



OAHU'S GROUNDWATER AQUIFER AND SITING NEW LANDFILL

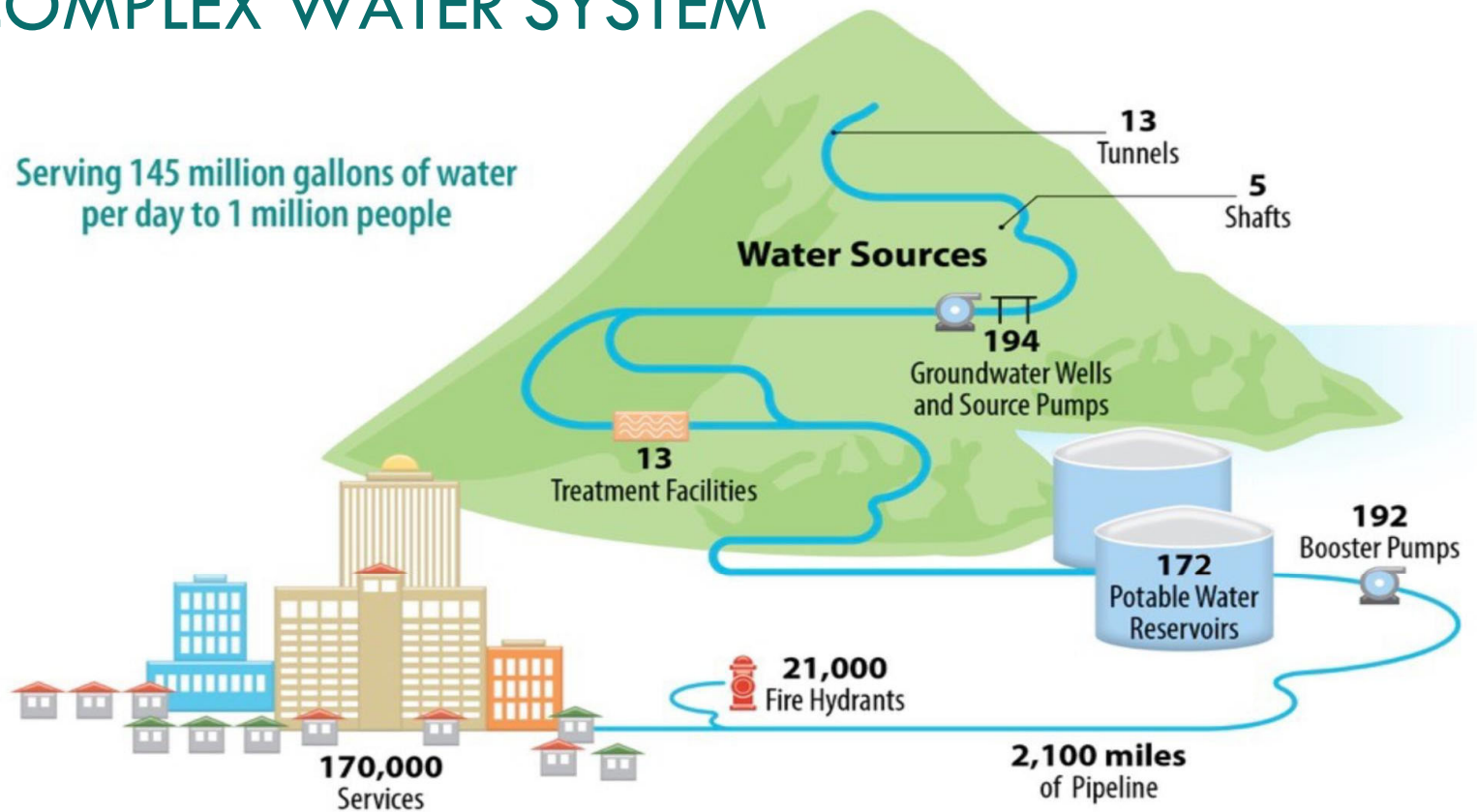
January 14, 2025
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CITY REQUEST FOR BWS POSITION ON SITING NEW LANDFILL

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CITY REQUEST FOR BWS POSITION ON 6 LANDFILL SITES

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU

1810 ULUKOHA STREET, SUITE 300, KAPOLEI, HAWAII 96767
 TELEPHONE: (808) 768-3486 • FAX: (808) 768-3487 • WEBSITE: <http://deh.honolulu.gov>

RICK BLANGIARDI
 MAYOR



ROGER BABCOCK, JR., Ph.D., P.E.
 DIRECTOR

MICHAEL O'KEEFE
 DEPUTY DIRECTOR
 IN REPLY REFER TO:
 DIR 22-88

November 3, 2022

SENT VIA EMAIL

Ernest Y. W. Lau, P.E.
 Manager and Chief Engineer
 Honolulu Board of Water Supply
 elau@hbws.org

Dear Ernest

Thank you for your time and attention during the October 24, 2022, Board of Water Supply (BWS) board meeting. This letter follows up on the item for information, "Briefing by the Department of Environmental Services on their Landfill Siting" that was on that meeting's agenda.

