] Superintendent Monthly Report, May 1958, p. 8.
[92] Superintendent Monthly Report, April 1957, p. 2. For photographs of its construction, see D50 240 identification caption: construction of pumphouse/filter tank, J.A. Stites, 1957-59; photograph D50 085, identification caption: filter tank, Donald Black, October 14, 1957; D50 139, ca. 1957; D50 160 and 161, no date, all in HAVO Archives.
[93] Superintendent Monthly Report, November 1957, p. 13.
[94] See Photos D50 082 though 084, identification caption: "Utilities water system, sand trap between filter tank and pumphouse, J.A. Stites, 1957," and photos D50 160 and 161, identification caption: "View of the 23,500 gallon

Between the pump house and the inlets of the newly constructed 500,000 gallon steel storage tanks, crews laid a 2" pipeline in fall 1957. Water mains were also laid to connect the 500,000 gallon steel tanks with the distribution system. This work would "make a suitable cross-connection to the existing supply lines and replace old pipe lines that now supply water to the main feed tank and chlorination unit."[95] The mains connecting the steel tanks to the distribution system were laid above ground on concrete piers and "a valved cross connection was made to the service lines of the existing wood storage tanks with a continuation of piping to provide a direct flow to the present main feed tanks and chlorination unit." The layout allowed the water in the storage tanks to be directly pumped into the distribution system, "without using the inter-pipe system of the wooden storage tanks."[96] By December 1957, the work had been nearly completed.[97]

In addition to tank and pipeline construction, park personnel dismantled two of the 10,000 gallon wood water tanks housed under the old rain shed in June 1958. The materials for one of the tanks were saved, and it was rebuilt in another, unspecified, location. The remaining nine tanks (seven 10,000 gallon and two 50,000 gallon) housed under the old rain shed were drained and dismantled the following month to be sold as surplus. The removal of the tanks necessitated alterations to the rain shed since the two 50,000 gallon tanks had supported the framework. In their place, wood support columns were built and additional bracing was put in place.[98] The building had already been altered after a cyclone in September 1955 caused extensive damage. The park's Supervisor of Construction and Maintenance described the situation.

> Painting was started on the Rainshed roof and about one third complete when a whirlwind suddenly came up and ripped a section of the roof completely off damaging the frame work and water collection system. Temporary repairs were made but the entire structure is very weak. Emergency funds was [sic] provided and the lumber purchased to strengthen the entire building. This work is going on as rapidly as possible in order to prevent future damage.[99]

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sand filter tank, and the shelter for pumping and chlorinator units. The 4" gravity supply line, shown at lower right and at tank from the wood collection and settlement tanks is controlled by the external valve and a float valve within the filter. The overflow line, indicator board for water level and [illegible] and connection to sand trap and drain are shown between the [illegible] and shelter," all in HAVO Archives. Superintendent Monthly Report, November 1957, photograph caption accompanying monthly report.

[95] Superintendent Monthly Report, October 1957, pp. 12-13.

[96] Superintendent Monthly Report, November 1957, pp. 12-13.

[97] Superintendent Monthly Report, December 1957, p. 11.

[98] Memorandum from Park Engineer to Superintendent, Subject: Engineering Report for June 1958, July 7, 1958, p. 2 in Superintendent Monthly Report, June 1958; Superintendent Monthly Report, July 1958, p. 10.

[99] Memorandum from Supervisor Construction and Maintenance to Park Engineer, Subject: Monthly Report for the Month of September 1955, October 3, 1955, p. 1, in Superintendent Monthly Report, September 1955.

Even more work on the structure was needed after a "Kona storm" on January 17-18, 1959 damaged the north end of the building, ripping off the end wall and about 10,000 square feet of the galvanized iron roof, as well as causing other minor structural damage. Equipment stored in the building sustained water damage, estimated at $7,100. Repair work consisted of adding bracing to the frame and replacing the corrugated metal roof.[100] The damage was so severe that the 16' end bay was not replaced. The original large sliding doors at that bay were relocated so as to provide better access to the storage areas. To prevent future wind damage, "all column supports were anchored to concrete foundation piers and the connections between the roof trusses and purlins were improved." Strap iron anchors were installed at the bearing columns and at the roof rafter and purlin junctions. "Inadequate" bearing post foundations were replaced with "properly anchored concrete piers" and additional purlins were put in the roof to "reduce the excessive span widths and provide more bearing and nailing surfaces.[101] The repairs were completed by March 1959.

The often repaired and heavily renovated rain shed would be supplemented by a new rain shed, construction of which began in spring 1957. The contract for the project included construction of a rain shed and trestle. The park received six bids for the work and, on the advice of Supervising Engineer R.T. Montgomery, accepted the low bid of $43,809 submitted by H. Sonomura of Hilo, Hawaii.[102]

Construction of the new rain shed, designated Building No. 241, began with grading the site "to provide adequate drainage" in April and May 1957.[103] Construction of the foundation began the following month with crews laying the lines for the pier foundations and working around the rock outcroppings. The footings were then excavated, and the formwork put in place. The foundation consisted of concrete piers that were pyramidal in shape.[104] By July, the concrete pier foundations had been completed, and the framework could be erected.[105] The Superintendent's monthly report from July noted "the well organized operation for the layout of the bents with an extended boon on a truck-mounted tractor hoist." Once the main timber bents, which had an average height of 20', had been placed on the concrete pier foundations, the connecting beams could be secured to the frame. The roof structure consisted of purlins attached to beams with corrugated aluminum sheathing on top. Completion of

[100] Superintendent Monthly Report, January 1959, pp. 11-12, and photographs accompanying report. For photographs of damage, see D50 035-053, "Kona Storm Damage," J.A. Stites, January 17 & 18, 1959, in HAVO Archives.
[101] Memorandum from Park Engineer to Superintendent, Subject: Maintenance Report for February 1959, March 5, 1959, p. 3 in Superintendent Monthly Report, February 1959; Superintendent Monthly Report, March 1959, photographs accompanying report.
[102] Superintendent Monthly Reports, February 1957, p. 10; March 1957, p. 12. Sonomura subcontracted the aluminum pipe work to P.E. Pell Company of Honolulu, see Superintendent Monthly Report, April 1957, p. 10.
[103] Superintendent Monthly Reports, April 1957; May 1957, p. 12.
[104] Superintendent Monthly Report, June 1957, p. 10.
[105] Superintendent Monthly Report, July 1957, p. 10.

the roof was delayed because of late shipment of the roofing material.[106] By October, the rain shed project was estimated to be 98 percent complete, but problems were identified with the construction. One issue was that the corrugated rubber stripping used to "close the voids under the roofing at the edge of the gutter" had not been "adequately secured." In addition, the "nailing of the roofing" was deemed to be "not up to specifications." The contractor attempted to remedy the situation, but it was not until November that a second satisfactory attempt was made.[107] The completed rain shed measured 200' x 200' with a height of 20', although current measurements indicate it is approximately 220' x 202' and encompasses 45,929 square feet.[108] It housed a pump house used to redistribute water among the tanks or to supply the tanker trucks carrying filtered water to various filtered water storage tanks throughout the park, such as the one located at Bird Park.

In 1963, the supports of the new rain shed had to be repaired because of dry rot at the bottom 24". In some cases, sections had to be removed and replaced, while in other cases, the entire support was removed. All the members were then repainted.[109]

The trestle constructed as part of the rain shed project was built of pre-framed trestle bents on which an aluminum conduit rested. The framing sat on concrete pier foundations. The structure stood as high as the new rain shed's roof so water could be collected from the roof and transferred to the existing wood tanks.[110] Pipe connections also appear to have been made from the roof gutters of the new steel tanks to a 10" aluminum conduit. This increased the rain collection area by 7,260 square feet.[111]

The completion of the water collection system allowed the second phase of construction to begin. In March 1958, the park opened bids for Contract No. 14-10-418-20, the installation of a water distribution system, including the re-plumbing of the residences and buildings in the park and the installing of pipeline. Three bidders submitted proposals, and the contract was awarded to the lowest, Isemoto Contracting Company.[112] Although the distribution system is out of the scope of this project, a brief summary of the work will be provided. Copper lines were installed at the

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[106] Superintendent Monthly Reports, July 1957, p. 10 and accompanying photographs; August 1957, pp. 10-11.
[107] Superintendent Monthly Report, October 1957, p. 13. The November Monthly Report praised the contractor, stating he was "most cooperative in all respects, reasonable in matters of extra work orders and suggested minor changes," p. 12.
[108] Superintendent Monthly Report, October 1957, information from caption of photograph accompanying report.
[109] Superintendent Monthly Report, October 1963, p. 4.
[110] Superintendent Monthly Report, August 1957, p. 11. For images, see D50 024 and 026, identification caption: "New water storage tank, rainshed and aqueduct to carry water, Donald M. Black, October 14, 1957" in HAVO Archives.
[111] Superintendent Monthly Report, September 1957, p. 11. The park has found that aluminum negatively impacts the quality of the water.
[112] Superintendent Monthly Reports, March 1958, p. 12; April 1958, p. 12. The bidders included: H. Harada Contractor, $54,844.20; Jas. W. Glover, Ltd. at $51,864.95; Isemoto Contracting Company, Ltd., at $47,924.86.

residences in June 1958.[113] The following month, layout of the main distribution lines began. The upper loop of mains consisted of two lines, an 8" main and a 3" pumping line, running parallel to one another aboveground. In those instances when the pipes crossed roads or trails, they were buried. Heavy vegetation sometimes caused bypasses through particularly dense areas. The lower loop consisted of 4" and 8" mains.[114] A separate contract was awarded in May 1958 to Hawaii Planing Mill, Ltd. for extension of the water line to the Lava Tube via 7,600' of ¾" polyethylene plastic pipe.[115] In July, a 10,000 gallon redwood tank was placed on a concrete pier foundation at the end of the pipeline at the Lava Tube, replacing the two 500 gallon wood tanks that previously collected water from the roof of the Lava Tube Comfort Station.[116] On December 18, 1958, the new system was declared complete, with service provided to all buildings, residences and fire hydrants in the park.[117] There were problems with corrosion in the galvanized pipes, a situation that plagued pipelines throughout the island. One solution used by the park was to add hydrated lime to the water.[118]

As completed in 1958, the park had centralized the water collection system behind the former Volcano House hotel and the visitor center. Vehicular access was provided via a spur road extending past the visitor center and former Volcano House hotel. Water was collected from the roofs of the two rain sheds and carried via pipes to fourteen wood raw water tanks located behind the old rain shed. The fourteen wood tanks were arranged in two rows and numbered from seven to twenty with odd numbers to the south and even numbers to the north. A 6" raw water main extended from the raw water collection and sedimentation tanks to the filter tank. Slow sand filtration took place in the filter. The filtered water then passed through a sand trap and into the adjacent chlorinator and pump house. The finished water was then pumped back up to one of the four 500,000 gallon steel water tanks. Numbered one through four, the tanks were not only connected to the filter tank by a 2 ½" pump line but also were connected to the 6" main distribution line, which made a loop around the headquarters and residential sections of the park. The 6" main was connected to

[113] Superintendent Monthly Report, June 1958, p. 10.
[114] Superintendent Monthly Reports, July 1958, p. 12; August 1958, pp. 9, 12; September 1958, pp. 7, 10; October 1958, pp. 8, 11; November 1958, pp. 9, 12. See photos D50 080, identification caption: "Pipelines of new distribution system and pump line near point 42. Lack of clearance in a heavy stand of eucalyptus trees required a bypass of the 3" pump line"; Photo D50 081, identification caption: "Pipeline and connection, J.A. Stites, December 1957"; pipeline at point 39 depicted in photos D50 056 though 059, February 1959; photographs D50 022 and 023, July 1958 of redwood tank at Lava Tube, photograph D50 080, identification caption: "Pipelines of new distribution system and pump line near point 42. Lack of clearance in a heavy stand of eucalyptus trees required a bypass of the 3" pump line"; D50 081, identification caption: "Pipeline and connection, J.A. Stites, December 1957"; pipeline at point 39 depicted in photos D50 056 though 059, February 1959. All photographs in HAVO Archives.
[115] The winning bid for the Lava Tube project was for $625.48. The other five bids were from P.S. Pell & Co. Ltd. for $703.76; Theo. H. Davies & Co. Ltd. for $727.32; GASPRO, Ltd. for $747.84; Lewers & Cooke, Ltd. for $897.56; and American Factors, Ltd. for $1019.92.
[116] Memorandum from Park Engineer to Superintendent, Subject: Engineer Report for July 1958, August 7, 1958, p. 3 in Superintendent Monthly Report, July 1958.
[117] Superintendent Monthly Report, December 1958, pp. 8, 12.
[118] Superintendent Monthly Reports, December 1958, p. 9; March 1959, p. 8.

the residences and buildings via 6" and 4" mains.[119] In 1962, the distribution system was extended to the USGS Observatory on Uwekahuna and a pump house constructed.[120]

Additions have been made to the system since 1958. After 1980, a second slow sand filter tank (known as Slow Sand Filter 2) and clear well were constructed. Around 1993, two 750,000 gallon tanks (known as Tank Nos. 18 and 19) were erected on the location of six of the original redwood tanks. Another 500,000 gallon tank (known as Tank No.5) was installed next to Tank No. 4. Two catchments were also installed. The larger one dates to the early 1970s while the smaller one was built ca. 1993.[121]

Part II. Site Information

A. General Description:

The Hawaii Volcanoes National Park Water Collection System, as of 2008, consists of two rain sheds, a trestle carrying a 10" pipe overhead, six redwood water tanks (with a combined capacity of 626,600 gallons), five steel tanks each with 500,000 gallon capacity, two steel tanks each with 750,000 gallon capacity, two catchments and a pump house, two slow sand filters, and a pump and chlorinator building, plus the pipes connecting the various components. The site is located behind the visitor's center and the former Volcano House hotel, now the Volcano Art Center. Another underground reservoir and pump house are located at the firehouse, but those are outside the scope of this project. Individual descriptions of the main features of the system are below.

Building No. 43

The old rain shed (Building No. 43) is a 110' x 358-1/2' frame building with a 22'-10" interior height at the center. It originally measured approximately 110' x 182'. The surface area of the roof is about 40,228 square feet. In 1950, the building encompassed 743,256 cubic feet.

The structure consists of 4" x 6" posts typically on 2' tall reinforced concrete pier foundations measuring 2' square at the bottom and narrowing to 1' square at the top. Metal straps inserted into the concrete piers are attached to the posts by 5/8" bolts. The piers are typically placed in five rows on a grid about 25' x 15'-7" apart. On some of the piers, 3/8" eyebolts were drilled into the concrete piers. Wire rope

[119] U.S. Department of Interior, National Park Service, Engineering Branch, WODC, "Water Distribution System, Kilauea Headquarters, Hawaii National Park," Region IV, January 1958, As Constructed, March 25, 1959, Sheets 1 and 2; San Juan Construction, Inc., As Constructed Drawings, Rehabilitate Park Water System, Headquarters Area, June 1993, set of 35 drawings.

[120] The contract for the extension was awarded to H. Harada, Contractor, who submitted the winning bid of $15,860.90 (Contract No. 14-10-0434-860). The work was delayed due to a shipping strike, but by June the pump house and 8" main had been completed. Superintendent Monthly Reports, February 1962, p. 7; March 1962, p. 9; April 1962, p. 8; June 1962, pp. 1, 8; July 1962, p. 5.

bracing ran on a diagonal from the top of a nearby post to the eyebolt. This was modified by adding additional wood to the post and then securing the eyebolts to the altered post.

The frame is made up alternating truss types. The first type (labeled "Truss Type A" on the As-Constructed Drawings completed in 1993 for the park) is made up of a double 2" x 8" bottom chord and a 2" x 8" top chord to which 2" x 6" diagonal and vertical members are bolted. The distance from the bottom chord to the floor is 15'-10". Additional support is provided by a 2" x 6" horizontal girt that has a 10'-10" clearance. The second type (labeled "Truss Type B") is made up of a double 2" x 8" bottom chord and a 2" x 8" top chord to which two 2" x 6" vertical members and 2" x 6" and 2" x 8" diagonal members are bolted. Truss Type B is stepped, with the higher clearance of 16'-9" at the center of the building. Additional support is provided by a 2" x 6" horizontal girt that has a 10'-10" clearance like that in Truss Type A. The trusses are typically placed about 15'-7" apart.

Additional bracing is provided by frames placed along the center line of the structure between trusses. Eleven of the frames have a 7'-6" vertical clearance and are made up of 4" x 6" bottom and top chords with two 4" x 6" diagonal members. At the point where the diagonals cross is a 16" x 16" x 5/8" plywood gusset plate. At each corner of the frame, at the point where the diagonal members meet the posts and chords, are 12" x 12" x 5/8" plywood gusset plates. A different type of frame was located at the west end of the building between the first two trusses, both at the center line and just about 25' from the north wall. These two frames have a higher vertical clearance at 11'-6", but the basic form is the same as the predominant frame type. In addition to the higher clearance, these frames have extra 4" x 6" posts secured to the main post.

The old rain shed has a gable roof with a 1 ½: 12 rise up to the center. The roof structure is made up of 3" x 4" purlins spaced approximately 24" apart that sit on 2" x 6" rafters. The roof is now clad in corrugated aluminum. Rain running off the roof is collected via a gutter that sits on wood supports screwed to the exterior posts of the building. The gutter is a wood box lined with metal, and the rain is channeled into it via a piece of flashing bent downward from the roof into the gutter. Boxed outlets at various points in the gutter connect to a pipe that hangs from metal straps attached to the ridgepole and runs transverse to the other side of the building.

The rain shed is partially clad in panels of corrugated metal that have been nailed to the exterior wall frame, which is made up of horizontal and vertical members. The northwest and northeast walls are fully clad in corrugated metal, while the southeast wall is open. The southwest wall is partly closed, with the south end open. The corrugated metal panels have been cut at their tops to accommodate the roof purlins. The northwest end wall of the building features two sets of sliding doors. Both are constructed of corrugated metal panels and run along a track installed on the wall above the doorway opening. The door to the north is smaller than that at the south end of the wall. Above the sliding doors are three sets of windows. The two sets at

the north end are identical and are made up of two side by side, six-over-six light, double-hung sash windows in wood frames. The window at the south end over the larger sliding door is made up of three six light fixed windows in a wood frame.

The open plan of the rain shed's interior has been divided into spaces for various functions, including shop, storage, and vehicle parking. A redwood shed is located in the northeast corner of the building with a set of stairs adjacent that lead to a platform with storage space. The northwest corner of the building contains enclosed shops: the Trails Shop is to the north while the Sign Shop is to the south. A bathroom is also located in this area. At the center of the building are enclosed spaces bordered by wire fencing. The southeastern portion of the building is open and used as a carport for the park's service vehicles. The floor has been covered with hot mix, but portions of the foundations for two of the nine wood water tanks housed in the shed until 1958 are visible. Originally the southeast corner was cordoned off with wire fencing to create an enclosed space, but that was removed some time after 1993.[122]

New Rain Shed, Building No. 241

The new rain shed, designated Building No. 241, is a 219'-6" x 201'-6" frame building with an interior height of 21' from the top of the pier foundations to the top of the diagonal bracing members. The 6" x 6" support posts rest on reinforced concrete piers, which are located on a grid approximately 15'-6" off center. On the lines of posts and piers running from east to west, alternate posts are connected by 2" x 6" beams and two 2" x 6" diagonal members that cross one another to form an X. The height of these braces is 4'-6". The lines that run from north to south also have braces located between alternate posts. These braces are a bit larger, measuring 5'-6" in height, but are similar in design. Wire rope bracing provides additional stability and support to the structure.

The roof slopes down towards the center at a 2:100 slope. The roof structure consists of 2" x 8" purlins that sit in corresponding notches in the girders. The roof is clad in corrugated aluminum. A 22" diameter flume is located on the roof's center, positioned so that each sloping side of the roof drains water into it. The conduit then leads to the catchment where the water is stored; originally, it connected to the redwood storage tanks. The drawings of the structure as constructed indicate the corrugated metal roofing was to be nailed "at every third configuration at each purlin." The laps and joints of the roof were to be sealed with mastic sealing compound.

[122] Description based on fieldwork done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, June 1993, including Sheets 19, 20, 21, and 22; and Building No. 43 information sheet, March 1, 1950, in HAVO Archives.

The interior of the rain shed is open with a few enclosed areas. The original transfer pump house is located under this rain shed, near Tank No. 4.[123]

Water Tanks

There are several types of water tanks in the HAVO water collection system, representing different eras of tank technology.

The first type of tank dates to the first half of the twentieth century. The 10,000 gallon redwood tanks located behind the old rain shed are no longer in use. Originally, there were as many as fourteen arranged in two rows of seven, but eight of those have been removed. The remaining six tanks are designated Tank Nos. 7 through 12. Drawings of the removed tanks indicate that they ranged in height from 18'-6" to 16" and are 30' in diameter. The sides of the remaining tanks consist of redwood staves placed vertically around the concrete foundation with tension rods encircling them. The rods are spaced more closely together at the bottom, with the distance widening at the top of the tanks. The anchors connecting the ends of the rods are offset. Most of the tanks were constructed on a concrete pad, except for Tank No. 8, which sits on a stone platform for unknown reasons. Wood gutters encircle the conical roof of each tank to collect additional water.[124]

The second generation of tanks is made up of four steel tanks dating to the 1950s (designated Tank Nos. 1, 2, 3, and 4) with capacities of 500,000 gallons each. Tank Nos. 1 and 2 serve as finished water storage, while the remaining two store the raw water. The welded steel tanks measure 20' high with a 65' interior diameter and sit on a concrete ring that rests on a foundation. They are outfitted with 6" diameter outlets, 2" diameter overflows, 6" drains, 2" diameter inlets, 24" manholes, and interior and exterior ladders up the side of the tanks. A network of pipe is located at the bottom of the tanks. A girder and rafter system inside the tank supports the roof. At the peak of the conical roofs are screened vents, "sized to compensate for 300 gallon withdrawal rate." A ladder up the side of the tank provides roof access. Water was to be collected from the roofs of the tanks, so an 8" diameter semi-circular eave trough was installed with a 4" diameter downspout.[125]

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[123] Description based on field work done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, June 1993, including Sheets 24 and 25; U.S. Department of the Interior, National Park Service, "Rain Shed," As Constructed Drawing, 1956, Sheet 3 of 7.

[124] Description based on field work done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, "Demolition," June 1993, Sheet 3.

[125] Description based on field work done by Todd Croteau, HAER, in August 2008; U.S. Department of the Interior, National Park Service, Branch of Engineering, Western Office, Division of Design and Construction, As Constructed Drawing, "500,000 Gal Steel Water Tank," Kilauea, Hawaii National Park, November 1956; Terminal Steel Company, Ltd., Hawaii National Park, Kilauea, Hawaii, "500,000 Gal Steel Water Tank, Details," 1957, Sheet 2 of 7. Photographs of the completed tank include D50 142 through 145, ca. 1957; D50 164 through 170, and D50 241 through 243, all taken by J.A. Stites, August 1957. Photograph D50 165 has identification caption: "Steel water storage tank erection complete showing general view. Photos of the lightweight metal flume connecting gutters of tanks for roof drainage water. J.A. Stites, August 1957." Photograph D50 170 has identification caption: "Establishing road bed around drainage sump near the 500,000 gallon steel tank. Spraying the layer of chips with

The third generation of tanks dates to ca. 1993 and consists of two 750,000 gallon capacity tanks and one 500,000 gallon capacity tank built of bolted steel panels with aluminum geodesic dome roofs. The fifth 500,000 gallon capacity tank (designated Tank No. 5) was installed to the northeast of the original steel tanks ca. 1993. This tank is used for raw water storage. The two 750,000 gallon capacity, raw water storage tanks (designated Tank No. 18, Asset #40178 and Tank No. 19, Asset #40177) that replaced the removed redwood tanks date to ca. 1993 and are built of bolted steel panels with aluminum geodesic dome roofs. The tanks sit on a reinforced concrete floor slab on 6" of "compacted granular material." The foundation is made up of a reinforced concrete ring wall. Aluminum ladders provide access to each tank's roof. The tanks are also equipped with a 6" PVC overflow pipe, a water level indicator, 6" drain, 4" inlet and 6" outlet.[126]

Ground Catchments

Two lined catchments are located to the east of the old rain shed and redwood tanks and are serviced by a pump house. The 1970s era catchment (Asset #21492) is located closer to the old rain shed and raw water tanks. It is the larger of the two with a square footage of 128,878 square feet. The smaller catchment (Asset #21493) is adjacent to the other one and covers 51,000 square feet. It was built ca. 1993. The catchments are connected to a pump station and to the raw water tanks by 4" and 6" mains. Each catchment is equipped with a suction intake and drain sump. A 24" reinforced concrete pipe collects water from the old rain shed and delivers it to the larger catchment.[127]

Treatment

The raw water passes through one of two roughing cartridge filters and then one of the two slow sand filter tanks. One filter tank dates to 1957, while the other was constructed around 1980. The tanks have conical roofs, each equipped with a movable sector that pivots for access along with a ladder. They are outfitted with a 4" overflow pipe, 2" outlet, 3" inlet, and a water gauge. The original tank measures 20' in diameter and 10' high. The unfiltered water enters the tank via a 2" line at the top of the tank and passes through a 3' layer of sand and then a 12" layer of graded rock before exiting the tank via the bottom 2" drain. The tank is also equipped with a 2" overflow pipe. A float switch set to turn the pump on when the tank was full and turn it off when the water drops about 2' controls the water level. A 6' water level indicator board helps park personnel monitor the tank. The original filter had a 21.8 gallon per minute (gpm) rate and a 31,416 gallon capacity per 24 hours. The clear

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bitumuls before placing a hot mix layer to seal foundation of steel tanks. J.A. Stites, 1957-59." All photographs in HAVO Archives.

[126] Description based on field work done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, "Tank Farm and Rainsheds," June 1993, Sheets 11 and 12.

[127] Description based on field work done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, "Site Plan," June 1993, Sheets 4, 5, and 11.

well stored water effluent from the filter tanks for use in backwashing operations, necessary to keep the sand in the filter clean.[128]

Pump House

The pump house, located adjacent to the filter tanks, has a shed roof and is clad in corrugated metal siding. Double doors provide access at the front façade while fixed windows provide natural lighting to the space. The pump house holds the pump and chlorinator, as well as a lab table.[129]

Overhead Pipe

A trestle originally carried a 10" aluminum pipe from the new rain shed to the raw water redwood storage tanks nearly 16' off the ground, but now carries water to the ground catchments. The structure is made up timber bents constructed of 2" x 6" cross and horizontal members bolted to supports sitting on concrete footings. Each timber bent is 15' long with ends measuring 6' wide at the bottom that narrow to just over a foot wide at the top. The timber used in construction of the trestle was specified as structural grade Douglas fir or better. The 10" aluminum pipe was to be furnished and installed by the contractor. The pipe rests on a wood block cut on the top with a half circle to accommodate the pipe. Horizontal members bolted to the top of the supports run alongside the pipe.[130]

B. Site Layout:

At the north end of the site are the two slow sand filters, clear well, and pump house, located a short distance from the main collection system and accessed by a road that connects to State Highway 11. To the west of the filter tanks is the new rain shed, Building No. 241. A collection of five 500,000 gallon steel water tanks are located south of the new rain shed. The six remaining redwood water tanks and two 750,000 gallon steel tanks are grouped east of the old rain shed, Building No. 43. The two catchments are south and east of the old rain shed.[131]

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[128] Rigging International, Kilauea Headquarters Area, "New Slow Sand Filter, Modifications to Existing Slow Sand Filter," February 6, 1980; U.S. Department of the Interior, National Park Service, "Slow Sand Filter," As Constructed Drawing, November 1956, Sheet 7 of 7; U.S. Department of the Interior, National Park Service, Branch of Engineering, Western Office, Division of Design and Construction, "Steel Tank for Slow Sand Filter," Kilauea, Hawaii National Park, As Constructed Drawing, November 1956, Sheet 6 of 7; Terminal Steel Company, Ltd., Hawaii National Park, Kilauea Hawaii, "Steel Tank for Slow Sand Filter, Tank Details," 1957, Sheet 3 of 7.

[129] Description based on field work done by Todd Croteau, HAER, in August 2008.

[130] Description based on field work done by Todd Croteau, HAER, in August 2008; U.S. Department of the Interior, National Park Service, As Constructed Drawing, "Trestle," November 1956, Sheet 4 of 7.

[131] Description based on site work done by Todd Croteau, HAER, in August 2008; San Juan Construction, Inc., As Constructed Drawings, "Headquarters Area, Site Plan," June 1993, Sheet 4.

Part III. Operations and Process

A. Operations:

In order to provide fresh drinking water for the park's visitors and residents, rainwater has to be captured, purified, and stored or distributed.

When the system shifted from its location in the Utility Area to the Headquarters Area in the late 1940s and early 1950s, it consisted of the old rain shed, under which were housed fifteen tanks of various sizes. Fourteen redwood tanks were located behind the rain shed. A pump and chlorinator completed the system.[132]

The system as completed in the 1950s collected rainwater from the roofs of the two rain sheds, as well as the tanks. Water collected from the new rain shed ran through a 10" overhead aluminum pipe resting on a trestle, to the north and east of the four 500,000 gallon steel tanks and between the old rain shed and redwood tanks. A 6" main ran between the two rows of redwood storage tanks, connecting to each tank's outlet. A 4" x 6" reducer allowed the raw water to be piped via a 4" main to the slow sand filter tank where a 4" x 2" reducer was located. After filtration occurred in the filter tank, the water exited the tank, ran through the adjacent sand trap, and then was pumped through the chlorinator and pump house via a 2" pump line to the four 500,000 gallon steel storage tanks. Water was distributed via inlets into the treated water storage tanks, which were also equipped with 6" drain valves connected to a 4" drain and recirculation line. Treated water entered the upper and lower loops of the distribution system through 8" mains with 3" pump lines running parallel. The movement of water throughout the system was controlled via gate and stop valves and reducers.[133]

The system now collects water from the roofs of the rain sheds and moves it directly into an open ground catchment. Water collected from the new rain shed is moved through a 10" pipe to the old rain shed, where it enters that building's drain system. The collected water then flows to the larger lined ground catchment through a 24" pipe. Water is also collected in the two lined ground catchments. The remaining redwood tanks that originally stored the water have been taken offline. A pumping station takes water from the ground catchments to the 750,000 gallon capacity steel raw water storage tanks via a 4" line. Other 4" lines deliver the raw water to three of the 500,000 gallon capacity steel tanks (Tank Nos. 3, 4 and 5). The raw water tanks all connect to 4" lines that deliver the untreated water to one of the two slow sand

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[132] Maps, "Water-Collection & Sewer System," and "Water Distribution-Kilauea Headquarters," March 1953, Sheets 1 & 2, available in HAVO Archives.

[133] U.S. Department of the Interior, National Park Service, As Constructed Drawing, "Schematic Flow Diagram," 1956, Sheet 2 of 7; U.S. Department of the Interior, National Park Service, As Constructed Drawing, "Water Storage & Treatment System Layout," revised 1964, Sheet 4 of 4; U.S. Department of the Interior, National Park Service, Branch of Engineering, Western Office-Division of Design and Construction, "Water System Piping," Kilauea, Hawaii National Park, As Built Status as of March 1960, 1961; U.S. Department of the Interior, National Park Service, Engineering Branch, WODC, "Water Distribution System," Kilauea Headquarters, Hawaii National Park, As Constructed Drawing, March 25, 1959, January 1958, Sheet 1 of 4.

filters. The filtered water exits the filter tanks at the opposite side of the tanks. Effluent from the filter tanks is stored in the clear well for use in backwashing operations. The filtered water then goes through one of two chlorinators before being pumped via a 4" line to one of the two 500,000 gallon steel finished water tanks (Tank Nos. 1 and 2). The finished water then enters one of the two 8" main distribution lines servicing the park. Some of the filtered water is also pumped into or from tanker trucks using the distribution pump located in Building No. 241.[134]

B. Machines:

Pumps used in the water collection system include the following: Premia 75/Solenoid Metering pump; Pono pump, ITT AC Model 606 with a 206 gpm, 179' head, 175 psi, 12/93; and Fresh Water pump, ITT AC Model 800 with 41 gpm, 38' head.[135]

C. Technology:

There were two types of filtration available when HAVO was establishing its collection system: slow sand filtration and rapid sand filtration. Both filters use sand as the filtering medium, but there are distinct differences in how they operated. In slow sand filters, also known as English filters since they originated and were widely used there, water filtered slowly through beds of sand without the use of chemicals. The water passes "downward by gravity through beds of sand of certain depth" leaving most of the bacteria on the sand's surface.[136] Rapid sand filters, on the other hand, use chemicals to help settle the bulk of particles out of water via the sedimentation and coagulation processes before filtration occurs.

Slow sand filtration was used in the United States as early as 1832 at Albert Stein's plant in Richmond. Its first successful application was in a plant located in Poughkeepsie, New York, which was based on James P. Kirkwood's proposed plant for St. Louis that looked to European models of filtration.[137] The main issue with slow sand filters in this country, particularly in the Midwest, was that "the suspended particles of clay in the highly turbid waters…do not adhere to the grains of sand, but pass through the filter, bringing with them many infectious bacteria."[138] Thus, rapid sand filtration became the preferred method. In the roof collection system used at HAVO, however, such concerns about water turbidity were not present and allowed the use of the less complex slow sand filter rather than the rapid sand filter, with its need for multiple structures and chemical usage. The installation of a slow sand filter system at Hawaii Volcanoes National Park and the construction of additional

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[134] San Juan Construction, Inc., "Headquarters Area, Site Plan," June 1993, Sheet 5.
[135] Information provided by park staff, December 2008.
[136] James H. Fuertes, *Water Filtration Works* (New York: John Wiley & Sons), pp. 75-76; George D. Norcom and Kenneth W. Brown, "Water Purification for Plant Operators," (New York: McGraw-Hill Book Company, Inc., 1942).
[137] J. Michael LaNier, "Historical Development of Municipal Water Systems in the United States 1776-1976," *Journal of the American Water Works Association* 68, no. 4 (April 1976): p. 179.
[138] LaNier, p. 179.

collection structures supported the growth of the park and eased concerns about availability of clean drinking water.

Part IV. Sources of Information

A. Primary Sources

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Public Health Program

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Many files on this site are in Adobe Acrobat format.

With almost 400 National Park Service (NPS) sites and hundreds of millions of visits per year, a large potential exists for exposure to disease agents within the NPS system.

The National Park Service Office of Public Health (OPH) is an internal agency-specific public health capability, managed, funded and operated by NPS. This program is primarily staffed with commissioned officers on detail to the agency from the United States Public Health Service and is a national activity headquartered in Washington, DC with field staff located across the NPS system.

Through disease surveillance and response, on-site evaluation/hazard analysis, consultation, policy guidance, and coordination with local, state and other federal health jurisdictions, OPH professionals assist park superintendents to protect and promote visitor health in the frontcountry and backcountry/wilderness.

The NPS OPH conducts work in all of the following primary programmatic areas:

1. Environmental Health - OPH field staff assist park units with the identification and reduction or elimination of public health hazards through comprehensive on-site evaluations and consultations that focus on four priorities.
   - Drinking Water - The NPS owns and operates approximately 1,300 drinking water systems. On-site visits are used to evaluate the degree of control that park units have over critical drinking water safety issues and to provide guidance about compliance with applicable regulatory requirements.
   - Wastewater - The NPS operates a wide variety of wastewater facilities, ranging from pit privies to advanced wastewater treatment plants. OPH professionals conduct plan reviews and evaluate the operation and maintenance of these systems. Compliance with primacy agency regulations is also evaluated and communicated to park unit managers.
   - Food Safety - Food service facilities of all types, both permanent and temporary, are evaluated by OPH professionals. Consultation is provided to concessioners in risk reduction and strategies for reducing the potential of foodborne illness, chemical poisoning, or accidental injury.
   - Backcountry Operations - The basic National Park Service policies for food, water, and waste sanitation are stated in Directors Order 83, sections A, B, and C and are delineated in greater detail in the accompanying reference manual to each section above. However, there are numerous activities which occur in the backcountry of many National Parks, that sometimes create sanitation issues that require solutions different than those for more permanent facilities. Examples of such activities include but are not limited to, white water rafting, horse packing, bicycle tours, jeep tours, snowmobile tours, trail crews, and backcountry ranger cabins. While conditions in the backcountry are often different from developed areas, the basic principles of disease prevention are the same (e.g. the need to control the growth of disease causing microorganisms by properly treating drinking water and/or by maintaining foods at proper temperature).
   - **Recreational Waters** - Bathing Beaches, Swimming Pools and Spas, both permanent and seasonal, are evaluated by OPH professionals. Consultation is provided to concessioners in risk reduction and strategies for reducing the potential of waterborne illness, chemical poisoning, or accidental injury.
   - Zoonotic and Vectorborne Diseases - OPH staff work with wildlife health and (IPM) coordinators to identify diseases of animal origin that might be transmitted to people and determine the best risk reduction strategy consistent with NPS management policy.
2. Disease Detection and Response - The OPH conducts investigations of disease outbreaks that occur in the National Park System. Supported by a medical epidemiologist, OPH staff work with park units to detect disease transmission, limit impact, investigate root causes, and utilize this information to improve visitor protection. Diseases and Illnesses can be caused by Infectious Agents (Waterborne, Foodborne & Vectorborne) or Chemical and Environmental Agents such Fish Advisories.
3. **Comprehensive** Public Health Protection and Promotion - OPH staff work with programs, regions, and parks to identify all public health issues and to design and implement effective and efficient intervention strategies.
4. Emergency Preparedness and Response - The OPH provides leadership and coordination of NPS preparedness initiatives for public health emergencies. Public health officers serve as ready responders providing public health services during natural disasters and intentional acts.

Points of Contact

Hot Topics

- OneHealth Fall 2013 Newsletter
- Microgrant opportunities to engage Park and health leaders through inspired hikes in America's National Parks
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National Park Service

DIRECTOR'S ORDER #83: PUBLIC HEALTH

Approved: /s/ Donald W. Murphy (signed original on file)
(for) Director

Effective Date: October 21, 2004

Sunset Date: October 21, 2010

This renewed edition of Director's Order #83 is essentially the same as the edition that was scheduled to sunset August 3, 2007. The only revision is in Section B.6, which now allows park unit managers to consider for front country use suitable alternate wastewater systems (such as composting and evaporative toilets), in consultation with the assigned Regional Public Health Consultant or Park Environmental Health Officer/Sanitarian.

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I. Background and Purpose

The National Park Service hosts nearly 300 million visitors to the national parks each year. To provide for visitor enjoyment of the parks, the NPS operates (directly or indirectly) water supply systems, waste management systems, food service operations, bathing beaches, swimming pools and overnight accommodations. In most cases, there are Federal, State and/or local codes--designed to protect the public health--that govern the conditions under which these facilities and services are provided. To ensure these facilities and services are operated in a safe and healthful manner and according to existing public health laws and regulations, the NPS Public Health Program (PHP) conducts health risk and environmental compliance assessments. The PHP provides technical assistance to parks on request. PHP staff provides training to NPS personnel in the recognition and management of health risks, and provides health awareness information in the form of factsheets, messages in the

Operational Notes section of the Ranger Morning Reports, and on its NPS internet website (http://www.nps.gov/public_health/) and the InsidePublicHealth intranet website (http://www.nps.gov/public_health/intra/).

The purpose of this Director's Order is to outline what the NPS will do to ensure compliance with prescribed public health policies, practices and procedures. This order establishes NPS policy with respect to all public health activities within areas of NPS jurisdiction, regardless of whether those activities are carried out by NPS or other Federal employees, or by other organizations, including the U.S. Public Health Service (PHS). The core PHP includes prevention, control and investigation of food-, water-, and vector-borne diseases in the national parks.

This Director's Order, and Reference Manual 83 (RM83), supersede and replace Director's Order-83 dated August1998 and any other previously issued policy or procedural statements that may be at variance with the policies and procedures stated herein. It applies to all facilities and services provided in the parks, whether by the NPS directly, or by concessioners, leaseholders, or permittees.

II. Authority

The authority to issue this Director's Order is contained in 16 U.S.C. 1 through 4 (the National Park Service Organic Act), and Part 245 of the Department of the Interior Manual.

III. General Policy

A. It is the policy of the NPS to protect the health and well-being of NPS employees and park visitors through the elimination or control of disease agents and the various modes of their transmission to man and to ensure compliance with applicable Federal, State and local public health laws, regulations and ordinances. Implementation of this policy will be tempered by the Organic Act's requirement that the NPS conserve the scenery and natural and historic objects and the wildlife therein in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

B. The Associate Director, Visitor and Resource Protection, will issue RM83 to provide more detailed information on the public health policies, practices, procedures and standards that park managers must adhere to in providing facilities and services to the public.

C. Based on the unique circumstances and conditions of National Park Service sites, the Public Health Consultant (PHC) has the discretion to recommend adaptations to these requirements considering specific site conditions and relevant authority under the law.

IV. Operational Policies and Procedures

A. Drinking Water

NPS unit managers will reduce the risk of waterborne diseases and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, monitored, and deficiencies promptly corrected. Water systems will be regulated in accordance with 1) the Safe Drinking Water Act, as amended (42 U.S.C. 7401 et seq.), or 2) the Primacy Agency (e.g. the agency designated by

Federal law as having oversight responsibility). Additional guidance for non-public or other unregulated water systems is provided in RM83(A1).

A.1 All parks that operate public drinking water systems will have certified operators as required by the primacy agency. Parks that operate only non-public drinking water systems will have appropriately trained operators.

A.2 NPS unit managers will develop training plans and assure that operators receive any required and/or appropriate training.

A.3 NPS unit managers will assure that required records are maintained in permanent files for periodic review by the regional Public Health Consultant (PHC) or Primacy Agency representatives, and that reports are submitted on a timely basis as requested by the PHC and/or the Primacy Agency.

A.4 Bacteriological and chemical sampling will be performed in accordance with Federal, State and local laws/regulations. In the absence of Federal, State and local regulation, systems will comply with the requirements of RM83 (A1).

A.5 All water samples will be tested in laboratories certified by the Primacy Agency.

A.6 All surface water sources and any groundwater sources under the direct influence of (GWUDI) surface water, as determined by the Primacy Agency for public systems will be provided with approved filtration. Non-public surface water sources and groundwater sources under the direct influence of (GWUDI) surface water, as determined by the PHC, will be provided with approved filtration.

A.7 All public drinking water systems will be continuously disinfected. Acceptable disinfecting methods are those which provide a measurable disinfectant residual in the distribution system. The PHC may specifically exempt non-public systems after a complete sanitary survey of the system is made.
A.8 For park-operated, public drinking water systems utilizing a chemical disinfectant, one (1) disinfectant residual sample will be measured and recorded per day from representative points. Parks operating non-public drinking water systems or receiving water from municipalities should contact the PHC for residual monitoring guidance.

A.9 Sanitary surveys for State regulated, public drinking water systems will be conducted in accordance with Primacy Agency requirements. The PHC may conduct sanitary surveys of unregulated and/or non-public water systems.

A.10 All parks operating drinking water systems will have a documented cross connection control program on file for review by the Primacy Agency and/or the PHC (See RM83(A2)).

A.11 Water for all NPS water hauling operations, whether conducted by the park or a private contractor, will be obtained from an approved water source that meets the requirements of the Safe Drinking Water Act.

A.12 All parks will comply with the public notification requirements of the Safe Drinking Water Act.

A.13 When drinking water system modifications or new construction is proposed, parks will contact the Primacy Agency to determine if plans and specifications should be submitted for approval. A copy of the plans and specifications will be provided to the PHC upon request.

A.14 Potable water for backcountry operations must be 1) obtained from an approved public system, 2) boiled, or 3) filtered and disinfected.

B. Wastewater

NPS unit managers will reduce the risk of waterborne diseases and provide safe wastewater disposal by ensuring wastewater systems are properly operated, maintained, monitored, and deficiencies promptly corrected. Wastewater systems will be in compliance with 1) the Clean Water Act, as amended (33 U.S.C. 1251 et seq or 2) the Primacy Agency (e.g. the agency designated by Federal law as having oversight responsibility). Additional guidance for non-public or other unregulated wastewater systems is provided in RM83(B1).

B.1 NPS unit managers will ensure operators are adequately trained and certified in accordance with operator requirements of the Primacy Agency. Park managers will designate, in writing, primary operators, and backup operators who have adequate training and skills to operate the system(s). Parks that operate only individual, on-site wastewater systems will have appropriately trained operators.

B.2 NPS unit managers will develop training plans and assure that operators receive any required and/or appropriate training.

B.3 NPS unit managers will assure that required records are maintained in permanent files for periodic review by the PHC or Primacy Agency representatives and that reports are submitted on a timely basis as requested by the PHC and/or required by the Primacy Agency.

B.4 When wastewater system modifications or new construction are proposed, parks will submit plans and specifications to the Primacy Agency for approval. A copy of the plans and specifications will be provided to the PHC.

B.5 All wastewater facilities will be installed, operated and monitored in accordance with Primacy Agency requirements.

B.6 Typical front country wastewater systems include flush toilets, vault toilets, and chemical toilets (used only for temporary purposes). Where conditions are suitable, alternate wastewater systems, such as composting and evaporative toilets may be considered for front country use. Park unit managers must contact the assigned Regional Public Health Consultant or Park Environmental Health Officer / Sanitarian for guidance and advice when planning to install, upgrade, or make substantive changes to any wastewater system. All wastewater systems must be installed and operated according to the manufacturer's instructions and in compliance with Primacy Agency requirements.

B.7 Suitable backcountry waste systems include flush toilets; composting toilets; barrel toilets; evaporator toilets; incinerator toilets and pit privies. Pit privies should only be used as a last resort where other types of facilities are not possible. The Park Sanitarian or the PHC should conduct the siting of pit privies.

B.8 All new vault toilets will incorporate the U.S. Forest Service Sweet Smelling Toilet (SST) design features. Vault toilets will be pumped as necessary. The U.S. Forest Service In-Depth Design and Maintenance Manual for Vault Toilets is provided in RM83(B2).

B.9 All toilet facilities will be cleaned and re-supplied as often as necessary to maintain a high degree of sanitation. The U.S. Forest Service guidance manual Cleaning Recreation Sites is provided in RM83 (B3).

B.10 Adequate sanitation facilities will be required for remote areas such as river rafting, horseback riding, back country biking, backpacking and similar activities in accordance with RM83(F).

B.11 Septic tanks shall be inspected annually to determine the amount of accumulated scum and sludge. Records of septic tank measurements, inspections, and pumping will be available for review by the PHC. Septic tank risers will be provided for inspection holes to facilitate inspection and pumping. Septic tanks will be pumped when the scum and or sludge levels in the tank dictate (generally every 3-5 years). The bottom of the scum should never be closer than 3 inches to the bottom of the outlet device, and the top to the sludge layer should never be less than 8 inches from the bottom of the outlet device.

B.12 Septic tank drain fields shall be surveyed annually during a high use period to identify system failures such as odors and surfacing wastewater. The drain field should be kept clear of trees and bushes, which may send roots into the drain field piping system resulting in clogging and causing premature failure.

B.13 Personnel who routinely come into contact with sewage, work in, or inspect wastewater treatment facilities, lagoons, etc. will have a current immunization for tetanus.

B.14 Wastewater treatment plant personnel will not eat, drink or smoke when performing maintenance or inspecting equipment, which may be contaminated with human sewage.

B.15 In the event of a major wastewater leak or spill, the PHC will be notified within one business day. Facilities and equipment contaminated with sewage as a result of leaks, spills, and sewage system backflow will be thoroughly washed down with water and detergent. Further guidance is provided in RM83 (B4) - Raw Sewage Spill Notification and Cleanup

C. Food Safety and Sanitation

NPS unit managers will reduce the risk of foodborne illness to employees, the visiting public, and park partners by ensuring that all food service facilities are operated in accordance with the most recent edition of the FDA Food Code, unless specifically exempted by PHC, and DO48. Food operations include but are not limited to NPS operations, concessioner operations, special events, incidental business permit operations and emergency incidents. The FDA Food Code is provided in RM83(C1).

C.1 All permanent food service facilities will be inspected according to schedules established by the PHC and concession program manager.

C.2 Temporary food service operations (stationary and non-stationary facilities) will meet the same general requirements as permanent facilities by complying with the FDA Food

Code and consulting with the regional PHC to determine additional recommendations and alternative compliance options to the Food Code. See RM83(C2) for additional guidance on temporary food service operations and RM83(F) for backcountry operations.

D. Recreational Waters

NPS unit managers will reduce the risk of waterborne diseases by ensuring that recreational water sites are properly operated, maintained and monitored in accordance with state or local regulations. Deficiencies will be promptly corrected with applicable state/local regulations. In the absence of applicable state or local regulations, the following NPS policies will apply.

D.1 Bathing Beaches. NPS unit managers will reduce the risk of waterborne diseases by ensuring designated bathing beaches are properly operated, maintained and monitored. Deficiencies will be promptly corrected, in compliance with the Beaches Environmental Assessment and Coastal Health Act of 2000 and applicable state/local regulations. In the absence of applicable state or local regulations, the following NPS policies will apply. Bathing beaches can be located at lakes, rivers, oceans, hot springs, and other bodies of water. Additional guidance is provided in RM83(D1). The complete Beaches Environmental Assessment and Coastal Health Act of 2000 can be accessed at: http://www.epa.gov/ost/beaches/beachbill.pdf.

a. Bathing beach monitoring is required for each designated beach. Designated beaches are those that the Park has identified (using signs, brochures etc.) as available to the public for contact recreational water activities. Monitoring is recommended for other areas that are heavily used (40 or more people per 100 linear feet of shoreline). Specific requirements of the monitoring program include:

(1) Conducting a sanitary survey;

(2) Preparing a bathing beach monitoring protocol. This protocol includes the names of areas to be sampled; sampling station locations; a map or sketch of each area showing the location of each sampling station; bacterial standard used; and the name of the laboratory doing the bacterial analyses;

(3) Sampling for enterococcus or Escherichia coli bacteria levels; and

(4) Issuing swimming advisories when bathing beach waters exceed the bacterial standards.

b. A copy of the bathing beach monitoring plan and current bathing beach sanitary survey report will be sent to the PHC for review and concurrence approximately 1 month before the beginning of the recreational season.

c. Samples will be collected in conformance with the most recent edition of Standard Methods for the Examination of Water and Wastewater.

d. Analyses will be done in conformance with the most recent edition of Standard Methods for the Examination of Water and Wastewater. Parks that have their own laboratory should meet state certification requirements. Parks that do not do their own sample analyses will use a certified microbiological laboratory.

e. Parks will submit bacteriological sampling results to the PHC.

f. When the applicable bacterial density standard is exceeded, Park managers will report the bacterial density results to the PHC and the applicable state agency. Advise the PHC, applicable state agency and the local news media that a health advisory regarding the affected area will be posted. The advisory will notify the public of the potential health risks from swimming at the designated beach. The affected beach will be re-sampled immediately by taking two samples each day at each sampling location where the bacterial standard was exceeded. Re-sampling will be continued until the bacterial standard is not exceeded for two consecutive days. The PHC can waive this re-sampling requirement. Resume routine monitoring and notify the PHC, the local public health agency and the news media of the decision to reopen the beach. All signs should be removed.

D.2 Swimming Pools. NPS unit managers will reduce the risk of waterborne illness by ensuring that NPS and concessioner swimming pools are properly constructed, operated, maintained, monitored, and deficiencies promptly corrected in accordance with applicable state or local regulations. In the absence of applicable state/local regulations, the NPS has adopted "The National Pool and Spa Institute's ANSI Standard for Public Swimming Pools" as policy. A copy of this standard is provided in RM83(D2).

D3. Spa and Hot Tubs. NPS unit managers will reduce the risk of waterborne diseases by ensuring that NPS and concessioner run spas and hot tubs are properly constructed, operated, maintained, monitored, and deficiencies promptly corrected in accordance with applicable state or local regulations. In the absence of applicable state/local regulations, the NPS has adopted "The National Pool and Spa Institute's ANSI Standard for Public Spas" as policy. A copy of this standard is provided in RM83(D3).

E. Illness Surveillance and Initial Response

NPS unit managers will reduce the risk of waterborne, foodborne and vectorborne diseases by designating, in writing, a person responsible for implementing and coordinating the Illness Surveillance and Initial Response Program. Responsibilities include maintaining reporting logs, notifying PHC's or WASO Public Health when a suspected outbreak is occurring, and coordinating, at the park level, the appropriate response. When a Sanitarian or Environmental Health Specialist is located in the park, that person should be designated as the Illness Reporting Program Coordinator. A copy of the written designation will be provided to the PHC. Additional guidance is provided in RM83(E).

E.1 When a foodborne, waterborne, vectorborne or occupational illness is suspected, the Illness Surveillance and Initial Response Coordinator will contact the PHC for advice and support. At the direction of the PHC, request assistance from applicable local, state, or Federal public health agencies that are staffed with trained public health professionals. Depending upon park jurisdiction, federal agencies will respond only at the request of local health departments.

E.2 NPS unit managers will take any appropriate steps to restrict or close, in whole or in part, any establishment, facility, or operation when evidence suggests an outbreak of disease may be occurring, or recurring. These steps may include the closure of the entire park or portion thereof where conditions warrant. This authority may be found in 36 CFR 1.5. Such a decision should be made after careful consideration of all facts, and in consultation with the

PHC, the Illness reporting Coordinator, and involved local/state/federal health officials.

E.3 NPS unit managers and/or the Public Affairs Officer will decide when or if a news media release is appropriate.

E.4 The Illness Surveillance and Initial Response Coordinator, and where appropriate, dispatch centers, district rangers, and NPS unit managers will maintain a list of applicable telephone numbers for PHC's and applicable local and state health agencies.

E.5 The park concession office will be notified when an illness investigation is conducted in a concessioner's facility.

E.6 Persons who complain of illness while in a park will be referred to a health care provider for evaluation, and possible laboratory confirmation.

E.7 For guidance on collecting, storing, shipping and analysis of samples, the Illness Reporting Coordinator will consult with the PHC or local/state/federal consultants contacted for support.

E.8 The Illness Surveillance and Initial Response Coordinator will keep the NPS unit manager informed of the status of the investigation. A written summary of the investigation should be submitted to the NPS unit manager, with a copy to the PHC within 30 days. The report should include pertinent information such as the number of ill persons, symptoms, diagnosis (confirmed or suspect), duration of outbreak, action taken, conclusions, and recommendations to prevent similar outbreaks from occurring.

F. Backcountry Operations

NPS unit managers will reduce the risk of waterborne, foodborne and vectorborne diseases by ensuring that all backcountry water, wastewater and food operations (NPS, concessioner, special events, incidental business permits and emergency incidents) are operated in accordance with current Public Health regulations and policies. Additional guidance is provided in RM83(F).

F.1 Potable water for backcountry operations must be 1) hauled from an approved public system, or 2) boiled, or 3) filtered and disinfected.

F.2 Adequate sanitation facilities are required for remote activities such as trail maintenance, fire fighting, ranger stations, river rafting, horseback riding, backcountry biking, backpacking, and similar activities.

F.3 NPS Park Managers will ensure that all backcountry food service operations (stationary and non-stationary facilities) meet the same general requirements as permanent facilities by complying with the FDA Food Code and consulting with the PHC to determine additional recommendations and alternative compliance options to the FDA Food Code.

G. Vectorborne and Zoonotic Disease

G.1 NPS unit managers will reduce the risk of transmission of vector-borne and zoonotic diseases to park visitors and employees through education, surveillance, and control efforts

when necessary. Control procedures will reduce risk while minimizing adverse impact on natural and cultural resources. The NPS will follow an integrated pest management approach in addressing vector-borne disease issues as outlined in Director's Order 77-7.

G.2 At minimum, parks shall establish a point of contact at the local public health and/or vector-borne disease control agency in order to keep up to date on potential and current trends in vector-borne disease prevalence in and around the park. Some parks may need to assign an individual to coordinate vector-borne disease issues based on an elevated risk and the recommendation of the PHC.

G.3 The designated park staff member responsible for addressing vector-borne and zoonotic disease issues will have the responsibility to implement the recommendations of the PHC. Whenever possible, this individual should be the park Integrated Pest Management (IPM) coordinator or the park sanitarian. The duties and responsibilities may include:

- Coordinate with local and state departments of health, PHC, and IPM program coordinator.
- Ensure educational materials are available for park staff and visitors, and conduct or coordinate preventive education and training sessions.
- Establish and maintain a passive surveillance program within the park.
- Coordinate active surveillance activities within the park.

G.4 Guidance and information will be provided on specific diseases by the Zoonotic, Vector-borne and Environmentally Transmitted Disease (ZED) Steering Committee, a collaborative effort of the Biological Resource Management Division, Public Health and Risk Management Programs. Further information on ZED can be found at http://www.nps.gov/public_health/zed/zed.htm.

----------End of Director's Order----------

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 9, 2015**
Report Subject **Telephone Interview of Matthew Duryea**	

On February 23, 2015, Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed by telephone Matthew Duryea, a program assistant with Hawaii Volcanoes National Park (HAVO), who had submitted allegations to the Office of Special Counsel (OSC) related to the potable water system at the park. Balestra read to Duryea the Warnings and Assurances for Voluntary Interviews notification since Duryea had not yet emailed the form back to her with his signature. He provided the form after the interview. The following is a summary of the interview, which was recorded with Duryea's consent.

Duryea said that he had worked for HAVO since December 2010, and he was currently a GS-level 6 employee. He said that as a program assistant, he was responsible for doing data entry, issuing park keys, distributing mail, and being a liaison with the Human Resources office, among other duties. He said that his supervisor was Budget Analyst Jill Lippert.

According to Duryea, his complaints to OSC stemmed from concerns about safety at HAVO and "mounting" personnel and management concerns. He said that HAVO management's failure to act on various issues led him to submit his claims.

Duryea said that his knowledge of problems with HAVO's potable water system began when he was being considered for the role of backup for the park's water treatment operations. He said that he had experience with water treatment from working in the military, and HAVO had him spend a great deal of time in late 2013 and early 2014 in training and learning about the water operating system from maintenance mechanic Phil Gagorik. During this time, he said, he noticed problems with HAVO's water system, and he also came across an environmental health survey that outlined various issues.

According to Duryea, he had spoken with numerous employees about problems with HAVO's water system, including Gagorik, Buildings and Utilities Supervisor Tom Foster, Motor Vehicle Operator Lead Jeff Thacher, and Facilities and Grounds Supervisor Daniel Ortiz. During this time, he said, Ronald Borne was the chief of the park's maintenance division. When Borne went on a detail, he said,

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Trails Supervisor Rodney McCollam and park employee Joanna Dixon each served in an acting capacity as the chief of maintenance. Currently, he said, Foster was the acting chief of maintenance.

We asked Duryea about the absence of "backflow" preventers in HAVO's water system, which was outlined as a concern in OSC's request for an investigation. Duryea said that the backflow preventers were a recent issue at the park, explaining that his understanding was that HAVO did not have any backflow preventers, and no one there was trained in backflow prevention. Duryea explained that the purpose of a backflow preventer was to prevent contaminants from entering the water system by reducing the water pressure. Without backflow preventers in place, he said, contaminants could be drawn into the system. When asked, however, Duryea said he knew of no evidence showing that this had actually occurred. He said that HAVO had purchased the equipment to install the backflow preventers, but he was not sure if installation had happened.

Equally important to the issues with the backflow preventers, Duryea said, was HAVO staff's treatment of water without the presence of a certified water treatment plant operator. He stated that if failures in the water system occurred while an operator was not present, the effects could be devastating. Duryea explained that Gagorik was HAVO's sole "Level 2" certified water treatment plant operator and the only individual certified to inject chemicals into the water system. Duryea said that Gagorik had no backup when he was off duty. He also stated that HAVO's water treatment needs exceeded what Gagorik could manage in an 8-hour day. He said that he believed the water was being treated overnight by a pump on a timer when Gagorik was not present, which he believed was not within the State of Hawaii's policy guidelines. When asked why it was important for an operator to be present when the water was being treated, Duryea said that chlorine "residual" testing needed to be done every 4 hours.

Duryea believed that Jodi Yamami, an employee with the Hawaii State Safe Drinking Water Branch, had sent a letter to HAVO to immediately correct the deficiency caused by the absence of certified operators. He said that HAVO had responded with a list of individuals who would immediately get certifications; however, some did not take the certification test and the ones who did failed, so the problem persisted. Duryea also said that Foster, who was responsible for overseeing the water distribution system, was required to have the same certifications as Gagorik, but he did not. In addition, according to Duryea, Thatcher was a Level 1 operator, and in the past, HAVO had improperly informed the Hawaii State Safe Drinking Water Branch that Thatcher was a Level 2 operator. Duryea said that he paid to take the test to become a Level 2 operator in June 2014 but was eight points short of passing. HAVO would not pay for him to take the test, he said, because of concerns about the "overload" of work he was already receiving.

Duryea discussed other concerns he had about HAVO's water system, including pictures he had seen of open or improperly sealed hatches on the tops of water tanks. He believed that this left the water tanks vulnerable to rats getting in. Duryea also said he did not think that chlorine and other chemicals were properly stored, labeled, or handled at the park, and HAVO had no procedures for handling chemicals. In addition, he said, staff had expressed concern that HAVO's "vault" toilets did not have liners and were basically situated over cracks in the earth; however, he believed waste getting into the water system was unlikely due to the toilets' distance from the raw-water ponds. According to Duryea, HAVO was required to send out samples of its drinking water for testing, and he did not believe that any issues of concern had ever been identified.

Duryea stated that, overall, HAVO's water distribution infrastructure was "very dilapidated." He said that the water system had distribution and pressure pumps that were critical to the system, but were failing and past their life expectancy. The current system, he said, was made of steel; new polyethylene pipes had been purchased as a replacement but had never been used, and these pipes had been sitting for years.

When asked where the fault for the problems with HAVO's water system rested, Duryea said that it was with HAVO Superintendent Cindy Orlando. He said that she had been informed of safety violations and hazards at HAVO and had ignored them, choosing instead to focus on cultural or "natural" concerns; all of HAVO's funding and attention had been on endangered species and fence control issues, and the maintenance division had been left "in limbo" for some time. Duryea believed that Orlando had met with the Hawaii State Safe Drinking Water Branch and was aware of concerns with the water system.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 13, 2015**
Report Subject **Interview of Craig Ungerecht**	

On February 25, 2015, Special Agent Michael Graziano telephonically interviewed Commander Craig Ungerecht, U.S. Public Health Service (USPHS), Regional Public Health Consultant, National Park Service (NPS), San Francisco, CA, concerning an environmental health survey Ungerecht had conducted at Hawaii Volcanoes National Park (HAVO) in December 2013. Ungerecht agreed to be interviewed and consented to the interview being recorded. Prior to the interview, Graziano provided Ungerecht with a Warnings and Assurances for Voluntary Interviews form, which Ungerecht signed and returned via email. The following is a summary of the interview.

Ungerecht said that he had been working in the field of public health for approximately 22 years. He stated that he was a commissioned officer in USPHS, but was detailed to the U.S. Department of the Interior with a specific assignment to NPS as a public health consultant. He explained that public health consultants conduct sanitary surveys once per fiscal year at national parks that have public water systems, and that the consultants provide recommendations based on their observations during those surveys. Parks were not required to respond to environmental health surveys, however, because the surveys were done by consultants and were not regulatory.

Ungerecht stated that his routine during these surveys was to meet with the relevant park staff to discuss any previous surveys and the work planned for the current survey. Ungerecht explained that a park's facility manager or chief of maintenance was generally responsible for water systems, but superintendents had overall responsibility for any activity in the park they supervised. Ungerecht also reviewed water operator certifications and visited each water system site in the parks. He typically took handwritten notes during surveys and occasionally photographed specific locations.

Ungerecht said that he conducted two environmental health surveys at HAVO, one in February 2013 and one in December 2013. During both surveys, he examined the water system, wastewater system, and matters related to food sanitation.

***Agent's Note**: Information provided by Ungerecht and noted in this report pertained to the environmental health survey he conducted at HAVO in December 2013.*

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At the time of Ungerecht's December 2013 survey, HAVO's permanent facility manager, Ron Borne, had been detailed to another park, so he was not present. Ungerecht did not meet with HAVO Superintendent Cindy Orlando during this visit either. Steve Brum, who was the park's engineer and also a USPHS officer, hosted Ungerecht during his visit and escorted him to various water locations. Ungerecht stated that Brum had some knowledge of HAVO's water system, but he did not know if Brum was responsible for managing the system.

For the most part, Ungerecht noted many of the same deficiencies in both of the surveys he conducted in 2013; he said that in December HAVO had not corrected the deficiencies he noted in February, but this was not unusual. Ungerecht had no contact or follow-up with HAVO staff since December 2013, so he did not know what, if any, corrective actions had been taken since then.

Ungerecht discussed the "Operator Certification" portion of his December 2013 survey report. He explained that he examined four different certification categories, and each category's certifications were graded 1 through 4, with 4 being the highest. The "Water Treatment" category had to do with treating water to make it potable prior to distribution and use; "Water Distribution" pertained to the water delivery system; "Wastewater Collection" related to small wastewater systems, like septic tanks and drain fields; and "Wastewater Treatment" pertained to large wastewater collection sites. HAVO did not have any systems that fell into the "Wastewater Treatment" category.

Ungerecht said that HAVO was required to have one person on staff certified for water distribution, and it was highly recommended that this person have a backup. Even though no one at HAVO held a wastewater collection certification, Ungerecht found during his survey that these systems were operating as designed.

In his December 2013 survey report, Ungerecht made several observations under the "Parkwide Water Observations & Recommendations" heading. During the interview, he provided commentary on each one:

- "There is no locked security gate to the water collection and storage site." Ungerecht stated that since September 11, public health consultants have always recommended that water collection and storage sites be secured, but he did not know whether security was required by regulations. According to Ungerecht's survey report, the Park had submitted a project to correct this issue.
- "There have been several major breaks recently in the distribution system which could be due to the age of the system." Ungerecht said that waterline breaks are common in older water systems like the one at HAVO, and these breaks could have a negative impact on the water supply, such as the introduction of dirt and contaminants, if not corrected. According to Ungerecht, HAVO repaired any breaks as they were discovered. He said that the lifespan of a water system varies based on wear and tear. At the time of his survey, HAVO staff indicated that replacing the system had been discussed, but he did not know if further action had been taken.
- "The backflow prevention assemblies are not being tested by a certified inspector on an annual basis." Ungerecht said that HAVO had backflow assemblies, but no one on staff was certified to inspect them annually as required. In addition, HAVO had no documentation to show that the assemblies were being inspected. He explained that most parks do not have staff certified for backflow systems, so they routinely contract out the annual inspections. HAVO could have contracted out its inspections, but HAVO staff did not produce any evidence that an inspection

had been done recently. Ungerecht said that, to the best of his knowledge, all locations at HAVO that required backflow assemblies had them in place. Ungerecht himself was not certified to inspect backflow systems and therefore did not know the operational status of HAVO's systems during his visit.

Ungerecht's report also noted several observations under the "HAVO Water System" heading of his survey. He explained these as well:

- "The berms that surround the two catchment ponds were found not to be high enough to prevent water from the road for entering the ponds." While driving a vehicle around the ponds during the visit, water from the road was splashing into the collection ponds. Ungerecht did not know if berms had a recommended or required height, but said that the residual effect of water splashing into the ponds was that more chemicals would be needed to treat the water before it could be distributed. His report recommended that HAVO raise the berms to a height that would prevent the introduction of water from the roadway.
- "There are several activities in the HVO [Hawaii Volcano Observatory] that may contaminate the water system in the event of a backflow condition." Ungerecht said that a backflow preventer was required at this location, but he could not specifically recall whether there was one at the time of his visit.
- "The fire sprinkler system at the Jaggar Museum is not equipped with a backflow device." Ungerecht said that this location was required to have a backflow device to prevent stagnant water from the sprinkler system from flowing back into the water supply.
- "The exterior of the HVO [Hawaii Volcano Observatory] water storage tanks showed signs of oxidation and corrosion." Ungerecht explained that it was important for the metal tanks not to be exposed directly to the water because the water's high acidity could cause rapid corrosion. According to Ungerecht, HAVO had seven or eight water storage tanks, some of which were being repainted at the time of his visit and others that HAVO was planning to repaint.
- "At the TLT [Thurston Lava Tube] comfort station the inline booster pump pressurizes the hydropneumatic tank for comfort station use." The existing redwood storage tank is no longer on line. No additional storage is provided. Ungerecht said that there was no water storage at that comfort station. He explained that it would be better for HAVO to have storage there rather than pump water to that location through the distribution line.
- "The water storage tanks have not been cleaned in recent years. Sediment can accumulate and increase the chlorine demand, reducing available disinfectant for the distribution system." Ungerecht said that he presumed at the time of the survey that the tank had not been cleaned given the buildup of sediment inside it. He said that sediment buildup is more of a maintenance issue than a health issue because the sediment could get into the treatment system and clog it. Ungerecht stated that this condition was common throughout the national park system.
- "The lagoon liners for rain catchment are blistering and delaminating in several places. The cause is unknown." The liners are over 20 years old and may be reaching the end of their life expectancy. Ungerecht said that HAVO was in the process of replacing the liners, with one replacement scheduled to occur in fiscal year 2014. He stated that liner replacement was an expensive endeavor, and the only effect of a defective liner would be the loss of collected rainwater, which could lead to a shortage of water at the park during the dry season.
- "Exterior paint on the slow sand filters is oxidizing." Ungerecht explained that a fresh coat of paint on these filters would prevent corrosion and oxidation.
- "The water storage tank's exterior paint at the rainshed area is peeling." Ungerecht believed

that HAVO was correcting this issue at the time of his visit and that the tank was one of several storage tanks projected to be painted.

- "The rainshed roof is in very poor condition. If not repaired or replaced in the very near future, failure could result and there would be significant loss in rainwater collection." As with the pond liner observation, Ungerecht said that the effect of this issue would be the loss of collected rainwater.

Ungerecht noted one relevant observation under the "Wastewater Systems" heading of his report:

- "The effluent from the septic tank at Thurston Lava Tube discharges to an open crack." Ungerecht explained that septic tanks generally flow into a drainage field or mound, but in this case the effluent was flowing openly into a crack in the ground. He did not know if this was consistent with Hawaii State code, so he advised HAVO to check with the State to confirm that it was permissible.

Ungerecht said that Table 5 of NPS Reference Manual 83A1 listed specific requirements for water testing for all parks. He said that although he typically reviewed water testing records during a survey, he did not review HAVO's records due to time constraints on the day of his visit. He did not know whether water at HAVO had ever tested outside acceptable limits for bacteria.

Ungerecht was reluctant to prioritize his findings, but he said that anything that had to do with "post-treatment, during distribution and usage," would be of greater concern. He said that he found no specific indication that anything noted in the survey would result in a risk to public health, but added that there were "always chances" that something could occur in a water system.

To sum up his findings, Ungerecht said that HAVO had a few issues related to backflow, its distribution system needed to be upgraded, and the remainder of his findings fell into the category of routine maintenance. He said that he routinely observed similar conditions in water systems among the various parks he visited and surveyed.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Site Visit of HAVO Water Distribution System**	

On March 3, 2015, Office of Inspector General (OIG) Evaluator Claire Wyly arrived at the National Park Service's (NPS) Hawaii Volcanoes National Park (HAVO) to observe HAVO's environmental health survey for 2015. This survey was performed by John Leffel, a third-party consultant with the U.S. Public Health Service (USPHS), which has a memorandum of understanding with NPS to perform these inspections every fiscal year.

Wyly met Leffel and was also introduced to Stephen Brum, Park Engineer and Safety Manager for HAVO. The following is general background information on Leffel and Brum and notes from the site visit.

Background on John Leffel

Leffel, who is also a USPHS captain, is a certified third-party sanitary surveyor with the State of Washington. Leffel's supervisor is Adam Kramer, who reports to USPHS Director Sarah Newman. Leffel said that he has bachelor's and master's degrees in public administration. He is also a registered environmental health specialist, with recertification required every 2 years. Leffel said that this was his first time performing a water survey at HAVO, and that he would be relying on Brum to show him the facility.

As part of his work, Leffel said, he would review the last HAVO survey report, prepared by USPHS Commander Craig Ungerecht in December 2013, and note any corrective actions made since that report was issued. He also planned to ask questions of HAVO's water operators and make observations to help identify any new issues. In addition, he said, he would ask the park's water operators about certifications and pending projects in the project management information system (PMIS). He said that he would also perform a food inspection at the Volcano House restaurant. The surveys, he said, are guided by NPS Director's Order No. 83 in terms of actions, frequency, goals, and accomplishments.

Leffel explained that the overall goal of his review was to help HAVO secure NPS funding, improve the park's operations, and educate upper management on water and wastewater inspections. Wyly

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asked Leffel if he would be using a checklist during his inspection. Leffel explained that he had developed a checklist for inspections but did not bring one on this trip; he said that the information was all in his head. He did not know whether USPHS had a standardized checklist for these inspections.

Leffel said that he would complete a report within 30 days explaining the results of the day's inspection and agreed to provide a copy to Wyly.

Background on Stephen Brum

Brum has been working at HAVO since 2011. He said that he is a licensed project engineer for the States of Alaska and Hawaii and has a master's degree in civil engineering. Brum is also a lieutenant commander for the USPHS. Brum told Wyly that the U.S. Environmental Protection Agency (EPA) came to HAVO about 3 years ago to do a survey and that he would provide OIG with a copy of that report. According to Brum, HAVO had two active construction projects in the PMIS—one for water storage tank epoxy paint recoating (project no. 16447) and the other for a reservoir liner replacement (project no. 150327).

Site Visit Notes

Plumber Shop

Wyly met with Phil Gagorik, HAVO's certified water operator. Leffel asked Gagorik questions about operations and recordkeeping. Gagorik said that he kept records associated with water, such as chemistry results of inspections and classes he attended. Wyly observed that many of the water-related logs are kept on paper.

According to Gagorik, drinking water checks take about 3 hours a day, or longer when maintenance issues are addressed. The park is short-staffed on water operators, he said. Wyly observed that Leffel asked Gagorik about the chemical results from the State. Gagorik explained to Leffel that he is responsible for maintaining the pH of the park's water at an appropriate level. Gagorik said that he tests the pH levels at various locations and logs the values once a week. He also tests raw and potable water once a week, as required by the State. Other water quality tests that he performs include water temperature checks, mV (a measure of oxidation), and NTU (a measure of water clarity). Wyly observed the manual log used to note the tracked test levels.

Gagorik explained that zinc is also added to the water for corrosion control because the system has some old galvanized pipes. Some faucets are old and have lead in them, according to Gagorik, but no issues have been found by the State; and if the State found a problem, the park would know about it.

Gagorik showed Leffel a log showing the amount of chlorine that has been tracked. The chlorine level in storage tanks was measured daily and once a month at seven different locations, according to Gagorik. Leffel recommended that chlorine residual be tested more regularly. Coliform samples are taken at seven sites, and HAVO is required to test them 4 times a month, Gagorik said, but he does it 7 times a month. The automatic pressurization system at the park is good, according to Leffel. He also told Wyly that he was comfortable so far with what he has heard and had no reason not to trust the information provided by Gagorik.

Roof Water Catchment System

The building structure for the roof water catchment was built in the 1920s, according to Brum. Two HAVO buildings have this roof catchment system. Brum said that he felt that the roof is in okay condition, but will be replaced in future. The park has some old water tanks that were not in use and will be demolished, he said. Wyly observed that the old tanks were belted, as described by Gagorik, and have wood panels on the outside, whereas the new ones were bolted.

Water Reservoir Ponds

Wyly observed HAVO's two water catchment ponds. One of the ponds can catch up to 3 acres of water directly and from the roof water-catchment system, according to Gagorik. A hypalon-lined sheet (rubber-like) sits on top of the water on the 3-acre pond and will be replaced in 8 to 10 years, according to Brum. The other pond can hold up to 1 acre of water, and its hypalon-lined sheet was damaged and removed.

Cracks in the ground are also being examined. They will be covered with cement and vented, according to Gagorik.

Heat from geothermal activity has damaged the liner, and it will be replaced with a thicker and chemical-resistant one. Wyly observed the hot spots under the reservoir.

The berms around the pond were 6 inches high, which was to address the concern in the last survey that they were too low, according to Brum. Once the liner for the pond under construction is replaced, that pond will have 8-inch berms, he said. The replacement is planned in the next few months, according to Brum. Leffel recommended to Brum that the vegetation along the pond liner perimeter be pulled back to extend its useful life.

Pumphouse

The pumphouse is where chemicals are mixed to adjust the pH for the storage tanks, according to Gagorik. The water's pH is tested to adjust the acidity. The amount of soda ash used to regulate the pH is also tracked, according to Gagorik. Wyly observed that the pumphouse is kept locked. According to Gagorik, only three water operators have access, including himself. Some chemical mixing is done at the pumphouse to minimize corrosion in the storage tanks. Leffel said that the pumphouse by the ponds looked good to him, but it is a small structure. Gagorik explained that the size is the same it has always been, and the park likes to keep the original size.

While at the site, Gagorik told us that he may retire and needs a backup person he can train. HAVO paid for Gagorik's backflow certification in August 2014, which cost $1,200 and was an intensive course, he said. His certification is good for 2 years. Gagorik also stated that there is nobody at the park who can do what he does. There is a local company, however, that can and would charge the park about $100 per unit. Wyly did not ask for elaboration on what Gagorik meant by "unit." Gagorik said that when he retires he may consider contracting with NPS or a similar agency, but that it is only a thought for now.

Six HAVO employees have some type of water operator certification, according to Gagorik. These individuals are—

- Alvin Asato, certified in water treatment (grade 1);
- Danny Ortiz, certified in water treatment (grade 1);
- Jeff Thacher, certified in water treatment (grade 1) and water distribution (grade 1);
- Gagorik, certified in water treatment (grade 2), water distribution (grade 4, which is considered complex), and backflow;
- Tom Foster, certified in water treatment (grade 1); and
- Daniel Patao, certified in water treatment and new to HAVO.

Gagorik noted that Patao worked at Haleakala Park on the island of Maui prior to coming to HAVO.

Newest Raw Water Tanks

According to Gagorik, HAVO has two new water tanks that have been onsite since 1996 or 1998 and can each hold about 750,000 gallons. Three other tanks were also observed. The tanks and the water reservoir ponds can hold up to 6 million gallons in total, per Gagorik. The water demand at the park is 2,600 gallons a day. After September 11, 2001, the park had to do a vulnerability assessment. The hatches in the raw water tanks are locked, according to Brum.

Slow Sand Filters

Wyly observed three sand filter tanks that were locked. The exteriors showed signs of corrosion. Gagorik explained that the tanks hold gravel and sand to filter water. The tanks are operated one at a time, according to Brum, and repainting the tank exteriors is an active project in PMIS. Leffel did not note any problems.

Clear Well

Wyly observed one clear well. Brum explained that water from the sand filter travels to the clear well and on to the chlorine building, where it is injected with chemicals and then flows to the treated water tanks. Leffel did not note any problems.

Chlorination Pumphouse

Wyly observed that the chlorination pumphouse was located next to the sand filter tanks. Gagorik said that he performs turbidity testing (NTU) to see how dirty the ground catchment is. Leffel stated that the testing room appeared clean and very organized. Gagorik performed a turbidity test on the spot, and the reading came out as 0.94 NTU. Gagorik said that the raw water was dirty, but according to Leffel, that number was excellent for a raw water level. The final NTU testing came out as 0.18 NTU. Gagorik explained that the turbidity testing is done daily from the faucet in the room. Wyly observed that Leffel kept notes on the test results. Leffel said that he was happy with the results.

Wyly observed that there was a chart in the room used for logging the meter readings, which show how much water is pumped in 24 hours, how much is used, and how much is left. The piping was in good shape and there were no safety concerns, per Leffel. The peristaltic pump was reliable, according to Gagorik, and is used to adjust the quantity of chlorine being injected; he said that he had to adjust it occasionally. Gagorik said that he checks the chlorine every day. Leffel asked Gagorik about spare peristaltic parts, and Gagorik stated that the park had spares and had other critical parts on hand. Leffel

recommended to Gagorik that he have a standard operating system (written procedures or SOPs) and a critical spare parts list.

At the pumphouse, Leffel reviewed some of the past survey recommendations with Gagorik. Leffel noted that backflow prevention assemblies were not being tested by a certified inspector, according to the last survey. Leffel told Gagorik and Wyly that he was not certified in backflow prevention, but that he can see an obvious backflow issue and is not certified to speak up on it. Brum told Wyly that HAVO had a licensed backflow inspector, Dana Kuffer, but he retired in December 2013 and the park did not have a replacement at the time of the last survey. Gagorik is now certified in backflow inspection. Leffel also mentioned to Wyly and Gagorik that he was not a cross-connection control specialist and would rely on the park's specialist or outside specialist for relevant information.

Treated Water

Wyly observed two treated water tanks and was told that one is online and the other is being worked on, per Brum. Leffel recommended that all vegetation be removed from around the tanks to reduce paint oxidation on them. Leffel looked in the interior of one of the treated water tanks that was recently painted, and was told by Brum that the paint is drying and will be ready for inspection tomorrow. Leffel mentioned to Brum that a water tank should be cleaned every 5 to 10 years, but that it should be inspected yearly. The last time the tanks were cleaned was in 2007, according to Brum. Leffel recommended that HAVO bring in someone to look at the tanks to determine whether buildup exists or they see anything unusual.

Pressure Pumphouse/Booster Pumps

The pressure pumphouse has state-of-the-art computerized controls, according to Gagorik. He said that he is able to see how much water the park is using and can tell when there is a leak. He said that he can visually inspect for leaks too. HAVO has not had any leaks in the past year, according to Gagorik. Wyly observed that the park is pumping 35 – 42 gallons of water per minute (gpm). The park has a backup generator for the pressure pumphouse, according to Gagorik and Brum.

Wastewater System

HAVO has never had any issues related to wastewater, according to Brum. The waste in the park septic tanks is pumped out by a contractor, he said. There is no certified wastewater operator at the park because one is not needed, per Brum, given how the water is currently handled.

Thurston Lava Tube

The Thurston Lava Tube is farthest away from the water storage tanks of the water distribution system, according to Brum. He said that this location has the only septic system that is not pumped, to serve the comfort station. The effluent discharges into a crack in the ground, according to Brum. Wyly observed a septic smell outside the bathroom. Brum stated that this was his area of concern. He said that there are challenges to putting in a modern septic tank. A storage tank currently exists behind the vegetation, per Brum, but it was not operational. Leffel said that Brum and the park seemed to have a handle on the situation, so Leffel had no recommendations.

Hawaii Volcanoes Observatory

The Hawaii Volcanoes Observatory (HVO) building is occupied by USGS, according to Brum. He said this location has both pressure and firefighting storage. One of the two tanks holds 20,000 gallons of water, and the other is a 60,000-gallon tank. The HVO is close to the volcano's crater, so the tanks wear out quickly, according to Brum. Wyly observed corrosion, and Brum said that it would be addressed sometime in 2020.

Jaggar Museum

The Jaggar Museum has a sprinkler but no water service, according to Brum. There has been discussion about getting a backflow preventer to the main area, according to Brum. He said that it would be done in 3 months, noting that it was a concern addressed in the last survey.

Areas Not Covered in the Survey

The Kahuku Unit, Namakanipaio Campground, and the KVC septic sewage system at Kilauea were not covered in Leffel's survey. According to Brum, the Kahuku Unit is about 1.5 hours away from the main park. He said that occasionally the park had experienced negative water pressure because it is backcountry. Visitors have no access to water at this unit. Leffel did not look at this area and did not feel a need to at that time.

Based on the last survey, Wyly observed that no issues were found at the Namakanipaio Campground and the KVC septic sewage system at Kilauea.

Additional Observations

Wyly observed that a gate to the water collection and storage site was opened when we went there. According to Brum, the gate stood open during the day and was locked in the evening. Brum said that in the past year, there have not been any leaks in the distribution system. But in the years prior, he said, the water main had about one leak a year. He said that repairs were done immediately and required shutting parts of the system down. If repairs were not done, the park would have lost a lot of water.

Wyly observed Leffel performing a food safety inspection at the Volcano House restaurant. The inspection took a couple of hours to complete. Leffel gave the park a 15-point rating—which was considered satisfactory. Only minor issues were found that could easily be addressed, per Leffel. Wyly asked Leffel about his overall observation, and Leffel stated that overall it looked like a good operation. As for the water side, Leffel stated that Gagorik appeared to be organized and do things meticulously.

Summary of Recommendations Made by Leffel

- The chlorine residual testing needs to be done more regularly.
- The vegetation along the pond liner perimeter needs to be pulled back to extend the liner's useful life.

- Gagorik should have a standard operating system (written procedures or SOPs) and a critical spare parts list for the chlorination pumphouse.
- All vegetation around the tanks needs to be removed to reduce paint oxidation on them.
- HAVO should bring in someone to look at the tanks to determine whether buildup exists or if observe see anything unusual.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 17, 2015**
Report Subject **Interview of Cindy Orlando**	

On March 4, 2015, Special Agent Katie Balestra, Special Agent Michael Graziano, Auditor Mitos Ciriaco, and Evaluator Claire Wyly interviewed Cindy Orlando, Superintendent of Hawaii Volcanoes National Park (HAVO). We questioned Orlando about allegations that the park's potable water system had numerous deficiencies that posed serious risks to the public's health. Orlando signed the Warnings and Assurances for Voluntary Interviews form and agreed to have the interview recorded. The following summarizes the interview.

Orlando said that she has been the HAVO park superintendent for nearly 11 years. She said that she manages the park through her division chiefs and, among other things, is responsible for maintaining and assuring public safety with the park's drinking water. Phil Gagorik, she said, is the lead for the park's water system.

When asked to describe any known issues with the drinking water system, Orlando explained that the park has good-quality water. According to Orlando, park staff tests the water daily and send samples to the State twice a month. She said that the park does not have any problems with its water system. She stated that there may have been one occurrence of an issue with the water, but she could not recall the details.

We asked Orlando about the concern about the park's backflow preventers highlighted in the 2013 public health survey report from the Public Health Service. Orlando said that she thought the park had replaced one at the Jaggar Museum. Orlando said that Park Engineer Stephen Brum would know more about that issue. She stated that she knew that the park had backflow preventers, but she did not know their condition or age. She said that she knew of annual inspections of the backflow preventers conducted by Gagorik, who was certified to conduct such inspections. She added that before Gagorik, Dana Kuffer, who is now retired, performed the inspections.

Orlando said that the park has always had someone certified in inspections because it is a U.S. Environmental Protection Agency (EPA) requirement. She further explained that, if the park did not have someone certified on staff, the park could contract the function out. Orlando understood that

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

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Gagorik was the only person on staff certified to conduct inspections of the backflow preventers. She said that park employee Jeff Thacher was Gagorik's backup and could perform all of the same tasks except for those inspections.

We also asked Orlando if she knew of any lapses in the residual testing of the chlorine in the drinking water. Orlando responded: "No, we test the pH. We test the chlorine. No." We informed Orlando of emails between the Hawaii State Safe Drinking Water Branch and the park maintenance staff about lapses in chlorine testing, and that there was a period of time when it was not tested. According to Orlando, this period of time may have occurred because of weekends, holidays, and recent retirements. In response, the park created policy ensuring it had a backup to conduct the water testing. According to Orlando, as part of her corrective actions, she hired Brum, whose background was in water, as the park's professional engineer.

Orlando provided us with a copy of the park's Daily Water Treatment Standard Operating Procedures. When asked again if she knew of the 2013 lapse in the residual testing, Orlando said: "Yeah. There was a gap because we didn't have the staff." The park now has two backups for Gagorik, according to Orlando. She said that Thacher and Dan Pateo serve as Gagorik's backups, and three other employees are receiving training.

Orlando told us that at this point, to her knowledge, there were no lapses in water testing, and that the park worked closely with the State, whose representatives for water issues were located in Hilo, HI. She said that park officials conducted the tests in-house and that the park sent samples to the State twice a month. In response to whether Thacher actually conducted testing when Gagorik was unavailable, Orlando said that although she would not know when Gagorik was on annual leave, the intent was to have a backup for weekends, holidays, and sick or annual leave.