At that meeting we briefed the board that BWS presented on groundwater and landfills to the Landfill Advisory Committee (LAC) and the LAC, based on BWS' presentation, despite evaluating and ranking six sites did not recommend any of the six sites as an alternative to the existing landfill (please see attachment A for final report).

Given this sequence of events, at the October 24 BWS board meeting, I requested clarity on BWS' legal authority over landfill siting and whether that authority was exercised, and if not exercised, when the City should seek a determination.

In order to clarify BWS' position and due to the impending deadline set by the State Land Use Commission Decision and Order for the Department of Environmental Services to "identify an alternative landfill site that may be used upon closure of WGSLL [Waimanalo Gulch Sanitary Landfill]" by December 31, 2022, I am writing this letter to formally ask for BWS' official position on the six potential landfill sites (please see attachment B for details on those six sites) the LAC evaluated. Specifically, were Mayor to select any of the six ranked sites off the LAC's list, what would be BWS' official response or position?

Ernest Y.W. Lau, P.E.
 November 3, 2022
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Given the timeline before us, I would appreciate a response as soon as possible. Please contact me at 768-3486 if you have any questions with respect to the foregoing.

Sincerely,

Digitally signed by O'Keefe,
 Michael
 Date: 2022.11.03 11:33:02
 -1000

For Roger Babcock, Jr., Ph.D., P.E.
 Director

APPROVED:

Digitally signed by Formby,
 Michael
 Date: 2022.11.03 13:58:17
 -1000

Michael D. Formby, Managing Director
 Office of the Managing Director

Attachments: A - LAC Report [Here](#)
 B - Sites

cc: Rick Blangiardi, Mayor
 Brian Andaya, Chair, Board of Water Supply

Attachment B

June 2022



June 2022

June 2022

4-18

June 2022

BWS RESPONSE DISAPPROVING THE 6 LANDFILL LOCATIONS OVER THE DRINKING WATER AQUIFER

<p>BOARD OF WATER SUPPLY</p> <p>CITY AND COUNTY OF HONOLULU 630 SOUTH BERETANIA STREET HONOLULU, HI 96843 www.boardofwatersupply.com</p> <p></p> <p>November 16, 2022</p> <p>RICK BLANGIARDI, Mayor BRYAN P. ANDAYA, Chair KAPUA SPROAT, Vice Chair MAX J. SWORD MILAREN ANTHONY JONATHAN KANESHIRO JADE T. BUTAY, Ex-Officio DAWAN B. SZEWczyk, P.E., Ex-Officio ERNEST Y. W. LAU, P.E. Manager and Chief Engineer ERWIN M. KAWATA Deputy Manager</p> <p>Roger Babcock, Jr., Ph.D., P.E. Director City and County of Honolulu Department of Environmental Services</p> <p>Dear Dr. Babcock,</p> <p>Subject: <u>Response to November 3, 2022 Letter Regarding the Board of Water Supply's Official Position on the Six Potential Landfill Sites</u></p> <p>The Honolulu Board of Water Supply (BWS) is in receipt of your November 3, 2022 letter, in which the City and County of Honolulu Department of Environmental Services (ENV) "formally ask[s] for the BWS' official position on the six potential landfill sites" that were evaluated by the Landfill Advisory Committee (LAC)¹ for possible use upon the closure of the Waimanalo Gulch Sanitary Landfill and "clarity on BWS' legal authority over landfill siting."² For the reasons set forth below, the BWS does not approve any of the six proposed landfill sites that are located above (or mauka) the No Pass Zone and over Oahu's drinking water aquifer system.</p> <p><u>The Board of Water Supply's Legal Authority Concerning Plans Proposing Waste Disposal Facilities</u></p> <p>Safeguarding Oahu's water supply from sources of potential contamination is not a matter of discretion; it is constitutionally mandated. The Hawaii Constitution guarantees that "[a]ll public natural resources are held in trust for the benefit of the people" and directs the State, and by extension the BWS, "to protect, control and regulate the use of Hawaii's water resources for the benefit of its people." Haw. Const. art. XI, § 1, 7. As the largest municipal drinking water utility in Hawaii, the BWS has a constitutional public trust responsibility to protect the water resources it manages and to preserve the rights of present and future generations in the waters of Hawaii. See <i>Kaui Springs, Inc. v. Planning Comm'n of Cty. of Kauai</i>, 133 Haw. 141, 171, 324 P.3d 951 (2014) (holding</p> <p>¹ See <i>O'ahu Landfill Siting Study & Landfill Advisory Committee Recommendations: Final Report</i> (June 2022) ("LAC Final Report").</p> <p>² At the October 28, 2022 meeting of the BWS Board of Directors, ENV posed similar questions during an item for information before BWS Board. However, ENV's November 3, 2022 letter is directed to the BWS Manager and Chief Engineer.</p>	<p>'State <u>and its subdivisions</u> shall (emphasis in original)). Specifically, o maintain the purity and flow of the waters of our land are put to rest here, drinking water is among <i>Water Use Permit Application</i>, 94</p> <p>ect Oahu's drinking water, the BWS enforce rules and regulations having prevention of waste and pollution of the proper conservation and city." Revised Charter of the City (54-33). To ensure that s are protected, the BWS has facilities, including municipal ceive written approval from the Regulations § 3-301(1).</p> <p>"Zones" which generally prohibit landfills, in areas that may d to be used for domestic water s, § 3-301(2).⁵ The No Pass Zone brings that define the areas of thick a) the No Pass Zone are primarily bles the aquifer to replenish within ent of infiltrated rainwater that falls o prevent surface contamination above the No Pass Zone, have no that is used for drinking water. plans proposing certain waste red and the Manager and Chief there is any basis to expect that</p> <p>sibility is "unlimited by any surface-ground ater. <i>In re Water Use Permit Applications</i>,</p> <p>oward achieving the highest water quality shall be liberally interpreted to obtain § 174C-2(c).</p> <p>establish "No Pass Zones" which ... shall waste disposal facilities. BWS Rules and ns areas in which the installation of waste es used or expected to be used for (emphasis added).</p>	<p>ly wastewater therefrom may sources used or expected to § 3-301(2)-(3).</p> <p><u>Potential Landfill Sites</u></p> <p>WWS' No Pass Zone, and all drogeologically-connected of this groundwater aquifer ect it been more ng with what the Hawaii d environmental disaster" Fuel Storage Facility that ly and the pollution of this s unfortunate environmental tive in protecting all of our s of contamination. Oahu's</p> <p>to the LAC, the BWS nges associated with finding esign and engineering can adversely impact the evaluated by the LAC are directly over Oahu's drinking y (USGS), citing EPA nto the environment and that both old and modern GS Fact Sheet FS-040-03</p> <p>do contain a wide range of ing concentrations—such as and per- and polyfluorinated have the potential to</p> <p>nated sole-source groundwater s 77 percent of the total island Agency (EPA) determined that ing water" for the island, and that outhern Oahu Basal Aquifer in the Fed. Reg. 45496, at 45497 (Nov.</p>	<p>Waimanalo Gulch Sanitary annually that contains al dissolved solids rinking water maximum dfill leachate n Oahu in December eachate at the charges of municipal Gulch stream and osed landfill sites that could impact Oahu's</p> <p>groundwater is always and impact other parts of d can move relatively use of this, contaminant bust monitoring well) drinking water result, contamination from dwater aquifer and it could—as was the water supply wells in the</p> <p>hat any landfill sited at ty and/or quantity of the . See BWS Rules and</p> <p>n Sanitary Landfill, Kapolei, bmitted to the State of Hawaii f BWMR_Final.pdf); United The Destruction and Disposal Perfluoroalkyl and er 18, 2020 527-0002_content.pdf); Leachate PFOA and PFOS mpleted in Collaboration with March 6)</p> <p>f Haw., No 19-224 (D. Haw. h <i>Honolulu and Waste v. epa.gov/newsreleases/epa-angle-gulch</i>.</p>	<p>e consideration of the requisite guidelines and disapprove all six of the proposed landfill sites above</p> <p>ed to protect Oahu's drinking water from underground WS continues to urge ENV to explore new landfill sites including, where appropriate, requesting additional ion to explore other siting options.</p> <p>feel free to contact me at (808) 748-5061.</p> <p>Very truly yours,  ERNEST Y.W. LAU, P.E. Manager and Chief Engineer</p> <p>ardi, Mayor, City and County of Honolulu ing Director, Department of Environmental Services Director, Department of Environmental Services rager, BWS</p> <p>ty of Honolulu agreed when it adopted Resolution 03-09, FD1 Council resolved to establish a policy "of the city that municipal d anywhere ... within the [BWS'] groundwater protection zone, or ces." This resolution was partially a result of the Council's chnology that can guarantee that hazardous or other harmful f the city's aquifer will not, over the long-term, enter the city's o the public health and welfare of Honolulu's citizens."</p> <p>its Final Report, specifically noting the importance of the "Board commending any of the final landfill sites. Indeed, "[a]ll LAC the location of the proposed sites in the No Pass Zone and, for O'ahu's drinking water resources" (LAC Final Report 1-4) and st support a landfill sited within the BWS No Pass Zone due to n of groundwater resources on O'ahu" (LAC Final Report 6-4).</p>
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BWS 2024 RESPONSE REAFFIRMING 2022 DISAPPROVAL