Orlando said that the park uses soda ash to adjust the water's pH, as well as a chlorinator. She stated that the park tests the chlorine every day. According to Orlando, staff checks the pump and chlorinator every day at a certain time in the morning. She said that the park had great water considering its environment and the condition of the water storage tanks. According to Orlando, the park used to have redwood water tanks, but those had been replaced with steel tanks. She said the steel tanks were in pretty good shape other than the occasional corrosion. Orlando explained to us that the whole water distribution system was on a steam crack and because the park was an active volcano, steam could be seen around the area.

We also asked Orlando about the overall deterioration of the water distribution system and whether new pipes had been purchased years ago but had not been installed. Orlando told us that the park did have old pipes, but she did not know if new pipes had been purchased. Orlando stated, however, that the park just replaced about 3,500 feet of pipe last summer and that some pipe work had been completed at the resource management area. According to Orlando, the park planned four phases to replace the water distribution line by removing the old pipe and replacing it with new pipe.

When asked whether any issues about open hatches on the water-storage tanks had been brought to her attention, Orlando said that the State might have included this issue in its written report. According to Orlando, the issue might have been related to a seal on the hatch, which was corrected right away. She suggested that we talk to Brum because he would have worked with the State.

Regarding water obtained by rainwater catchment in the backcountry, Orlando said that the water is not potable and never has been. She said that park visitors have to treat their own water, and signs are posted informing the public of the need to do so.

When asked about the issues outlined in the public health survey report, Orlando stated that the maintenance team normally addressed those issues. Orlando explained that for the 2013 survey, Rodney McCollum was the park's acting chief of maintenance because the former chief of maintenance, Ron Borne, had transferred to another park. According to Orlando, when she received the survey report, park officials reviewed the report and identified corrective actions that needed to be taken. She said that the park currently had projects planned that were waiting for funding, such as recoating the water-storage tank, installing a new reservoir liner, painting the exterior of the water tanks, and replacing distribution lines. She said that McCollum, Gagorik, and Brum would have addressed the issues in the 2013 survey.

She said that each year, public health officials from the regional office visited who, as part of their survey, addressed the status of the issues and whether corrective actions had been taken. This new survey, she said, should have happened on Monday, March 2, 2015, and she would receive a copy of the report. Although the Public Health Service did not check back on their survey observations until the next survey, she said, the park continued to monitor issues and take corrective action. She said that the park had to contract for some duties, such as painting the water tanks, so the park had to first obtain funding.

According to Orlando, the park used the Project Management Information System for all of its work orders. Some water-related projects currently scheduled in the system included the installation of the backflow preventer for the museum, the four phases of replacement of the distribution line, recoating the water storage tank, replacing the liner for the reservoir, and painting the exterior of the water tanks. Last year, she said, the park replaced the reservoir liner, and the interior of the water tanks were currently being painted. According to Orlando, the park received funding for these types of activities from the National Park Service (NPS) regional office. She said there was a national pot of money, and that NPS determined the priorities.

We asked Orlando if the park has had any issues completing projects since Borne transferred to a different park or because it had not hired a permanent chief of maintenance. Orlando said that she did not know of any issues. According to Orlando, any issues or concerns are "a planning and funding issue" and "having professional staff to help us walk through it." The park has had ongoing projects for as long as she has worked there, she said, so they did not just plan these projects. According to Orlando, park staff uses reports, surveys, audits, and whatever extra information they have to help them plan and complete projects.

Orlando stated that the park's maintenance division was severely underfunded and barely getting by. She said that the park was finally receiving some increases in this year's budget for seasonal hires. She said that these funding issues were not unique to HAVO, and that the park's budget had dramatically decreased in recent years, partly due to sequestration. Orlando believed that the park would receive a $300,000 base increase, and that the maintenance division could hire four new positions, but they had to be seasonal hires.

Finally, Orlando explained that if a determination was made that the park needed to replace the entire water system, she would expect that cost to be substantial, approximately $10 million or $15 million.

She said that NPS could provide funding from Line-Item Construction—a funding source reserved for big projects—but that NPS did not have enough money to provide funding for all of its parks, and some years Congress does not provide this funding at all.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 17, 2015**
Report Subject **Interview of Cindy Orlando**	

On March 4, 2015, Special Agent Katie Balestra, Special Agent Michael Graziano, Auditor Mitos Ciriaco, and Evaluator Claire Wyly interviewed Cindy Orlando, Superintendent of Hawaii Volcanoes National Park (HAVO). We questioned Orlando about allegations that the park's potable water system had numerous deficiencies that posed serious risks to the public's health. Orlando signed the Warnings and Assurances for Voluntary Interviews form and agreed to have the interview recorded. The following summarizes the interview.

Orlando said that she has been the HAVO park superintendent for nearly 11 years. She said that she manages the park through her division chiefs and, among other things, is responsible for maintaining and assuring public safety with the park's drinking water. Phil Gagorik, she said, is the lead for the park's water system.

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Gagorik was the only person on staff certified to conduct inspections of the backflow preventers. She said that park employee Jeff Thacher was Gagorik's backup and could perform all of the same tasks except for those inspections.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 27, 2015**
Report Subject **Interview of Jeffrey Thacher**	

On March 6, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed Jeffrey Thacher, Vehicle Operator and Work Leader, Level 5 (WL-5), in the facilities and grounds unit at Hawaii Volcanoes National Park (HAVO), about allegations that HAVO's potable water system had numerous deficiencies, posing serious risks to the public's health. Thacher signed the Warnings and Assurances for Voluntary Interviews form and agreed to have the interview recorded. The following is a summary of the interview.

Thacher said that he worked for the National Park Service (NPS) for almost 20 years, at HAVO for almost 15 years. His supervisor at HAVO is Danny Ortiz. Thacher also said that he is a Vietnam veteran.

Thacher told us that he has certifications for Water Treatment Plant Operator (WTPO) Level 1 and Distributions Systems Operator (DSO) Level 1. Thacher said that his certifications are up-to-date and valid until 2017.

When asked what his responsibilities were regarding the water system at HAVO, Thacher said: "Everything. I work weekends and holidays. I'm the only one [who] works weekends and holidays for water." Thacher said that his water system duties included overall coordination as well as changing out the different water tanks, switching tanks and sand filters, adding sodium hydrochloride (a derivative of bleach) to chlorinate the water, and performing daily residuals testing and turbidity testing (a measure of water clarity). He said that he performed water tank and pond readings and tank level readings in the morning. For the water testing duties, he performed turbidity testing in the morning and residual testing in the afternoon. Thacher said that it took about 3 hours each Saturday, Sunday, or holiday to perform these duties.

Thacher said that the only difference between a Level 1 and Level 2 WTPO and DSO certification is that Level 1 personnel cannot operate the sodium hydrochloride solution meter. Thacher explained that he was not certified to turn or adjust the meter knob that regulates how much chlorinating occurs or, in other words, how much of the solution goes into the water system. Thacher said that he sometimes

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prepared the sodium hydrochloride solution; he indicated that Phil Gagorik, who has WTPO-3 and DSO-4 certifications, usually prepared the solution. He said that the solution was made by mixing a gallon of sodium hydrochloride with 30 gallons of water. Thacher said that the prepared solution was stored in a drum and injected into the water system when the meter knob was turned; the amount of solution going into the water depended on how much water was pumped. He said that at HAVO, 30,000 gallons of water are typically pumped a day. Thacher said that the level of the sodium hydrochloride mixture was measured every day.

As part of the water treatment process, Thacher said that Tanks 1 and 2—the potable or fresh water tanks—were tested for chlorine residuals. Thacher said that staff tried to keep the chlorine residual levels at a value between 1.5 and 1.6. If the residual level was higher than 1.6, Thacher said that Gagorik turned down the meter knob a little bit to lower the residual level. When residual levels are high, Thacher said, "you'll be able to taste and smell it—the sodium hydrochloride and stuff." Thacher said that there was a clipboard in the chlorinating room to track how much the sodium hydrochloride meter dial/knob was turned up (depicted by an up-arrow symbol) or turned down (depicted by a down-arrow symbol). He said that an injector "that runs off a rubber band, kind of like a hose" was used to inject the sodium hydrochloride mixture into the 3-inch line that "goes up to [the] potable water tanks."

When Thacher was asked what he did when Gagorik was away and the meter knob had to be adjusted, Thacher said: "Usually, he'll have it ready on the weekend for me," and suggested that weekend staff typically would not have to make meter adjustments. Thacher explained that it took days to get the chlorine residual readings from Tank 1 or Tank 2. Thacher said that chlorine residual levels changed gradually, not rapidly, and these changes would be noted in their logs. He confirmed that there usually would be no need to touch the dials. He said that "restocking the drum" with the sodium hydrochloride solution was the task he might need to do.

When Thacher was asked to describe the park's biggest water issues/problems, he referred to having a new supervisor for the water system operation who may not be committed or care. He also said that he felt one of the biggest issues was "mostly just managing the [water] system, people-wise."

When asked whether he believed not having an appointed chief of maintenance at HAVO for almost 2 years was a problem, Thacher said "yes," it was a problem, and that he had worked for four or five chiefs or acting chiefs of maintenance: "They come and go." When Thacher was then asked what repercussions this turnover had had on the park, he said: "People don't want to get involved [in HAVO's water operation] because they see what happened to me. I got sucked into it, you know."

Thacher explained that he was at a Wage Grade Level 3 (WG-3) when he first got involved in the park's water system operations. Later on, he said that he was designated the acting WL-6 for the facilities and grounds unit, probably in part because of his experience with HAVO's water system. He said that he held the acting position for 5 years—the same number of years that Ortiz had held the acting supervisor position.

After being in the acting WL-6 position for 5 years, Thacher said that he complained to Ron Borne, HAVO's former chief of maintenance, about not getting promoted. Thacher said that Borne "kept stringing [him and Ortiz] along" with promises of promotions, "but [they] never got it." Thacher said that he should have been a WG-8 or WG-9, and had intended to sue the park because "nothing [had] happened." Thacher said that he emailed Borne with his intent to take legal action against the park, and he CC'd Peter Amapool [phonetic spelling] in Human Resources.

When Thacher was asked whether his primary complaint was that he performed work outside of the position he was hired for but did not get paid or promoted for it, he said: “Big time. Yeah. It’s not fair.” He said that he tells coworkers: “Don’t get sucked into Water because it’ll happen to you.” Thacher said that, after having done WL-6 work “for years and years,” he was dropped back to a WL-5.

Thacher said that he was first pushed back down to a WL-4 after holding the Acting WL-6 position. He said that his WL-4 position was later reclassified to a WL-5 position as a result of his military service, which qualified him for a position upgrade without having to compete in an open announcement. He said, however, that he was put on a 2-year probation for the WL-5 position even though he had worked at HAVO for 15 years.

Thacher said that Rodney McCollam, acting chief of maintenance, “upgraded” him to a WG-8 for “being water wise” while Borne was on a detail in Guam. He said that “stuff hit the fan” when Borne came back to HAVO from his detail, and Borne took away Thacher’s WG-8 position upgrade.

When asked whether anyone in the maintenance division was advocating for funding for the division, Thacher said that he did not know. He said that the facilities and grounds unit used base money and did not have special funds.

Thacher said that the maintenance division “really needs to be reworked.” He said that, on one occasion when Gagorik was out sick for 2 weeks in 2013, “no one handled the water during the week”—for 5 days. Thacher said that, when the first weekend came, he was the one who found the gaps in the log books, and he was the one who brought it to supervisors’ attention. According to Thacher: “If it wasn’t for me, the EPA would have been all over the park big time.” Thacher said that, when he came in on the Saturday after Gagorik’s absence, he “noticed the tank levels weren’t right. There was no chlorinating water in the drums [and] the pumps were about running dry.”

Thacher said that Tanks 1 and 2 are 500,000-gallon tanks. He said that the park “can go a month on a half-a-million-gallon tank.” On the first weekend Gagorik was out sick, Thacher said, he mixed Tanks 1 and 2 together to fix the low water level problem, and he also switched over raw water tanks and sand filters. According to Thacher, the tasks he performed that weekend were within the scope of his certifications, and he did not perform anything outside of his certifications or any tasks that only Gagorik could do. Thacher said, however: “It’s not in my PD [position description] to do this water [work].”

Thacher said that on the following Thursday (after the weekend he “got everything running right again”), he noticed that Gagorik had not yet returned to work, and Thacher again noted gaps in the logs. At this point, Thacher said that he “went and talked to Rodney [McCollam] because Rodney was acting chief, and I brought to his attention what was going on.” According to Thacher, McCollam said that he was not aware of the situation, and McCollam then talked to Tom Foster, HAVO Buildings and Utilities Supervisor, about it.

Thacher was of the opinion that Foster was to blame for the scheduling incident that led to these water problems. Thacher said that Foster “never said nothing to no one” about Gagorik being out sick, and Foster did not arrange to have a backup for Gagorik.

Thacher said that as a result of the incident, a calendar was instituted to manage the water schedule. He said: "We didn't have a water calendar until all this came down." When Thacher was asked if there was still a risk for a similar incident to happen now that a water calendar was in place, he said yes, because Foster needed to manage the calendar. Thacher also said that he could not add his own leave time on the electronic calendar so he would have to email his leave plans to Foster.

When asked if Maintenance Worker Alvin Asato had to do any water-related tasks when Gagorik was absent from work in 2013, Thacher said no, but he thought Asato "could have been [involved] another time. . . . There [have been] a few times that Asato probably had to take water samples to town before." Thacher did not know whether Asato had ever had to prepare the sodium hydrochloride mixture. Thacher reiterated that as part of the facilities and grounds unit, he and Asato were "not even supposed to be in the water business."

When asked if he thought more of the park staff would be interested in getting WTPO- or DSO-certified if it meant more pay or a promotion for them, Thacher said: "Pretty much. They just want to be paid for what they're doing." Thacher said that the park had a "guy who [had] certification for waste water. . . . The park just went to him and asked him [to use] his license" without paying him. Thacher said: "That's not right. . . . You know, they're asking too much from us. . . And it seems like more and more every year."

Thacher agreed "pretty much" that there were not enough people certified at the park to operate HAVO's water system. Thacher said, however, that "people don't want [the certification]. . . . For one, it's not an easy test" to take.

When Thacher was asked what would be an ideal number of certifications and levels at the park, he said: "Probably a couple more WTPO-1s and 2s . . . and DSOs." Thacher confirmed that everyone with certifications at the park was current on their certifications. Thacher said that Asato might have a certificate to perform residual testing, so he would be allowed to perform residual tests. But Thacher also said that Asato was not his backup; his backup was Daniel Carpenter.

When asked whether HAVO's water system had any major safety hazards or issues that need to be addressed immediately, Thacher said that most of the park's water pipelines are old and rusty. He said that years ago some new pipes were purchased for another project, were not used, and now were stored at the park's rain shed. He said that they wanted to put new pipelines throughout the park. Thacher said that a pipe replacement project would require a lot of money to "hook [the pipes] together [because] a lot of this stuff [was] buried under the ground." Nevertheless, he said: "People didn't like to drink the water before, [but] people say it's pretty nice—pretty good water now."

When asked whether he knew of any occasions when the park was operating outside of regulations and policies, Thacher said no, but then noted: "Before, I was asked to—I'm not going to name names—write in numbers on logs. And I told them that I wouldn't do this. . . . I don't write nothing down that I don't see." Thacher was referring to gaps in the logbooks. According to Thacher, he was asked to fill in the residual testing and other testing gaps with false numbers since he did not actually perform the tests during these missed days. Thacher said that the 2013 incident when Gagorik was out sick was not the only time when gaps in the logbooks occurred. He said: "There [are] other days." He also said that these other incidents probably happened as a result of scheduling conflicts. Thacher said: "They wanted me to fill in the blanks. And I said, 'You fill them in.'" Thacher did not know if the logbooks were actually filled in by anyone. Thacher also did not know whether Gagorik had ever been asked to

fill in logbook gaps with false data. Thacher did not want to say who asked him to falsify the records because he was concerned about "backlash."

Thacher said that he was told by Ron Borne that if he did not perform the water-related duties he "would be written up and/or fired."

Thacher did not know about any issues with the backflow preventers at the park museum and observatory. He said that Gagorik would be the person to talk to about that topic. Thacher also did not seem to be familiar with the NPS Public Health Program's Environmental Health Survey that was performed at the park.

Thacher said that about 4 or 5 years ago, Rose Cortez (a former maintenance supervisor) hired a family member friend, who had a water tank business, to haul water to the park because HAVO did not have enough rainwater. Thacher said that the water truck used for the project was not a potable water truck, nor was it certified. As a result, the potable water that was delivered to the park at the time might have had some bacteria from the water truck.

Thacher said that breaks in the water system happen all the time. He said that, "maybe last year," a PVC pipe by the Thurston Lava Tube broke when "someone stepped on it or a tree came down on it."

Thacher said that he was aware of the issue with the tank hatch that was not sealed properly. Thacher said the issue was resolved between the park engineer and Gagorik. Thacher said that for 8 months the tank had "a big gap." Thacher thought that the gap was an issue because the park had 60 to 70 inches of rain in that time period, and the rain "went into our potable water from a dirty top of a tank." Thacher said that the pH balance of the water was affected "big time" by the rain water coming in through the gap. Thacher said, however, that residual testing of the water showed that the water was safe to drink. Thacher also said that the park engineer's decision to use silicone to close the gap was not a good one.

Thacher said that the park engineer also "screwed up" the water pumping system at *Kahuku* Ranch, which was a unit of the park comprising 117,000 acres. Thacher said that the park spent from $50,000 to $70,000 to redo the water pumping at *Kahuku* Ranch, Makai (or ocean) side. Thacher said that when they went to turn the water on, no water came out. Even with all these alleged "screw-ups," Thacher described the engineer as "a really good engineer."

Thacher said that Foster was responsible for the operation of the water system, and thought that he thought the new chief of maintenance will be arriving at HAVO on March 23, 2015.

On March 27, 2015, Special Agent Michael Graziano telephonically re-interviewed Thacher. The purpose of the interview was to follow up on information Thacher provided during his March 6, 2015 interview concerning falsifying the data in the park's water-testing logbooks so that it would appear as though the water was being tested as required. Thacher stated that on several occasions in the past, Foster made statements to him to the effect of: "Why don't you just write something in?" or "Why don't you just put something in there?" Thacher said that Foster typically made such statements in conjunction with a lapse in testing. He said that the last time it occurred was approximately 1 to 2 years earlier.

Thacher said that he never acted on Foster's statements, and always retorted: "Why don't *you* just

write something in there?" He said that the matter was generally not discussed further after he responded in this way.

Thacher said that he did not interpret Foster's comments as a firm directive, but rather as a suggestion. He said that he refused to falsely report any of the water testing because he did not want to risk losing his certification.

Thacher said that when Rodney McCollam assumed duties as the acting facility manager, McCollam told Thacher that he wanted the water logs done properly and "by the book." Thacher said that he was already completing the logs accurately, so he did not know what McCollam was implying with that statement. Thacher reiterated that he never falsely reported any information pertaining to water testing or falsely reported anything related to HAVO'ss water system.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Philip Gagorik**	

On March 4, 2015, Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed Philip Gagorik, National Park Service (NPS) Maintenance Mechanic, Hawaii Volcanoes National Park (HAVO), about allegations related to the potable water system at the park. Gagorik read and signed the Warnings and Assurances for Voluntary Interviews notification. The following is a summary of the interview, which was recorded with Gagorik's consent.

Gagorik said that he had worked at HAVO for almost 20 years. He started at the park as a lava ranger and later transitioned into various maintenance positions, including carpenter, maintenance worker, and, since 2007, plumber and water operator. His supervisor at HAVO was Tom Foster, the acting supervisor of maintenance.

Gagorik's Water System Responsibilities at HAVO

Gagorik explained how HAVO gets its water. He said that water was collected in "rain sheds," and from there it went into catchment areas—large ponds that also capture rainwater—on the property. This "raw" water was pumped into HAVO's five raw-water tanks, where it was stored until needed. Once a week, he said, he took a "full chemistry" of the ponds.

To treat the water, he said, the system first fed the water through a "slow sand filter," a type of mechanical and biological filter, which filtered out impurities and "junk." The water was disinfected as it was being pumped into HAVO's freshwater tanks. He said the system essentially operated 24 hours a day.

Gagorik stated that he tested the chlorine "residuals" (the amount of chlorine needed to prevent bacteria growth) in the tanks daily, between noon and 4 p.m., and seven times a month at other sample points throughout the HAVO system. He said that he might add more chlorine based on the pH level of the water, which could rise or fall depending on volcanic activity on the island. Because chlorine also raises pH, he tried to "blend" water from different tanks before treatment to achieve a neutral pH. He

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.
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told us he would mix a solution of about 7,000 parts per million (ppm) of chlorine and inject it into a pump, which ran continuously and injected chlorine into the water with every stroke.

When asked to describe his day-to-day duties with respect to the water systems, Gagorik said that he checked the water and filled out water logs, which, he explained, was meant to be a "quick photo" of the system's operation. On a given day, he said, he would perform maintenance on the system, such as cycling the valves. At the time of the interview, he was replacing piping and preparing to replace a pump in HAVO's raw-water pumphouse.

He also described different types of water sampling he performed at HAVO. He said that he took bacterial samples twice a month and transported them to the State health department in Hilo, HI, for analysis. He told us that based on the population served by HAVO, he was required to take four samples per month, but he took seven to ensure the safety of the water at the park. HAVO was also required to submit other samples, such as lead and copper, at longer intervals.

Lack of Certified Water System Operators

Gagorik explained that, as a water operator, he was required to hold certain levels of certification. Based on his position and the structure of the water system at HAVO, he was required to hold a "Grade 2" water treatment operator certification and Grade 2 distribution system operator certification. He said that he held a Grade 4 license as a distribution system operator and obtained a "backflow license" in November 2014. Gagorik said that HAVO paid for his backflow prevention certification.

We asked Gagorik if he were the only person at HAVO who treated the water. He said that another HAVO employee, Jeff Thacher, mixed the chlorine for him and tested residuals. Gagorik explained that he had a chart for Thacher to follow, so Thacher could do what was needed even if Gagorik was not available to help him. Gagorik said that he lived 5 minutes from HAVO and Thacher had his cell phone number if the readings showed problems with the water. When we asked if Thacher had the correct certifications to be mixing chemicals and testing water, Gagorik said that Thacher had a Grade 1 license. He believed that Thacher was allowed to do this work under his supervision, and that his availability and proximity constituted supervision. He said that another operator at HAVO, Daniel Pateo, had a Grade 1 license for either water treatment or distribution, but Thacher was "the only operator I have that I really trust."

We also asked Gagorik if he had ever been far away from work or unavailable to supervise, and he replied: "Yes. And that's when we get into trouble." He explained that in August or September 2013, he had gone to a wedding on the U.S. mainland and then had gotten sick, so he was unexpectedly away from work for 2 weeks. During that time, he said, "there were periods where no readings were taken, nothing was done, and the system was running automatically with . . . nobody monitoring it, which is bad news." When asked why no readings were taken, he said that no one had been scheduled to do them on the days when Thacher and Gagorik were both out. He stated that Foster "got in trouble" for not ensuring that the testing would be covered, but he did not know of any other effects of their absence, such as the possibility of the park being shut down.

Gagorik said that after these scheduling issues occurred, they had created a schedule where employees would note their leave and availability. Nevertheless, he said, if there were a medical emergency and he and Thacher were both out for an extended period, "we'd be screwed."

Gagorik said that he had asked for more certified operators who could step in as backup for the system. He explained that many of HAVO's employees were temporary, seasonal, or interns, and the certification process required too much time and effort for short-term employees. He mentioned two employees, Daniel Ortiz and Alvin Asato, who could become licensed, but they had not begun the process. He said that Asato did not want to because it required a great amount of additional effort but would yield no additional compensation. Gagorik also said that he had been "pushing" for HAVO employee Matthew Duryea to become a backup, saying Duryea had water experience, seemed reliable, and was intelligent. Duryea took the test for his certification, but he did not pass.

Gagorik, who worked 8-hour shifts, was unsure whether the Environmental Protection Agency, State of Hawaii, or NPS required an operator to be onsite 24 hours a day. He said that if he was sick, HAVO would likely have to ask a certified water operator from another park to do the work, or contract it out.

We also asked Gagorik if a safety hazard currently existed for the HAVO water system due to the lack of backup support, or whether one could easily happen. He replied: "If nobody touched the water and did a drastic change to it, it would be all right for a period until they got somebody here that knew what they were doing."

To truly solve the problem, he said, he felt that employees would need more of an "incentive" to become certified. He said that Thacher and Asato would only get certified if they had some kind of incentive because of the substantial effort required to pass the certification test. Gagorik said, however, that Duryea was willing and able to do the work without an incentive. "That is what I'm looking for," he said. Gagorik said that Duryea had even paid the fees required to take the test himself. Gagorik said that he had asked Foster if NPS could pay for Duryea's test, but Foster hold him no because Duryea did not work in the same division as Gagorik and Foster.

We asked Gagorik about an email from Brum to State employee Mike Miyahira, dated September 16, 2013, explaining that there were 8 nonconsecutive days for which daily residual and turbidity readings were not recorded. According to the email, a drop in the residuals had been minor, and the readings were "rebalanced" within a day. The email stated that HAVO would contract with water operators in the event of an emergency. It also listed employees, including the water division's "weekend and weekday supervisors," who would be scheduled to take the water operator training and test. Gagorik said that Foster, who is the only supervisor for the division (it has no weekend supervisors), did not take the training. Asato was listed on the schedule as well, and Gagorik said that he (Asato) took the test but did not pass. He did not know whether HAVO ever contracted with outside operators.

Potential Issues With Water, Water Systems, and Piping

We asked if the State's tests of HAVO's water samples had ever shown contamination. Gagorik replied that there had been a few "hits" many years before he began doing the testing. Since he took on that responsibility, he had had only one hit, around 2010 or 2011, when a sample had tested positive for chloroform. He explained that he had resampled the water as the State required, and the resample tested negative. He believed that dust from nearby construction may have contaminated the first sample.

Gagorik confirmed that HAVO was complying with requirements for lead, copper, and radium nuclei monitoring. He also confirmed that HAVO was in compliance with water treatment provisions, including filtration of surface water sources and groundwater sources under direct influence, turbidity

monitoring, and disinfection. He said that the State had suggested that turbidity be monitored 24 hours a day, and he was in the process of installing a meter for that purpose. Water from backcountry sources, he said, was nonpotable, and users of that water had to purify it themselves. He also explained that the water supply was not at risk due to the vault toilets installed around the park. Finally, he said, he knew of no problems at HAVO with chemicals being improperly stored, labeled, ventilated, or handled.

We asked Gagorik if he knew of any problems with HAVO's potable water system, and he said the system had "a couple of defects." He explained that the biggest issue was that much of the galvanized steel piping system was very old and subject to corrosion inside.

Gagorik also said that it was difficult to keep the necessary amount of chlorine in the tanks to prevent bacteria growth (this amount is known as the "residual"). He said that he had to add a good deal of chlorine at the top of the tanks in order for the bottom to have a chlorine residual, which was problematic because chlorine tended to react with the metal in the pipes and could produce carcinogenic "daughter" chemical products. Ideally, he said, he tried to keep the chlorine levels in the water at 0.2 ppm to prevent the creation of daughter products, and chlorine levels were still "fairly low."

Gagorik said that replacing the piping system would be an expensive endeavor. He said that HAVO had actually purchased high-density polyethylene piping and valves some 4 years before, but they were never installed. "We really do need to do that," he commented. He explained that HAVO had not installed the pipes mainly because of funding issues and the need to consult with Resource Management for permission to dig in the park.

Gagorik described other issues at HAVO that he felt should be addressed. He said that one of HAVO's two 500,000-gallon freshwater tanks had been undergoing sandblasting and painting since November 2014. This meant that Gagorik had only one tank available for fresh water, which made it harder for him to add the right amount of chemicals to treat the water.

Gagorik also noted that when new hatches were being installed in the tanks, the contractor had not installed gaskets in the hatches, which he said left the tanks vulnerable to contamination for approximately 9 months. He said that he reported this issue to Foster. He also reported it to HAVO employee Stephen Brum, who was overseeing the contractors, but Brum wanted to use the issue as "leverage." Eventually, he said, the contractors returned and repaired the hatches, but they used silicone sealants, which were not approved for that purpose, to make the repairs. He explained that silicone could also contaminate the water in the tanks. He said that his contact at the State, Theresa (McGeehan-Takiue), was "horrified" by this, but he did not know whether the tanks had ever been properly sealed. He said that when the proper gaskets were installed in the tanks, that would solve the problem, and that he tested the water in those tanks daily for bacteria. He explained that he was also required to test the two tanks daily for chlorine.

Backflow Preventers

We asked Gagorik to discuss the backflow preventers at HAVO. He explained that HAVO had 11 reduced-pressure backflow preventers and 1 double-check valve installed at various points in the system. Their purpose, he said, was to prevent nonpotable water (containing waste, custodial chemicals, etc.) from flowing into pipes containing potable water, which would contaminate the

potable water. The only place at HAVO that did not meet the requirement to have a backflow preventer, he said, was the museum, whose sprinkler system did not have one of the backflow preventers it needed. He said that this was not an imminent safety threat to the public, but it would be "bad PR" for HAVO "if we've got a drinking fountain out there that starts putting out black water."

Gagorik also mentioned the HAVO laboratory, where the volcano was monitored. He said that there was the potential for contamination from lab chemicals because while the faucets themselves had siphon breaks to prevent backflow, the lab did not have a reduced-pressure backflow preventer, as required for labs by the EPA. Paul Robinson of the Public Health Department had observed that issue several times in the past, he said. Again, he said, the lack of a backflow preventer did not necessarily represent an imminent threat to health, but there was a potential risk to users of the water supply.

Gagorik did not know who was testing the backflow preventers before he started doing so, nor did he know where the records of such tests were kept. He said that he tested them in September 2014, and that they were in "good" shape. He said that he did not have a certified backup for these tests, but since they were only required once a year, he did not feel a backup was strictly necessary.

Gagorik said that water service at the park had never been discontinued because the backflow preventers stopped working. He said that before he became backflow certified, a HAVO employee named Dana Kuffer (now retired) was certified and did the backflow testing, but Kuffer had kept no records of his tests or findings.

Other Observations and Issues

We asked Gagorik about some of the observations noted in the 2013 survey conducted by the Public Health Department, as well as other issues that had been presented to us:

- Gagorik stated that HAVO did have a certified wastewater operator, but he did not know his name. He said that septic functions at the park were contracted out, so this certified operator was there as a backup.
- Gagorik said that HAVO only had three water operators, not four, who held certifications—himself at Level 2 and Thacher and Pateo at Level 1. Foster, who was on HAVO's list as a Level 1 operator, was actually not certified, and Thacher had incorrectly told Gagorik in the past that he (Thacher) held a Level 2 certification. Gagorik did not know who, if anyone, kept records of the certificates for HAVO employees.
- Gagorik confirmed that there was no locked security gate around the water storage site. He explained that this was a "big problem" because only water operators were supposed to have access to water collection and storage sites, but contractors entered and exited the area regularly and the area was often used for general storage or parking. Two security cameras were in the area, but he did not believe that they worked, and he did not know specifically who monitored them. He felt that a fence with a locking gate could be installed, but it would be difficult because of the large number of people who were in the area every day.
- Gagorik also confirmed that breaks were occurring in the water lines, causing precious water to be lost. Most breaks, he said, occurred in a PVC line that went down to the Thurston Lava Tube; the line was old and had become brittle from exposure to the sun. He said that HAVO employees fixed breaks as the breaks were discovered, and that he had been told that HAVO planned to run a new water line in that area, but he did not know if this was true. Gagorik said that this problem had to do with the age of the system. Another problem, he said, could be

damage to the larger 8-inch pipes when earthquakes occurred. He said that the pipes had two vulnerable areas: the flanges, and the connections where the pipe passes into a "sleeve." During earthquakes, he said, it was possible for the shaking to cause pipes to pull out of their sleeves and for the bolts on the flanges to break. He said that he had recently upgraded these bolts to stainless steel bolts and was replacing flanges when he had time.

- Gagorik said that HAVO was addressing the issue of impure water splashing into water storage areas. The park was replacing the liner of a ground catchment tube, and planned to raise the berm around the first ground catchment. Plans were also in place to replace the berm, but not until 2016 or 2017.
- Gagorik said that all of HAVO's tanks needed to be sandblasted and repainted. Only one was being done at a time, so although the park was addressing the issue, completing the work would take time.
- Regarding the survey's recommendation that HAVO install additional water storage at the Thurston Lava Tube comfort station, Gagorik said that if HAVO replaced the leaking water line with a larger line, the comfort station would not need additional water storage.
- The survey stated that the water storage tanks needed cleaning. Gagorik said that the tanks were all cleaned in 2007, which was within the 10-year industry-recommended guidelines.
- Gagorik did not know how HAVO planned to address the survey's observation that septic tank effluent was discharging into an open crack in the ground at the Thurston Lava Tube. He explained that the septic system was discharging liquids from the septic tank into the crack instead of a proper leach field where these liquids could dissipate; he said that this practice was "kind of legal, but it's really not." He believed that the risk to potable water was small because of the heat under the ground and the fact that it would take "many, many eons" for the septic liquids to work their way into the water supply, but he said the smell was very unpleasant.
- Gagorik acknowledged that HAVO did have a "cross-connection control program," which had to do with backflow preventers. He explained that his role was to check and make sure users did not misuse the water system, such as run hoses down drains.
- Gagorik also said that HAVO did have an operation and maintenance plan and an emergency management plan in place. Park Superintendent Cindy Orlando had the copies of those plans, he said.

Gagorik explained that the public health survey was annual, and the inspector would review past surveys and see if HAVO had made the changes recommended in the previous surveys. He said that Brum was HAVO's public health consultant and was charged with prioritizing and addressing the observations and recommendations. According to Gagorik, Brum was also have reports and recommendations from State inspections.

Gagorik said that addressing the issues at HAVO was sometimes difficult because of the budget, noting that at one point his department had gone from a staff of 14 employees down to 4. He said that he and his coworkers saw the matter as money "going to the top" to support administrative staff rather than being given to them so that they could do their work. While he did not feel that HAVO management was ignoring water issues at the park per se, he did not think that management, other than Foster, appreciated how important water was for HAVO.

On March 6, 2015, after Gagorik's interview, Balestra contacted him and asked a follow-up question about a new issue she had learned about. She asked him if he had ever been asked to write in the water testing logbooks that a test had been performed when in fact it had not. Gagorik said that he had never been asked to do this. He acknowledged that he had seen blank entries in the logbook when he had

returned to work from leave, which meant that there was a “gap” in the testing, but he had never heard of anyone being asked to falsify an entry.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Daniel Ortiz-Calder**	

On March 5, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed Daniel Ortiz-Calder, Maintenance Worker Supervisor, Wage Supervisor (WS) level 7, for the facilities and grounds unit with Hawaii Volcanoes National Park (HAVO), about allegations that HAVO's potable water system had numerous deficiencies, posing serious risks to the public's health. Ortiz-Calder signed the Warnings and Assurances for Voluntary Interviews form. The following is a summary of the interview, which was recorded with his consent.

Ortiz-Calder said he has worked at HAVO since 1992—about 20 years. He started as a Laborer, Wage Grade (WG) level 4. He said the other positions he had held during his time at HAVO included Maintenance Worker (WG-5 and WG-7), Work Leader, and Wage Leader (WL) level 6. He has been a Maintenance Worker Supervisor for 3 years and he currently supervises 10 personnel, including Jeff Thacher.

Ortiz-Calder said that the building and utilities (B&U) unit was responsible for the water systems, not the facility and grounds (F&G) unit, but the F&G unit helped them out by providing a water operator. Ortiz-Calder explained that his employees worked 7 days a week, but the B&U staff did not work on weekends.

Certifications

Ortiz-Calder said that he previously held a water system certification (level 2), but it expired about 5 years ago and that he was asked to get it again. He said that previously, he performed the work on the water system that Phil Gagorik does now. Ortiz-Calder said he used to work under B&U and did the "water part." At that time, Ortiz-Calder said that Gagorik was a maintenance worker but was not certified to do water system operation.

Ortiz-Calder said the water duties are included in his current position description, but these duties were not his major responsibility. Ortiz-Calder explained that the water duties were added to his position description about 2 or 3 years ago. He said, about a year ago, he took the test to get certified at a level

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.
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1 but did not pass the test. He said: "It's a very difficult test and you've got to be [a mathematical] wizard." He continued: "It's not an easy thing to get certified. . . . You've got to have the drive to sit down and study. . . . I'm 56 years old. I'm a grandpa. I'm not interested [in getting certified], but I feel forced to do it. But I'm not interested, seriously, I know it's not part of my major duties; I've got plenty of work to do just my job alone. But honestly, I don't feel that I have the time or the drive to go out and pull books and study. I did that years ago in my 20s when I was in college. And I don't have the drive anymore or the motivation."

He stated that Thacher was level 1 certified in both the distributions systems operation "and the other one" (water treatment plant operation).

Ortiz-Calder did not know the differences between a level 1 certification and a level 2 certification. He said: "Honestly, I would have to look it up again. I've just been out of the loop for a long time." He noted that Phil Gagorik or Tom Foster might know what activities were allowed or not allowed for the different certification levels. Ortiz-Calder stated that the regulations for the tiered certification levels "come from the state." He tried to remember the name of the person at the state who might have this information, but could only recall her first name—Theresa.

When we asked if he was aware of Thacher performing duties outside of his certification as a level 1 operator, Ortiz-Calder said: "Yes, I'm aware." He explained: "Certain things just got to be done, so he does it, you know. . . . Yeah, there's no way to get around it. I mean, either you do or you don't."

When asked if he specifically knew what Thacher was doing that was outside the scope of his level 1 certification, Ortiz-Calder said that Thacher was "not supposed to mess with the dials, change the settings. . . . He [Thacher] doesn't do that." Balestra pointed out that Thacher sometimes had to measure the chlorine and mix the chlorine with water to prepare the chlorine mixture in the drum, and asked Ortiz-Calder if Thacher should be performing this task because it could be outside Thacher's level 1 certification. Ortiz-Calder replied that perhaps Thacher should not be performing this task. Ortiz-Calder said that Thacher was allowed to perform the chlorine residual testing in the mornings. He could not recall any other duties that Thacher was performing, but may not be certified to do.

When asked if anyone else was certified other than Phil Gagorik and Thacher, Ortiz-Calder said that the carpenter, Danny Batel, had a valid level 1 certification. He said that Batel used to work for HAVO then he left for Maui then he came back to HAVO in the past year. He said Batel did water system tasks on weekdays when Thacher and Gagorik were not available. He said that Thacher worked "mostly on weekends or when none of them are around." Ortiz-Calder said Batel reported to Foster.

When we asked Ortiz-Calder what he thought would be the best solution for HAVO to get more people certified, he replied: "Contracting is an option." He said that he had heard contracting was expensive, but added: "You know, if they cover all the legal parts, then we don't have to worry about that. . . . So contracting is a great option. It gives [the division] more time to concentrate on what [we are] really here for, to take care of the visitors and maintain the park." He stated that HAVO's plumber, Gagorik, took care of the water system, but it took up a lot of his time. He noted: "When [they] get a call, the restroom is down, the lines are down, it needs repair, [and Gagorik is] out doing water . . . it's kind of difficult for [Gagorik] to keep up with things."

<u>Lack of Funding</u>

We asked Ortiz-Calder if not having a permanent chief of maintenance at HAVO for almost 2 years has been a problem. He answered: “No.” He continued: “I think we can live [without] one, to tell you the truth. . . . I don’t think a Chief of Maintenance will drive what we need to do on a daily basis. We are fine. We don’t need a Chief of Maintenance to tell us what we already know.”

When asked if he felt that his unit was underfunded, he replied: “Oh, yes. . . . The F&G Department . . . are short-staffed four people. The other ones [departments] are in worse shape.” Ortiz-Calder also stated: “[Foster’s] crew, the B&U Department, they are lacking people, positions that they can’t fill. And these guys are getting burn[t] out and stretched out.”

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of W. Thomas Foster**	

On March 6, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra, Special Agent Michael Graziano, Auditor Mitos Ciriaco, and Evaluator Claire Wyly interviewed Wendell Thomas (Tom) Foster, Buildings and Utilities Supervisor and Acting Chief of Maintenance, Hawaii Volcanoes National Park (HAVO). OIG questioned Foster about allegations that HAVO's potable water system had numerous deficiencies, posing serious risks to the public's health. Foster signed the Warnings and Assurances for Voluntary Interviews form. The following is a summary of the interview, which was recorded with his consent.

Foster said that he had been the acting chief of maintenance for about a week and a half, describing his position as "pretty hectic." He said he had been chief of maintenance before, but this time everything had been "pretty chaotic." Foster had been in his buildings and utilities supervisor role for almost 7 years at the time of the interview; and prior to that he was a maintenance worker and painter. Foster said he had been with HAVO for almost 40 years, and his current pay level was a Work Supervisor Level 9 (WS-9).

According to Foster, he had no certifications in water operations. He said that he used to be certified, but that was actually just training he received before they started classifying four levels of certification. According to Foster, he was currently equivalent to a Level 2 certification because he mixed chemicals and "manufactured water." (Foster explained that manufacturing water meant mixing chemicals, such as softeners and chlorinators, with water in the water system.) According to Foster, employees who held a Level 1 certification could add some chemicals, open valves in the water distribution system, and do some testing, but could not use or mix chemicals to manufacture water.

Foster explained that the EPA and the State Public Health Department had strict requirements on water, and the test to become a certified operator was difficult to pass. He said that HAVO was sending staff to refresher classes and offering practical experience so that staff could take and pass the test. Unfortunately, he said, HAVO staff who took the tests recently did not pass. Foster said that he had not tried to take the certification test lately; no one had asked him to take it, and he is not required to have any of those certifications in his current position.

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

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According to Foster, the minimum requirement for the park is a Level 2-certified employee. HAVO had one such employee, he said, but used to have three. According to Foster, one person with Level 2 certification would suffice, but a Level 1 employee could not mix chemicals or manufacture water. Level 1 employees could read certain tests, he explained, and a Level 1 distribution system operator (DSO) could open valves and move water through the system. A Level 1 was actually able to do almost everything that a Level 2 could, except for mixing chemicals.

Foster explained that Jeff Thacher, a Level 1-certified HAVO employee, may be adding chlorine to the water because the chlorine is already mixed, but Thacher cannot adjust the dials that change chemical levels. He said Thatcher can do everything but "twist the knob." We asked if Thacher could scoop chlorine, and Foster said yes because the substance was premixed. He said Thacher can also add the chlorine in a container, from which the machine would inject it into the water stream. He explained that after the water has been processed, it filters down and enters the pump. Then the filtered water is pumped up and gets injected with the chlorination and other required chemicals. He said that these chemical levels have been calibrated already. "The mixture is what controls everything going inside . . . you have to be knowledgeable [about] what's going in and how to adjust it according to the readings," he said, which was why a Level 2 is needed. If the container was merely empty, however, he said that Thacher could fill it with the premix. According to Foster, the amount of solution going into the water could only be changed by adjusting the dial on the pump.

Foster said that he was confident about how HAVO took care of its water and believed that the park does an excellent job. According to Foster, HAVO has never been written up for any violation, nor has the water system been shut down because of a violation. He acknowledged that HAVO had self-reported to the State in the past when the park did not have water operator coverage for a couple of days; the State had the park send in water samples and provide some of its records so that the State could check HAVO's readings, and HAVO was found to be okay.

We asked Foster what he feels are the biggest problems related to HAVO's drinking water. According to Foster, the aging pipeline is the most severe. He said: "It is to the point where we're just one big earthquake away from having a catastrophic failure on our pipelines because it hasn't been maintained." Foster said that earthquakes happen at HAVO every day, and one of a magnitude of around 7 could place the park in serious trouble. Foster said that the last big earthquake at HAVO, a couple of years before, was about a 7 magnitude, but it was just a quick jolt. He said that one of longer duration could cause problems.

According to Foster, HAVO replaced a small section of the water line with new high-density polypropylene pipe (HDP) about 4 years ago, but the rest of the pipeline was very old. He explained that some of the leaks needed to be fixed because the pipes were starting to move and rust.

When asked about his knowledge of new pipes that have not yet been installed, Foster said that the new HDP pipe is in storage and had been earmarked to replace the pipeline, but the project had not gone through yet. He said it was in phase 2 and is just a matter of getting the project going again. When asked whether it would be expensive to put in the piping, he said it would be, and added that the job will probably be contracted out. He said that HAVO staff could put small pipelines in place, but a bigger pipeline would be more complicated than what staff could do in-house, with their limited equipment and manpower.

According to Foster, his division has been trying to get backup water operators for the last couple of years. He said that the park used to have backups, but they retired or left for other positions. Now, he said, his division is training people now as best they can. If Phil Gagorik were to leave anytime soon, he said, HAVO could contract the water system out to a local company if needed, but it would be preferable not to contract so that the park could maintain control of its system.

When asked if he thought that operators had an incentive to get to a Level 2 certification, Foster said no, because everybody wants to get paid more to do that work. A certification would enhance employees' careers, he explained, because they could be eligible for higher grade positions in the future, but the operators do not have this mindset. Some, he said, felt that they deserved the benefits of certification right away and believed that they were entitled to them instead of working their way up. "It's a little different mindset," he said.

According to Foster, anybody can get to a Level 2 but only if the person is conscientious and passes the test. Foster said that Thacher may get to a Level 2; having been a Level 1 for a long time, he should have much of the required knowledge. He said that they had been encouraging the water operators to get some experience and training so that they could feel confident enough to take the test.

The other alternative, Foster said, would be for HAVO to offer a position with a Level 2 certification included in the requirements. He said, however, that some would believe this was unfair. While some employees had expressed interest in getting the Level 2 certification in the past, they were not permanent employees and thus were not afforded the same training opportunities, according to Foster. He said that he has not considered getting the certifications himself because he is close to retirement age.

Foster said he read the 2013 and 2014 public health surveys. In response to whether there any reoccurring issues that have been coming up over the last couple years, Foster said no and that on the last survey they were written up for an issue with backflow preventers. Foster believed that an employee named Dana (last name unknown) had a Level 1 backflow certification, but Dana left before Gagorik got his certification. According to Foster, there were no records that Dana had conducted the required annual review of backflow preventers before he retired in 2013. The gap between Dana leaving and Phil getting certified could have been about a year or year and a half, according to Foster.

Gagorik got certified for backflow preventers sometime last year, Foster said, and HAVO was able to certify the testing equipment and get it recalibrated. The last thing from the survey that they needed to address, he said, was the double-check valve in the fire suppression system at the Hawaii Volcanoes Observatory (HVO). According to Foster, the valves are being ordered and will probably be installed in the spring of 2015. According to Foster, HAVO Engineer Steve Brum is responsible for making sure the items identified in the survey are fixed. Foster said that the facility manager is ultimately responsible for everything in the maintenance department.

When asked about an incorrect backflow preventer on the sprinkler system at the museum, Foster clarified that this preventer is at the HVO. He said that he is not aware of any issues the museum, just the HVO. Even if there were an issue at the museum, he said, they plan to install new valves there that would take care of the problem.

Foster said that HAVO had no wastewater system operators on staff. He did not know of any employees who were certified as wastewater operators, but thought it likely that Lonnie Lake was

certified because he used to be a wastewater treatment operator. HAVO contracts out its septic services, he explained.

Foster believed that everyone's certifications at HAVO were current. He planned to send Thacher and Daniel Ortiz to an upcoming free DSO test review class put on by the Hawaii Rural Water Association. According to Foster, once Thacher and Ortiz pass the test, they will be Level 2 certified. The WTO certification and DSO certification require two separate tests. Foster said that a certified water distribution system operator could open up valves, move things around, check valves—anything having to do with distributing water throughout the system. The water treatment certification allows the operator to "do the chemicals," he said. Foster said that he hoped Thacher can pass the Level 2 test because he did not pass it the last time.

We asked Foster about the survey finding that the water storage site did not have a lockable security gate. Foster said HAVO was installing a security gate; he believed that Brum was managing this project and already had the money to complete it. He said the gate would likely be finished in the next couple of months.

According to Foster, the last major break or leak in the water system occurred in approximately 2013. The cracked section was isolated because it was shooting water from one of the joints. The repair crew had to cut the pipe section off, put in a new pipe, reconnect it, disinfect the line, flush all of the lines, and test before reopening the line. According to Foster, his employees learn about leaks either when somebody notifies them or by observation (walking and inspecting the line).

According to Foster, HAVO is most concerned about the pipes near the rain shed, where two breaks had occurred within the last 5 years. He said that one of the pipelines runs right over the steam vent, so the area has a lot of moisture, corrosion, and movement. According to Foster, leaks would not be concentrated in a single area because the whole water system is so old that it can happen anywhere, but leaks were a higher possibility in areas where the pipeline is partially buried and where the old PVC lines have become brittle and need replacement.

Foster said that plans to replace the old PVC pipes were "in the works." For example, he said, a project to replace the whole PVC line with new HDP pipe at the Thurston Lava Tube was just funded.

We asked Foster about the public health survey finding that septic effluent was entering an open crack in the ground at the lava tube. He said that the previous septic system also used to empty into the crack because that was the "way they used to do things." Foster acknowledged that the area had a foul smell, but said that any septic system would. The park has been trying to address the problem, he said, but their options were limited in that area.

When asked a how many times a day the water at HAVO gets chlorinated, Foster told us that the chlorination is automated and it depends on whether the water operators are "manufacturing water." Foster said that Gagorik tests the chlorine "residuals" at least once a week as well as the pH of the water. When asked if he performed these tests every day, Foster said that it depends on what water tank they are using. He said that every day Gagorik tests the water before it is injected into the system for consumption. "I know from experience that we used to check it like every day, check all the tanks every day to make sure they're up to snuff," he said.

We then asked if the operators' roles (primary and backup) were clarified in writing. Foster said that

everyone knew that Gagorik was the primary operator and the backups knew who they were. He said that Thacher was the primary backup and the next one was Daniel Pateo. Pateo just started to work at HAVO and was certified at Level 1. Foster said that he would like Pateo to get a Level 2 certification, but Pateo was not interested because he was close to retirement and did not want to take on more responsibilities.

Foster said that if the park has to manufacture water and Gagorik was not available or if there was an emergency, HAVO would be able to contract the work out, but the park has enough storage capacity to keep going for as long as 30 days. According to Foster, when Gagorik is offsite they make sure they have enough water available to distribute so that they do not have to manufacture more.

Foster told us about the gap in testing that occurred in 2013. He said the gap occurred because of a miscommunication about which operators would be unavailable. Foster explained that Thacher's leave had not been posted in the leave calendar, which had been set up so that Foster and his staff would know if coverage for one of the operators would be needed. Normally, he said, Gagorik worked from Monday through Friday, and Thacher worked Saturday and Sunday. During the time in question, Thacher took time off, but it was not marked on the calendar, and Gagorik was also on leave. Foster said that the "gap" lasted a couple of days.

According to Foster, the leave calendar is "locked" so that managers can keep track of schedules but employees cannot change schedules without his knowledge. Foster said that the calendar was not as important as Thacher contacting him and letting him know when he was going to be on leave. Ortiz was aware of the protocol too, Foster said.

We said that we had been told that other, shorter gaps had occurred at certain times. Foster acknowledged that sometimes miscommunications and human error occurred, but said that HAVO always self-reported, so if anything went wrong on a given day, the test results from the prior days would help employees determine whether the test results were within acceptable limits.

We asked if Foster knew whether employees had ever been asked to write in test results even if no tests had been taken that day. Foster said that he had not directed anybody to do that, nor did he know of anybody else either doing it or being asked to do it. Foster said that there was no reason to falsify test results "because if we have a gap, we have a gap, and we just report it." He added: "That's falsification of records. That's a pretty freaking bad offense, especially with the water system too." He said that he would be willing to take a polygraph test on the matter.

According to Foster, bacteria tests of the water go to the State twice a month. He recalled one sample from HAVO that was "suspect," so another sample was taken, which showed clear. Foster said that a sample can get contaminated, and believed that the first bad reading may have been due to dust in the air. He said that he, Gagorik, and HAVO Superintendent Cindy Orlando get copies of the lab results, and HAVO is required to issue a public "consumer report" every year describing any problems or shutdowns in the water systems.

Foster said that certified employees were asked to keep copies of their certifications for their personnel records. Employees are responsible for keeping track of when their certifications are due for a renewal, according to Foster, and must also take classes to keep up with their continuing education units (CEUs). Foster could not remember how many CEUs they are required to maintain in a year. According to Foster, the State has a list of all certified operators and will let them know if their

certification is expired. The operators take classes to keep up with their training, but to keep their certification they have to retake the test about every 3 years, he said.

With regard to an email stating that weekend and weekday supervisors would be taking the next available operator training and certification test, Foster said his name may have come up as a potential candidate for certification. He said, however, that he is not required to have a certification for his position. While Foster said he did not fight the attempt to have him certified, he felt that HAVO should invest in somebody who is going to be around longer and not someone like him, who will be out of the park soon. He believed that the pressure to certify more employees was “a knee-jerk response” after the gap in testing occurred in 2013.

We asked whether an emergency notification system was ever implemented so that the treatment group could trigger it if a lapse in monitoring occurred. Foster believed that Brum was going to implement it, but did not think it had happened yet. Foster also did not think that the proposed contract with a local company for emergency monitoring had happened yet, but that it was in process. He said these would be the contingency plans for the system if anything happened.

Foster agreed that not having a fulltime chief of maintenance to serve as an advocate for getting funding for necessary projects was not helping his department. He said that since Ron Borne left, three employees had served as acting chiefs—Rodney McCollum, Joanna Dixon, and now himself. Foster said that there has been a huge gap in leadership. He said that Dixon was “more than capable” and had a thorough knowledge of maintenance. McCollum came from the Forest Service, so he was not accustomed to HAVO’s maintenance needs and practices. He said that it was difficult for someone in an acting role to get anything done. He said that it had taken almost a year and a half to fill the position because of several reasons—the way the position was advertised, budget reasons, and problems with Human Resources. Nevertheless, according to Foster, the position has been filled now and the new maintenance chief would arrive on March 27, 2015.

When asked who chooses where the money is supposed to go for a particular maintenance project, Foster said the park submits projects up to the Regional Office for approval and prioritization, and then the request goes up to the national level for further approval and prioritization. Once HAVO receives the money for a project, the project is set up and funded. Temporary staff members are hired with money allotted for the projects. He said that the facility manager ultimately decides which projects will be done at the park itself. Sometimes the foreman can make a decision because he directs the work, he said, but he still has to get the clearance from the facility manager.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Joanna Dixon**	

On March 10, 2015, Office of Inspector General (OIG) Special Agent Michael Graziano and Special Agent Katie Balestra telephonically interviewed Joanna Dixon, Facility Management Program Coordinator, Pacific West Region, National Park Service (NPS), San Francisco, CA, concerning the public water system at Hawaii Volcanoes National Park (HAVO), and her role at HAVO while she was detailed there. Dixon agreed to be interviewed and also consented to the interview being recorded. Prior to the interview, Graziano provided Dixon with a Warnings and Assurances for Voluntary Interviews form, which she signed and subsequently returned via email. The following is a summary of the interview.

Dixon said that she had served in her current capacity since 2012. Before that, she was an FMSS specialist with NPS at Fort Mead, NV. She said that in her current role, she primarily provided support, in the manner of a "help desk," to users of numerous maintenance-related data systems—such as FMSS and systems related to property, fleet management, and real property—at national parks in the Pacific-West Region.

Dixon served at HAVO on detail as the acting facility manager between October 21, 2014, and February 16, 2015. She stated that during her detail at HAVO, she did have overall responsibility for its water system, but she was not significantly involved in the system's day-to-day operations. She said that she was aware of several ongoing projects involving the water system, but daily operations fell to HAVO employee Tom Foster. She also said that another HAVO employee, Stephen Brum, was involved with water system projects and working with various contractors.

Dixon said that she was unaware of any specific problems with HAVO's water system. When asked about an issue involving contracted work on the hatch of a water storage tank, Dixon said she did not know anything about it. She explained that if an issue involving contracted work on a storage tank had come to her attention, she would have immediately met with the contractor and the NPS contracting representative to ascertain whether the contractor was working within the terms of the contract, and she would then work to have the problem remedied.

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

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Dixon knew that NPS public health consultants conducted periodic sanitation surveys of water systems at national parks, but said that she was not directly involved in any at HAVO. She was aware that a sanitation survey was scheduled to take place at HAVO after her detail ended, but she had no further information about it. She was also aware that HAVO had replaced some water distribution lines in the past, but did not know that additional materials, purchased to replace more of the lines, were still in storage at the park.

In addition, Dixon was not aware of any public-safety issues related to HAVO's water system. She said that she did not know about the reported issues pertaining to backflow preventers, water operator certifications, "gaps" in time between water tests, or falsifying of water testing records. It was Dixon's opinion that the water system at HAVO was generally in a similar state of repair as those of other parks in the Region. In general, she said, parks' water systems were very old, required maintenance often, and were very expensive to replace.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Stephen Brum**	

On March 5, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed Stephen Brum, Park Civil Engineer and Safety Manager, Hawaii Volcanoes National Park (HAVO), about allegations that HAVO's potable water system had numerous deficiencies, posing serious risks to the public's health. Brum signed the Warnings and Assurances for Voluntary Interviews form and agreed to have the interview recorded. The following is a summary of the interview.

Brum is a commissioned officer with the United States Public Health Service and has been assigned to HAVO since March 2011. He spends half of his time at HAVO on civil engineering related duties and the other half as a safety manager, which involves managing safety policies and programs per the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA). He serves as the technical expert on HAVO's water system and provides expertise and prioritizes projects, given HAVO's failing infrastructure. He makes recommendations to management, but is not a supervisor and does not direct work.

HAVO's Water System and Related Issues

Brum explained that the current priority at HAVO is the replacement of the failing water distribution system, which supplies potable water to the public and employees. According to Brum, the system is stressed because it is 30 years old, and this stress is magnified by the volcano's caustic environment. He explained that sulfur dioxide emissions create acid rain and sulfuric acid, causing the water to have a very low pH. Efforts to adjust the pH have damaged the inside of the system's iron pipes, and they are now heavily tuberculated, meaning the pipes are filled with iron scale. In addition, because the pipes are located above ground, many of the joints and valves are failing. Brum said that zinc orthophosphate, a corrosion control agent, is used to combat this problem.

In 2013, two leaks occurred after pipes cracked, which, as Brum explained, is problematic because of potential cross contamination. The system loses pressure when these cracks occur, allowing adjacent

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ground water with bacteriological components to enter the system through these cracks. Brum noted that this is not the same as the backflow issue and, in fact, presents an even greater danger.

Before Brum arrived at HAVO in 2011, his predecessor replaced a portion of the water supply system. Specifically, he replaced approximately 3,000 feet of iron pipe between the housing area and the research area with buried high-density polyethylene (HDPE) pipe. Brum noted that because the work on this project was done in-house, there were some problems with it, including injuries. Brum thought that some of the injuries occurred when the pipe was carried by hand through a heavily forested area. Some HOVA personnel did not want heavy equipment to damage vegetation there. Some HDPE pipe was left over from this project and is currently stored in the rain shed. Brum did not know why this piping was not installed.

The water storage tanks at HAVO are also problematic, said Brum, because they have exceeded their life expectancy. A project to repair and repaint the tanks is currently underway, but this project will not be completed until approximately 2020. Based upon his personal inspection of these tanks, Brum believes this project, once completed, will likely give the tanks another 30 years of usability.

Another ongoing project is the replacement of a failed liner in one of the two reservoirs that store raw water at HAVO. The storage tank project and the reservoir liner project are the only two projects that have actually been contracted, said Brum.

Phil Gagorik and Jeff Thacher are two of the HAVO employees who work on the water system. Gagorik holds a Level 2 water treatment certification, and Thacher has a Level 1 certification. Brum believed that Thacher can produce water, but did not think he should adjust the chemical injection pump. Brum was comfortable that Thatcher could mix the chlorine to the correct dilution. HAVO supervisors, not Brum, are responsible for monitoring this work on a daily basis. Dan Ortiz is Thatcher's direct supervisor.

Regarding operator certifications reported on an Environmental Health Survey conducted in December 2013, Brum stated that the Park misreported to the inspector that employees Alvin Asato, Daniel Ortiz, and Tom Foster held also a current Level 1 certificate in water treatment, which was not correct. Brum believed that the three employees had attended training which qualified them to take the certification examination, but as far as he knew, none of them had passed the examination at the time of the survey.

Brum thought that Gagorik and Thacher were generally doing a good job of producing potable water. He was concerned, however, about an incident in 2013 where they missed 3 days of water testing, which Brum said was "a red flag." The chief of maintenance is responsible for ensuring that this does not occur, said Brum. That position, which had not been permanently filled for 18 months, has now been filled and the new hire should report to HAVO by April 2015. Brum said the new hire is a landscape architect by trade, and thus may not have any water certifications or even any experience with water systems. Policy does not require that the chief of maintenance hold such a certification. Brum believed the lengthy vacancy exacerbated problems with the water system. "That's the core cause in my opinion," said Brum. "We don't have that responsible party that is going . . . to those supervisors every day and saying what's going on."

Brum explained that when HAVO's hotel was not running, Gagorik could turn on the chlorine injection pump in the morning and produce water during his shift. Gagorik could then turn it off at the end the day. The tank would be full and there would be approximately 1 million gallons of treated

water available for use. Water was being produced almost 24 hours per day, but Brum said that the system did not need to be checked and monitored around the clock; the daily testing met all requirements and, in Brum's view, was adequate.

During the 3-day period in 2013 when the water was not being tested, the chlorine residual level was unknown. If the chlorine residual level gets too low, Brum explained, the bacteria in the water will not be destroyed. Brum noted that HAVO's water is of a good quality, and it could probably sit for a few weeks and still have an adequate chlorine residual level. Although it did not create a major health issue, the lack of testing caused concern. Brum described the situation as "a clear indication that something isn't being managed correctly." Brum said that he intentionally did not inform anyone that the water quality at HAVO is generally quite good and the health risk from this incident was "probably very, very low" because he did not "want to give anyone a false sense of security." Brum said: "I want to keep the pressure on."

He further stated that while the water system clearly needs to be repaired, it does not pose an imminent danger to health and safety. Brum noted that HAVO is competing for funding with many other National Park Service facilities. Given that any repairs will be done in phases, it will likely be many years before the entire system is replaced. The next phase may get funded in 2017. Brum estimated that repairing the entire system all at once would cost approximately $4 million.

Brum said that HAVO-specific knowledge is not required to run the water system. Rather, the instrumentation is standard throughout the nation. Brum also said there is no need for a waste water system operator at HAVO and he informed Leffel of this during his March 2015 site visit. According to Brum, the issue involving an additional water storage area for the comfort station has been resolved and he noted that this was not a requirement. Brum also said that HAVO did not have an environmental health officer but noted that it was not required to have one.

Brum said that from November 2013 until August 2014, he realized there was an opening in one of the water tank hatches, where a contractor did not install a gasket. Disputes arose with the contractor over a change order, the contractor walked off the job, and the hatch did not get fixed. Brum did not believe that the issue was serious because any rainwater at the park, which was known to have zero bacteriological components, would enter the opening in small quantities. He said the opening was big enough for maybe a mouse and bugs to get in. When we asked Brum why the gap in the hatch was not fixed right away, he stated, "It was not a concern." He said that when the State health department found out about the issue and he was contacted, he ensured the hatch was fixed in a day or two.

We asked Brum about reports that the silicone used to seal the hatch was not safe, and he replied that silicone was not a contaminant, and using it to seal the hatch temporarily was a nonissue. Brum said that the silicone sealant used on the water tank hatches was inert and not a potential contaminant. When asked, Brum acknowledged that he tried to use the hatch issue as leverage with the contractor during disputes, telling him, "There is a serious concern here … you need to get back on site and get this work done." Rain water leaking into the tanks through the gaps in the tank hatches presented a very low risk of contamination, said Brum, and he was not concerned about them. The State wanted the gaps to be fixed, which is why they were ultimately repaired.

A locked security gate protects the water collection and storage site, Brum said. It is open during the day and locked at night, but Brum would prefer to have an automated security gate there to keep

unauthorized individuals out of that area. He explained that he asked Ungerecht to include that issue on his survey because he wanted to obtain funding for the project.

Regarding the septic tank's discharge into the crack near the Thurston Lava Tube area, Brum said that it was not a violation, although it was not ideal. He said it was "really an odor issue." EPA usually allows that level of discharge because of the large area involved.

Brum did not think that the designated primary and backup water system operators are documented in writing anywhere, although he thought they should be. Brum has prepared standard operating procedures to address this issue, but it has not been implemented.

According to Brum, there was no need for a waste water system operator at HAVO.

Backflow Preventers

Brum said that they are required to respond to annual health surveys and complete the required actions almost immediately. The backflow issue at the HAVO observatory and elsewhere took longer to address, said Brum. Certain kinds of backflow preventers are required for certain areas, and these preventers have not yet been procured. Brum said this is a problem, but "not a grave concern," in part because bacteriological testing on the water is done continuously. Since Brum arrived at HAVO, there has only been one positive finding, which most likely occurred from an airborne contamination during the sampling. However, Blum agreed that the U.S. Environmental Protection Agency requires that backflow preventers, and it is a "failure" for them not to be in place. He also stated that the system at the museum has been used for decades and he was not aware of any problems that resulted from not having a backflow preventer in place. Brum said HAVO is currently adopting a cross-connection control program, which will list all of the backflow prevention devices and identify their annual inspection requirements. He also stated that backflow preventers will be installed at both the museum and the observatory by July 2015.

Dana Kuffer was responsible for backflow inspections before Gagorik took on that responsibility, said Brum. HAVO had no records showing that Kuffer completed these inspections.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Rodney McCollam**	

On March 6, 2015, Office of Inspector General (OIG) Special Agent Michael Graziano and OIG Evaluator Claire Wyly interviewed Rodney McCollam, Facilities Manager, Haleakala National Park (HNP), National Park Service (NPS), Maui, HI. The purpose of the interview was to discuss allegations that the potable water system at Hawaii Volcanoes National Park (HAVO) had numerous deficiencies that posed serious risks to the public's health. McCollam signed the "Warnings and Assurances for Voluntary Interviews" form and agreed to have the interview recorded. The following is a summary of the interview.

McCollam said he was a GS-12 and had worked at HNP since October 2014. From 2011 to 2014, he was a roads and trails supervisor with Hawaii Volcanoes National Park (HAVO). He also spent 23 years working with the U.S. Fish and Wildlife Service at Klamath Basin National Wildlife Refuge in Northern California.

McCollam said Ron Borne was the facilities manager for HAVO during the period he was there (2011-2014). He said when Borne was on leave or detail, he, Tom Foster, Building and Utility (BU) Supervisor, HAVO, or Steve Brum, Engineer, HAVO, filled in as the acting facilities manager. He specifically remembered filling in as the "acting" from August 2013 through early December 2013 when Borne was on a detail to Guam, and again from July 2014 to October 2014 after Borne had left HAVO for good.

HAVO Water System

McCollam said as acting facilities manager, he did not have direct oversight on the HAVO water system. He said that Foster, as BU supervisor, was responsible for the water system. He said that Phil Gagorik, plumber, HAVO, was the immediate person in charge of the water system. McCollam did not know if there was anyone qualified to fill in for Gagorik if he was on leave or otherwise not available.

McCollam said that in October 2013 while he was acting facilities manager, it was reported to him that some daily testing of the water system had been missed. He explained the water was tested daily for

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chlorine, but he did not know if it was tested for anything else such as bacteria. McCollam said most of the employees who conducted the water testing worked for Foster, except for Danny Ortiz, Facility and Grounds, HOVA, who did the testing on the weekends. McCollam recalled there had been some miscommunication on scheduling and there were a number of days that the water system went untested. McCollam said when he became aware of that, he immediately contacted the water division for the State of Hawaii to inform them of the problem. He said Foster was given a letter of counseling on the mishap. He recalled about this same time, there was a shortage of qualified personnel to conduct water testing, but additional employees were trained and they rescheduled how monitoring of the daily testing would be accomplished.

McCollam was asked about his knowledge of other issues involving HAVO's water system. He recalled while he was acting facilities manager from July to October 2014, Gagarik reported that a contractor completed work on a water tank hatch and left gaps in the seal of the tank. McCollam said Brum had a contractor come out and seal the tank with silicone but Gagarik claimed the material was not the right type for potable water. McCollam told Brum about Gagarik's concern, but he (McCollam) did not know if it had been corrected and said that Brum did not seem to think there was a problem.

McCollam also said a project had been funded to replace aboveground water piping and the pipe had been purchased but had not been installed. He said this did not occur while he was the acting facilities manager, and he did not know why the project was not finished. He remembered a water line had been replaced by a contractor along the "Crater Rim Drive" while he was the acting facilities manager and that Brum had been the contracting officer's representative on that job. The only other issue that McCollam was aware of involving the water system pertained to a problem getting a contractor to complete a funded job requiring relining a freshwater tank. He did not know the name of the contractor in either of these incidents.

He did not know if Cindy Orlando, Superintendent, HAVO, received any reports pertaining to the water system, and explained that she relied on her staff to ensure there were no issues.

McCollam was aware that the U.S. Public Health Service routinely conducted environmental surveys on HAVO's water system and that sometime in December 2013, they had conducted a survey while he was acting facilities manager. He thought they had found some deficiencies but did not remember seeing their report. He said Foster would have been required to correct the deficiencies, but he did not have any specific knowledge of what was done, saying it was out of his (McCollam's) scope of work and he relied on Foster to manage that.

McCollam did not know if anyone from the State of Hawaii's Safe Water Drinking Branch conducted surveys at HAVO. He was aware that Gagorik was required to send water samples to a private laboratory in Oahu on a biweekly or monthly basis to be tested. The results of those tests were provided to the State monthly. He did not know the name of the lab that conducted the tests.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Ronald Borne**	

On March 10, 2015, Office of Inspector General (OIG) Special Agents Katie Balestra and Michael Graziano interviewed Ronald Borne, Chief of Facility Engineering, Yosemite National Park, via telephone, regarding allegations that the potable water system at Hawaii Volcanoes National Park (HAVO) had numerous deficiencies that posed serious risks to public health. Prior to his current position, Borne served as the HAVO Facility Manager. Borne signed the Warnings and Assurances for Voluntary Interviews form prior to the interview and agreed to have the interview recorded. The following is a summary of the interview.

Borne stated he was the HAVO Facility Manager from October 2008 to July 2014, when he accepted his current position. During his time at HAVO, Borne spent 120 days in Guam for a detail assignment in 2013.

Borne directly supervised several individuals: three wage-grade branch chiefs, one or two landscape architects, an engineer, and several analysts. Stephen Brum worked for him as an engineer, Jon Mitsuda temporarily reported to him on a 120-day detail as a branch chief, and Tom Foster worked for him as a branch chief.

When asked to describe any concerns he had with the HAVO water system, Borne replied that there always were concerns relating to the age and type of system and system management, including recurring inspections by the county, the State's Department of Health, and the National Park Service (NPS) regional Public Health Service officer. HAVO had the largest potable water system in the country. It was built in the late 1920s, and the water treatment system was installed in the 1950s. Borne stated they made modifications to the water system when possible to address issues uncovered during inspections.

Borne also identified issues relating to the qualifications of NPS employees tasked with operating the water system. According to Borne, Philip Gagorik was the only person certified as a Level 2 operator who could operate the chlorine injector pump during the system's sanitation phase. Gagorik did not have a qualified backup for his duties, since the proper certifications for other employees expired.

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After returning from his detail in Guam, Borne discovered that his employees did not have the proper certification and sent them to training. When told that Gagorik still did not have a qualified backup because other employees could not pass the treatment certification test, Borne stated that this was a concern but noted that HAVO did not have to stop producing water because only one person was properly certified.

Borne said that he did not require water treatment employees to provide copies of their certifications. According to Borne, managers mistakenly believed that one other employee, Jeff Thacher, had the proper Level 2 certification. They later discovered, however, that Thacher was only certified in water distribution, not treatment. Borne stated that Thacher's supervisor knew he took the certification course, but did not know that Thacher had not passed the final test. Borne said they then contacted state officials to confirm who held the proper certifications. Borne did not believe that any of the employees intentionally withheld that they lacked the proper water treatment certification; instead he believed it was an honest mistake. Borne did not recall directly asking Thacher if he was certified as a water treatment operator.

When asked if Thacher had ever performed work outside of his certification, Borne recalled that this may have been an issue during his 120-day detail to Guam. After his return, Borne said, he discovered that Thacher was not certified as a water treatment operator.

Borne stated that he, Gagorik, Brum, and the NPS Public Safety Officer walked through the water treatment operations to determine what Gagorik did and what Gagorik allowed to be done while he was not physically at the water plant. They discovered that Gagorik did the calculations and system adjustments and the only thing Thacher was allowed to do was inject the hydrochloride into the system. This involved refilling a drum containing the chemical and recording the readings. Thacher was not allowed to make any adjustments to the amount of chemical in the water system, but was permitted to shut it down if the readings were out of tolerance or if other system problems were detected. Borne believed that this was reasonable, given that they only had one person with the proper certification, and said that Thacher was operating within HAVO policy.

Borne said that treated water was stored in two potable water storage tanks within the park. This enabled them to make further adjustments to the chlorine levels, if needed, prior to delivering the water for public distribution and consumption.

When asked about contingency plans for when Gagorik was unavailable, Borne responded that they would have allowed Thacher to run the system; however, this was no longer an option after they discovered Thacher was not properly certified. He then said they would shut down the water manufacturing system and rely on the water stored in the tanks. In the event that Gagorik would be out for an extended period of time, Borne explained, they planned to borrow a water treatment operator from another plant.

When asked about the time Gagorik took leave in 2013, Borne explained that he was detailed to Guam at that time. He said Gagorik's supervisor tried to coordinate with Thacher to do the required testing when manufacturing water, but Thacher was unable to do so. Borne did not recall why Thacher was unavailable. Borne understood that there was approximately a 1-week gap when no certified operator was on duty. When we told Borne that OIG investigators understood that the water system became almost dry during that time, Borne said that was incorrect and that he never heard the system ran dry. He only recalled that they were technically incorrect because a certified treatment operator was not

present on site. Gagorik tested the water in the storage tanks when he returned and found it within tolerable specifications. Borne stated that they would have dumped the water had they found it unsatisfactory, and they notified State authorities of the issue, which resulted in a recommendation that HAVO have a sufficient number of employees trained as treatment operators.

When asked about other times over the years when no certified treatment operator was on duty, Borne recalled one other instance when Gagorik notified his supervisor, Tom Foster, that no entries were recorded in the treatment log. Borne did not recall the result of that situation, and he believed it was not a major issue because the water was not being directly distributed into the water system; it only went into the storage tanks. Borne explained that they would have dumped the stored water if they discovered a problem with the water, and then refilled it with clean water with a high concentration of chlorine to sanitize the tank.

When asked about a situation where a HAVO employee was asked to record water test results when no one actually performed the test, Borne responded that he was unaware of this ever happening and denied instructing anyone to falsely record test results. He repeated that he had no knowledge of this occurrence.

When Borne discovered that Foster did not have the Level 2 certification, he asked Foster to attend certification training. He believed that Foster did not attend the training, but surmised that there may have been an issue with the maximum number of attendees in the certification class. Foster still intended to attend the certification training at the time Borne left for his assignment at Yosemite National Park.

When asked about reports that the park water system was significantly corroded and deteriorated, Borne said that this has always been an issue. They worried about turbidity issues, which affect pipe erosion, taste and odor of the water, and the amount of bacteria in the water. Borne explained that the water distribution system, much of which was designed to be above ground for ease of repair, was susceptible to any type of ground disturbance. HAVO replaced some pipes with polyurethane pipes, which are more flexible and are buried underground to prevent damage from a surface installation.

Borne recalled that HAVO purchased a large quantity of pipe prior to sequestration so that it would be available for pipe replacement should the project funds become available at a later time. According to Borne, most of the replacement pipe has not been used because they have not received funding for the project. Borne noted, however, that they were able to replace one critical area of pipe.

Borne explained that it would be expensive to replace the existing surface pipe because of the cost associated with burying the new pipe. Instead of replacing the whole system, they tried to replace pieces, as needed, using in-house labor rather than issuing a contract for the work. They eventually stopped replacing large sections because of low HAVO staffing levels stemming from funding issues.

Borne stated that the park superintendent knew about the extra pipe because she saw them moving it.

When asked about the need for a backflow preventer at the observatory and museum, Borne said he was aware of the need and the concern of a potential safety issue. The backflow preventer for the observatory was a high enough priority that they initiated a project for it.

Borne noted that they had to find a qualified person to inspect the backflow preventers installed in the

park. He recalled a 1-year time period when the inspection requirement existed and HAVO did not have an inspection contract in place, allowing the backflow preventers to operate without an inspection. Borne did not recall any issues with the system at the time.

When asked specifically about the absence of a backflow preventer at the observatory, Borne said it was never brought up to him as a major public health and safety issue or that it needed to be installed immediately. Instead, he only recalled being asked if they had one. He said State authorities knew the water system and that the requirement for backflow preventers began after the system was constructed. Borne did not recall a State inspection of the water system, but did recall that the Public Health Services officer inspected the water system annually. Borne said that they would have initiated a project for the observatory backflow preventer had it been identified as an issue during an inspection.

When asked why a backflow preventer had not yet been installed at the observatory, despite a 2013 public health survey report that identified the need for one, Borne did not recall if HAVO issued a work order for the project. He said Brum would have been responsible for initiating a work order for the project; as the facility manager, he would have been responsible for obtaining funding for the project. Borne would have also been responsible for ensuring that issues identified in the public health survey were corrected.

When asked if there were any public safety issues regarding the HAVO water system and if it was safe to drink, Borne replied there were no issues because they had performed the required testing and filed the necessary reports. He said Gagorik was “fanatical” about the water. Borne stated they would have shut down the water system if they identified any issues and corrected the problem before it was restarted. He noted that NPS had a system-wide problem of antiquated water systems in its parks and that the HAVO water system was comparable to other parks.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Alvin Asato**	

On March 5, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra and Auditor Mitos Ciriaco interviewed Alvin Asato, Maintenance Worker, Wage Grade Level 5 (WG-5), in the facilities and grounds unit at Hawaii Volcanoes National Park (HAVO), about allegations that HAVO's potable water system had numerous deficiencies, posing serious risks to the public's health. Asato signed the Warnings and Assurances for Voluntary Interviews form and agreed to have the interview recorded. The following is a summary of the interview.

Asato said that he has worked at HAVO for almost 11 years, and his supervisor is Tom Foster. He said that Foster, who was a painter, has been his supervisor for about 5 years. He said that Rose Cortez was his prior supervisor, and Foster filled Cortez's position when she left HAVO.

Asato said that his daily duties include general building maintenance such as carpentry work, painting, framing, changing light fixtures, and roofing. Asato said that he is certified to read or test chlorine residuals in the water system, but not to put any chemicals into the water. He said that he does not have a Water Treatment Plant Operator (WTPO) certification, nor has he ever taken the test to get certified as a WTPO. Asato said that he and others were asked to take the test when one of the park's "water guys," left HAVO. According to Asato, he tried to take classes to study for the WTPO exam, but it was difficult to add the coursework into his work schedule and still complete his regular duties; he noted that water is separate from these normal duties.

Asato originally said that he was the "backup of the backup"—the backup was Jeffrey Thacher—for chlorine residual testing in the water system. A little while later, Asato said that Daniel Pateo might actually be Thacher's backup now, but Asato was not sure. Asato said that Phil Gagorik was "the head water guy and the plumber, and then after that it would be Jeff Thatcher." Asato said that Pateo came to HAVO only about 8 months ago, and he believed that Pateo has a WTPO Level 1 certification.

Asato said that he was asked to perform the residual testing when Gagorik and Thacher were both away or on leave at the same time. Asato said that he might have had to do the residual testing maybe four times. Asato said that the last time he had to do the residual testing might have been 3 years ago,

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and he said that he got his certification maybe 4 years ago.

Noting that the certification must be renewed periodically, Asato said that he was not sure when exactly his certification needs to be renewed, but he was "pretty sure," although "not 100 percent sure," that he is current on his certification. Asato thought that he might have gotten recertified about a year and a half ago. Asato said that someone from the State of Hawaii Department of Health (he thought) would come to HAVO and conduct "a little test" to renew the certifications. Asato said that either the State notified the employees when their certifications were about to expire or they would contact the State. Asato said that Gagorik was usually the person who reminded him about renewing his certification.

Asato said that, on the days that he had to perform the residual testing, the chlorine was added to the water automatically. Asato explained that "there's a 55-gallon drum of chlorine that is . . . injected" into the water system. Asato confirmed that Gagorik prepared the drum of chlorine. Asato said that he did not think he ever had to mix the chlorine solution in the drum, but he said that staff do replace the chlorine solution. Asato said that he has been with Gagorik when the chlorine solution was replaced, but he did not think that he had ever done it by himself. Asato said that a 55-gallon drum of chlorine solution would probably last a month. He explained that the solution was added daily to the water via an automatic injection pump: "Once the timer goes on, the water kicks in, then the injection pump will start, and it'll pump whatever amount of dosage chlorine per however much gallons of water that we're cycling in."

Asato said that he did not remember ever flipping a switch to inject the chlorine from the drum into the water system. He said that he only remembered taking water samples.

Asato said that his only concern regarding the water system would probably be that work scheduling could be better handled. Asato said that "two guys" are needed to back up Gagorik, or the work should be contracted out so the park "can have somebody [who] can give that 100 percent." Asato said that, currently, Gagorik has two jobs—plumbing and water. Asato said he thought the duties related to the water system were really critical because of the number of visitors that come to HAVO. Asato guessed that a minimum of 3,000 visitors come to HAVO every day. Asato said that the park needs at least two full-time WTPO Level 2s to handle the water system, or the work should be contracted out, because Gagorik is not a young man, and he might retire or have health problems that affect his ability to work.

Asato said that he thought that Thacher was doing the exact same work as Gagorik and, therefore, Thacher may be doing more than his certification allows. Asato said that Gagorik has a higher certification level than Thacher.

Asato said that he was aware of the National Park Service Public Health Program's environmental health survey conducted at HAVO and noted that the issues found during the survey were usually posted in the break room. He said that the only longstanding issue that was mentioned on the latest survey was about Gagorik not having a backup. Asato said that all the issues found in the survey were probably valid issues and they were trying to address them right now.

When asked about the gaps in the water system logbooks in 2013, Asato said that the gaps happened when both Gagorik and Thacher took leave without coordinating their schedules. Asato confirmed that he was pulled in as an emergency backup to take water samples and bring them to the Department of Health for testing. Asato said that he called Gagorik on the mainland to make sure that he was taking

the water samples in the right way. When asked whether he did anything with the chlorine solution, Asato said: “If I did, [Gagorik] probably explained to me what I had to do.”

When asked if he knew of any issues with the backflow preventers, Asato said: “I know we had to put some in some spots.”

Asato did not recall anyone bringing up issues with gaps in the water tank hatches.

Asato said that the only current project he knew about with regard to the water system was the cleaning of the water tanks. He said that they were trying to sandblast on the inside of the tanks, then recoat and clean them up.

RM 83A2
Policy for the Control of Backflow and Cross-Connections

1 **Section 1. Cross-Connection Control Policy**

1.1 **Purpose.** The purpose of this policy is:

1.1.1 To protect the public and non-public water supply of **[Name of Park Here]** from the possibility of contamination or pollution.

1.1.2 To promote the elimination or control of existing cross-connections, actual or potential, between the potable water system(s) and non-potable water system(s), plumbing fixtures and industrial piping systems; and,

1.1.3 To provide for the maintenance of a continuing program of cross-connection control which will systematically and effectively prevent the contamination or pollution of all potable water systems.

1.2 **Responsibility.** The **[Park Position - Chief of Maintenance./Facilities Management suggested here]** shall be responsible for the protection of the public and non-public potable water distribution systems from contamination or pollution through the water service connections. If, in the judgement of the **[Park Position - Chief of Maintenance./Facilities Management suggested here]**, Regional Public Health Consultant, or appropriate regulatory officials, an approved backflow prevention assembly is required for the safety of the water system, The **[Park Position - Chief of Maintenance/Facilities Management suggested here]** shall install, or have installed, such an approved backflow prevention assembly.

2 **Section 2. Definitions**.

2.1 **Park Chief of Maintenance/Facilities Manager**. The **[Park Position - Chief of Maintenance./Facilities Management suggested here]** is in charge of the park maintenance and is invested with the authority and responsibility for the implementation of an effective cross-connection control program and for the provisions of this policy.

2.2 **Approved.** Accepted by the **[Park Position - Chief of Maintenance/Facilities Management suggested here]** as meeting an applicable specification stated or cited in this ordinance, or as suitable for the proposed use.

2.3 **Auxiliary Water Supply**. Any water supply on or available to the premises, other than the National Park Service approved potable water system, will be considered an auxiliary water supply. These auxiliary waters may include water from another purveyor's public potable water supply or any natural source(s) such as a well, spring, river, stream, lake, etc., or "used waters" or "industrial Fluids". These waters may be contaminated or polluted or they may be objectionable and constitute an unacceptable water source over which the National Park Service has no sanitary control.

2.4 **Backflow.** The reversal of the normal flow of water caused by either backpressure or backsiphonage.

2.5 **Backpressure.** The flow of water or other liquids, mixtures or substances under pressure into the pipes of a potable water supply system from any source(s) other than the intended source.

2.6 **Backsiphonage**. The flow of water or other liquids, mixtures or substances into the distribution pipes of a potable water supply from any source(s) other than its intended source caused by the reduction of pressure in the potable water supply system.

2.7 **Backflow Preventer.** An assembly or means designed to prevent backflow.

2.7.1 **Air gap**. The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the vessel. An approved air gap shall be at least double the diameter of the supply pipe, measured vertically, above the overflow rim of the vessel; and in no case less than one inch.

2.7.2 **Reduced Pressure Principle Assembly**. An assembly of two independently acting approved check valves together with a hydraulically operating, mechanically independent differential pressure relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and resilient seated shut-off valves at each end of the assembly. The entire assembly shall meet the design and performance specifications as determined by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California (USC), University Park, Los Angeles, CA 90089., for backflow prevention assemblies. The assembly shall operate to maintain the pressure in the zone between the two check valves at an acceptable level less than the pressure on the potable water supply side of the assembly. At cessation of a normal flow the pressure between the two check valves shall be less than the pressure on the public supply side of the assembly. In case of leakage of either of the check valves, the differential relief valve shall operate to maintain the reduced pressure in the zone between the check valves by discharging to the atmosphere. When the inlet pressure is two pounds per square inch or less, the relief valve shall be open to the atmosphere. To be approved , these assemblies must be readily accessible for in-line testing and maintenance and be installed in a location where no part of the assembly will be submerged.

2.7.3 **Double Check Valve Assembly** An assembly of two independently operating approved check valves with resilient seated shut-off valves on each end of the check valves, plus properly located resilient seated test cocks for the testing of each check valve. The entire assembly shall meet the design and performance specifications as determined by the aforementioned Foundation for Cross Connection Control at USC for backflow prevention assemblies. To be approved, these assemblies must be readily accessible for in-line testing and maintenance.

2.8 **Contamination**. Means an impairment of the quality of the potable water by sewage, industrial fluids or waste liquids, compounds or other materials to a degree which creates an actual or potential hazard to the public health through poisoning or through the spread of disease.

2.9 **Cross Connection.** Any physical connection or arrangement of piping or fixtures between two otherwise separate piping systems one of which contains potable water and the other nonpotable water or industrial fluids of questionable safety, through which, or because of which, backflow may occur into the potable water system. This would include any temporary connections, spools, dummy section of pipe, swivel or change-over devices or sliding multiport tube.

2.10 **Cross Connections** - Controlled. A connection between a potable water system and a nonpotable assembly properly installed and maintained so that it will continuously afford the protection commensurate with the degree of hazard.

2.11 **Cross Connection Control by Containment**. The installation of an approved backflow prevention assembly at the water service connection to any building where it is physically and economically infeasible to find and permanently eliminate or control all actual or potential cross connections within the building owner's water system; or, it shall mean the installation of an approved backflow prevention assembly on the service line leading to and supplying a portion of a building's water system where there are actual or potential cross connections which cannot be effectively eliminated or controlled at the point of the cross connection.

2.12 **Hazard, Degree of.** The term is derived from an evaluation of the potential risk to public health and the adverse effect of the hazard upon the potable water system.

2.12.1 **Hazard - Health**. Any condition, device, or practice in the water supply system and its operation which could create, or in the judgement of the **[Park Position - Chief of Maintenance./Facilities Management suggested here]**, Regional Public Health Consultant, or the appropriate area regulatory officials, may create a danger to the health and well-being of the water consumer.

2.12.2 **Hazard - Plumbing.** A plumbing type cross-connection in an consumer's potable water system that has not been properly protected by an approved air gap or approved backflow prevention assembly.

2.12.3 **Hazard - Pollution**. An actual or potential threat to the physical properties of the water system or the potability of the water supply which would constitute a nuisance, be aesthetically objectionable, or could cause damage to the system or its appurtenances, but would not be dangerous to health.

2.12.4 **Hazard - System**. An actual or potential threat of severe damage to the physical properties of the potable water system, or of a pollution or contamination which would

have a protracted affect on the quality of the potable water in the system.

2.13 **Industrial Fluids System**. Any system containing a fluid or solution, which may be chemically, biologically or otherwise contaminated or polluted in a form or concentration such as would constitute a health, system, pollution or plumbing hazard if introduced into an approved water supply. This may include, but not be limited to: pollution or contaminated waters, all types of processed waters and "used waters" originating from the public potable water system which may be deteriorated in sanitary quality; chemicals in fluid form; plating acids and alkalies; circulating cooling waters connected to an open cooling tower and/or cooling towers that are chemically or biologically treated or stabilized with toxic substances; contaminated natural waters such as from wells, springs, streams, rivers, irrigation canals, or systems, etc; oils gases, gaseous fluids used in industrial or other purposes or for firefighting purposes, recirculating hot water systems, hot water heating systems, solar systems with antifreeze solutions, and charged fire systems.

2.14 **Pollution**. Means the presence of any foreign substance (organic, inorganic or biological) in the water which tends to degrade the water quality so as to constitute a hazard or impair the usefulness or quality of the water to a degree which does not create an actual hazard to the public health but which but which does adversely and unreasonably affect such waters for domestic use.

2.15 **Water - Potable**. Any water which, according to recognized standards, is safe for human consumption.

2.16 **Water - Nonpotable**. Water which is not safe for human consumption or which is of questionably quality.

3 Section 3. Requirements.

3.1 Water System

3.1.1 The water system shall be considered as made up of two parts: the utility system and the building system.

3.1.2 The utility system shall consist of the source facilities and the distribution system; and shall include all those facilities of the water system up to the point where the building system begins.

3.1.3 The source shall include all components of the facilities utilized in the production, treatment, storage, and delivery of water to the distribution system.

3.1.4 The distribution system shall include the network of conduits used for the delivery of water from the source to the building system.

3.1.5 The building system shall include those parts of the facilities beyond the termination of

the distribution system which are utilized in conveying delivered domestic water to points of use.

3.2 **Policy**.

3.2.1 No water service connection to any premises shall be installed or maintained by the National Park Service unless the water supply is protected by State laws and regulations and this Cross Connection and Backflow Prevention Policy. Service of water to any premises shall be discontinued by the National Park Service if a backflow prevention assembly required by this Cross Connection and Backflow Prevention Policy is not installed, tested and maintained, or if it is found that a backflow prevention assembly has been removed, by-passed, or if any unprotected cross connection exists on the premises. Service will not be restored until such conditions or defects are corrected.

3.2.2 The building system should be open for inspection at all reasonable times to authorized representatives of the National Park Service to determine whether cross connections or other structural or sanitary hazards, including violations of theses regulations exist. When such a condition becomes known, the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** shall deny or immediately discontinue service to the premises by providing for a physical break in the service line until the building owner has corrected the condition(s) in conformance with the State and Local statutes relating to plumbing and water supplies and the regulations adopted pursuant thereto.

3.2.3 An approved backflow prevention assembly shall also be installed on each service line to a building water system at or near the property line if relevant, or immediately inside the building being served, but , in all cases, before the first branch line leading off the service line whenever the following conditions exist:

3.2.3.1 In the case of premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** or Regional Public Health Coordinator, the public water system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line appropriate to the degree of hazard.

3.2.3.2 In the case of premises on which industrial fluids, sewage, or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line appropriate to the degree of hazard. This shall include the handling of process waters and waters originating from the utility system which have been subjected to deterioration in quality.

3.2.3.3 In the case of premises having (1) an internal cross connection that cannot be permanently corrected or controlled, or (2) intricate plumbing and piping arrangements or

where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross connections exist, the public or nonpublic water system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line.

3.2.4 The type of protective assembly required under subsections 3.2.3.1 - 3.2.3.3 shall depend upon the degree of hazard which exists as follows:

3.2.4.1 In the case of any premises where there is an auxiliary water supply as stated in subsection 3.2.3.1 of this section and it is not subject to regulation by the National Park Service, the public or nonpublic water system shall be protected by an approved air gap separation or an approved reduced pressure principle backflow prevention assembly.

3.2.4.2 In the case of any premises where there is water or a substance(s) that would be objectionable but not hazardous to health if introduced into the public or nonpublic water system, the public or nonpublic water system shall be protected by an approved double check valve assembly.

3.2.4.3 In any case of any premises where there are "uncontrolled" cross connections, either actual or potential, the public or nonpublic water system shall be protected by an approved air gap separation or an approved reduced pressure principle backflow prevention assembly at the service connection.

3.2.5 Any backflow prevention assembly required herein shall be a model and size approved by the **[Park Position - Chief of Maintenance./Facilities Management suggested here]**. The term "approved backflow assembly" means an assembly that has been manufactured in full conformance with the latent standard established by the American Water Works Association entitled:

AWWA C506 Standards for Reduced Pressure Principle and Double Check Valve Backflow Prevention Device

and, has met the laboratory and field performance specifications of the Foundation for Cross Connection Control and Hydraulic Research of the University of Southern California established by:

Specifications of Backflow Prevention Assemblies - Section 10 of the most current issue of the Manual of Cross Connection Control.

Said AWWA and FCCC&HR standards and specifications have been adopted by the **[Park Position - Chief of Maintenance./Facilities Management suggested here]**. Final approval shall be evidenced by a "Certificate of Approval" issued by an approved testing laboratory certifying full compliance with the said AWWA standards and FCCC&HR specifications.

The following testing laboratory has been qualified by the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** to test and certify backflow preventers:

Foundation for Cross Connection Control and Hydraulic Research
University of Southern California
University Park
Los Angeles, CA 90089

Testing laboratories other than the laboratory listed above will be added to an approved list as they are qualified by the **[Park Position - Chief of Maintenance/Facilities Management suggested here]**

Backflow preventers, which may be subjected to backpressure or backsiphonage, that have been fully tested and have been granted a Certificate of Approval by said qualified laboratory and are listed on the laboratory's current list of "Approved backflow prevention assemblies", may be used without further qualification. However, annual testing by a state certified backflow prevention specialist is required to ensure proper continual operation.

3.2.6 It shall be the duty of the building owner at any premises where backflow prevention assemblies are installed to have certified inspections and operational tests made upon installation and at least once per year. In those instances where the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** deems the hazard to be great enough he may require certified inspectors at more frequent intervals. These inspections and tests shall be at the expense of the building owner and shall be performed by a state certified tester. It shall be the duty of the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** to see that these tests are made in a timely manner. The building owner shall notify the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** in advance when the tests are to be undertaken so that an official representative may witness the tests if so desired. These assemblies shall be repaired, overhauled or replaced at the expense of the building owner whenever said assemblies are found to be defective. Records of the such tests, repairs and overhaul shall be kept and made available to the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** or the Regional Public Health Consultant.

3.2.7 All presently installed backflow assemblies which do not meet the requirements of this section but were approved assemblies for the purpose described herein at the time of installation and which have been properly maintained, shall, except for the inspection and maintenance requirements under subsection 3.2.6, be excluded from the requirements of these rules so long as the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** and the Regional Public Health Consultant are assured that they will satisfactorily protect the utility system. Whenever the existing assembly is moved from its present location or requires more than the minimum maintenance or when the **[Park Position - Chief of Maintenance./Facilities Management suggested here]** or

Regional Public Health Consultant finds that the maintenance constitutes a hazard to health, the unit shall be replaced by an approved backflow prevention assembly meeting all the requirements of this section.

Date:

State Certified Cross Connection Control Program Specialists

Last Name	First Name	Certification Number	Certification Expiration Date

OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Theresa McGeehan-Takiue**	

On March 9, 2015, Office of Inspector General (OIG) Special Agent Katie Balestra, Special Agent Michael Graziano, and Auditor Mitos Ciriaco interviewed Theresa McGeehan-Takiue, Environmental Health Specialist with Hawaii's State Department of Health, Safe Drinking Water Branch. OIG questioned McGeehan-Takiue about allegations that the Hawaii Volcanoes National Park's (HAVO) potable water system had numerous deficiencies, posing serious risks to the public's health. The following is a summary of the interview, which was recorded with McGeehan-Takiue's consent.

McGeehan-Takiue has been employed with the Department of Health as an environmental health specialist since 2003. Her interactions with HAVO are limited to scheduling the park's monthly total coliform bacteriological samples for testing at the State lab in Hilo and assisting the park with its compliance monitoring schedule. According to McGeehan-Takiue, she also determines what drinking water samples are required by the National Drinking Water Standards within the current monitoring period, 2014 through 2016.

According to McGeehan-Takiue, HAVO sends water samples to the State for bacteria testing twice a month, and test results have never come back positive for any bacteria. She said, however, that a chemical compliance sample tested for volatile organic chemicals had once returned positive and that it occurred before her employment in 2003.

Other than assisting HAVO with water sampling, McGeehan-Takiue occasionally assisted on sanitary surveys of the water system. She explained, however, that she was not responsible for writing reports or any deficiencies in the reports. The last sanitary survey was done in summer 2014, according to McGeehan-Takiue, but she did not assist on that survey. She said that the survey was conducted by Alain Carey or Joan Corrigan.

McGeehan-Takiue told OIG that her contact with HAVO is through either Phil Gagorik or Tom Foster. Tom Foster is her primary contact, but she said that she is also in contact with Gagorik because he is the certified distribution system operator.

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

Authentication Number: 5B6DCCC7381BCD963B04EF64D4BA1AC8

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According McGeehan-Takiue, the bacteria monitoring testing is done through her via the Public Health Lab, but the chemical contaminant monitoring is done at “the city.” She clarified that not all of the national drinking water contaminant test parameters are run at the Public Health Lab, because the State of Hawaii does not have the equipment or certified chemist to run them. According to McGeehan-Takiue, some tests have to be contracted out by the water systems to private laboratories located all over the Nation. Three or four were located on Oahu, but they did not run the majority of the chemical parameters, she said. Most were done by the larger certified drinking water labs on the U.S. mainland, and those tests are scheduled directly by HAVO with whatever labs they need to contract with, according to McGeehan-Takiue. As for the scheduling of the bacteria testing, McGeehan-Takiue said that she schedules it and Gagorik takes the samples. The actual test is done by the Hilo Department of Health Micro Lab, which only has one certified microbiologist on staff.

REFERENCE MANUAL 83A1
DRINKING WATER

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A. DRINKING WATER POLICY

NPS Unit Managers will reduce the risk of waterborne diseases and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, monitored, and deficiencies promptly corrected. Drinking water systems will be regulated in accordance with 1) the Safe Drinking Water Act, as amended (42 U.S.C. 7401 et seq.), or 2) the Primacy Agency (e.g. the agency designated by Federal law as having oversight responsibility). Additional guidance for ***non-public*** or other ***unregulated*** drinking water systems is provided in RM83(A1).

A.1 All parks that operate public drinking water systems will have certified operators as required by the primacy agency. Parks that operate only non-public drinking water systems will have appropriately trained operators.

A.2 NPS Unit Managers will develop training plans and assure that operators receive any required and/or appropriate training.

A.3 NPS Unit Managers will assure that required records are maintained in permanent files for periodic review by the regional Public Health Consultant (PHC) or Primacy Agency representatives, and that reports are submitted on a timely basis as requested by the PHC and/or the Primacy Agency.

A.4 Bacteriological and chemical sampling will be performed in accordance with Federal, State and local laws/regulations and will comply with the requirements of RM83 (A1).

A.5 All water samples will be tested in laboratories certified by the Primacy Agency.

A.6 All surface water sources and any groundwater sources under the direct influence of (GWUDI) surface water, as determined by the Primacy Agency for public systems will be provided with approved filtration. Non-public surface water sources and groundwater sources under the direct influence of (GWUDI) surface water, as determined by the PHC, will be provided with approved filtration.

A.7 All public drinking water systems will be continuously disinfected. Acceptable disinfecting methods are those which provide a measurable disinfectant residual (minimum .2 mg/l free chlorine, optimum range is .5 to 1.0 mg/l free chlorine) in the distribution system. The PHC may specifically exempt ***non-public*** systems after a complete sanitary survey of the system is made.

A.8 For those park operated, public drinking water systems utilizing a chemical disinfectant, one (1) disinfectant residual sample will be measured and recorded per day from representative points. Parks operating ***non-public*** drinking water systems or receiving water from municipalities should contact the PHC for residual monitoring guidance.

A.9 Sanitary surveys for State regulated, public drinking water systems will be conducted in accordance with Primacy Agency requirements. The PHC may conduct sanitary surveys

of unregulated and/or non-public water systems.

A.10 All parks operating drinking water systems will have a documented cross connection control program on file for review by the Primacy Agency and/or the PHC (See RM83(A2)).

A.11 Water for all NPS water hauling operations, whether conducted by the park or a private contractor, will be obtained from an approved water source that meets the requirements of the Safe Drinking Water Act.

A.12 All parks will comply with the public notification requirements of the Safe Drinking Water Act.

A.13 When drinking water system modifications or new construction are proposed, parks will contact the Primacy Agency to determine if plans and specifications should be submitted for approval. A copy of the plans and specifications will be provided to the PHC upon request.

A.14 Potable water for backcountry operations must be 1) obtained from an approved public system, 2) boiled, or 3) filtered and disinfected.

A.15 Appropriate training requirements for non-certified operators will be described in park policy that is reviewed and approved by the Regional Public Health Consultant.

A.16 All parks operating drinking water systems will have an Operations and Maintenance Plan and an Emergency Management Plan.

B. WATER SYSTEM DEFINITIONS

B.1	Public Water System (**PWS**):	A system which provides water to the public for human consumption through pipes or "other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days per year".
B.2	**C**ommunity Water System (**CWS**):	A public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
B.3	**N**on-**T**ransient Non-Community Water System (**NTNC**):	A public water system that is not a [CWS] and that regularly serves at least 25 of the same persons over 6 months per year. Examples: Systems serving facilities such as schools or non-residential work sites where the same people use the water on

a regular basis.

B.4	Transient **N**on-**C**ommunity Water System (**TNC**):	Any public water system not described in 1 or 2 above that serves more than 25 persons per day at least sixty days out of the year. Examples: systems serving campgrounds or other non-residential areas not used by at least 25 of the same persons over 6 months a year.
B.5	**N**on-**P**ublic Water Systems (**NP**):	A water system that serves less than 15 service connections, or an average of less than 25 of the same persons per day. Examples could include systems serving ranger stations, individual residences and small campgrounds.

C. BACTERIOLOGICAL MONITORING

Definitions of the systems described below, as well as definitions of other terms used in this guideline are listed above and on pages 21-22.

C.1 Number and Frequency of Samples:

a. Community Water Systems [CWS]: Two samples per month, minimum, or as per Table 1 (Page 23). Samples must be taken at equally spaced intervals two times per month.

b. Non-Community Water Systems [NTNC & TNC]: Two samples per month, minimum, or as per Table 1 (Page 23). Samples must be taken at equally spaced intervals two times per month.

c. Non-Public Water Systems [NP]: One sample per month. The sampling frequency may be changed if authorized in writing by the PHC. *This authorization will only be given after a complete sanitary survey and review of the operational records indicates a reduced sampling frequency would not increase risk to end-users*.

C.2 Special Sampling Requirements:

a. Seasonal systems: Seasonal systems must obtain two consecutive, **negative** samples prior to utilization of the system. Samples may be collected on the same day, but not at the same time and must be collected at different sampling sites according to the site-sampling plan, if applicable.

b. Source water monitoring: Some Primacy Agencies require periodic source (raw) water monitoring. Sampling of source water must be in accordance with the Primacy Agency requirements.

c. Municipal supplies: National Park Service operated distribution systems serviced by municipal systems should be included in the municipality's bacteriological sampling programs whenever feasible. When the municipality does not monitor a distribution system, the PHC should be contacted to determine if and when the system requires sampling.

C.3 Site-sampling plan: Each system must have a written site-sampling plan available for review by the Primacy Agency, and/or the PHC. All bacteriological samples must be collected from identified sampling sites.

C.4 Positive samples: All positive total coliform samples require that the system operator obtain repeat samples in accordance with the Primacy Agency or at a minimum the following:

a. Public systems: Three repeat samples must be collected within 24 hours of laboratory notification of the positive result. One sample must be collected at the site of the positive sample, and one sample collected upstream and one downstream of the positive sample site, each within 5 service connections of positive sample site. In addition, a minimum of five samples must be collected the following month. **NOTE**: This includes public non-community systems.

b. Non-public systems: Two repeat samples must be collected and analyzed. One sample must be collected at the site of the positive sample.

C.5 Non-compliance - Public Systems: **If any repeat samples are positive,** the park must notify the Primacy Agency and the PHC by close of business of the day following receipt of notification of sample results. If the repeat test results indicate a fecal coliform or an *E.coli* contamination, public notification and corrective action must be taken immediately. The Park must contact the Primacy Agency for their concurrence on the content and method to be used in notifying the public. The Primacy Agency and the PHC must be contacted for assistance in determining the source of the contamination and in implementing corrective action.

Public notification is required if the requisite number of samples is not collected, or if more than one routine sample per month is positive for total coliform. Coordination with the Primacy Agency and/or the PHC is required.

C.6 Non-compliance - Non-Public Systems: The procedure described for public systems must be followed except that notification and involvement of the Primacy Agency is not required.

D. CHEMICAL MONITORING

The monitoring requirements in this section may be waived for non-public and/or unregulated systems if authorized, in writing, by the PHC. This authorization will only be given after a

complete sanitary survey of the system and review of the operational records indicates a reduced sampling frequency or waiver would not increase risk to end-users.

Systems connected to municipal supplies are not required to perform chemical monitoring if current analyses are available from the municipality. If current analyses are not available, the Park may be requested by the PHC to perform the analyses.

Monitoring requirements are as shown in **Table 5 (Page 41): National Park Service Water Systems Routine Monitoring Requirements**.

For a complete overview of the EPA National Primary Drinking Water Standards go to: http://www.epa.gov/safewater/standards.html

D.1 Primary, secondary, and general mineral: Primary inorganic, secondary inorganic and general mineral analyses must be conducted to meet regulatory requirements and/or to determine the most feasible treatment methodologies to provide water of satisfactory quality. Samples shall be collected from the source before treatment. NOTE – Nitrates are required annually for all sources.

For more information on inorganic chemicals, specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mcl.html#inorganic

D.2 Organics:

a. Pesticides, Herbicides & PCB's: All public community and public non-transient non-community systems must be sampled annually unless a State or Primacy Agency waiver has been issued. All public non-community (transient users only) and non-public systems must be sampled one time. Additional sampling requirements are dependent upon the initial sampling results and source vulnerability. Samples should be collected after treatment and prior to entry to the distribution system.

b. **V**olatile **O**rganic **C**hemicals (**VOC**): There are fifty-five VOC's that have MCL's (regulated or unregulated) that must be analyzed. Samples should be collected after treatment and prior to entry to the distribution system.

i. Groundwater Supplies. Public community and public non-transient non-community systems served by groundwater supplies should have collected a sample from each entry point to the distribution system for an initial analysis by **December** 1990. A single routine sample must be collected at three-year intervals thereafter, unless the Primacy Agency has issued a waiver.

ii. Surface Water Systems. The initial sampling for public community and public non-transient non-community systems served by surface sources consists of four quarterly samples to be collected over a one-year period.

The first sample should have been collected by **December 1990**. Sampling must be repeated at three-year intervals thereafter, unless the Primacy Agency has issued a waiver.

iii. All Other Public Systems (ground or surface water). These systems should be sampled one time for baseline information. Contact the PHC for additional information and guidance.

iv. Non-public Systems. These systems should be sampled in special situations only. Contact the PHC for additional information and guidance.

For more information on organic chemicals, specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mcl.html#organic

Note: If the primacy agency grants a waiver for organic chemical monitoring for a public system, the PHC may also grant a waiver for those non-public systems not regulated by the State but lie within the same aquifer.

D.3. Disinfectants/Disinfection Byproducts: This rule is intended to balance the use of disinfectants with the potential health effects from long term exposure to byproducts formed by the reaction of disinfectants with natural organic and inorganic matter in drinking water

a. This rule applies to all community and non-transient non-community water systems that add a chemical disinfectant to the water in any part of the treatment process. This includes surface water systems, groundwater systems under direct influence of surface water, and groundwater systems.

b. **Compliance dates:**

i. Surface Water and GWUDI of Surface Water Systems. For systems serving 10,000 or more people/day, the effective date is **January 2002**.

ii. Small Surface Water and GWUDI of Surface Water Systems. For systems serving less than 10,000 people/day, the effective date is **January 2004**.

c. **Byproducts to be monitored:**

i. Total trihalomethanes (TTHM): The sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

ii. Haloacetic acids (HAA5): The sum of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

iii. Bromate: For those systems using ozone for disinfection.

iv. Chlorite: For those systems using chlorine dioxide for disinfection.

d. **Disinfectants to be monitored:**

i. Chlorine: for those systems using chlorine.[1]

ii. Chloramine: for those systems using chloramine.

iii. Chlorine dioxide: for those systems using chlorine dioxide.

e. **Monitoring requirements:**

i. Large surface water systems (>10,000 persons/day): monitor 4 samples/plant/quarter for TTHMs and HAA5s.

ii. Small surface water systems (<10,000 persons/day): monitor 1 sample/plant/year for TTHMs and HAA5s.

iii. Very small surface water systems - serving less than 500 people each day: monitor 1 sample/plant/year for TTHMs and HAA5s.

iv. Large ground water systems - serving more than 10,000 people each day: monitor 1 sample/plant/quarter for TTHMs and HAA5s.

v. Small ground water systems - serving less than 10,000 people each day: monitor 1 sample/plant/year for TTHMs and HAA5s.

vi. All Systems – monitoring per TCR for chlorine, chloramines and chlorine dioxide (which ever is used for disinfection).

[1]The MCL for chlorine under the stage 1 disinfection byproducts rule is 4.0 mg/L for systems serving fewer than 10,000 persons/day and is effective January 2004.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/dbpfr.pdf

E. LEAD AND COPPER

On June 7, 1991, final national primary drinking water regulations for lead and copper were adopted for public-community and public non-transient non-community water systems. The rule establishes maximum contaminant level goals (MCLG), and action levels for both lead and copper. It also sets forth treatment technique requirements and specifies monitoring requirements, analytical methods, public notification requirements, record keeping and reporting requirements, and compliance schedules. An EPA public education program is also required if

an action level is exceeded.

To comply with the rule and in order to assess for and reduce the health risks associated with lead and copper, parks should:

E.1 **Initial Surveillance for All NPS Water Systems:**

a. Have the water entering each system analyzed for lead and copper at a certified laboratory with a MDL of 0.001 mg/l for lead and 0.020 mg/l for copper. This will normally be done as part of the inorganic analysis.

   If source water exceeds 0.015 mg/l of lead or 1.3 mg/l of copper, the levels must be reduced below those levels before the water enters the system. Systems with lead or copper contamination problems will have 24 months to install treatment specified by the Primacy Agency and 12 months after treatment installation to correct follow-up source samples.

   After treatment, source water monitoring will be standardized to a three-year cycle established by the Primacy Agency.

b. Take first draw tap samples (one liter) at each Park Service owned residence and have them analyzed for lead and copper. If one or more first draw tap samples are elevated for lead or copper (>0.015 mg/l, >1.3 mg/l), contact your PHC for further recommendations.

c. Assure that lead solder or flux is no longer used in domestic water plumbing.

d. Replace drinking fountains listed by EPA under the Lead Contamination Control Act.

E.2 **Monitoring:**

a. Monitor community and non-transient non-community systems for lead and copper by collecting one set of samples every 6 months effective **July 1993**.

b. If the samples are not above the action levels in the 90th percentile, samples must be collected once a year for three years and then once every three years as long as the results are below the action level.

c. If the action level is exceeded in the 90th percentile at the consumer's tap, treatment methods approved by the Primary Agency must be installed.

* The Primacy Agency may allow reduced monitoring if certain conditions are met. Otherwise, base monitoring is required.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/lcrmr/implement.html

F. RADIONUCLIDES

F.1 In 2000, EPA revised the radionuclides regulation, which had been in effect since 1977. The revisions required new monitoring provisions to ensure that all customers of community water systems will receive water that meets the Maximum Contaminant Levels for radionuclides in drinking water. EPA also issued a standard for uranium, as required by the 1986 amendments to the Safe Drinking Water Act. The current standards are: combined radium 226/228 of 5 pCi/L; a gross alpha standard for all alphas of 15 pCi/L (not including radon and uranium); a combined standard of 4 mrem/year for beta emitters. The new MCL for uranium is 30 µg/L.

Community water systems (CWSs), which are water systems that serve at least 15 service connections or 25 residents regularly year round, are required to meet the final MCLs and to meet the requirements for monitoring and reporting.

Non-transient, non-community water systems (NTNCWSs) will not be regulated at this time. EPA will further consider this matter and may propose to regulate radionuclides at these systems in the future. NTNCWSs are public water systems that are not a CWS and serve at least 25 of the same people more than 6 months per year

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/radionuclides/regulation.html#one

G. WATER TREATMENT

G.1 Filtration:

a. All surface water sources and any groundwater sources under the direct influence of surface water must be provided with approved filtration.

b. Compliance schedule for provision of filtration: For surface water supplies, filtration must have been in place and operational effective June 29, 1993. For groundwater supplies that are determined to be under the influence of surface water, filtration must be in place and operational 18 months after the Primacy Agency officially issues the determination

c. Parks with groundwater sources clearly under the direct influence of surface water should contact the PHC for assistance in developing a schedule to provide filtration or developing a new groundwater source.

d. In those cases where it is not certain if a groundwater source is under the influence of surface water, parks should be aware that the criteria for making such determinations have not been developed by all Primacy Agencies. When these

criteria are developed, parks should contact the PHC for assistance in developing and initiating a modification schedule.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/mdbp.html

e. On December 16, 1998 EPA finalized an Interim Enhanced Surface Water Treatment Rule (IESWT), which became effective **February 16, 1999**. This rule is intended to improve control of microbial pathogens, including specifically the protozoan *Cryptosporidium*, by enhancing physical removal efficiencies in drinking water, and addresses risk trade-offs with disinfection byproducts.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/ieswtr.html

f. In January 2004, the EPA Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) became effective. This rule follows the IESWTR and regulates systems of less than 10,000 people. This rule includes the compliance with Stage 1 Disinfectants/Disinfection Byproducts Rule. These new rules affect public and non-public surface water treatment plants including ground water systems under the influence of surface water.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/app_b_regulatory.pdf

g. In December 2005, the EPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfection Byproduct Rule became effective. The Long Term 2 Enhanced Surface Water Treatment Rule and the Stage 2 Disinfection Byproducts Rule are the second phase of rules required by Congress. These rules strengthen protection against microbial contaminants, especially Cryptosporidium, and at the same time, reduce potential health risks of disinfection byproducts. The new regulations apply to public water systems that use surface water or ground water under the influence of surface water.

Under the LT2ESWTR, systems will monitor their water sources to determine treatment requirements. This monitoring includes an initial two years of monthly sampling for *Cryptosporidium*. To reduce monitoring costs, small filtered water systems will first monitor for *E. coli*—bacterium which is less expensive to analyze than *Cryptosporidium*—and will monitor for *Cryptosporidium* only if their *E. coli* results exceed specified concentration levels.

Monitoring starting dates are staggered by system size, with smaller systems beginning monitoring after larger systems. Systems must conduct a second round of monitoring six years after completing the initial round to determine if source water conditions have changed significantly. Systems may use (grandfather) previously collected data in lieu of conducting new monitoring, and systems are

not required to monitor if they provide the maximum level of treatment required under the rule.

Cryptosporidium treatment: Filtered water systems will be classified in one of four treatment categories (bins) based on their monitoring results. The majority of systems will be classified in the lowest treatment bin, which carries no additional treatment requirements. Systems classified in higher treatment bins must provide 90 to 99.7 percent (1.0 to 2.5-log) additional treatment for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the "microbial toolbox" to meet their additional treatment requirements. All unfiltered water systems must provide at least 99 or 99.9 percent (2 or 3-log) inactivation of *Cryptosporidium*, depending on the results of their monitoring. These *Cryptosporidium* treatment requirements reflect consensus recommendations of the Stage 2 Microbial and Disinfection Byproducts Federal Advisory Committee.

Other requirements: Systems that store treated water in open reservoirs must either cover the reservoir or treat the reservoir discharge to inactivate 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium*. These requirements are necessary to protect against the contamination of water that occurs in open reservoirs. In addition, systems must review their current level of microbial treatment before making a significant change in their disinfection practice. This review will assist systems in maintaining protection against microbial pathogens as they take steps to reduce the formation of disinfection byproducts under the Stage 2 Disinfection Byproducts Rule, which EPA is finalizing along with the LT2ESWTR.

The Stage 2 Disinfection Byproducts Rule strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5). The rule targets systems with the greatest risk and builds incrementally on existing rules. This regulation will reduce DBP exposure and related potential health risks and provide more equitable public health protection.

Under the Stage 2 DBPR, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 DBPR compliance monitoring.

Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system.

The Stage 2 DBPR also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review their operational practices and submit a report to their state that identifies actions that may be taken to mitigate future high DBP levels, particularly those that may jeopardize their compliance with the DBP MCLs.

Entities potentially regulated by the Stage 2 DBPR are community and nontransient noncommunity water systems that produce and/or deliver water that is treated with a primary or residual disinfectant other than ultraviolet light.

A community water system (CWS) is a public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents.

A nontransient noncommunity water system (NTNCWS) is a water system that serves at least 25 of the same people more than six months of the year, but not as primary residence, such as schools, businesses, and day care facilities.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/disinfection/lt2/regulations.html

http://www.epa.gov/safewater/disinfection/stage2/regulations.html

h. The Environmental Protection Agency (EPA) is in the process of promulgating the final Ground Water Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use ground water sources. The rule establishes a risk-targeted strategy to identify ground water systems that are at high risk for fecal contamination. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from ground water systems from bacteria and viruses.

   The rule addresses risks through a risk-targeting approach that relies on four major components:

   1. Periodic sanitary surveys of ground water systems that require the evaluation of eight critical elements and the identification of significant deficiencies (e.g., a well located near a leaking septic system). States must complete the initial survey by December 31, 2012 for most community water systems (CWSs) and by December 31, 2014 for CWSs with outstanding performance and for all non-community water systems.

   2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions:

- *Triggered monitoring* for systems that do not already provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and that have a total coliform-positive routine sample under Total Coliform Rule sampling in the distribution system.
- *Assessment monitoring* - As a complement to triggered monitoring, a State has the option to require systems, at any time, to conduct source water assessment monitoring to help identify high risk systems.

3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following correction action options:
    - correct all significant deficiencies,
    - eliminate the source of contamination,
    - provide an alternate source of water, or
    - provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.
4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99 percent (4-log) inactivation or removal of viruses.

For specific rule information, compliance dates, and regulatory updates, go to:

http://www.epa.gov/safewater/disinfection/gwr/regulation.html#therule

G.2 **Turbidity Monitoring:**

a. All water systems requiring filtration under the Surface Water Treatment Rule, Interim Enhanced Surface Water Treatment Rule, Long Term 1 Enhanced Surface Water Treatment Rule and Long Term 2 Enhanced Surface Water Treatment Rule (See G.1.) must be analyzed for turbidity. The unit of measure for turbidity is the Nephelometric Turbidity Unit (NTU). The MCL is 1.0 NTU for diatomaceous earth and slow sand filtration and 0.3 NTU for conventional and direct filtration. The MCL for "other technology" filtration such as bag filtration is 1.0 NTU unless a more stringent requirement is established by the Primacy Agency. The turbidity must never be greater than 1.0 NTU. Systems serving 500 or fewer persons per day must collect one grab sample per day. Effective **June 29, 1993**, systems serving more than 500 persons per day must collect one grab sample every four hours when water is served to the Public or continuous monitoring may be substituted for grab sampling.

The PHC must be informed of any violation. The issuance and content of public

notification must be determined in consultation with the Primacy Agency and/or the PHC.

For specific rule information, compliance dates, and regulatory updates, go to: http://www.epa.gov/safewater/mdbp/mdbp.html

G.3 **Disinfection:**

All public drinking water systems will be continuously disinfected. Acceptable disinfecting methods are those which provide a measurable disinfectant residual (minimum .2 mg/l free chlorine, optimum range is .5 to 1.0 mg/l free chlorine) in the distribution system. The PHC may specifically exempt ***non-public*** systems after a complete sanitary survey of the system is made.

Acceptable disinfection methods are those which provide a measurable disinfectant residual in the distribution system.

a. Distribution System Residual: A minimum free chlorine residual of 0.2 mg/l must be maintained at all points throughout the distribution system. If disinfectants other than chlorine are used, the PHC or Primacy Agency must be contacted for residual levels required to be maintained. The absence of a residual indicates either an equipment failure or the presence of contamination in the system. If an equipment failure is not the cause, the park must contact the PHC or the Primacy Agency for assistance in determining what action to take.

b. Routine Monitoring: All **chlorinated** distribution systems must be monitored for the presence of a **chlorine** residual. A minimum of one sample per day must be measured and recorded from representative points in the distribution system. Parks receiving water from municipalities should contact the PHC for residual monitoring requirements.

In addition to monitoring the distribution system itself, parks with surface water systems must monitor the entry point to the distribution system for the presence of a chlorine residual. The minimum chlorine residual is 0.2 mg/l or a higher level determined using CT calculations. If the residual drops below 0.2 mg/l (or the CT-Value, which ever is greater), it must be restored within four hours. Whenever the residual falls below the required value, the park must notify the Primacy Agency and the PHC as soon as possible but not later than the end of the next business day. For systems serving more than 3300 persons, the chlorine residual must be monitored on a continuous basis. Systems serving fewer than 3301 persons can take grab samples in lieu of continuous monitoring at the following frequencies:

System Population	Samples/day
< 500	1
501-1000	2
1001-2500	3

b. Redundancy of Disinfection Equipment: For surface water systems, replacement of disinfection equipment must be available and in service within four hours of problem identification.

c. Special Monitoring - Bacteriological Sampling: The chlorine residual must be measured at the bacteriological sample site each time a bacteriological sample is collected. The monitoring results must be recorded on the operators log and the laboratory form.

H. OPERATOR REQUIREMENTS

H.1 All parks that operate public drinking water systems will have certified operators as required by the primacy agency. Parks that operate only non-public drinking water systems will have appropriately trained operators.

H.2 The park must designate in writing, backup operators who have adequate training and skills to properly operate the system when the primary operator is not available.

Equivalent backup operator certification and training is recommended and may be required by some primacy agencies.

H.3 Appropriate training requirements for backup operators and for noncertified operators of nonpublic systems will be described by Park policy, reviewed and approved by the Regional Public Health Consultant.

H.4 NPS Unit Managers will develop training plans and assure that operators receive any required and/or appropriate training.

I. SANITARY SURVEYS

The 1986 amendments to the Safe Drinking Water Act require that the Primacy Agency conducts sanitary surveys or an entity approved by the Primacy Agency. For unregulated and/or non-public systems, contact the PHC.

J. CROSS CONNECTION CONTROL

Each park must have a documented cross connection control program on file for review by the Primacy Agency and/or the PHC. An example policy for cross-connection and backflow control is provided in RM83 (A2).

K. POTABLE WATER HAULING

In the absence of State or local standards, the following standards shall apply to NPS water hauling operations whether conducted by the Park or a private contractor:

K.1 Water shall be hauled from an approved source that meets the requirements of the Safe Drinking Water Act (SDWA).

K.2 Containers must be, (1) constructed of non-toxic materials, (2) be non-porous, (3) have never been used for storing anything but potable water, (4) used only for hauling potable water, and (5) be labeled "potable water only".

K.3 Before the container is filled, sufficient chlorine shall be added to achieve a free chlorine residual of 1.0 ppm, in the water hauled. A free chlorine residual sample shall be taken, and recorded.

K.4 The container must be flushed each time water is hauled if it has not been used for more than one day.

K.5 At no time during the water filling operation shall a potential for backflow exist.

K.6 Hoses used to fill and empty tanks shall be properly identified, and used only for potable water. The ends of the hoses shall be capped, when not in use, and the caps shall be attached to the hoses.

K.7 Hoses shall be stored in such a manner that they are not subject to contamination from surface run-off, birds, rodents, and other sources of contamination.

K.8 All valves and fire hydrants shall be flushed before the connection of any hoses.

K.9 No bacteriological testing will be required on water hauling tanks when source water systems and receiving water systems have a monitoring program in place.

L. REPORTS AND RECORDS RETENTION

The park has the responsibility for the maintenance of official records and to have them available in an organized manner for the review and inspection of various regulatory entities and for periodic review by the PHC. Records must be retained as follows or as required by the Primacy Agency:

RECORDS	RETENTION PERIOD
Chemical Analyses	Indefinitely
Bacteriological Analyses	Five years
Turbidity Measurements	Five years
Public Notices, Administrative Orders, Variances and Exemptions	Five years
Sanitary Surveys	Ten years
Operating Records--includes water usage, water production, chemical usage, chlorine residuals, etc.	Five years
System History - includes well logs test pump data, system	

modifications, as-builts, operator designations, significant events	Indefinitely
Lead and Copper Rule Records	Twelve years

M. WATER CONSERVATION

NPS Management Policies (Chapter 9.1.5.1) requires that the NPS design, construct, manage, and maintain water supply systems in a fashion that promotes conservation. Conservation measures which should be considered include: metering, leak detection and correction, automatic irrigation systems, low-use water fixtures, low flush toilets, and programs which discourage wasteful use of water.

N. PAYMENT OF FEES FOR SERVICE

Many Primacy Agencies charge fees for services. Fees are charged for plan review, construction and operating permits, and for sanitary surveys conducted by the Primacy Agency. The Safe Drinking Water Act placed federally owned and operated systems under the jurisdiction of Primacy Agencies. Parks may be required to pay subject fees. Payment of fees should be included in annual budget and contracting plans, as appropriate.

O. PUBLIC NOTIFICATION

The public notification requirements of the Safe Drinking Water Act require water systems to notify the persons they serve when:

O.1 Violation(s) of a National Primary Drinking Water Regulation or its monitoring requirements occur.

O.2 Variances or exemptions are in effect.

O.3 Systems do not comply with any schedule associated with a variance or exemption

The public notification requirements distinguish between serious violations, such as failure to meet a maximum contaminant level (MCL), and minor violations such as failure to use the proper analytical technique. This is accomplished by a two-tiered structure of public notification requirements. Tier I violations pose acute risk to human health and require rapid notification. Tier II violations do not pose an acute risk and more time is allowed for notification.

The Primacy Agent is responsible for approving the content distribution and timing of public notices. Therefore, whenever public notification is required, parks must contact the Primacy Agency for assistance in preparing such notices.

P. PLAN REVIEW AND APPROVAL

Whenever major water system modifications are proposed, parks must contact the Primacy Agency to determine whether or not plans and specifications must be submitted for approval.

The PHC may be contacted for technical review and guidance on public health related issues (e.g. treatment, backflow prevention, disinfection).

Q. POTABLE WATER FOR BACKCOUNTRY OPERATIONS

Water used for drinking and culinary purposes by backcountry concessionaires must be obtained from an approved public system or from a source known to be free of chemical contamination and treated by:

a. **Boiling**: Bringing to a rolling boil for 1 minute, or 3 minutes for elevation above 6500 feet.

OR

b. **Filtering and Disinfecting**: Filtering through an "Absolute" 1 micron filter, or one labeled as meeting American National Standards Institute (ANSI/NSF) (formerly the National Sanitation Foundation) International Standard #53 for "Cyst Removal" followed by disinfection. Add 8 drops of liquid chlorine bleach per gallon of water or another approved sanitizer and let stand for 30 minutes.

OR

c. Taking a supply of water from an approved public water system and properly storing in containers that are free from contamination and disinfected between every use. Due to the lack of labeling and manufacturing standards, there is no assurance that bottled water is safer than public drinking water and may require boiling also.

Water storage containers must be free of contamination when in use and must be washed and sanitized as necessary.

R. CONSUMER CONFIDENCE REPORTS

The Safe Drinking Water Amendments of 1996 require that Public Community Systems provide all consumers with a yearly Consumer Confidence Report which outlines all bacteriological, physical, and chemical monitoring results and Maximum Contaminant Levels for the preceding year.

S. DRINKING WATER SECURITY AND EMERGENCY PREPAREDNESS

Security and emergency response planning have always been a critical element of managing a drinking water system. Threat categories include physical destruction, bioterrorism/chemical contamination, cyber attacks, and personnel disruption. Potential threats can come from vandals, disgruntled employees, insider sabotage, activist groups, or state-sponsored terrorist groups.

The Park should determine if there are any state mandated requirements for providing drinking water security assessments.

If there no state requirements, the park can utilize the following list of actions that each park can do to protect the water supply from contamination and other harm:

1. Prepare or update an emergency response plan. Ensure all level of involvement and that all staff receive training on the plan.
2. Post updated emergency 24-hour numbers in highly visible areas (pumphouses, vehicles, offices) and give them to key personnel and local response officials.
3. Get to know the Park Ranger staff and/or the local law enforcement personnel. Ask them to add your facilities to their routine patrols. Practice emergency response procedures with the rangers, emergency response and public health staff.
4. Fence and lock your drinking water facilities and vulnerable areas (e.g. wellhead, hydrants, manholes, pumphouses, and storage tanks).
5. Lock all entry gates and doors and set any alarms to indicate illegal entry. Do not leave keys in equipment or vehicles at any time.
6. Install good lighting around your pumphouse, treatment facility and parking lot.
7. Identify existing and alternate water supplies and maximize use of backflow prevention devices and interconnections.
8. Use your Source Water Assessment information to lessen any threat posed by potential sources of contamination.
9. Lock monitoring wells to prevent vandals or terrorists from pouring contaminants directly into ground water near your source. Prevent pouring or siphoning contaminates through vent pipes by moving them inside the pumphouse or treatment plant. If that is not possible, fence or screen them.
10. In the event of an emergency, first call "911" then activate your emergency response plan.

A self-assessment vulnerability checklist is provided at: http://www.nps.gov/public_health/intra/. A more in-depth vulnerability profile assessment can be found in the Association of State Drinking Water Administrators, National Rural Water Association "Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems" document.

These and other drinking water security references can be accessed at the following NPS website: http://www.nps.gov/public_health/intra/

T. GENERAL DEFINITIONS

Item	**Definition**
CT-value (Concentration X Time)	The product of "residual disinfection concentration" in mg/l determined before or at the first customer, and the corresponding "disinfection contact time" in minutes.
Cryptosporidium	Coccidian protozoan shed in the feces of man and animals in the form of oocysts, which can survive under adverse environmental conditions for long periods of time. Responsible for a severe gastrointestinal disease called cryptosporidiosis.
Escherichia coli (*E.coli*)	One of the species of bacteria in the fecal coliform

	group. It is found in large numbers in the gastrointestinal tract and feces of warm-blooded animals and man. Its presence is considered indicative of fresh fecal contamination, and it is used as an indicator organism for the presence of less easily detected pathogenic bacteria.
Fecal Coliforms	Aerobic and facultative, gram-negative, non-spore-forming rod-shaped bacteria capable of growth at 44.5 degrees C., and associated with fecal matter of warm-blooded animals.
Giardia lamblia	Flagellate protozoan shed in the feces of man and animals, usually in the cyst stage, and responsible for a severe gastrointestinal disease called giardiasis.
Ground water under the direct influence of surface water (**GWUDI**)	Water beneath the surface of the ground with (1) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia;* or (2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.
Heterotrophic Plate Count (**HPC**)	Number of colonies of heterotrophic bacteria grown on selected solid media at a given temperature and incubation period, usually expressed in number of colony forming units per milliliter of sample (CFU/ml).
Heterotrophic microorganisms	Bacteria and other microorganisms that utilize organic matter synthesized by other organisms for energy and growth.
Inorganic Chemicals (**IOC**)	Chemical substances of mineral origin not having carbon in their molecular structure.
Maximum Contaminant Levels (**MCL**)	The highest permissible concentration of a substance allowed in drinking water, as established by EPA.
Maximum Contaminant Level Goals (**MCLG**)	The highest permissible concentration of a substance allowed in drinking water at which no known or anticipated health effects will occur. They are health goals and are not enforceable.
Minimum Detection Limit (**MDL**)	The lowest achievable concentration of a contaminant that can be measured under ideal laboratory conditions. A more technical definition is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the concentration of the substance being measured is greater than zero.
Potable Water Hauling:	The transportation of potable water as a primary, a supplemental, or an emergency source in containers greater than 50 gallons.
Primacy Agency	Generally a State agency authorized by the EPA to

	administer provisions of Safe Drinking Water Act. (Note: Not all States have requested this authorization. If authorization is not requested, EPA is the Primacy Agency).
Radionuclide	A material with an unstable atomic nucleus, which spontaneously decays or disintegrates, producing radiation.
Sanitary Survey	A detailed investigation of the features of a water system and conditions, which may impact the ability of the system to deliver safe drinking water.
Synthetic Organic Chemicals (**SOC**)	Man-made organic chemicals, many of which have been detected in drinking water. This group includes the VOCs.
Trihalomethanes (**THM**)	A group of volatile organic compounds formed when chlorine reacts with naturally occurring humic substances. Individual Compounds are not regulated under THM's.
Total Coliforms	A group of bacteria predominantly inhabiting the intestines of man or animals but occasionally found elsewhere. Presence in water is used as indication of possible pathogen contamination.
Total Trihalomethanes (**TTHM**)	A term used to designate the total concentration of chloroform, bromoform, dibromochloromethane, and bromodichloromethane in the National Primary Drinking Water Regulations. Combination of THM compounds is regulated.
Volatile Organic Compounds (**VOC**)	Lightweight, man-made organic compounds that vaporize, or evaporate, easily.
Waiver	The relinquishing of the requirements to perform certain monitoring and/or sampling procedures.

TABLE 1
NPS – TOTAL COLIFORM SAMPLE
REQUIREMENTS FOR PUBLIC SYSTEMS

Population Served Per Day	Minimum Number of Samples Per Month
25 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8

7,601 to 8,500	9
8,501 to 12,900	10
12,901 to 17,200	15
17,201 to 21,500	20
21,501 to 25,000	25
25,001 to 33,000	30
33,001 to 41,000	40
41,001 to 50,000	50
50,001 to 59,000	60
59,001 to 70,000	70
70,001 to 83,000	80
83,001 to 96,000	90
96,001 to 130,000	100

The population served (**p**) is defined as the sum of the residents (**r**) and the average daily transient population (total number of transients (**t**) served per month divided by the number of days (**d**) of the month during which the transients were served), i.e., **p = r + t/d**. (If the transient population changes significantly from month to month, utilize information from previous years of operation to calculate the average daily transient population for the current month.)

Note: the local State or County jurisdiction may require an increased sampling protocol based on local regulations.

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in public water systems. The table below divides these contaminants into Microorganisms, Disinfection Byproducts, Disinfectants, Inorganic Chemicals, Organic Chemicals, and Radionuclides.

TABLE 2
NATIONAL PRIMARY DRINKING WATER STANDARDS

Microorganisms

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Cryptosporidium (pdf file)	zero	TT [3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and fecal animal waste
Giardia lamblia	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Heterotrophic plate count	n/a	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment
Legionella	zero	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and *E. Coli*)	zero	5.0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and *E. coli* only come from

				human and animal fecal waste.
Turbidity	n/a	TT[3]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff
Viruses (enteric)	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste

Disinfection Byproducts

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Bromate	zero	0.010	Increased risk of cancer	Byproduct of drinking water disinfection
Chlorite	0.8	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection
Haloacetic acids (HAA5)	n/a[6]	0.060	Increased risk of cancer	Byproduct of drinking water disinfection
Total Trihalomethanes (TTHMs)	none[7] ---------- n/a[6]	0.10 ---------- 0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection

Disinfectants

Contaminant	MRDLG[1] (mg/L)[2]	MRDL[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Chloramines (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes
Chlorine (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes
Chlorine dioxide (as ClO_2)	MRDLG=0.8[1]	MRDL=0.8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes

Inorganic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0[7]	0.010 as of 01/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronicsproduction wastes
Asbestos (fiber >10 micrometers)	7 million fibers per liter	7 MFL	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits
Barium	2	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion

				of natural deposits
Beryllium	0.004	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	TT[8]; Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits
Cyanide (as free cyanide)	0.2	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories
Fluoride	4.0	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled	Water additive which promotes strong teeth; erosion of natural

			teeth	deposits; discharge from fertilizer and aluminum factories
Lead	zero	TT[8]; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Mercury (inorganic)	0.002	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	0.05	Hair or fingernail loss;	Discharge from

			numbness in fingers or toes; circulatory problems	petroleum refineries; erosion of natural deposits; discharge from mines
Thallium	0.0005	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories

Organic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Acrylamide	zero	TT[9]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops
Atrazine	0.003	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene (PAHs)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines

Carbofuran	0.04	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities
Chlordane	zero	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide
Chlorobenzene	0.1	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories
2,4-D	0.07	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops
Dalapon	0.2	0.2	Minor kidney changes	Runoff from herbicide used on rights of way
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards
o-Dichlorobenzene	0.6	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories
p-Dichlorobenzene	0.075	0.075	Anemia; liver, kidney or spleen damage; changes in	Discharge from industrial chemical

			blood	factories
1,2-Dichloroethane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
1,1-Dichloroethylene	0.007	0.007	Liver problems	Discharge from industrial chemical factories
cis-1,2-Dichloroethylene	0.07	0.07	Liver problems	Discharge from industrial chemical factories
trans-1,2-Dichloroethylene	0.1	0.1	Liver problems	Discharge from industrial chemical factories
Dichloromethane	zero	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories
1,2-Dichloropropane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
Di(2-ethylhexyl) adipate	0.4	0.4	Weight loss, liver problems, or possible reproductive difficulties.	Discharge from chemical factories
Di(2-ethylhexyl) phthalate	zero	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories
Dinoseb	0.007	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and

				vegetables
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories
Diquat	0.02	0.02	Cataracts	Runoff from herbicide use
Endothall	0.1	0.1	Stomach and intestinal problems	Runoff from herbicide use
Endrin	0.002	0.002	Liver problems	Residue of banned insecticide
Epichlorohydrin	zero	TT[9]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals
Ethylbenzene	0.7	0.7	Liver or kidneys problems	Discharge from petroleum refineries
Ethylene dibromide	zero	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries
Glyphosate	0.7	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use
Heptachlor	zero	0.0004	Liver damage;	Residue of banned

			increased risk of cancer	termiticide
Heptachlor epoxide	zero	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor
Hexachlorobenzene	zero	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
Hexachlorocyclopentadiene	0.05	0.05	Kidney or stomach problems	Discharge from chemical factories
Lindane	0.0002	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens
Methoxychlor	0.04	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock
Oxamyl (Vydate)	0.2	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes
Polychlorinated biphenyls (PCBs)	zero	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased	Runoff from landfills; discharge of waste chemicals

			risk of cancer	
Pentachlorophenol	zero	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories
Picloram	0.5	0.5	Liver problems	Herbicide runoff
Simazine	0.004	0.004	Problems with blood	Herbicide runoff
Styrene	0.1	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners
Toluene	1	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories
Toxaphene	zero	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle
2,4,5-TP (Silvex)	0.05	0.05	Liver problems	Residue of banned herbicide
1,2,4-Trichlorobenzene	0.07	0.07	Changes in adrenal glands	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.20	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories

1,1,2-Trichloroethane	0.003	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories
Trichloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories
Vinyl chloride	zero	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories
Xylenes (total)	10	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories

Radionuclides

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Alpha particles	none[7] ---------- zero	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	none[7] ---------- zero	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta

				radiation
Radium 226 and Radium 228 (combined)	none[7] ---------- zero	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Uranium	zero	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

Notes

[1] Definitions:
Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water.

[2] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

[3] EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- Cryptosporidium: (as of1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- Giardia lamblia: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- Legionella: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.

- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.

- HPC: No more than 500 bacterial colonies per milliliter.

- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, Cryptosporidium removal requirements, updated watershed control requirements for unfiltered systems).

- Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

[4] more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli if two consecutive TC-positive samples, and one is also positive for E.coli fecal coliforms, system has an acute MCL violation.

[5] Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

[6] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG.

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

[7] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

[8] Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level,

water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

[9] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

- Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA

recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

- National Secondary Drinking Water Regulations - The complete regulations regarding these contaminants availible from the Code of Federal Regulations Web Site.
- For more information, read Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals.

List of National Secondary Drinking Water Regulations

TABLE 3
NATIONAL SECONDARY DRINKING WATER STANDARDS

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

TABLE 4
GENERAL MINERALS*

Contaminant	(mg/L)
Sodium	200 or less is preferred. 20 is considered the level for concern for people with the need to control intake.
Alkalinity	30-500
Calcium	75-200
Hardness	<200
Hydrogen Sulfide	Test at source only when necessary
Magnesium	50-150
Phosphate	<0.2
Potassium	For corrosion control
Specific Conductance	For corrosion control
Temperature (At Source)	For corrosion control

- Values listed are for information only. No limits are established.

TABLE 5
NATIONAL PARK SERVICE WATER SYSTEMS
ROUTINE MONITORING REQUIREMENTS

SYSTEM		BACTERIO-LOGICAL ANALYSIS	CHLORINE RESIDUAL ANALYSIS	TURBIDITY (SURFACE WATER ONLY)	CHEMICAL ANALYSIS					
					PRIMARY INORGANIC	SECONDARY INORGANIC/ GENERAL MINERAL	ORGANICS		RADIO-NUCLIDE	LEAD AND COPPER
							PESTICIDE/ HERBICIDE	VOLATILE		
COMMUNITY WATER SYSTEN (CWS)	GW	TWO/MONTH OR PER TABLE 1	ONE/DAY	POPULATION <500 ONE/DAY POPULATION >500 CONTINUOUS OR EVERY 4 HOURS	EVERY THREE YEARS Annual Nitrates	EVERY THREE YEARS	ANNUAL UNLESS STATE WAIVER ISSUED	EVERY THREE YEARS UNLESS STATE WAIVER ISSUED	Quarterly by end of 2007, then every 3, 6, or 9 years depending on results	**INITIAL** SAMPLE ALL WATER SOURCES AND HOUSING **MONITOR** (PC/PNT) EVERY SIX MONTHS. THERE - AFTER BASED ON RESULTS
NON-TRANSIENT NON-COMMUNITY (NTNC)	SW		SEE TABLE PAGE 16		ANNUALLY Annual Nitrates	ANNUALLY				
NON-COMMUNITY TRANSIENT (NCT)	GW		ONE/DAY		EVERY NINE YEARS Annual Nitrates	EVERY NINE YEARS	ONE TIME	ONE TIME BY 1994	ONE TIME	
	SW		SEE TABLE PAGE 16						NOT REQUIRED	
NON-PUBLIC (NP)	GW	ONE /MONTH	THREE/ WEEK	DETERMINE ON INDIVIDUAL BASIS	EVERY NINE YEARS Annual Nitrates	EVERY NINE YEARS	ONE TIME	SPECIAL SITUATIONS	NOT REQUIRED	
	SW									

(7.f) MAY 2013

	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3
1															
2	7-8	13-4	17-3	18-4	16-10	12-11	18-6	22-8	21-11	0.21 NTU 4.08	65 0.44 NTU 5.75	0.42	0.8 / 0.8	116780	
3	7-8	13-3	17-5	18-6	16-10	12-10	18-6	22-8	21-11	4.05	64 5.78	0.11	0.9 / 0.9	1.0 / 0.6	11698
4	7-8	12-11	17-7	18-8	16-10	12-0	17-10	22-8	21-11	1240 4.08	67 5.76	0.03	—	0.9 / 0.9	116880
5	7-8	12-5	17-7	18-7	16-10	12-0	17-10	22-8	21-11	0.63 1011 4.02 NTU	63 0.97 NTU 5.76	0.10	—	1.0 / 1.0	11698
6	7-8	12-1	17-6	18-6	16-10	12-0	17-9	22-8	21-11	4.02	62 5.76	0.01	—	0.4 / 0.4	11698
7	5-5	12-8	17-6	18-5	16-10	16-11	17-3	22-8	21-11	3.80	650 5.50	0.01	—	1.9 / 0.6	11698
8	4-10	13-4	17-7	18-8	16-10	16-11	16-1	22-8	21-11	3.79	64 1120 5.51	0.01	—	0.5 / 0.5	11698
9	3-10	13-10	17-6	18-5	16-10	16-10	16-0	22-8	21-11	3.78	64 1020 5.50	0.00	—	0.5 / 0.5	11698
10	6-16	13-6	17-4	18-5	16-10	16-11	15-6	22-8	21-11	0.43 NTU 3.95	650 0.43 NTU 5.60	0.49	—	116900	0.5 / 13
11	7-8	13-1	17-4	18-4	16-10	16-10	18-6	22-5	21-11	1008 0.65 NTU 3.78	67 0.54 NTU 5.52	0.12 NTU	—	116950	5 / 14.5
12	7-8	12-6	17-4	18-4	16-10	16-10	18-6	22-2	21-11	1021 0.51 NTU 3.90	67 0.55 NTU 5.58	0.44	—	116980	5 / 15
13	7-9	12-1	17-3	18-3	16-10	16-10	18-6	22-0	21-11	615 3.94	5.60	0.19	—	116980	5 / 16
14	7-9	11-7	17-2	18-3	16-10	16-10	18-6	21-8	21-11	72 3.90	640 5.60	0.01	—	116980	7 / 15
15													—		
16	7-9	11-8	16-11	16-0	16-10	16-10	18-6	21-1	21-11	66 0.47 NTU 3.86	63 0.54 NTU 5.58	0.10	—	116960	7 / 19
17	7-9	11-10	16-11	17-7	16-10	16-10	18-6	21-6	21-11	0.45 NTU 3.85	5.65	0.12	0.5 / 0.5	116980	—
18	7-9	12-0	16-11	18-1	16-10	16-10	18-6	22-0	20-9	68 1154 0.65 NTU 3.95	64 0.52 NTU 5.65	0.25	0-6 / 2-3	116980	—
19	7-9	12-3	17-3	18-5	16-10	16-10	18-6	22-0	19-10	67 0.60 NTU 3.96	62 0.66 NTU 5.68	0.07	0.9 / 2-6	116980	—
20	7-9	12-4	17-7	18-7	16-10	16-10	18-6	22-0	18-11	0.40 NTU 4.04	62 0.70 NTU 5.72	0.36	0.4 / 0.6	116980	—
21	7-9	12-6	17-5	18-5	16-10	16-10	18-6	22-0	18-10	0.42 NTU 4.13	62 0.6 NTU 5.82	0.56	0.3 / 0.3	116980	—
22	7-9	12-7	17-6	18-7	16-10	16-10	18-6	22-0	18-0	0.42 NTU 4.30	63 0.54 NTU 5.91	0.57	0.4 / 2-6	116980	—
23	7-9	12-8	17-7	18-8	16-10	16-10	18-6	22-0	17-5	0.5 NTU 4.42	60 0.44 NTU 5.18	0.51	0.5 / 0.5	116980	—
24	7-9	12-11	17-4	18-4	16-10	16-10	18-6	22-0	17-3	68 0.45 4.33	6.02	0.12	—	0.5 / 0.5	116980
25	7-9	13-1	17-7	18-8	16-10	16-10	18-6	22-0	22-0	66 0.46 4.10	62 5.80	0.04	—	0.7 / 1.8	116980
26	7-9	13-3	17-6	18-6	16-10	16-10	18-6	22-0	22-0	65 0.48 0.54 NTU 4.82	62 0.50 NTU 6.12	2.05	—	0.6 / 6.6	1168
27	7-9	13-4	17-4	18-6	16-10	16-10	18-6	22-0	22-0	65 1000 0.72 NTU 4.84	62 0.61 NTU 6.25	0.35	—	0.10 / 1-11	116
28	7-9	13-6	17-8	18-9	13-7 16-10	16-10	18-6	22-0	22-0	0.52 NTU 4.84	62 0.55 NTU 6.32	0.45	—	0-10 / 0-10	116
29	7-9	13-6	17-5	18-5	13-6	16-10	18-6	22-0	22-0	0.57 NTU 4.89	62 0.45 NTU 6.46	0.26	—	0-9 / 0-9	116
30	7-9	13-9	17-6	18-7	12-3	16-10	18-6	22-0	22-0	62 4.80	64 6.50	0.13	—	0-9 / 2-2	116
31	7-9	13-11	16-6	17-6	11-9	16-10	18-6	22-0	22-0	71 4.81	62 6.50	0.05	—	116980	
	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	

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	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3
1	7-7	12-9	17-6	18-7	16-7	15-11	18-1	22-6	22-6	1.38	3.12	0.02	-	1169600	8 / 21'
2	7-7	12-9	17-7	18-8	16-2	15-11	18-1	22-6	22-6	1.37	3.12	—	-	1169600	8 / 22'
3	7-7	12-0	17-7	18-8	15-11	15-11	18-1	22-6	22-6	1.36	3.10	—	-	1169600	5 / 21
4	7-7	11-6	17-7	18-8	15-8	15-11	18-1	22-6	22-6	1.33	3.08	0.01	-	1169600	5 / 21
5	7-7	10-10	17-5	18-9	15-8	15-11	18-1	22-6	22-6	1.33	3.08	—	0-7 / 0-10	1169600	-
6	6-6	12-7	17-6	18-7	17-7	14-8	18-1	22-6	22-6	1.15	2.88	—	0-4 / 0-11	1169600	-
7	5-4	14-6	17-8	18-9	17-7	13-7	18-1	22-6	22-6	1.15	2.88	0.01	0-4 / 0-4	1169600	-
8	5-4	11-3	17-7	18-7	17-7	13-7	18-1	22-6	22-6	1.13	2.87	0.02	0-6 / 0-6	1169600	-
9	7-11	13-10	17-4	18-9	17-7	13-7	18-1	22-6	22-6	1.28	2.95	0.24	0-6 / 0-6	1169600	-
10	7-11	13-11	17-8	18-9	17-7	12-5	18-1	22-6	22-6	1.92	3.17	0.80	0-7 / 0-7	1169600	-
11	7-11	14-0	17-6	18-7	17-7	12-4	18-1	22-6	22-6	2.10	3.48	0.60	0-8 / 0-8	1169600	-
12	7-11	14-1	17-3	18-4	17-7	12-4	18-1	22-6	22-6	2.09	3.43	0.28	-	0-6 / 0-6	1169600
13	7-11	13-8	17-7	18-8	17-7	12-4	17-2	22-6	22-6	2.10	3.17	0.29	-	2-6 / 0-6	1169600
14	7-11	13-1	17-7	18-8	17-7	12-4	17-1	22-6	22-6	2.38	3.10	0.51	-	0-8 / 0-8	1169600
15	7-11	12-7	17-5	18-6	17-7	16-7	17-1	22-6	22-6	2.36	3.70	0.14	-	0-5 / 0-5	1169600
16	7-11	12-1	17-4	18-4	17-7	16-7	17-1	22-6	22-6	2.22	3.52	0.41	-	0-9 / 0-9	1169600
17	7-11	11-9	17-3	18-3	17-7	16-7	17-1	22-6	22-6	2.37	3.93	0.34	-	0-9 / 0-9	1169600
18	7-11	10-11	17-8	18-9	17-7	16-7	15-1	22-6	22-6	2.38	4.09	0.28	-	0-5 / 0-5	1169600
19													-		
20	5-11	11-9	17-4	18-4	17-7	16-7	15-6	22-6	22-6	3.82	4.49	2.10	-	[illegible]	0- / 21
21	5-1	13-10	17-4	18-5	17-7	16-7	18-7	21-7	22-6	4.19	4.80	2.15	0-10 / 0-5	1169600	
22	5-1	13-4	17-8	18-9	17-7	16-7	18-7	20-10	22-6	4.00	5.03	0.23	-	0-4 / 0-4	1169600
23	5-1	12-10	17-7	18-8	17-7	16-7	18-7	20-10	22-6	3.96	5.24	0.15	-	0-4 / 0-4	1169600
24	5-1	12-5	17-6	18-7	17-6	16-7	18-7	20-10	22-6	3.94	5.40	0.31	-	0-4 / 0-4	1169600
25															
26															-
27	5-1	10-9	17-8	18-9	17-7	14-7	18-7	19-11	22-6	4.25	5.10	1.63	0-5 / 0-5	1169600	-
28	7-1	10-2	17-6	18-6	17-7	14-7	18-7	22-10	22-6	4.10	5.86	0.19		0-6 / 0-6	1169600 -
29	7-11	10-0	17-3	18-3	17-7	16-7	18-7	22-10	22-6	4.12	5.88	.03	0-5 / 0-5	1169600	-
30	7-11	9-8	17-8	18-9	17-7	16-7	18-7	22-10	21-6	4.13	5.84	.27	0-5 / 0-5	1169600	-
31	7-11	9-8	17-6	18-7	17-7	16-7	18-7	22-10	21-5	4.36	5.92	51		1169600	-
	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3

(3 AUG 2013

	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3
1	7-2	13-8	17-6	18-7	16-10	16-6	18-5	22-1	18-0	62 3.50	61 0731 5.24	0.02	—	1-0 / 1-10	1171300
2	7-2	13-10	17-2	18-3	16-10	16-6	18-5	22-1	17-11	1.46	65 0851 5.20	0.01	—	1171300	11 / 38
3	7-2	14-1	17-0	18-2	16-10	16-6	18-5	22-1	21-9	69 3.28	65 1221 5.06	0.06	—	1171300	11 F / 15
4	7-2	14-4	16-10	17-10	16-10	16-6	18-5	22-1	21-9	72 3.26	67 1218 4.99	0.8	—	1171300	11 / 19
5	7-2	14-6	16-9	17-10	14-11	16-6	18-5	22-1	21-9	65 3.25	65 0726 4.18	0.04	—	1171300	10 / 22
6	7-2	14-8	16-7	17-9	14-1	16-6	18-5	22-1	22-2	61 3.21	65 0701 4.16	0.04	—	1171300	15 / 26
7	7-2	14-1	16-7	17-9	13-3	16-6	18-5	22-1	22-2	61 3.21	62 0632 4.14	0.04	—	1171300	15 / 26.5
8	7-2	13-5	16-7	17-9	12-3	16-6	18-5	22-1	22-2	63 3.20	62 0656 4.13	0.02	—	1171300	15 / 28
9	7-2	12-10	16-10	17-11	10-10	16-6	18-5	22-1	22-2	65 3.19	63 0849 4.12	0.01	0-4 / 0-9	1171300	—
10	7-2	12-10	17-0	18-1	16-10	15-3	18-5	22-1	22-2	67 0.52 NTU 3.12	67 1041 0.33 NTU 4.10	1.76	1-0 / 0-6	1171300	—
11	7-2	13-0	17-3	18-4	16-10	13-10	18-5	22-1	22-2	65 0.46 NTU 3.32	66 0947 0.30 NTU 5.14	0.64	1-3 / 0-7	1171300	—
12	7-2	13-1	17-1	18-6	16-10	12-9	18-5	22-1	22-2	66 3.69	66 0710 5.22	0.02	0-5 / 1-3	1171300	—
13	7-2	13-3	17-0	18-0	16-10	12-8	18-5	22-1	22-2	68 0.37 NTU 3.66	68 0701 0.32 NTU 5.22	0.11	0-3 / 0-3	1171300	—
14	7-2	13-3	17-2	18-2	16-10	11-4	18-5	22-1	22-2	65 0.52 NTU 3.66	65 0643 0.36 NTU 5.33	0.12	0-2 / 1-5	1171300	—
15	7-2	13-6	17-5	18-5	16-10	9-10	18-5	22-1	22-2	65 3.58	65 1042 5.34	0.05	0-6 / 1-7	1171300	—
16	7-2	13-6	17-6	18-7	16-10	8-8	18-5	22-1	22-2	65 3.58	64 5.30	0.02	—	0-4 / 1-4	1171400
17	7-2	13-9	17-7	18-8	16-10	16-0	17-10	22-1	22-2	69 0.32 NTU 3.32	65 1015 0.32 NTU 5.20	0.25	—	0-10 / 0-10	1171400
18	7-2	13-10	17-2	18-3	16-10	16-0	17-3	22-1	22-2	67 3.29	69 1000 4.91	0.02	—	0-6 / 1-1	1171400
19							~~17-10~~								
20															
21															
22															
23															
24	7-2	15-0	17-2	18-3	16-10	16-0	11-10	22-1	22-2	69 0.26 NTU 3.20	67 1055 0.30 NTU 4.90	0.25	—	1171400	25 / 27.5
25	7-2	14-11	17-8	18-9	16-10	16-0	10-5	22-1	22-2	68 3.17	65 1020 4.89	0.02	—	1171400	17 / 27
26	7-2	13-11	17-4	18-5	16-10	16-0	10-5	22-1	22-2	65 3.10	69 0920 4.86	0.01	—	1171400	5 / 31
27								2							
28															
29															16 / 28
30	7-2	11-9	17-4	18-5	16-10	16-0	7-7	22-1	22-2	72 3.10	69 1014 4.80	0.06	—	1171400	16 / 28
31	7-2	11-6	17-5	18-7	16-10	16-0	6-9	22-1	22-2	72 0.62 NTU 3.14	65 0924 0.40 NTU 4.82	0.30		1171400	14 / 28
	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3

	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3
1	7-5	14-6	—	17-2	17-0	16-8	12-9	22-1	21-6	62 2.38	76 1304 4.00	0.03	—	1177700	5 / 21
2	7-5	14-8	—	17-0	17-0	16-8	12-5	22-1	21-6	58 2.22	71 0655 4.00	—	—	1177700	10 / 27
3	7-5	14-11	—	16-9	17-0	16-8	16-4	21-5	21-6	57 0.6 NTU 2.06	70 0.5 NTU 3.73	0.06	—	1177700	10 / 27
4	7-5	14-6	—	16-8	17-0	16-9	18-6	20-11	21-6	0.54 NTU 2.24	72 1035 0.46 NTU 3.77	0.70	—	1177700	10 / 27
5	7-5	14-1	—	16-7	17-0	16-8	18-6	20-6	21-6	62 2.16	72 932 3.76	0.05	—	1177700	9 / 27
6	7-5	13-11	—	16-7	17-0	16-8	18-6	20-1	21-6	57 0.7 NTU 2.24	69 0.6 NTU 3.57	0.32	0-9 / 0-8	1172400	—
7	7-5	13-4	—	17-3	17-0	16-8	18-6	19-1	21-6	58 2.17	5.40	0.02	0-11 / 0-11	1172400	—
8	7-5	12-8	—	17-9	17-0	16-8	18-6	18-1	21-6	58 2.13	76 5.13 3.27	—	0-6 / 1-0	1172400	—
9	5-11	12-6	—	18-4	17-0	16-8	18-6	17-0	21-6	56 2.16	69 0722 5.86	0.16	0-11 / 1-0	1172400	—
10	4-6	12-6	—	17-9	17-0	16-8	18-6	21-4	21-5	54 1.78	62 0700 5.42	—	0-4 / 0-4	1172400	—
11	7-6	11-9	—	15-3	17-0	16-8	18-6	22-3	20-4	57 0.7 NTU 1.63	68 0730 0.5 NTU 3.90	0.10	0-7 / 0-11	1178400	—
12	7-6	12-1	—	17-6	17-0	16-9	18-6	22-3	20-3	59 1.66	0744 3.36	0.02	0-3 / 0-3	1178400	—
13	7-6	12-4	—	15-0	17-0	16-9	19-6	22-3	19-4	59 0.65 NTU 1.68	0736 0.48 NTU 3.39	0.11	—	1-0 / 1-7	1178400
14	7-6	12-8	—	18-6	17-0	16-8	18-6	22-3	18-5	50 0.5 NTU 2.56	0705 0.5 NTU 3.75	1.46	—	0-5 / 1-4	1178400
15	7-6	12-10	—	17-6	17-0	16-8	18-6	22-3	18-4	55 2.52	0718 4.22	0.04	—	0-9 / 0-9	1178400
16	7-6	13-2	—	17-10	17-0	16-8	18-6	22-3	17-4	57 2.20	0731 4.41	0.06	—	0-5 / 1-4	1178400
17	7-6	13-6	—	18-3	[illegible]	16-8	18-6	22-3	21-3	59 0.5 NTU 1.96	0655 0.5 NTU 3.65	0.41	—	0-7 / 1-10	1178400
18	7-6	14-3	—	17-9	15-8	16-8	18-6	22-3	22-2	57 0.32 NTU 4.69	[illegible] 0.46 NTU 4.53	0.15	—	0-2 / 0-2	1178400
19	7-6	14-8	—	17-2	15-9	16-8	18-6	22-3	22-2	0737 0.35 NTU 4.88	0.42 NTU 4.90	0.65	—	0-4 / 0-9	1178400
20	7-6	14-11	—	17-7	14-8	16-8	18-6	22-3	22-2	56 4.64	0702 5.15	0.02	—	1178400	5 / 27
21	7-6	14-7	—	17-4	[illegible]	16-8	18-6	22-3	22-2	60 4.43	0659 5.35	0.04	—	1178400	5 / 22
22	7-6	14-0	—	16-7	14-0	16-8	18-6	22-3	22-2	61 4.23	0748 5.42	—	—	1178400	5 / 22
23	7-6	13-7	—	16-5	13-8	16-8	18-6	22-3	22-2	63 4.02	0726 5.52	0.06	—	1178400	10 / 29
24	7-6	12-11	—	16-1	16-11	16-7	18-6	22-3	22-2	59 0.43 NTU 3.8[illegible]	0736 0.38 NTU 5.46	0.16	—	1178400	8 / 2[illegible]
25															
26	7-6	12-10	—	15-8	16-11	16-7	18-6	22-3	22-2	62 0.36 NTU 3.92	1014 0.38 NTU 5.52	0.48	—	1178400	8 / 3[illegible]
27	7-6	13-1	—	15-4	16-11	16-7	18-6	22-3	22-2	60 0.5 NTU 1.95	0730 0.42 NTU 5.57	0.24	0-10 / 0-11	1178400	—
28	7-6	13-4	—	15-9	16-11	13-6	18-6	22-3	22-2	60 0.42 NTU 3.93	0706 0.38 NTU 5.60	0.26	0-9 / 1-2	1178400	—
29	7-6	13-7	—	16-3	[illegible]-11	12-2	18-6	22-3	22-2	59 0.42 NTU 3.93	0702 0.45 NTU 5.60	0.12	0-4 / 1-2	1178400	—
30	7-6	13-11	—	16-9	[illegible]-11	10-10	18-6	22-3	22-2	59 0.45 NTU 3.90	0751 0.47 NTU 5.60	0.15	0-11 / 1-4	1178400	—
31	7-6	14-4	—	17-3	16-11	15-3	17-3	22-3	22-2	55 0.5 NTU 3.75	0.45 NTU 5.38	0.16	0-8 / 1-9	1178400	—
	20K	80K	T1	T2	T3	T4	T5	T18	T19	CG1	CG2	Rain	SS1	SS2	SS3

HAWAII VOLCANOES NATIONAL PARK

Chlorination Pump House Daily Record

Month: Aug 2013

DATE	TIME	Meter /Gals	Wtr Pumped	Gals Used	Gals Left	Gals Mixed	Pump #1 Hours	Pump #2 Hours	Total Hrs	KW	Δ KW
1	0740	64966200	39700	12	19	4 ppm #1	59403.7	5945.9	23.4	37353	26
2	0909	64970900	4700	2	17	3.0 ppm #2	59406.5	5945.9	3.2	37356	3
3	1227	64987500	16600	6	25	4.9 ppm #2	59411.0	5953.4	13.9	37368	12
4	1241	65001700	14200	5	20	2.9 ppm #2	59415.4	5958.9	9.9	37379	11
5	0734	65012800	11100	5	15	3 ppm #2	59418.4	5964.0	8.1	37387	8
6	0714	65032100	19300	7	8	3.5 ppm #2	59424.0	5972.2	13.8	37402	15
7	0659	65051200	19100	7	24	5.5 ppm #2	59429.6	5980.4	13.8	37416	14
8	0703	65071700	20500	8	16	4.0 ppm #2	59435.2	5986.6	14.8	37432	16
9	0854	65105100	33400	14	2	3.0 ppm #2	59435.2	6015.4	25.8	37458	26
10	1030	65135700	30600	12	19	5.6 ppm #2	59435.2	6039.1	24.3	37483	25
11	1000	65166200	30500	12	7	5 ppm #2	59435.2	6062.6	23.5	37506	25
12	0654	65193200	27000	12	19	4 ppm #2	59435.2	6083.5	20.9	37522	22
13	0720	65193700	500	0	19	3 ppm #2	59435.2	6083.8	0.3	37522	0
14	0655	65224400	30700	12	7	3.0 ppm #2	59435.2	6107.6	23.8	37555	25
15	1056	65260500	36100	14	17	4.6 ppm #2	59435.2	6135.3	27.7	37582	27
16	0710	65286900	26400	10	7	4 ppm #2	59435.2	6155.9	20.6	37602	20
17	1225	65313400	26500	10	21	4.9 ppm #2	59435.2	6176.3	21.6	37623	21
18	1010	65315500	2100	0	21	3.0 ppm #1	59436.4	6176.4	1.3	37625	2
19											
20											
21											
22											
23											
24	1045	65447900	132,400	20	1	3.0 ppm	59466.0	6240.3	94.1	37722	97
25	1030	65482000	34100	11	20	3.0 ppm	59486.6	6240.4	20.7	37745	23
26	0935	65482700	700	0	20	3.0 ppm	59486.6	6240.5	.1	37745	0
27											
28											
29	~~1330~~										
30	1330	65552700	70000	20	1	3.0 ppm	59503.5	6275.5	52.1	37800	55
31	1340	65571400		7	24	4.0 ppm	59508.3	6284.6	14.3	37814	14

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CHLORINE RESIDUAL READING

Month: AUG 2013

DATE	Jagger RR	Bird Park	Magma House	Lava Tube	Volcano House	Visitor Center	Maint Office	Namak C G	Nama C B	Time	T 1	T 2
1		0.52cl						0.73 cl	0.72 cl	1345	1.52cl	1.53cl
2										1207	1.65cl	1.44cl
3										1235	1.59 cl	1.52 cl
4										1237	1.65 cl	1.65 cl
5										1232	1.03pc / 1.56cl	1.20pc / 1.53cl
6		1.50cl			0.31cl	1.02cl	1.11cl			1352	1.62cl	1.52cl
7										1221	1.59cl	1.50cl
8										1410	1.60cl	1.50cl
9										1215	1.55cl	1.45cl
10										1345	1.61 cl	1.62 cl
11										1241	1.60 cl	1.61 cl
12										1227	0.80pc / 1.67cl	0.55pc / 1.54cl
13										1202	1.57cl	1.48cl
14										1338	1.57cl	1.53cl
15	8:11 0.94cl									1309	1.66cl	1.48cl
16	20:0 0.44cl									1237	1.74cl	1.51cl
17										1221	1.57 cl	1.63cl
18										1242	1.56 cl	1.52cl
19											0.82pc	1.21
20	0.51cl		0.37cl	0.51cl								
21												
22												
23												
24										1240	1.29 cl	1.44 cl
25										1202	1.42 cl	1.50 cl
26										1201	1.46 cl	1.51cl
27												
28												
29												
30										1345	1.19cl	1.48cl
31										1216	1.20cl	1.46cl
										*	0.92pc	1.32pc

OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Jodi Yamami**	

On March 5, 2015, Office of Inspector General Special Agent Michael Graziano and Evaluator Claire Wyly telephonically interviewed Jodi Yamami, Compliance Engineer, Safe Water Drinking Branch, Hawaii State Department of Health, Honolulu, HI, regarding the State's oversight of the public water system at Hawaii Volcanoes National Park (HAVO). At the time of the interview, Graziano and Wyly were in Hilo, HI, and Yamami was at her office in Honolulu. Yamami agreed to be interviewed and consented to the interview being recorded. The following is a summary of the interview.

Yamami explained that her primary responsibility as a Compliance Section engineer was to manage the Operator Certification Program in the State of Hawaii. Specifically, she helped water operators in the State obtain and maintain the water certifications required by their roles in the various public water systems. Yamami said that beyond certification-related matters, she was not directly involved in oversight of HAVO's water system.

Yamami said that the water treatment plant at HAVO was classified as a Class 2 water treatment plant due to HAVO's use of cartridge filtration. She also said that the water distribution system was classified as a Class 2 system because it served between 1,501 and 15,000 water users. Based on these characteristics, HAVO was required by the State to have one water treatment plant operator (WTPO) with a Level 2 certification, and to have one Level 2 distribution system operator (DSO).

Yamami said that Phil Gagorik, a water operator at HAVO, was designated as the "direct responsible charge" (DRC) for the Park's water system and was directly responsible for managing the system. She confirmed that Gagorik held current Level 2 certifications in both WTPO and DSO categories.

She also confirmed that HAVO employees Daniel Patao and Jeffrey Thacher both held current Level 1 WTPO certifications, and that Thacher held a current Level 1 DSO certification. She noted that, according to her records, HAVO employees Matthew Duryea and Daniel Ortiz were qualified to take examinations to earn Level 1 WTPO certifications, and Thacher was qualified to take the examinations to earn Level 2 certifications in both WTPO and DSO.

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

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Yamami said that HAVO met all water-related certification requirements imposed by the State, and that there had been no gaps in required certifications at HAVO since at least around 2007 or 2008 when she started in her compliance position. She further explained that the State did not require additional certifications for employees acting in a "backup" capacity for either a WTPO or a DSO. She explained that as long as Gagorik, the DRC, remained in Hawaii, other operators, such as Thacher, could manage and operate the distribution system under Gagorik's direction and status as the DRC. If Gagorik left the State for any period of time, however, HAVO should have a backup with WTPO Level 2 certification available to make decisions as the DRC in Gagorik's absence.

Yamani said that, based on his certifications, Thacher was permitted to make daily process-control decisions related to the water system, such as injecting chemicals into the water. She said that Gagorik was the one making the overall decisions for the water system as the DRC, but that Thacher was authorized to conduct such activity under Gagorik's direction.

Yamani reviewed her office records and confirmed that the State conducted a sanitary survey at HAVO on July 17, 2014, and that the report was provided to HAVO Superintendent Cindy Orlando. She said that Mike Miyahira, the engineering supervisor for the Safe Water Drinking Branch, could better answer questions related to the survey, as she did not have any role in the activity.

Position Paper on the Levels of Certification Required for Distribution System Operators and Water Treatment Plant Operators

June 1, 2005

Based on discussion at the May 24, 2005, board meeting, and on provisions of Hawaii Administrative Rules, Title 11, Chapter 25, "Rules Relating to Certification of Public Water Systems," and Hawaii Revised Statutes, Chapter 340F, "Hawaii Law for Mandatory Certification of Public Water System Operators," cited below, the board has determined the following points.

For distribution systems (DSs):

1. The lowest level field supervisor shall be certified at a minimum as a DSO Grade 1.
2. The DRC of a DS shall be certified at the level of the DS.
3. The DRC must be available to the operators of the water system, and must be in-state but not on-island. A certified operator (at least one field supervisor) must be available on-island.

For water treatment plants (WTPs):

1. All WTPs shall be operated by certified WTPOs, with the exception of groundwater chlorination or fluoridation, which can also be operated by certified DSOs.
2. The DRC for a WTP shall be certified at the level of the WTP.
3. The DRC must be at the plant during manned hours, and available on-island during unmanned hours.

The following pertinent sections are cited from Chapter 25:

> 11-25-2.50(a)(1) Each public water system covered by this chapter shall be under the responsible charge of an operator(s) holding a valid certification equal to or greater than the classification of the WTP or DS;
>
> 11-25-2.50 (a)(2) All operating personnel making daily process control or system integrity decisions about water quality or quantity that effect public health shall be certified; and
>
> 11-25-2.50 (a)(3) A designated certified operator shall be available for each operating shift.
>
> 11-25-2.50 (b) ...All WTPs covered by this chapter shall be operated by certified WTP operators. Each WTP shall at all times be under the responsible charge of an operator holding a regular certification equal to or greater than the WTP classification.
>
> 11-25-2.50 (d) Each DS shall at all times be under the responsible charge of an operator holding a regular certification equal to or greater than the DS classification.

"Responsible charge" is defined in Chapter 25 as:

> the operator in responsible charge is the person(s) designated by the purveyor to be the certified operator(s) who makes decisions regarding the daily operational activities of a public water system, water treatment facility, or distribution system, that will directly impact the quality or quantity of drinking water.

Specific questions posed by personnel from the Maui Department of Water Supply on levels of certification required are answered in the following paragraphs. The order of the questions asked have been rearranged slightly based on subject matter. These comments pertain to **public water system operator certification** required, and do not apply to *other* types of certification that may be necessary, such as an electrical license, or license to operate heavy equipment, etc. In addition, these certification requirements are *minimum* standards set by the board of certification; it is ultimately up to the water purveyor if it wants to implement higher standards.

Based on the following treatment technology, what would a well pump with a disinfection system that serves a population of greater than 50K be classified?

It is a Class 4 Distribution System (DS), with a Class 1 water treatment plant (WTP). The water treatment plant can be operated by either a WTPO Grade 1 or a DSO Grade 1.

Assuming the above treatment technology, what grade license and type, WTPO or DSO, would be required for the following scenarios:

1. *Maintenance personnel that purchase & deliver sodium hypochlorite to the WTP? Maintenance personnel that transfer sodium hypochlorite from a holding tank to a working tank (suction side of a chemical metering pump)?*

   These personnel do not need to be certified.

2. *Maintenance personnel that repair/modify the electrical or electronic control of a disinfection pumping system? Maintenance personnel that repair pumps, injection lines, fittings etc. on a disinfection system?*

   These personnel do not need to be certified.

3. *Maintenance personnel that calibrate, in the distribution system, real time chlorine analyzers connected to a SCADA system that is subsequently used for alarming to a central control center?*

These personnel do not need to be certified. The EPA Guidance on the operator certification requirements states that

> "EPA believes that people who program or maintain telemetry/SCADA systems are not operators of water systems and are not required to be certified. However, if anyone who programs or maintains these types of systems is also making process control/system integrity decisions, that person would be required to be certified."

4. *Maintenance personnel that turn a well pump "ON/OFF", locally or remotely, that subsequently operates a disinfection system?*

   Based on direction given by EPA, the personnel who turn the well pump on or off do not need to be certified if:

   a. There is a Standard Operating Procedure for turning the well pump on or off.
   b. A certified operator has made the decision to turn the pump on or off, <u>not</u> the uncertified operator.
   c. There is a Responsible Charge operator for the water system, certified at the level of the distribution system.

5. *Maintenance personnel that turn "ON/OFF" a well pump, locally or remotely, that supplies the influent to a GAC filtration system?*

   Based on direction given by EPA, the personnel who turn the well pump on or off do not need to be certified if:

   a. There is a Standard Operating Procedure for turning the well pump on or off.
   b. A certified operator has made the decision to turn the pump on or off, <u>not</u> the uncertified operator.
   c. There is a Responsible Charge operator for the water treatment plant, certified at a minimum as a Grade 1 WTPO.

6. *Maintenance personnel that remove, repair and return to service a disinfection pump without altering the original dose level?*

   The personnel who remove and repair the disinfection pump do not need to be certified. The personnel who return the disinfection pump to service would need to be certified if the pump needs to be calibrated and the operator must make process control/system integrity decisions affecting water quality or quantity.

7. *Maintenance personnel that adjust the chlorine dosage on a Class 1 WTP and verify the chlorine residual on a hydrant in the distribution system of a population of >50,000?*

   These personnel shall be a certified WTPO1 or DSO1 or higher, because they are adjusting the chlorine dosage.

Miscellaneous questions/scenarios:

8. *Field personnel that work on (maintenance on pipes, valves, and associated appurtenances) a distribution system that serves a population > 50,000?*

   The personnel who perform the maintenance do not need to be certified. The field supervisor *who makes the decisions* on the maintenance to be performed must be certified (at a minimum Grade 1) because he/she is making system process control/system integrity decisions about water quality or quantity that affect public health.

9. *Field personnel that work on (maintenance on pipes, valves, and associated appurtenances) a distribution system that serves a population > 50,000? Maintenance personnel that maintain/repair well/booster pumps in the distribution that serves a population > 50,000?*

   The personnel who perform the maintenance do not need to be certified. The field supervisor *who makes the decisions* on the maintenance to be performed must be certified (at a minimum Grade 1) because he/she is making system process control/system integrity decisions about water quality or quantity that affect public health.

10. *Maintenance personnel that repair/maintain a UV disinfection system that serves a population of >50,000?*

    The person that repairs/maintains the UV disinfection system does not need to be certified. The field supervisor who oversees the repair and who decides when the UV disinfection is fit to be returned to service must be a certified Grade 1 WTPO or higher.

11. *Laboratory personnel that check the chlorine residuals in a system of > 50,000?*

    These personnel do not need to be certified public water system operators. These personnel must have passed the chlorine proficiency tests given by the DOH.

12. *How many DRCs are required for the entire Maui County System which includes Hana, Lahaina and Molokai?*

    The board recommends that the responsible charge operator is the highest level of field supervisor who makes decisions regarding the daily operational activities of the public water system, or a higher level of supervisor (such as a division chief) if that

person makes decisions regarding the **daily** operations. There can be more than one responsible charge operator per water system. The board has left this determination to the water purveyor.

Likewise, an operator could conceivably be the DRC for more than one system, if indeed that person does make daily decisions regarding both systems. It is improbable, however, that the same person could be the sole DRC of two large systems. It is preferable that each system have its own DRC.

Regarding the DRC of Molokai water systems, the board has deemed that the DRC **for the Distribution System** must be *available* to the water system, and does not necessarily need to be on-island. However, Molokai systems do need to have certified WTPOs operating the corrosion control plants, and certified DSOs or WTPOs operating the disinfection systems. The field supervisor making the decisions about the work on the distribution system must be a certified DSO.

Regarding water treatment plants in general, the DRC must be onsite for a manned plant, and available (on-island) for an unmanned plant. The DRC must be certified at the level of the treatment plant. Every operator operating a treatment plant shall be a certified WTPO, except for those operators that operate groundwater chlorination or fluoridation only. These operators can also be certified DSOs.

13. *Would the maintenance personnel that alter the disinfection system of a Class 1 WTP be considered the DRC for that system?*

That person could be considered to be the DRC of the WTP (WTPO Grade 1 or DSO Grade 1), but another higher level operator would need to be designated as the DRC for the DS (DSO Grade 4 for a system with > 50,000 population).

14. *Will the operator incur liability if a WTPO/DSO license is required as part of their job description?*

The operator does not incur liability just because the WTPO/DSO certification is required as part of his or her job description. Any person, certified or not, who violates safe drinking water regulations, shall be administratively or civilly penalized not more than $25,000 per day per violation. A "person" means an individual, corporation, company, association, partnership, county, city and county, state or federal agency.

In addition, any person, certified or not, who tampers with a public water system, attempts to tamper with a public water system, or threatens to tamper with a public water system shall be subject to criminal and administrative penalties. Tamper

means "to introduce a contaminant into a public water system with the intention of harming persons, or to otherwise interfere with the operation of a public water system with the intention of harming persons."

A person who violates any provision of Hawaii Revised Statutes, Chapter 340F, "Hawaii Law for Mandatory Certification of Public Water System Operators", or Chapter 25, "Rules Relating to Certification of Public Water System Operators," shall be subject to a civil penalty of not more than $25,000 a day for each day of continuing violation. One such provision is that it is unlawful for any individual to perform the duties of an operator without being duly certified. In addition, any individual who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under HRS Chapter 340F, shall be guilty of a misdemeanor.

Aside from the question of liability, it should be noted that an operator who has practiced fraud may have his certification revoked, suspended, or be refused for renewal. As stated in Chapter 25, section 11-25-9:

> The board may revoke, suspend, or refuse to renew the certification of an operator when it is found that the operator has practiced fraud or deceit in obtaining certification or in performing his or her duties; that reasonable care, judgment, or the application of knowledge or ability, was not used in the performance of his or her duties; that the operator is unable to properly perform his or her duties; or that the operator has violated chapter 340F, HRS or this chapter.

American Backflow Prevention Association

Backflow Prevention Assembly Tester

Issue Date	Certification Number	Expiration Date
10/24/2014	12 - 00116	10/24/2017

Philip E. Gagorik

[redacted]

Administrator

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

PHILIP E. GAGORIK is certified

as a Water Treatment Plant Operator, Regular, Grade 2

Certificate No. T2-157 Expiration Date 11/30/2017

(for) Director of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

PHILIP E. GAGORIK is certified as a

Distribution System Operator, Regular, Grade 4

Certificate No. D4-195 Expiration Date 11/30/2017

(for) Director of Health

STATE OF HAWAII
DEPARTMENT OF HEALTH
CERTIFICATE OF
CHLORINE COMPARATOR PROFICIENCY

Phil Gagorik

Name

10/02/2015

EXPIRATION DATE

LABORATORY OR SAFE DRINKING WATER BRANCH OFFICIAL

[redacted]

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER *is certified as a*

Distribution System Operator, Regular, Grade 1

Certificate No. D1-259 *Expiration Date* 11/30/2016

(for) Director of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-103 *Expiration Date* 11/30/2016

(for) Director of Health

NOV 13 2014

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER *is certified as a*

Distribution System Operator, Regular, Grade 1

Certificate No. D1-259 *Expiration Date* 11/30/2014

(for) Director of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-103 *Expiration Date* 11/30/2014

(for) Director of Health

NOV 29

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER *is certified as a*

Distribution System Operator, Regular, Grade 1

Certificate No. D1-259 *Expiration Date* 11/30/2012

(for) Director of Health

NOV 23 2011

CERTIFICATE

STATE OF HAWAII

BOARD OF CERTIFICATION

OF PUBLIC WATER SYSTEM OPERATORS

Be it known that **JEFFREY H. THACHER** **having met the required qualifications is hereby granted this certificate as a**

Water Treatment Plant Operator

Date Issued **January 26, 2010** **Grade** **1**

Certificate No. **T1–103**

STUART YAMADA, Department of Health

FEB 24 2010

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER is certified

as a Water Treatment Plant Operator, Grade 1

Certificate No. T1-103 Expiration Date 11/30/2012

for Director of Health

CERTIFICATE

STATE OF HAWAII

BOARD OF CERTIFICATION

OF PUBLIC WATER SYSTEM OPERATORS

Be it known that JEFFREY H. THACHER having met the required qualifications is hereby granted this certificate as a

Distribution System Operator

Date Issued April 28, 2009 Grade 1

Certificate No. D1-259

STUART YAMADA, Department of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

JEFFREY H. THACHER is certified as a

Distribution System Operator, Regular, Grade 1

Certificate No. D1-259 Expiration Date 11/30/2011

(for) Director of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/2016

(for) Director of Health

DEC - 4 2014

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/2014

(for) Director of Health

FEB 28 2013

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/2012

Joanna Seto

(for) Director of Health

NOV 17 2011

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/2010

(for) Director of Health

NOV 1 ... 3

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/08

(for) Director of Health

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO *is certified*

as a Water Treatment Plant Operator, Regular, Grade 1

Certificate No. T1-029 *Expiration Date* 11/30/06

(for) Director of Health

CERTIFICATE

STATE OF HAWAII

BOARD OF CERTIFICATION

OF PUBLIC WATER SYSTEM OPERATORS

Be it known that **DANIEL PATAO** **having met the required qualifications is hereby granted this certificate as a**

Water Treatment Plant Operator

Date Issued **September 19, 2001** **Grade** **1**

Certificate No. **T1-029**

William Wong

William Wong, Department of Health

OCT 1 2008

STATE OF HAWAII
BOARD OF CERTIFICATION OF
PUBLIC WATER SYSTEM OPERATORS

DANIEL PATAO is certified

as a Water Treatment Plant Operator Grade 1

Certificate No. T1-029 Expiration Date 2/28/04

(for) Director of Health

OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 19, 2015**
Report Subject **Interview of Michael Miyahira**	

On March 5, 2015, Office of Inspector General Special Agent Michael Graziano and Evaluator Claire Wyly telephonically interviewed Michael Miyahira, Section Supervisor, Engineering Section, Safe Water Drinking Branch, Hawaii State Department of Health, Honolulu, HI, regarding the State's oversight of the public water system at Hawaii Volcanoes National Park (HAVO). At the time of the interview, Graziano and Wyly were in Hilo, HI, and Miyahira was at his office in Honolulu. Miyahira agreed to be interviewed and consented to the interview being recorded. The following is a summary of the interview.

Miyahira explained that the State Department of Health had been designated as a "primacy agency" for the U.S. Environmental Protection Agency and charged with implementing and enforcing the U.S. Federal Safe Water Drinking Act. The department's jurisdiction extended to all public water systems within the state, which included the HAVO water system.

Miyahira said that inspections, known as sanitary surveys, were conducted on individual public water systems in the state approximately every 3 years. The most recent survey at HAVO occurred on July 17, 2014, at which time the inspectors identified one significant deficiency and made several other less important observations. The significant deficiency concerned the access hatch on a water storage tank, designated as Tank 2. During the survey, the inspector discovered a gap between the hatch opening and its base on top of the tank, which potentially could result in the introduction of foreign materials into the stored water. HAVO Superintendent Cindy Orlando received the report documenting these findings.

Miyahira said that significant deficiencies discovered during sanitary surveys required a response documenting the corrective actions taken for the public water system that had been inspected. In the case of HAVO's significant deficiency, HAVO's Steven Brum responded directly to the inspector who conducted the survey. Miyahira knew of no issues or concerns related to HAVO's corrective action.

When informed that silicone reportedly had been used to correct the hatch gap, Miyahira said that he did not consider silicone use to be a problem for tank hatch repair. Given the hatch's location at the top

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of the tank, the silicone did not make contact with the water and would only have been a problem if it came in direct contact with the water supply.

Regarding other HAVO water issues, Miyahira knew that the park self-reported a gap in the daily water testing, which occurred in August 2013. Any gap in water testing risked undetected contaminants entering the water system. In response to the incident, Miyahira reviewed chlorine and turbidity levels at HAVO both before and after the gap. Based on his interpretation of those levels, he determined that the testing gap did not harm to the water supply. Miyahira notified HAVO of his finding and considered the matter closed.

Miyahira did not know what water tests HAVO routinely conducted, or whether a state or private laboratory conducted the testing. HAVO had a rain catchment water system that technically fell outside the testing requirements of the Safe Water Drinking Act, which specifically covered ground and surface water systems. Miyahira said the State developed guidelines in 2014 for rain catchment systems but, not being regulatory in nature, the guidelines were not enforced.

Regarding his knowledge of HAVO's purchase of distribution line pipe that was not actually installed, Miyahira said that the circumstance sounded familiar since water system improvement projects commonly began and then stopped. He vaguely recalled that HAVO planned to conduct improvement projects such as this, but he could not recall specific details.

Miyahira did not have any specific information related to backflow prevention devices at the park.

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INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 9, 2015**
Report Subject **Site Visit of HAVO Water Distribution System**	

On March 9, 2015, Special Agent Katie Balestra, Special Agent Mike Graziano, and Auditor Mitos Ciriaco conducted a site visit of the Hawaii Volcanoes National Park (HAVO) water distribution system with HAVO water systems operator Philip Gagorik.

According to Gagorik, all of the drinking water at HAVO was collected from two rain sheds. He said that it took 3 hours a day to treat the water and perform readings of the chlorine levels. When asked how often he had seen that a "gap" had occurred in testing the drinking water for chlorine levels, meaning that no one had done the testing due to a scheduling error, Gagorik said this had happened a few times. "It's not good," he said. "You're violating all kinds of things." He said that when a gap occurred, it meant that no one had taken chlorine readings, tested turbidity (that is, the amount of particles in the water), or documented the water levels in the tanks.

When asked about a 2013 incident in which numerous days passed with no testing, Gagorik confirmed that this occurred and stated: "I couldn't believe it happened." While looking at his records, he said that during this long gap, it appeared that 132,400 gallons of water had been pumped into the drinking water system without any chlorine being injected. He said, however, that enough "residual" chlorine was in the water system for the water to still be drinkable. He said that the park had been "lucky" that a larger amount of water was in the tanks when the gap occurred, and enough residual chlorine existed to keep the water safe for drinking.

The following is a log of photographs taken by Balestra during the site visit:

1	Rain shed
2	Rain shed
3	Rain shed
4	Freshwater tank that has not yet been painted on the outside (inside done)
5	Freshwater tank that has not yet been painted on the outside (inside done)
6	Rain shed

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

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7	Second freshwater tank in use
8	Unapproved seal on water tank hatch
9	Close-up of hatch with unapproved seal
10	Close-up of hatch with unapproved seal
11	Top of water tanks
12	Top of water tanks and rain shed
13	Rain catchment system
14	Corroded pipe; not in use but "typical" condition found in HAVO's water pipes
15	Ground catchment pond 1
16	Water from rain shed going into pond
17	Water from rain shed going into pond
18	Ground catchment pond 1
19	Ground catchment pond 2, where liner is being replaced
20	Rain shed with raw-water tanks in use
21	Raw-water pumphouse
22	Ground catchment pond 1
23	Three sand filters
24	Main pumphouse
25	Injection pump, where only level 2 operator can change settings
26	Chart created by Gagorik on how much chlorine to add
27	Chlorine pump system
28	Drum where chlorine solution is mixed with water
29	Pipes that pump to fresh water tank
30	Where turbidity testing is conducted
31	Status board for water system
32	Logbooks for chlorine levels
33	Booster and fire pumps where the water system is pressurized
34	Reader that can show a leak in the water system
35	Drawing of water system
36	New high-density polyethylene pipe
37	Old pipe
38	Backflow preventer
39	Heavy equipment not being used
40	New high-density polyethylene pipe that has been sitting for 4 years (and would replace most of the water distribution system)
41	New high-density polyethylene pipe that has been sitting for 4 years (and would replace most of the water distribution system)
42	Gate to water systems locked at night but not during the day
43	Old pipe where, Gagorik said, a break is likely to occur
44	Pipe where a break occurred 2 years ago
45	Pipe where a break occurred 2 years ago
46	Old pipe
47	Reduced pressure backflow preventer
48	Double-check valve
49	Spill resistant pressure vacuum breaker
50	Pressure vacuum breaker

51	Backflow preventers installed by Gagorik to practice for his test
52	Gagorik's files
53	October 24, 2014 gap
54	August 19 – 23, 2013, and August 27 – 29, 2013 gaps
55	May 15, 2013 gap
56	December 19 and December 25 – 26, 2012 gaps
57	Chart on showing how much water is pumped and how much chlorine is injected
58	Chart showing actual chlorine levels in drinking water tanks
59	2014/2015 markings showing trails maintenance
60	Fresh water tanks at Volcano Observatory
61	Fire suppression system at Volcano Observatory and Jaggar Museum, where double- check valve is needed, according to Gagorik
62	Reduced pressure backflow preventer at Volcano Observatory
63	Open crack near restroom at Thurston Lava Tube
64	Vault toilet near ocean
65	Vault toilets near ocean
66	Vault toilet near ocean

SANITARY SURVEY OF HAWAII VOLCANOES NATIONAL PARK WATER SYSTEM (PWS 146).

The Safe Drinking Water Branch (SDWB) conducted a sanitary survey of the Hawaii Volcanoes National Park (HVNP) water system (Public Water System No. 146) on July 17, 2014. The survey was conducted by Mr. Alain Carey and Mrs. Joan Corrigan, both of the SDWB. The survey took approximately two hours.

The Hawaii Volcanoes National Park (HVNP) water system is owned by the U.S. Department of the Interior and the HVNP maintenance staff operates the system. Mr. Steve Brum of the U.S. Public Health Service was present during the survey.

SYSTEM DESCRIPTION AND FLOW

The HVNP water system is a community water system that serves approximately 3,374 visitors and staff personnel and has 76 service connections. The system serves the National Park Visitor Center, the restrooms at the Thurston Lava Tube, the Volcano House hotel and restaurant, the National Park offices and maintenance buildings, the National Park staff residences, the Magma House, the United States Geological Survey (USGS) Volcano Observatory, and the Namakani Paio Campground. The water system provides approximately 30,000 gallons daily to its customers.

The system relies on four rain catchment structures as its main source of water. Rainwater collected from the catchments is pumped into the five raw water storage tanks, filtered through roughing and slow sand filters, and disinfected. Following disinfection the treated water is stored in the four finished water tanks or goes into the distribution system.

CATCHMENT

The water system has four rain catchment facilities and they are described in the following table.

Catchment Facility Name	Area (square feet)	Description
GC 1	128,878	Rubber lined, in ground
GC 2	51,000	Rubber lined, in ground
Rainshed Building #241	45,929	Metal roof, above ground
Rainshed Building #43	40,228	Metal roof, above ground

The basins are not located in a flood zone.

Rainwater collected from the rainsheds flow by gravity into GC 1 and GC 2 and is pumped into the raw water storage tanks. GC 1 and GC 2 are with lined ethylene propylene diene Monomer (EPDM) rubber with geotextile fabric beneath it. The EPDM in GC 2 is delaminating and is scheduled to be replaced soon. Berms surround each ground catchment basin to keep out storm water from entering the basins. The basins are inspected daily and cleaned annually. The area in the vicinity of the basins is surrounded by a fence.

During time periods when the rain catchment basins are low, drinking water can be hauled and pumped into either the finish water tanks or the raw water tanks. Normally, the hauled water is from the Hawaii County Department of Water Supply and pumped into the finished water storage tanks via Transfer Pump House.

TREATMENT

The raw water from basins GC1 and GC2 is pumped into the two 0.5 MG steel raw water tanks T-3 and T4 by the 20 HP ground catchment booster pump, located adjacent to the catchment basins in a metal shed. At this shed, soda ash is injected into the raw water to stabilize and raise the pH of the water. The water may also be pumped to the 0.5 MG glass-lined steel tank T-5 or the two 0.75 MG glass-lined steel tanks T-18 and T¬19 for raw water storage. The booster pump is controlled by the water level in tank T-5 but the pump can also be manually controlled.

The raw water from the storage tanks flows by gravity through a pair of roughing cartridges prior to entering slow sand filters. The water system has three slow sand filters and usually one filter is online at a time. The filters are rotated on a weekly basis. Each filter can filter up to 30,000 gpd. Filtered water is held in a clearwell prior to disinfection.

DISINFECTION

HVNP has two sodium hypochlorite disinfection facilities. The main facility is located at the water treatment building downstream of the clearwell. Filtered water from the clearwell is disinfected here and zinc orthophosphate is also added for tuberculation control. Chlorinated water is then pumped by two 40 gpm booster pumps to the two 0.5 MG steel finished water tanks, T-1 and T-2.

A secondary disinfection facility is located inside the Transfer Pump House, which is where hauled water is unloaded at.

STORAGE

All of the storage tanks in the water system are of steel construction and are listed in the following table.

Tank Name	**Capacity (MG)**	**Water Quality**
Clearwell	0.0079	Filtered Raw
T-1	0.5	Finished
T-2	0.5	Finished
USGS 80K	0.08	Finished
USGS 20K	0.02	Finished
T-3	0.5	Raw
T-4	0.5	Raw
T-5	0.5	Raw
T-18	0.75	Raw
T-19	0.75	Raw

Raw water is stored in the tanks for approximately three to five months prior to treatment. There are a number of redwood tanks physically onsite, but have been disconnected from the system.

Mr. Brum mentioned that all storage tanks and slow sand filter tanks will be refurbished in the next several months. The refurbishment consists of sand blasting and recoating of the interior surfaces of the tanks, outfitting the tanks with new appurtenances, and repainting the exterior surfaces. At the time of the survey, Tank T-1 was being refurbished.

It was brought to Mr. Carey's attention after the survey was complete that Tank T-2 was put online on November 9, 2013 after it was "refurbished". However, the tank still has the old vent with no insect screen, the access hatches were not properly installed which causes contaminated runoff enter the tank, and there were holes and severe rusting on the roof.

BOOSTER PUMPING STATIONS

There are seven booster pumps in the water system and are summarized in the table below.

Pump Name	HP	Q (GPM)	Pumps From and To
Ground Catchment Pump	20	166	GC 1 and GC 2 to Raw Water Storage
Finished Water Booster Pumps 1 & 2 (Water Treatment Shed)	20	40	Clearwell/Chlorinators to Tanks T1 & T2
Transfer Pump	20	200	Transfer Pump House to T-1 & T-2
Booster Pumps #1 and #2 (New)	25	655	Tanks T-1/T-2 to USGS facilities & distribution
Fire Booster	100	2,056	System wide

Next to the Transfer Pump House is a pump station that houses two 25 horsepower, 655 GPM booster pumps (Booster Pumps #1 and #2) and a 100 horsepower, 2,056 GPM fire booster pump. Booster Pumps #1 and #2 transfers water from Tanks T-1 and T-2 into a 9,000 gallon pressure tank adjacent to the new booster pump station. The pressure tank floats on the distribution system, which minimizes the cycling of the booster pumps. Water is either boosted to the USGS facilities or into distribution.

DISTRIBUTION SYSTEM

The distribution system consists of 4-inch, 6-inch, and 8-inch galvanized steel and HDPE pipes. Most of the old galvanized steel pipes have been replaced with HDPE pipes. To date approximately 3,000 feet of HDPE pipe has been installed and all water mains are expected to be replaced in phases by 2017.

The pressure in the system ranges from 32 psi to 52 psi. Chlorine residual is 0.21 ppm at the last service connection, which is the Thurston Lava Tube restrooms.

MONITORING

Coliform Monitoring Program. No violations within the past 12 months.

Lead and Copper Monitoring Program. Satisfactory.

Phase II and Phase V Monitoring Program. In compliance.

Water Quality. No violations within the past 12 months.

Chemical Monitoring. No violations within the past 12 months.

CAPACITY ASSESSMENT

This section compiles data for SDWB use.

TECHNICAL

1. OPERATOR CERTIFICATION. Each public water system (except transient, non-community) shall be under the responsible charge of an operator(s) holding a valid certification equal to or greater than the classification of the WTP or DS. Check whether the water system operators are certified.

   Satisfactory. The system has a certified distribution system operator and is actively pursuing a certified back-up operator.

2. ADEQUATE WATER SOURCES. Discuss with manager whether the present water sources are adequate for the future (next 5 years).

   Satisfactory.

3. POTENTIAL FOR CONTAMINATION OF THE WATER. Inspect for pathways that could contaminate the finished water at the well site, storage tanks, or distribution system.

   Unsatisfactory. Please refer to the Significant Deficiencies section of this report.

4. MONITORINIG PROGRAMS. Check water quality monitoring performance. This evaluation is reported in the Monitoring section of the Sanitary Survey Report.

   Satisfactory. The system is performing the required monitoring of chlorine residual as per approved Ground Water Rule monitoring plan. Turbidity is monitored daily after chlorination. Weekly monitoring of turbidity, pH, temperature, and conductivity is performed at the roughing filter, ground catchment basins, and before and after the ground catchment pump station (soda ash addition).

5. BACKFLOW AND CROSS-CONNCECTIONS. Check whether backflow prevention devices are used if the water system serves hospitals, farms, golf courses, sewage treatment plants, or other activities that could cause a backflow of contamination into the drinking water.

   Satisfactory.

MANAGERIAL

1. CAPITAL IMPROVEMENT PROJECTS. Identify improvements to the water system and include the month and year the improvement was installed. The facility improvements indicate management support of the water system needs. If no improvements are noted indicate whether the existing system is adequate.

   The system is continuing its capital improvement program. Refer to previous sections of this report for details.

   The management of the refurbishing contract is questionable. Tank T-2 should not have been placed back online while pathways for contamination of the tank were visibly obvious.

2. SYSTEM MAINTENANCE. The overall condition of the water system infrastructure should be assessed. Is the present maintenance level adequate for the water system?

   Satisfactory.

3. EMERGENCY PLANS. Check whether the water system has an emergency plan. The plan should include obtaining backup sources of water in drought situations, loss of a well pump or extended loss of electrical power.

   Satisfactory. The system is able to import water from the County Department of Water Supply and the circulation pump has a back-up generator.

4. CORRECTION OF PROBLEMS. The water system should have plans to correct obvious significant problems noted during the survey. The water system should also have corrected earlier identified significant problem(s) in a timely fashion.

   Unsatisfactory. Tank T-2 was not adequately protected from contamination for at least nine months after the tank was placed back online after "refurbishing".

FINANCIAL

1. ADEQUATE FINANCIAL BUDGETS. Discuss whether funding levels for operation and maintenance are sufficient. Is there funding for capital improvements?

   Satisfactory.

2. NORMAL OPERATION AND MAINTENANCE.

   Satisfactory.

3. CAPITAL IMPROVEMENT PROJECTS.

   Satisfactory.

SIGNIFICANT DEFICIENCIES

The Ground Water Rule has been approved by the EPA and the State will incorporate the requirements of the Ground Water Rule into the Hawaii Administrative Rules, Title 11, Chapter 20 (HAR 11-20), Rules Relating to Potable Water Systems. The Ground Water Rule once incorporated into HAR 11-20, will require water systems with a significant deficiency to correct the deficiency or provide a written corrective plan of action and a completion schedule. Failure to correct the deficiency or provide a timely plan of action and schedule within 120 days of receiving written notice of the significant deficiency from the State, will subject the water system to penalties of not more than $25,000 per violation per day under HRS 340E-8.

A significant deficiency is a pathway where contamination could enter the drinking water.

After the Ground Water Rule has been incorporated into HAR 11-20, the SDWB may conduct follow-up inspections to verify that the significant deficiencies have in fact been corrected.

The following **significant deficiencies** were identified:

- Tank T-2:
  - Gaps between the access hatch frames and the roof.
  - Roof vent does not have an insect screen.
  - Numerous holes on the roof.

MANDATORY REQUIREMENTS

- Please submit construction plans and manufacturer's information for the ground catchment liner prior to when the catchment is placed back in service with the new liner.

RECOMMENDATIONS

1. The area where the slow sand filters and clearwell are at have excessive vegetation and should be trimmed.
2. A warning sign should be placed on the door of the Transfer Pump House since that is a secondary chlorination facility.

8/7/2014

Alain Carey, P.E.
Environmental Engineer

Date

Photos of Significant Deficiencies

Tank T-2: Gaps between the access hatch frame and the roof.

Tank T-2: Gaps between the access hatch frame and the roof.

Tank T-2: Holes in roof.

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
PRE-INSPECTION FORM

Survey Date: 7/17/2014

Persons Present During Sanitary Survey:

1. Alain Carey, DOH/SDWB
2. Joan Corrigan, DOH/SDWB
3. Stephen Brum, US Public Health Svc.
4.
5.
6.
7.

System Information:

PWS ID No: 146 Water System Name: Hawaii Volcanoes National Park

Island: Hawaii Classification: CWS NTNCWS TNCWS

Owner: U.S. Department of the Interior
Contact: Tom Foster
Phone: (808) 985-6059
Fax: (808) 985-6024
E-mail tom_foster@nps.gov

Population Served 3374 Service Connections 76

Water source type: surface, GWUDI, groundwater, roof catchment, hauled, other

Source Name	Type of Source	USGS Number
Ground Catchment Basin 1	rain catchment	
Ground Catchment Basin 2	rain catchment	
Rainshed Building #43	rain catchment	
Rainshed Building # 241	rain catchment	
Hauled Water (purchased)	groundwater	

Compliance History:

A. Microbiological & Turbidity Violations During the Past 12 Months

Violation Type	Date	Result	Comment
None			

B. Regulated Chemicals

See attached.

C. Unregulated Chemicals

See attached.

D. Date of last sanitary survey and major findings

See attached.

E. Operator Certification Compliance (HAR 11-25):

Name	Grade	Cert. #	Work Facility
See attached.			

System Management & Operation:

Annual Report or similar document provided? No

CCR database storage and compliance status: Yes.

Is an updated Emergency Response Plan available per HAR 11-19-5 (County only)? Yes

PWS ID: 146 Water System: Hawaii Volcanoes Nat.Park 8/1/2014

Water Treatment Plant Classification

- [ ] Class 1 - Slow sand filtration; chemical addition, such as for chlorination, fluoridation, pH control, or corrosion control; granular activated carbon filtration; or packed aeration towers or air stripping towers
- [X] Class 2 - Membrane filtration; cartridge filtration; or desalting (including distillation, electrodialysis, and reverse osmosis)
- [ ] Class 3 - Diatomaceous earth filtration, or package plants with diatomaceous earth filtration
- [ ] Class 4 - Conventional treatment; direct filtration; or package treatment plants with conventional treatment or direct filtration

Note: Chlorination and/or fluoridation facilities only can be operated by either certified WTPOs or DSOs.

Distribution System Classification

- [ ] Class 1 - Serves water systems with a population of 1,500 or less persons
- [X] Class 2 - Serves water systems with a population of 1,501 to 15,000 persons
- [ ] Class 3 - Serves water systems with a population of 15,001 to 50,000 persons
- [ ] Class 4 - Serves water systems with a population of over 50,000 persons

Name		Cert #	Exp	Name		Cert #	Exp
WTPO(s) in Responsible Charge				DSO(s) in Responsible Charge			
Gagorik	Philip E.	T2-157	11/30/2015	Gagorik	Philip E.	D4-195	11/30/2015
Other WTPO(s) operating the system				Other DSO(s) operating the system			
Thacher	Jeffrey H.	T1-103	11/30/2014	Thacher	Jeffrey H.	D1-259	11/30/2014

Please update information as necessary and submit form by July 18, 2014.

by Mail: Hawaii Department of Health
Safe Drinking Water Branch
919 Ala Moana Blvd., Room 308
Honolulu, HI 96814

by Email: jodi.yamami@doh.hawaii.gov

by Fax: 808-586-4351

6/24/2011

Tank T1 (finished water storage): Level indicator pipe opening is unscreened.

Tank T2 (finished water storage): Level indicator pipe opening is unscreened.
USGS 80,000 Gallon Tank: Manhole cover gasket is torn.

Old, unused vehicles near GC 1 should have its fluids drained and a higher berm should be built between the storage yard and GC 1 to prevent contaminated runoff from entering GC 1.

The perimeter of GC 1 and GC 2, where the asphalt swale runs in between, is lacking a sufficiently high enough berm to prevent storm water from washing into the two basins.

FACILITY_	FACILITY_	FACILITY_	SAMPLIN(	SAMPLIN(	ANALYTE_	ANALYTE_	COLLECTI	CONCENT	UNIT_OF_	MEASURE	MCL	MCL_UOM	RESIDUAL	RESIDUAL_CHLORIN
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	TTHM	41674	4.3	UG/L	4.3	80	UG/L		
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	BROMODI	41674	1.2	UG/L	1.2	1	UG/L		
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	CHLOROF	41674	3.1	UG/L	3.1	1	UG/L		
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	TOTAL HA	41674	4	UG/L	4	60	UG/L		
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	TRICHLOF	41674	1.3	UG/L	1.3				
HAWAII V(	DS146	DS	THURSTO	901	Disinfectar	DICHLOR(	41674	2.7	UG/L	2.7				
VOLCANC	TP001	TP	VOLCANC	5	Inorganic (	FLUORIDE	41731	0.37	MG/L	0.37	4	MG/L		

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
CATCHMENT SOURCE PROTECTION

Source Name: GC1 Lined Catchment (128,878 sf), GC2 Lined Catchment (51,000 sf), Rainshed Bldg #43 (40,228 sf), Rainshed Bldg #241 (45,929 sf)

Location: Hawaii Volcanoes National Park, near Kilauea Visitor Center

USGS # N/A (as applicable)

Type: Well Tunnel Spring Shaft Other: Rain catchment

Infrastructure immediately downstream: Raw water tanks T18 and T19

Source Specific Yield (ave.) 0.023 mgd / gpm / cfs

Permitted Use allocation (if applicable): N/A mgd / gpm / cfs

Confined / Unconfined Aquifer? N/A

Attach raw water quality data and sampling station location map if available

Contributing Watershed

Land area in acres or squ. miles (attach exhibit if available):

Estim. Land Uses or Zoning (%):

(Agricultural / Conservation / Residential / Urban / Industrial / Other)

Estimated Land Ownership (%)

(Private / City / State / Federal)

Vulnerability Assessments / baseline studies conducted in the watershed? Y (Y/N)

If yes, cite the document & date: Confidential

Emergency Spill Response Plan available? Y (Y/N)

Responding Agency: U.S. National Park Service

Potential Polluting Activities Near the Source:

1. Animals (for GC1 and GC 2)
2. Birds
3.

Potential Sources of Pollution	Minimum Horizontal Distance From Pollution Source	Estimated distance upgradient from source (feet)
Any sewer line	50 feet	None
Cesspool, septic tank, or subsurface sewage leaching field	1000 feet	300
Hazardous waste landfills, ponds, or chemical storage	1000 feet	30
Treated effluent injection well	1/4 mile	None

Is the source site in a 100-year flood plain? N (Y/N)

Protected from runoff? Y (Y/N) How? Berms

Source enclosed? N (Y/N) How?

Source site fenced & gated? N* (Y/N) Signage? N* (Y/N)

** However, entire site (catchment areas, tanks, pump stations, and treatment facilities) has a secure entrance gate and warning signs.*

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
PUMPS, PUMP FACILITIES & CONTROLS

Source: GC1 Lined Catchment & GC2 Lined Catchment
Location: Hawaii Volcanoes National Park, near Kilauea Visitor Center
USGS # N/A (as applicable)
Source type: Well GWUDI Tunnel Ditch Spring Shaft Rain Catchment
Infrastructure immediately downstream: Raw water tanks T18 and T19.

Pump Summary:

Pump No.	HP	Depth (ft)	Type *	Q (gpm)	TDH (ft)	Remarks**
GC BP	20	N/A	ls	166	139	Pumps to Raw Water Tanks
Finish BP1	20	N/A	ls	40	38	Pumps to Finish Water Tanks
Finish BP2	20	N/A	ls	40	38	Pumps to Finish Water Tanks
USGS BP	15	N/A	ls	11		Pumps to USGS Tanks on Wed & Fri. Oil-lube
Recirculation	20	N/A	ls	200	90	Chalmers Model 600; booster chlorination
Transfer Pump	25	N/A	ls	655	101	New; Baldor Reliance
Transfer Pump	25	N/A	ls	655	101	New; Baldor Reliance
Fire Pump	100	N/A	ls	2056	125	New; Baldor Reliance, Fire protection only

** Pump types can be described as submersible vertical turbine (s) or line shaft vertical turbine (ls)*

*** Identify lead/lag/standby or out of service pumps, motor brand, excessive bearing leakage, motor noise, etc.*

Do well and pump construction and materials appear to meet:
- AWWA Standards? Unknown (Y / N / Unknown)
- County Standards? Unknown (Y / N / Unknown)
- NSF 61? Y (Y / N / Unknown)
- State Well Construction & Pump Installation Standards? Unknown (Y / N / Unknown)

Is the pump "water-lubed"? Y (Y/N)
If not, is food grade grease or NSF 61-approved lubricating oil used to lubricate the pump?
Specify lubricant: _____
Condition of oil lube equipment: _____

Is the pump site in a 100-yr flood plain? N (Y / N / Unknown)
If "yes", does well casing extend a minimum of 2-feet above flood level? _____ (Y/N)
Is the pump site protected from runoff? Y (Y/N)
Well casing extends minimum 12 inches above well or floor slab? _____ (Y/N)
Well slab/floor material and condition: _____

Watertight seal for: NA
Pump base plate/discharge head openings? _____ (Y/N)
Airline tubing for water level measurements? _____ (Y/N)

Pump column vent hole/tubing? _____ (Y/N)

Pump-to-waste vent elevated? ___NA___ (Y/N/NA)
Is it screened? _____ (Y/N) All other ARVs screened? ___NA___ (Y/N/NA)
Direction of vent? _____ (up / down / sidways)
Condition of pump-to-waste piping flapper valve? _____
Do valve or flow tube vault walls extend above finish grade? _____ (Y / N / NA)

Note any cross connections (submerged outlets, standing water, hose bibb connections):
1. None
2. _____
3. _____

Safety cages for equipment? ___N___ (Y/N)
Identify daily maintenance log entries: flow, turbidity, chlorine residual, feed rate
Are the required spare parts and tool kits maintained on site? ___Y___ (Y/N)
Chemical addition onsite? ___Y___ (Y/N)
MSDS available onsite? ___Y___ (Y/N)
Are inappropriate chemicals stored onsite? ___N___ (Y/N)
If so, identify: _____

Does emergency power exist? ___Y___ (Y/N) Exercised regularly? ___Y___ (Y/N)
Is it well protected from vandalism or the elements? ___Y___ (Y/N)

Pump Site Fenced? ___Y___ (Y/N) *All pumps are located within secured sheds.*
Gates Padlocked? ___Y___ (Y/N)
Entrance Sign? ___Y___ (Y/N) *At main entrance gate to all water facilities.*

Remarks:

Attach maps, diagrams, sketches and plans to this field form for future reference - stamp “received Safe Drinking Water Branch” with date as applicable.

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
WATER TREATMENT

Facility Name (year constructed): Hawaii Volcanoes National Park (1962)

Raw water source name & type: Ground (Rain) Catchment Basins 1 and 2 (GC1 &GC2)
Raw water source flow (max/min/avg) 24,000/21,000/22,500 gallons per day
Bypass piping? N (Y / N / Unknown)
If yes, describe control / isolation valving and security measures

Describe the date and duration of the last bypass event

Was DOH and the public notified? (Y/N)
System infrastructure immediately downstream of WTP: Finish Water Tanks T1 & T2

Facility description (rated capacity, major processes, attach exhibits):
Explained in the write-up portion of the survey. Roughing cartridge checked and pressure washed weekly.

PreTreatment
Chemical addition
Purpose? Soda Ash used to raise pH to 6.5
NSF 60 chemicals used? List brand: NSF Grade 80, FMC Wyoming Corp.
Dosage? 6/23/11: Added one-inch
Unit Redundancy? None - One injection pump (Premia 75)
Prescreening
Strainer/filter type & sieve/pore size 2 edge-type roughing cartridge filters in parallel.
If backwashed, where are solids disposed of? None
Unit Redundancy? None

Major Treatment Process Train
Filtration (if applicable)
Configuration (# on-line / # backup / filter media): 3/0/slow sand filters in parallel
Filter backwash frequency? Basis? None
Describe alarms for filter failure/breakthrough: N/A

Filter Media changeout frequency? Once a year
Does recycling of supernatant or backwash water takes place? N (Y/N)
Do conv. or DF plants meet the Filter Backwash Recycling Rule? N/A (Y/N)

Post-Treatment
Purpose? Zinc Orthophosphate-Phosphoric Acid used for tuberculation control
Unit Process: Stenner injection pump
NSF 60 chemicals used? Brand? Yes, Nalco C-9
Dosage? Added as needed, approximately every other month.
Redundancy? None
Is WTP finished water blended for palatability? None

Operation & Maintenance

Is an updated O&M Manual available onsite for operator consultation? Y (Y/N)
Is an updated O&M Manual submitted to DOH every 2 years in July? N (Y/N)
Last update: _____
Are daily operations scheduled and listed for plant operators to follow? Y (Y/N)
Daily maintenance log kept onsite? Y (Y/N)
List daily log entries: feed rate, turbidity, chlorine residual, flow
Are appropriate spare parts and tool kits maintained onsite? Y (Y/N)

Is there a x-connection program? Unknown (Y/N)
List any cross connections found: None

Worker safety or training programs: The two certified operators have attended these type of training classes.

Chemical handling & storage

Proper chemical handling and safety equipment available? Y (Y/N)
Were chemicals stored in a separate room? N (Y/N)
Was adequate separation of different chemicals provided? Y (Y/N)
Were MSDS sheets available on site? Y (Y/N)
Was adequate ventilation provided? Y (Y/N)
Describe alarm system: Not Applicable

Emergency procedures: Unknown
Does emergency power exist? N (Y/N)
Is it exercised regularly? _____ (Y/N)

Monitoring: list parameters monitored & recorded with frequency / specific instrument name:

Parameter	Frequency	Instrument
pH	Daily	Russell RL 060
Turbidity	Daily	Hach 2100
Chlorine residual	Daily	Hach Colorimeter
Zinc Orthophosphate	Daily	Hach Colorimeter

Miscellaneous

Are site boundaries appropriately fenced and gated? Y * (Y/N)
Does appropriate warning or "keep out" signage exist? Y (Y/N)
Are all building doors appropriately signed (chlorine, etc.)? Y (Y/N)
Does site maintenance control vegetation & vector habitats? Y (Y/N)

Remarks:

* The entire site (catchment areas, tanks, pump stations, and treatment facilities) has a secure entrance gate and warning sign. Each 50 pound bag of soda ash in GC Booster Pump building takes about 2.5 months to use; Zinc Orthophosphate-Phosphoric acid and chlorine raises the pH to 7.5.

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
DISINFECTION

Source Name: Lined Catchment GC1 & GC2
Location: Near Kliauea Visitor Center

Disinfection Method:

Gas Cl2	Sodium Hypochlorite	Calcium Hypochlorite
Chloramination	UV	Other

Labeled chemical manufacturer's information: Brewer Environmental Industries
Hypochlor 1250

Do chemicals meet NSF 60? Y (Y/N)

Equipment in an enclosed structure? Y (Y/N)
Materials of Construction: Corrugated metal
Chlorinators in a separate room? N (Y/N)
Warning signs on doors? Y (Y/N)

Feed equipment type? Stenner 85 MH P17 injector pump
Target Residual (ppm) ? 1.58 ppm at injection point, 0.21 ppm at Thurston Lava Tube
How are feed adjustments made? Water quality & Residual monitoring, manually
Automatic switch over equipment None
Number of backup units backup onsite but not connected; switching to the backup unit has to be done manually
# of days of chemical are stored? 4 months
Chemical handling clothes, safety equipment & tools? Y (Y / N / NA)
Critical spare parts and cylinder repair kit on hand? Y (Y/N)
Spare pump available at all times (baristellic pumps); hoses are changed annually; solution barrels cleaned annually

Disinfectant feed point locations: At Water Treatment Control Building and booster chlorinate at transfer pump house

Daily log entries (feed rate, dilution ratios, dosage, residual monitoring, CT calculations, DBP formation)
turbidity, feed rate, chlorine residual, flow

Preventative maintenance program Y (Y/N)
Auxiliary power onsite? N (Y/N)
Emergency response plan procedures onsite? N (Y/N)
Fire and police department coordination? Y (Y/N)
Coordination is mainly with park rangers; there is a plan in place with the county in the event of "super emergencies" such as hurricanes

Attach maps, diagrams, sketches and plans to this field form for future reference - stamp "received Safe Drinking Water Branch" with date as applicable.

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM

FINISHED WATER STORAGE

Location: Hawaii Volcanoes National Park

Owner: U.S. Department of the Interior

Tank Name/No.	Spillway Elev.(ft)	Capacity (MG)	Material
1 Clearwell		0.0079	Steel
2 Finish Water Tank T1		0.5	Steel
3 Finish Water Tank T2		0.5	Steel
4 USGS 80,000 gallon Tank		0.08	Steel
5 USGS 20,000 gallon Tank		0.02	Steel
6 T3 (Raw)		0.5	Steel
7 T4 (Raw)		0.5	Steel
8 T5 (Raw)		0.5	Steel
9 T18 (Raw)		0.75	Steel
10 T19 (Raw)		0.75	Steel
11 Pressure Tank (Finished)		0.009	Steel

	1 Clearwell	2 Finish Water Tank T1	3 Finish Water Tank T2	4 USGS 80,000 gallon Tank	5 USGS 20,000 gallon Tank	6 T3 (Raw)	7 T4 (Raw)	8 T5 (Raw)	9 T18 (Raw)	10 T19 (Raw)	11 Pressure Tank (Finished)
Site Fenced?	OK	Not in Service	OK	N	N	OK	OK	OK	OK	OK	OK
Warning Signs?	OK		OK	OK	OK	OK	OK	OK	OK	OK	OK
Gates padlocked?	OK		OK	N/A	N/A	OK	OK	OK	OK	OK	OK
Exposure	2		2	3	3	2	2	2	2	2	2
Surrounding landscaping	1		4	4	4	5	5	5	5	5	4
X-conn potential w/ irrigation system	N		N	N	N	N	N	N	N	N	N
Site drainage	OK		OK	OK	OK	OK	OK	OK	OK	OK	OK
Tank exterior	OK		8	OK	OK	OK	OK	OK	OK	OK	OK
Access ladder	OK		OK	OK	OK	OK	OK	OK	OK	OK	N/A
Vent screens	OK		None	OK	OK	OK	OK	OK	OK	OK	N/A
Access MH(s)	OK		Y	OK	N/A	7	7	7	7	7	N/A
Level indicator	OK		OK	OK	OK	6	6	6	6	6	N/A
Overflow line	OK		OK	OK	OK	OK	OK	OK	OK	OK	N/A
Washout (blowoff) line	OK		OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A
Control valve vaults	OK		OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A
System pressure range											
O&M program	OK		OK	OK	OK	Y	Y	Y	Y	Y	Y
Isolated through valving	OK		OK	OK	OK	Y	Y	Y	Y	Y	Y
Disinfection Onsite?	Y		Y	N	N	N	N	N	N	N	N

1. Excessive vegetation
2. Secured site
3. Visitor Center
4. Pavement
5. Grass and dirt
6. No screen or cap
7. Did not inspect
8. Holes on roof

ALL tanks (including raw storage) will be re-coated inside, exterior to be repainted, and new appurtenances to be installed.
T1: Sandblasting to be done in August; need to furnish photo of vent & hatch
Clearwell & slow sand filters: excessive vegetation should be cleared

SAFE DRINKING WATER BRANCH SANITARY SURVEY FORM
DISTRIBUTION & TRANSMISSION

Owner: U.S. Department of the Interior
Contact: Tom Foster
Phone: (808) 985-6059
Fax: (808) 985-6024
E-mail tom_foster@nps.gov

System Reference Standards: Unknown

Pipe materials: 8", 6", and 4" galvanized steel and HDPE, and PVC
System pressure range: 32- 52 psi
Emergency interconnections w/ other systems? N (Y/N)
Method of isolation and security measures: Valving
Fencing and security cameras

Installation/repair program procedures: Minor repairs/installation are done as per AWWA and NSF standards/procedures. Major work performed by engineering staff.

Flushing program & schedule: every 6 months

Cross connection control program: Backflow prevention program.

Corrosion control program: control of pH and zinc orthophosphate. ~ 1-1.5mg/L
Spot chipping and painting of exterior structures and piping.

Leak detection control program: Comparison of monthly flow and water meter readings.
Real-time readings are checked multiples times per day

Regulatory Compliance Status?

Disinfection byproducts monitoring (attach appropriate data)	Y	(Y/N)
Total Coliform Rule monitoring (attach appropriate data)	Y	(Y/N)
Lead and Copper Rule monitoring (attach appropriate data)	Y	(Y/N)
Surface Water Treatment Rule (SWTR, IESWTR, LT1 ESWTR)	N/A	(Y/N)

Other:

Attach maps, diagrams, sketches and plans to this field form for future reference - stamp "received Safe Drinking Water Branch" with date as applicable.

Hawaii Volcanoes National Park

PWS 146

Sanitary Survey

7/17/2014

Rain shed building #43

Ground catchments 1 (left) & 2

Ground catchment 2

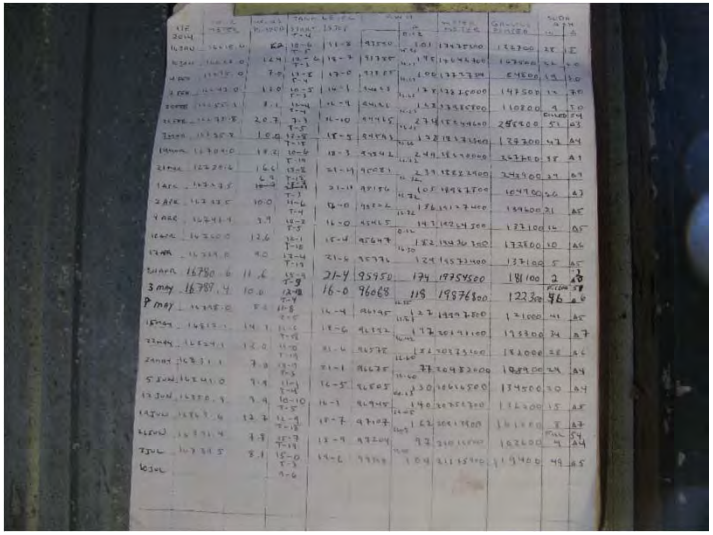
Ground catchment 2

Ground catchment 2 and inlet from ground catchment 1

Ground catchment 2 and inlet from ground catchment 1 (2)

Ground catchment pump house

Soda ash containers inside pump house



Soda ash log inside pump house

Ground catchment 1, raw tanks T-18 (right) & T-19, rain shed building #43

Raw tanks T-3 (left) & T-5, rain shed building #241

Water treatment building, slow sand filters, roughing cartridges (2)

Slow sand filters 1 (left), 2 (center) & 3, roughing cartridges

Water treatment building

Sodium hypochlorite storage containers and injection feed pump inside water treatment building

Sodium hypochlorite injection feed pump inside the water treatment building

Pair of finished water booster pumps inside the water treatment shed; extra roughing cartidges are stored nearby

Zinc orthophosphate container with injection feed pump inside water treatment building

Turbidimeter inside the water treatment building

Daily maintenance board posted inside the water treatment building

Slow sand filters 2 (left) & 3

Water treatment building, slow sand filter 1, roughing cartridges

Slow sand filter 1 (left) & clearwell

Rear view of slow sand filters 2 (right) & 3

Rainwater collection trestle from rain shed building #241, raw tank T-4 (left), finished water tank T-2

Transfer pump house

Inside of transfer pump house

Finished water circulation pump inside of transfer pump house

Booster pump station, 9,000 gallon pressure tank

Emergency diesel generator next to booster pump station

Booster pumps inside the booster pump station

MCC inside booster pump station

Rain shed building #241

Finished water tank T-2

Finished water tanks T-1 (left) & T-2

Finished water tank T-1 overflow line, work station shed

Inside finished water tank T-1
(currently being sand blasted)

Inside finished water tank T-1
(currently being sand blasted)

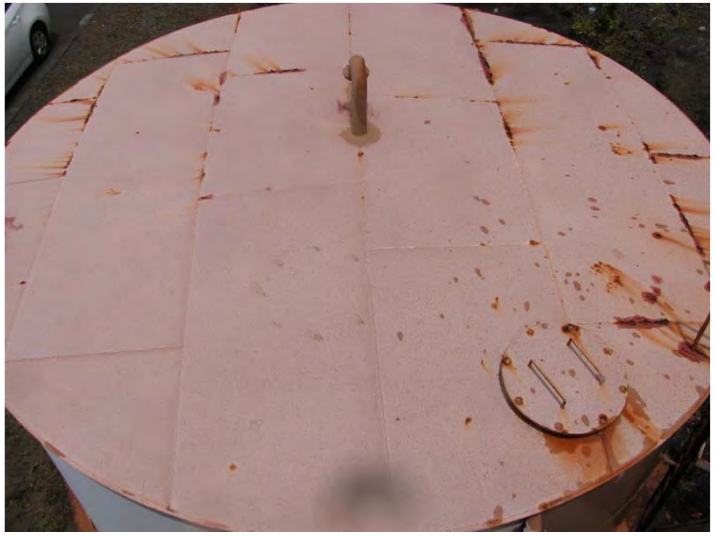
80,000 gallon tank

20,000 gallon tank

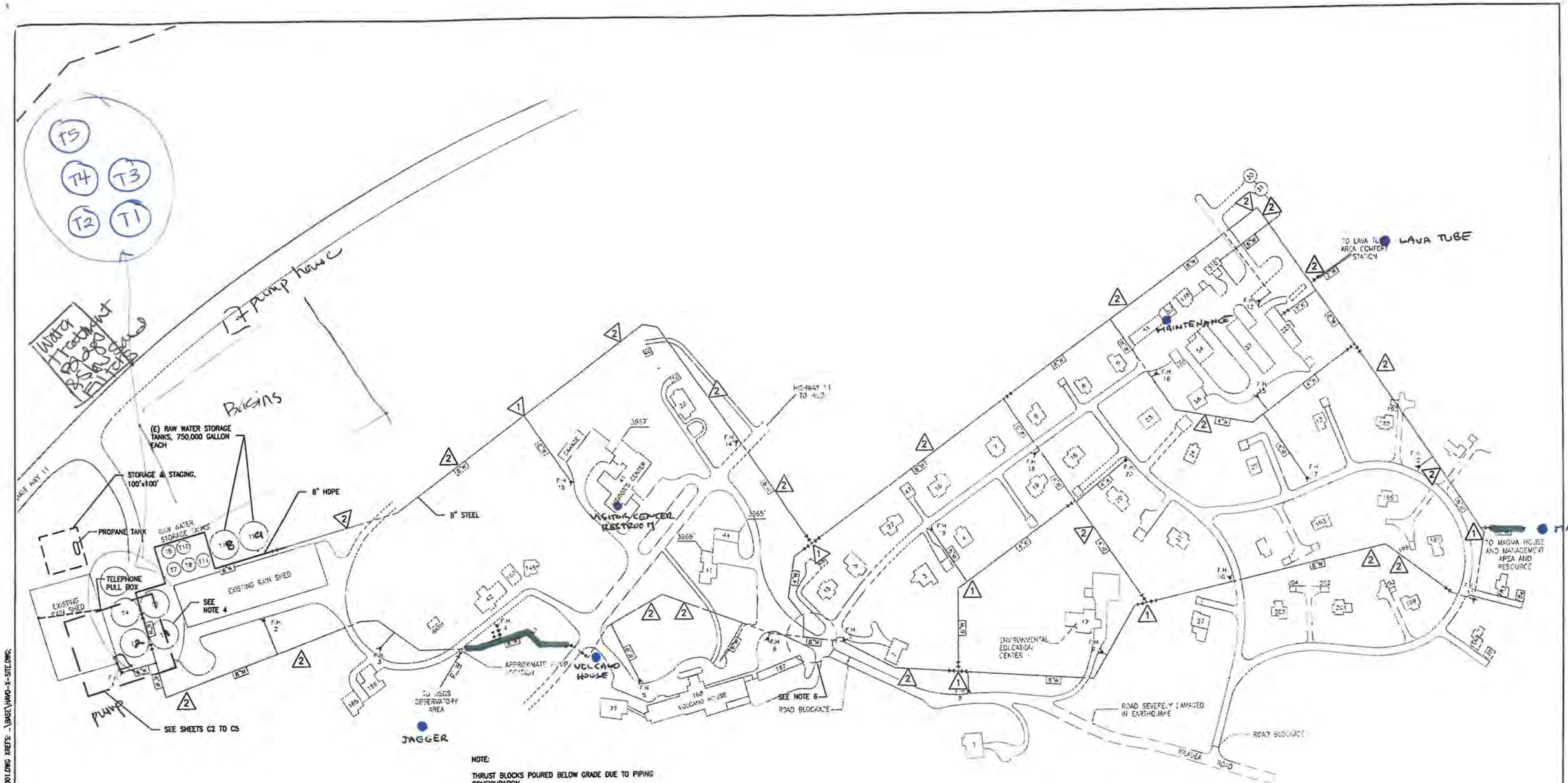
80,000 gallon tank roof

80,000 gallon tank hatch

Inside 80,000 gallon tank



20,000 gallon tank roof



NOTE:

THRUST BLOCKS POURED BELOW GRADE DUE TO PIPING CONFIGURATION.

NOTES:

1. THE FOLLOWING MAP IS A COMPILATION OF DRAWINGS, AND MAY NOT BE PRECISELY TO SCALE.
2. SPOT ELEVATIONS SHOWN ON BUILDINGS ARE APPROXIMATE AND WERE OBTAINED FROM 1940 & 1993 CONSTRUCTION DRAWINGS.
3. EXCEPT WHERE OTHERWISE NOTED, ALL FIRE HYDRANT LATERALS ARE 6".
4. TANKS T1 – T2 ARE TREATED POTABLE WATER STORAGE TANKS.
5. MAINTAIN WATER SERVICE TO PARK DURING CONSTRUCTION.
6. LAYOUT OF PIPING IN THIS AREA IS APPROXIMATE.

INSTALL THRUST RESTRAINTS ON THE FIRE HYDRANTS LISTED BELOW: SEE DETAIL 5/C10

FH# 4, 5, 9, 16, 18, 19, 25

● SAMPLE SITE

HDPE

PVC

1 INSTALL THRUST RESTRAINTS ON TEES (TOTAL OF 6), SEE DETAIL 3/C10

2 INSTALL PIPE RESTRAINTS (TOTAL OF 21), SEE DETAIL 1/C10, LOCATION TO BE FIELD DETERMINED BY CONTRACTING OFFICER

125 0 125 250

SCALE OF FEET

AS CONSTRUCTED

MICHAEL C. THALHAMER REGISTERED PROFESSIONAL ENGINEER No PE 8595 (CE) HAWAII, U.S.A.

11/08

DESIGNED	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
P. PATEL CADD C. BROWN TECH REVIEW M. THALHAMER DATE	C1	EXISTING WATER DISTRIBUTION SITE PLAN HAWAII VOLCANOES NATIONAL PARK	124 60032 PKG NO. 102407 SHEET 2 OF 31

09 16:16 RTORADO R17 P:\BWTD40714\WATRES\TASKS\TITLE I\SHEETS\HVO-001.DWG XREFS: ..\BASE\HVO-X-SITE.DWG;

MATCH LINE, SHEET C5

(E) TRANSFER PUMP HOUSE

2" TELEPHONE CONDUIT

(N) 4" HDPE, 30" BELOW GRADE

(N) 8" HDPE PIPE, BELOW-GROUND, SEE DETAIL 3/C9

(N) 8" GV

CONNECT (N) 8" HDPE PIPE TO (N) 8" DISTRIBUTION, SEE DETAIL 4/C8

(N) 10" 90° ELL

(N) 3" DRAIN ABOVE GROUND W/ QUICK DISCONNECT FOR HOSE

(N) 8" HDPE BELOW

(N) 10" HDPE PIPE BELOW GROUND

(N) 10" HDPE PIPE, BELOW GROUND

(N) 8" HDPE PIPE, BELOW GROUND

(N) PUMP BYPASS, SEE DETAIL 3/C8

(N) 7,000 GAL HYDROPNEUMATIC TANK, SEE SHEET C11

(N) 10" HDPE

(N) 4" GV

(N) 4" HDPE, 30" BELOW GRADE

(N) 10" HDPE TANK CONNECTION, SEE DETAIL 1/C8

6" HDPE BELOW GROUND

HYDROPNEUMATIC TANK DISCHARGE CONNECTION, SEE DETAIL 6/C8

(N) 10" GV

(N) 10" WELDED OUTLET 8" ABOVE TANK FLOOR TO ℄ (N) 10"

(N) 10" GV

(N) 10" WELDED OUTLET 8" ABOVE TANK FLOOR TO ℄ (N) 10"

MCC EQUIPMENT

TANK #2
(E) 500,000 GAL POTABLE WATER

(N) 6" BF ON (E) OUTLET

TANK #2

(E) EOP

(E) EOP

(N) 6" BF ON (E) OUTLET

(N) PUMP STATION, SEE SHEET C6

(E) MAINTENANCE SHED AREA

(N) PE PROPANE GAS LINE 24" BELOW GRADE, WARNING TAPE INSTALLED WITH TRACING WIRE

(N) PROPANE GENERATOR

CONNECT (N) 8" HDPE PIPE TO (E) 8" STEEL TEE, FLG

(N) BF ON TOP OF (E) 8" FLG TEE

(N) 8" HDPE POC TO TEE & 90°

(N) 4" HDPE, 30" BELOW GRADE

SCALE OF FEET

(E) EOP

(E) POWER POLE

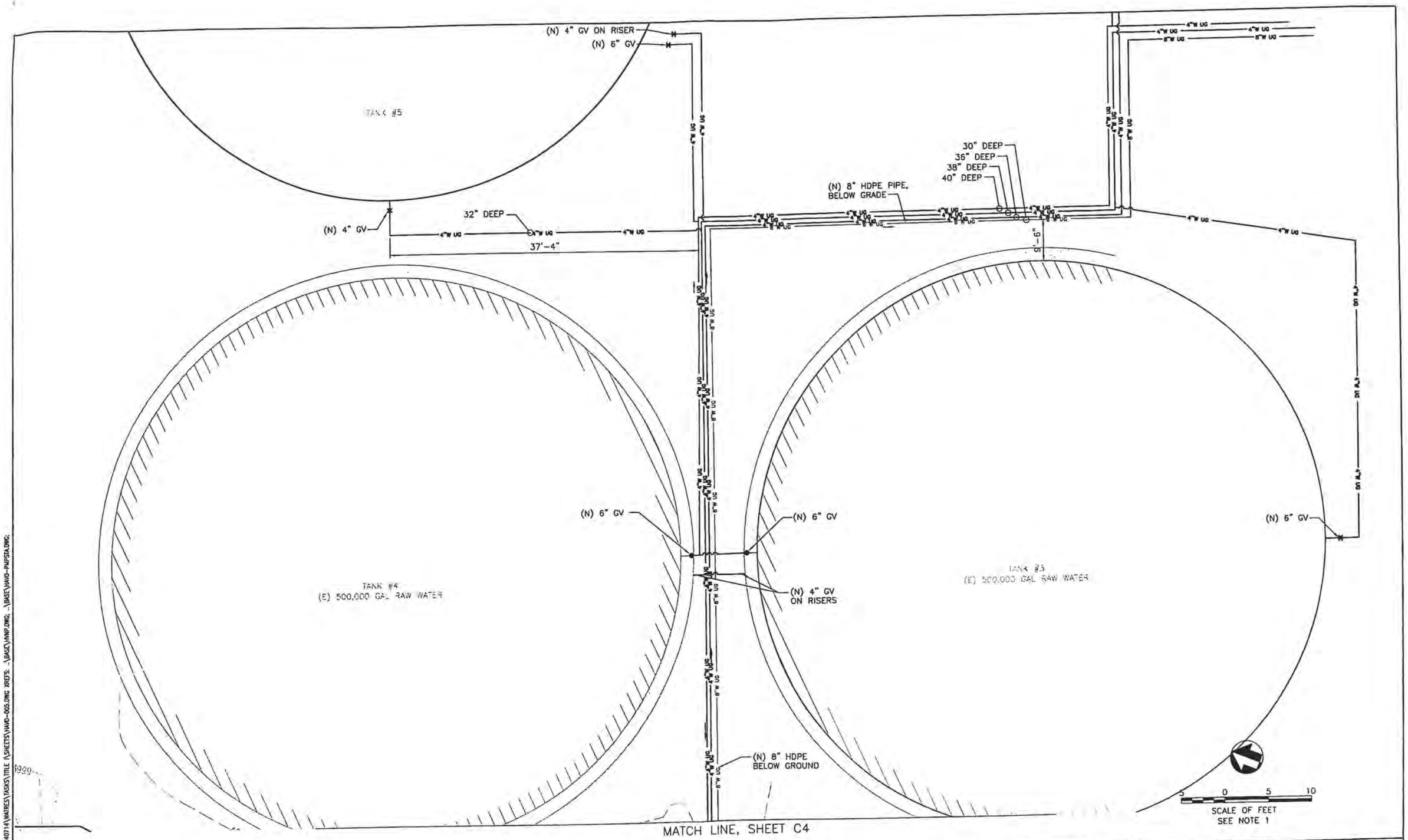
AS CONSTRUCTED

DESIGNED: P. PATEL	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO. 124 60032
CADD C. BROWN	C4	NEW OVERALL SITE PLAN	PKG. NO. 102407
TECH. REVIEW: M. THALHAMER		HAWAII VOLCANOES NATIONAL PARK	SHEET 5 OF 31
DATE:			

MICHAEL G. THALHAMER REGISTERED PROFESSIONAL ENGINEER No. PE 8595 (CE) HAWAII, U.S.A.

11/08

5/09 09:03 RTORADO R17 P:\BAK104714\WATRES\TASKS\TITLE 1\SHEETS\WWO-004.DWG XREFS: ..\BASE\WWO-PMPS X.DWG; ..\BASE\WWP.DWG;



NOTES:

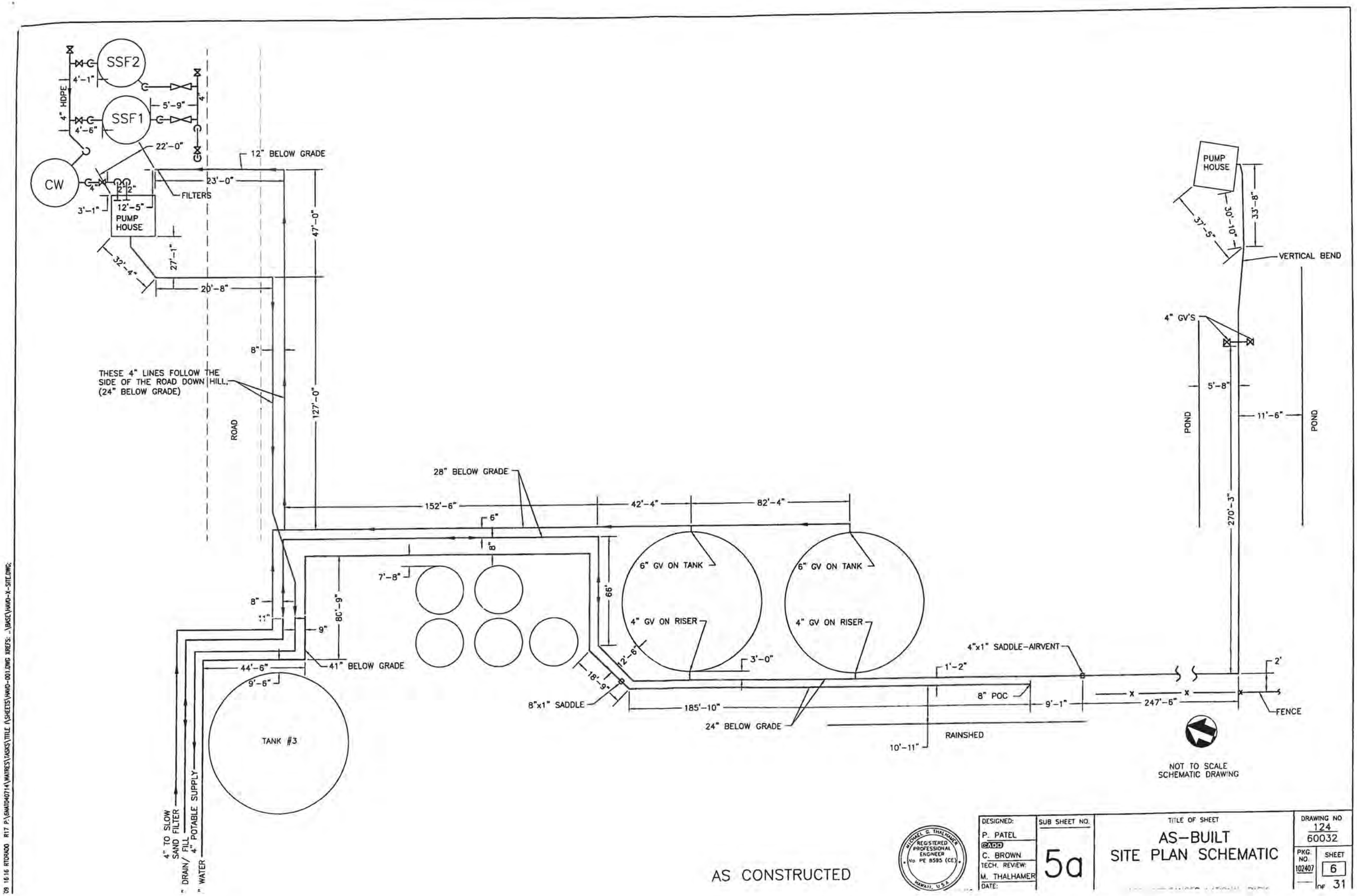
1. THIS MAP IS A COMPILATION OF DRAWINGS, AND MAY NOT BE PRECISELY TO SCALE.

AS CONSTRUCTED

MICHAEL G. THALHAMER REGISTERED PROFESSIONAL ENGINEER No. PE 8595 (CE) HAWAII, U.S.A. 11/08

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
P. PATEL CADD C. BROWN TECH. REVIEW: M. THALHAMER DATE: JAN 2009	C5	NEW OVERALL SITE PLAN HAWAII VOLCANOES NATIONAL PARK	124 60032 PKG. NO. 102407 SHEET 6 OF 31

3/09 09:03 RIORADO R17 P:\BMA10-0071A\WATRES\TASKS\TITLE 1\SHEETS\HAVO-005.DWG XREFS: ..\BASE\HAVO-PUPSTA.DWG; ..\BASE\HAVO-WNP.DWG; ..\BASE\HAVO-PUPSTA.DWG;

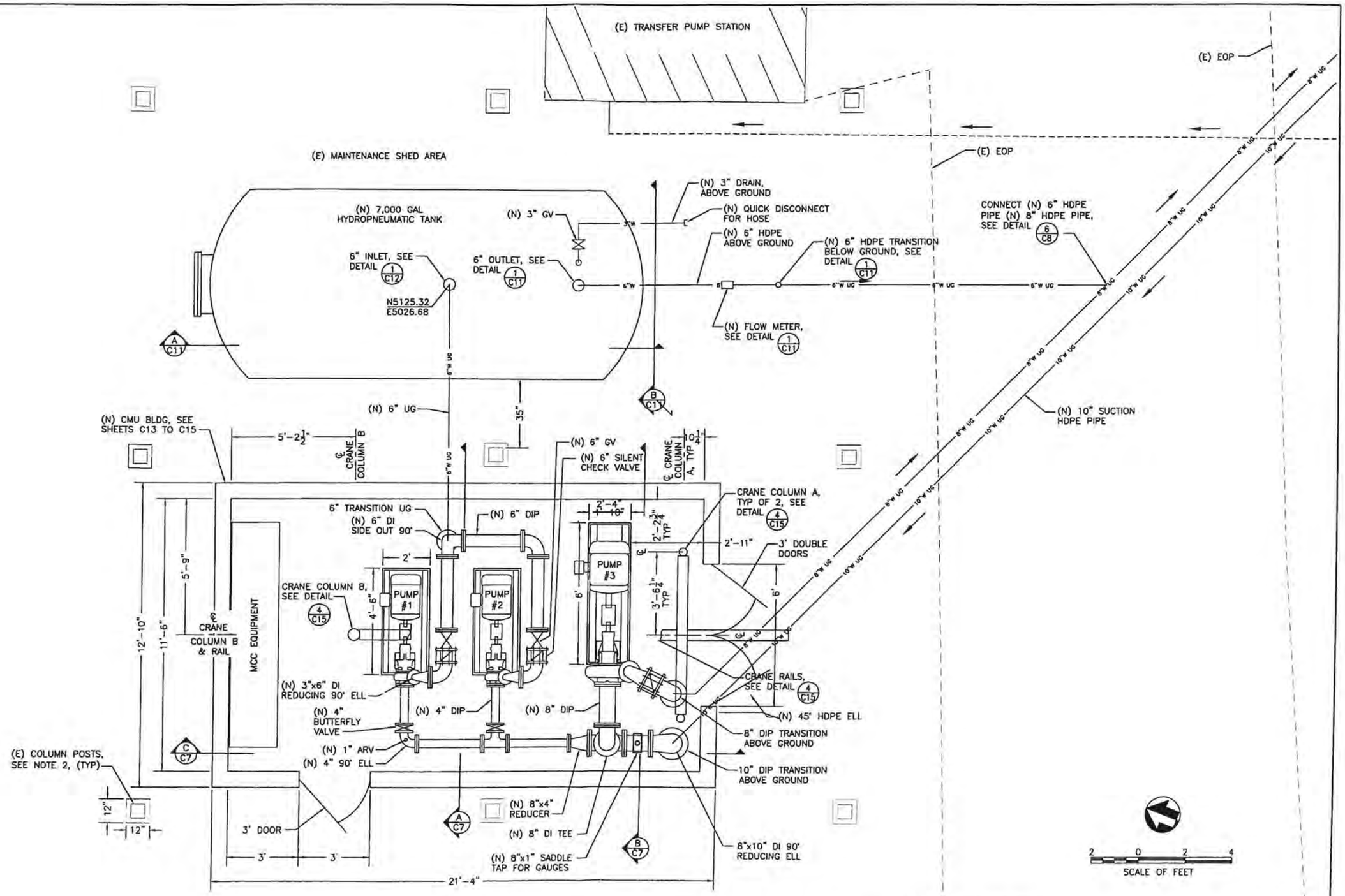


AS CONSTRUCTED

MICHAEL G. THALHAMER REGISTERED PROFESSIONAL ENGINEER No. PE 8595 (CE) HAWAII, U.S.A.

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO
P. PATEL CADD C. BROWN TECH. REVIEW: M. THALHAMER DATE:	5a	AS-BUILT SITE PLAN SCHEMATIC	124 60032 PKG. NO. 102407 SHEET 6 OF 31

09 16 16 RTOPAOO R17 P:\BMT040714\WATRES\ASKS\TITLE I\SHEETS\WAIO-001.DWG XREFS: ..\BASE\WAIO-X-SITE.DWG;



AS CONSTRUCTED

MICHAEL G. THALHAMER REGISTERED PROFESSIONAL ENGINEER No. PE 8595 (CE) HAWAII, U.S.A. 11/08

DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO
P. PATEL CADD C. BROWN TECH REVIEW: M. THALHAMER DATE JAN 2009	C6	PUMP STATION LAYOUT HAWAII VOLCANOES NATIONAL PARK	124 60032 PKG. NO. 102407 SHEET 7 OF 31

1/3/09 13:58 RTOKADO R17 P:\6HAT04714\WATRES\XSKES\TITLE (\SHEETS\HAVO-006.DWG XREFS: ..\BASE\TITLE.DWG; ..\BASE\HAVO-PMPSTA.DWG;

DEC 30 2014

12
M3 14

United States Department of the Interior

NATIONAL PARK SERVICE
Hawai'i Volcanoes National Park
Post Office Box 52
Hawaii National Park, Hawai'i 96718

RECEIVED
SAFE DRINKING
WATER BRANCH

IN REPLY REFER TO
A76

December 23, 2013

External Correspondence

To: Mrs. Joanna L. Seto, PE, Chief, Safe Water Drinking Branch

From: Park Civil Engineer and Occupational Health Safety Manager, Hawaii Volcanoes National Park

Subject: Public Water System 146 2014 Significant Deficiency Report

Dear Madame,
Hawaii Volcanoes National Park (HAVO) appreciated the sanitary survey report of our water system dated August 20, 2014. The report identifies the following significant deficiency. The treated water storage tank, T2, was observed to have gaps between the access hatch frame and the roof, no insect screen on the roof vent, and unsealed appurtenance holes on the roof.

These deficiencies were communicated to HAVO verbally by Mr. Alain Carey of the Safe Drinking Water Branch (SDWB) and resolved on August 6th, 2014. Photographic documentation of the corrected significant deficiencies is herein attached.

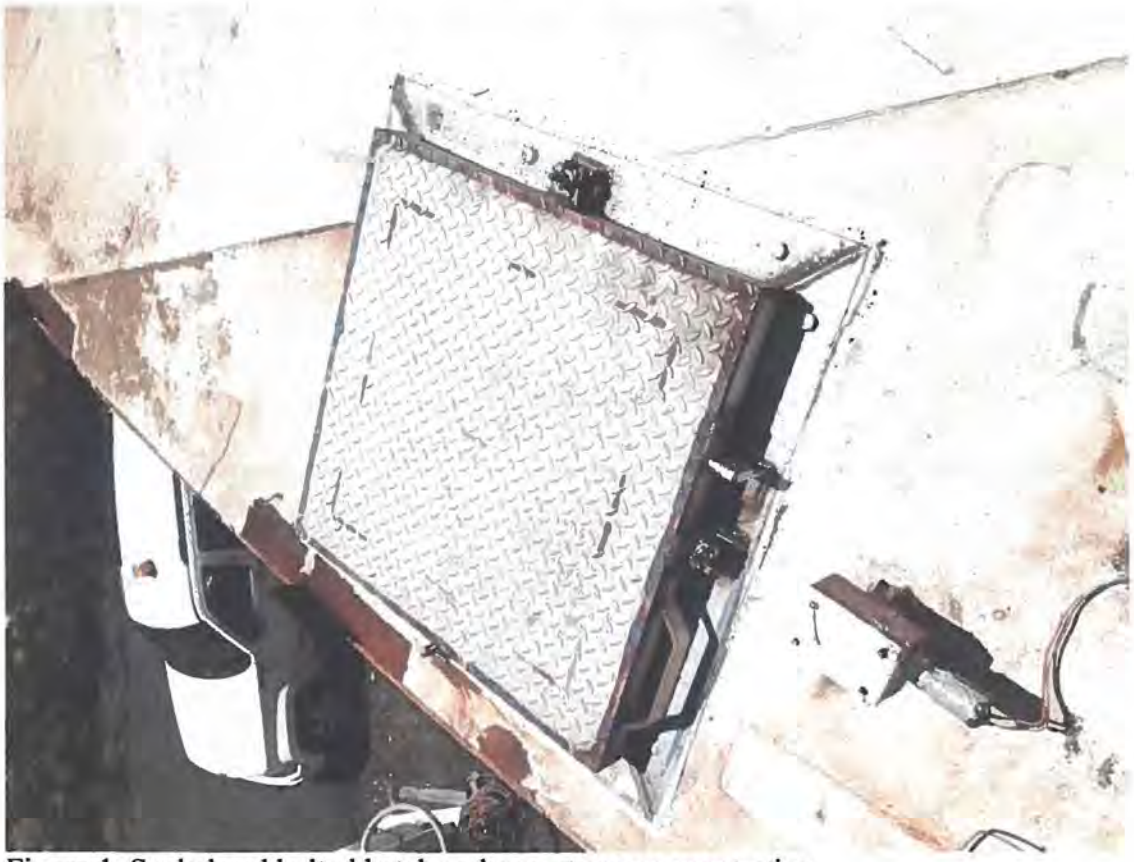


Figure 1. Sealed and bolted hatch and appurtenance penetration

Figure 2. Sealed upper hatch

Figure 3. Vent with installed insect screen.

In addition, HAVO has complied with the recommendations listed in the August 20, 2014 report by posting a " Warning, Chlorine Storage Facility," sign on the Transfer Pump House and cleared vegetation around the sand filters to the extent operations has allowed.

HAVO looks forward to continued cooperation and coordination with SDWB to insure the highest water quality for HAVO's public water system. Thank you for the opportunity to respond and please do not hesitate to request additional information.

Very Respectfully,

Stephen Brum, PE
Lieutenant Commander, U.S. Public Health Service
Park Civil Engineer and Occupational Health Safety Manager
Hawaii Volcanoes National Park
T: (808) 985-6140
M: (808) 339-0480
F: (808) 895-6024

From: Carey, Alain
To: "Brum, Stephen"
Subject: RE: Hawaii Volcanoes WST gasket 1 of 2
Date: Friday, August 01, 2014 11:04:00 AM

Hi, Steve,

My apologies for the late response. Do you have a photo of the gasket under the manhole cover for Tank 2? Is there an intact insect screen over this tank's roof vent (can't see from the photo)? For T1 and T2, I noticed there are gaps between where the manhole frame is bolted to the tank's roof. Could you apply a sealant between those gaps to prevent runoff from the roof from entering the tank?

Do you have the chlorine residual at Thurston Lava Tube?

Thanks for your help on this.

-Alain

From: Brum, Stephen [mailto:stephen_brum@nps.gov]
Sent: Friday, July 25, 2014 2:57 PM
To: Carey, Alain
Subject: Hawaii Volcanoes WST gasket 1 of 2

Aloha Alain,
Thanks for the visit. Attached are photos of Phil's gasket replacement on the 80k gal tank at the observatory.
We're planning for painting of the 20k gal tank up there in the new fiscal year.
Phil reported that the chlorine dilute tank is refreshed every threee days and the concentrate tank is continually maintained at full or near full.
The roughing cartridges haven't been replaced. Phil is able to clean them without degrading their performance.
I'll have the chlorine warning sign completed next week.
Photos of the new completed hatches and vents on tank2 and uncompleted hatches on tank1 are attached in the following emaiul
Let me know if you need anything else.
Have a good weekend.
Steve

--
Stephen Brum, PE
Lieutenant Commander, U.S. Public Health Service
Park Civil Engineer and Safety Manager
Hawaii Volcanoes National Park
T: (808) 985-6140
M: (808) 339-0480
F: (808) 895-6024

From:	Brum, Stephen
To:	Carey, Alain
Subject:	Hawaii Volcanoes WST gasket 2 of 2
Date:	Friday, July 25, 2014 3:08:57 PM
Attachments:	IMG_0780.JPG IMG_0781.JPG

---

2 of 2

---------- Forwarded message ----------
From: **Brum, Stephen** <stephen_brum@nps.gov>
Date: Fri, Jul 25, 2014 at 2:57 PM
Subject: Hawaii Volcanoes WST gasket 1 of 2
To: alain.carey@doh.hawaii.gov

Aloha Alain,
Thanks for the visit. Attached are photos of Phil's gasket replacement on the 80k gal tank at the observatory.
We're planning for painting of the 20k gal tank up there in the new fiscal year.
Phil reported that the chlorine dilute tank is refreshed every threee days and the concentrate tank is continually maintained at full or near full.
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Have a good weekend.
Steve

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Park Civil Engineer and Safety Manager
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F: (808) 895-6024

--
Stephen Brum, PE
Lieutenant Commander, U.S. Public Health Service
Park Civil Engineer and Safety Manager
Hawaii Volcanoes National Park
T: (808) 985-6140
M: (808) 339-0480
F: (808) 895-6024

From:	Brum, Stephen
To:	Carey, Alain
Subject:	Hawaii Volcanoes WST gasket 1 of 2
Date:	Friday, July 25, 2014 3:00:59 PM
Attachments:	IMG_2189[1].JPG IMG_2190[1].JPG IMG_2191[1].JPG IMG_2192[1].JPG IMG_2193[1].JPG

Aloha Alain,
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Steve

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Lieutenant Commander, U.S. Public Health Service
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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
919 ALA MOANA BLVD., ROOM 308
HONOLULU, HI 96814-4920

In reply, please refer to:
File: SDWB
146F0814.docxl

August 20, 2014

Ms. Cindy Orlando
U.S. Department of the Interior
Hawaii Volcanoes National Park
PO Box 52
Hawaii National Park, HI 96718

Dear Ms. Orlando:

SUBJECT: PUBLIC WATER SYSTEM NO. 146,
HAWAII VOLCANOES NATIONAL PARK
TRANSMITTAL OF SANITARY SURVEY REPORT

Thank you for the assistance and information provided during the sanitary survey inspection of the Hawaii Volcanoes National Park Water System conducted on July 17, 2014.

My staff appreciated the assistance provided by Mr. Steve Brum.

Enclosed is a copy of the Hawaii Volcanoes National Park sanitary survey report. A sanitary survey of a public water system is a periodic review of the system's facilities, operation and maintenance practices, and records to assure that proper conditions, policies, and practices are in effect for that water system. Maintaining of minimum standards of operation and maintenance is the responsibility of the operator.

Systems must comply with the sanitary survey requirements of the Ground Water Rule (GWR) as of December 1, 2009. The Rule requires ground water systems with an identified "**significant deficiency**" to consult with the State on a corrective action plan and schedule of completion within 30 days of receiving written notice of the deficiency. The system must complete the corrective actions or be in compliance with the agreed upon corrective action plan and completion schedule within 120 days of receiving written notice of the deficiency.

Photo documentation of all corrected significant deficiencies is required as of January 1, 2014. The Safe Drinking Water Branch (SDWB) reserves the right to conduct follow up inspections as necessary.

The Department of Health (DOH) also requests that the system review the "recommendations" (non-significant deficiencies) noted in the report, and provide written acknowledgement that they will address them in a timely manner, to the extent that resources and operations will allow. We strongly encourage the system to address "recommendations" as you would significant deficiencies to avoid related problems in the future. The DOH will be using this report's list of significant deficiencies and recommendations as a reference and benchmark for measuring system progress in future sanitary surveys.

If there are any questions, please call Mr. Alain Carey, of the SDWB Engineering Section, at (808) 586-4258.

Sincerely,

Ann T. Zane

for JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch

AC:cw

Enclosure

c: Ms. Theresa McGeehan-Takiue, East Hawaii EHS (w/o encl.) [via email only]

OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

INVESTIGATIVE ACTIVITY REPORT

Case Title **HAVO Water Distribution System**	**Case Number** **OI-PI-15-0259-I**
Reporting Office **Program Integrity Division**	**Report Date** **March 24, 2015**
Report Subject **Interview of Craig Ungerecht**	

On March 24, 2015, Special Agent Michael Graziano telephonically interviewed Commander Craig Ungerecht, U.S. Public Health Service (USPHS), Regional Public Health Consultant, National Park Service (NPS), San Francisco, CA, in follow-up to his interview on February 25, 2015, concerning an environmental health survey he had conducted at Hawaii Volcanoes National Park (HAVO) in December 2013. The following is a summary of the interview.

With regard to wastewater collection and treatment requirements at HAVO, Ungerecht said that the Park did have wastewater collections systems in the form of several small septic tanks, but did not have any wastewater treatment operations. He explained that the Park held a discharge permit for wastewater collection pursuant to the National Pollutant Discharge Elimination System (NDES), and as such the Park was required to conform to any certifications required by the EPA primacy agency providing oversight to it. In this case, the primacy agency is the State of Hawaii.

Ungerecht said that as far as he knew, the State of Hawaii did not require someone to be certified in wastewater collection at HAVO given the Park's wastewater collection system. However, Ungerecht did recommend that someone at the Park be "adequately trained" in the septic wastewater collection system.

Ungerecht referred to NPS Reference Manual (RM) 83B1, Wastewater Systems, which he said required certifications in wastewater only when the state required one, but in the absence of a state requirement, the manual recommended that someone be "adequately trained" to operate the system. Ungerecht said that he interpreted this to mean that HAVO was required to have someone who was generally knowledgeable of the wastewater systems at the Park; that is, someone who knew where the septic tanks were located, knew how to access them, and knew how to determine if they needed to be serviced.

Ungerecht said he believed the Park met the requirements of RM 83B1 pertaining to having someone adequately trained in wastewater systems. Ungerecht specifically said that Park employee Stephen

Reporting Official/Title Michael Graziano/Special Agent	Signature Digitally signed.

Authentication Number: BF34B37C3272CF6967E205E59CCE55EC

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Brum, who escorted him during the environmental survey he conducted in December, 2013, clearly demonstrated that he met those requirements.