BOARD OF WATER SUPPLY
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ERWIN KAWATA
DEPUTY MANAGER
HOPE IMAVAGA



December 17, 2024

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GENEC ALBANO, P.E., Ex-Officio

Roger Babcock, Jr., PhD, P.E.
Director
Department of Environmental Services
City and County of Honolulu
roger.babcock@honolulu.gov

SENT VIA EMAIL

Dear Dr. Babcock:

Subject: Mayor's December 10, 2024 Press Conference Announcing the Selection of Area Northwest of Wahiawā as City's Proposed New Landfill Site

The Honolulu Board of Water Supply (BWS) has reviewed the City and County of Honolulu's (City) December 10, 2024 announcement of a potential landfill site located in an area northwest of Wahiawā on agricultural land to the west of Kamehameha Highway, north of Pa'ala'a Uka Pūpūkea Road (previously referred to as "Area 3, Site 2" in the Mayor's Landfill Advisory Committee (LAC) June 2022 Final Recommendations Report, and referred to herein as the "Proposed Landfill Site"). While BWS appreciates the difficulties associated with selecting a new landfill site, the position of the Office of the Manager and Chief Engineer (OMCE) on the Proposed Landfill Site has not changed. As you know, by letter dated November 16, 2022, I exercised my authority as Manager and Chief Engineer to formally disapprove the six landfill locations identified by the Department of Environmental Services (ENV), including the Proposed Landfill Site (Babcock, 2022), because operation of a new landfill at any of these locations may impact the quality and/or quantity of the water resources used or expected to be used as drinking water (Lau, 2022). Neither the City nor ENV sought reconsideration of that final decision.

Board of Water Supply's Legal Authority Concerning Plans Proposing Waste Disposal Facilities

BWS is authorized to establish "No Pass Zones," which generally prohibit the installation of waste disposal facilities in sensitive areas in order to protect O'ahu's critical underground drinking water resources from contamination. See BWS Rules and Regulations §3-301(2). BWS' Rules and Regulations further empower the Manager and Chief Engineer to disapprove proposed waste disposal facilities, including landfills, that may affect the quality and/or quantity of water resources used or expected to be

Dr. Babcock, Jr.
December 17, 2024

domestic water. See BWS Rules and Regulations §3-301(3). All six of the landfill sites in the June 2022 Final Recommendations Report of the LAC are above the BWS' No Pass Zone and over O'ahu's hydrogeologically-connected water aquifer system. Accordingly, all six proposed landfill sites—including the Proposed Landfill Site—were disapproved in my November 2022 letter.

The importance of this groundwater aquifer has been more apparent, and never more so, than in the wake of the 2011 tsunami. As you know, the people of O'ahu are still coping with what the Hawaii State Department of Health aptly described as a "humanitarian and environmental disaster," caused by fuel releases from the Red Hill Bulk Fuel Storage Facility (Red Hill), that resulted in the contamination of O'ahu's drinking water supply and the pollution of this island's irreplaceable sole-source groundwater aquifer. This unfortunate environmental catastrophe is a stark reminder that we all need to be proactive in protecting all of our precious drinking water resources from underground sources of contamination. O'ahu's aquifer cannot be

replenished in prior correspondence and presentations to the LAC, BWS has emphasized the need for a new landfill, as well as the challenges associated with such a new landfill site. We also recognize that modern landfill design and engineering can attempt to reduce the risk that contaminant constituents will adversely affect the environment. However, the Proposed Landfill Site is located above the BWS' No Pass Zone and sits directly over O'ahu's drinking water aquifer system. The U.S. Geological Survey (USGS), citing EPA studies, has concluded that all landfills will leak into the environment and that the fate and transport of leachate in the environment, from both old and modern landfills, are a potentially serious environmental problem (USGS, 2003).

Recent data demonstrates that landfill leachates can and do contain a wide range of inorganic and organic chemical constituents in varying concentrations—such as metals, chlorides, volatile and semi-volatile organic, and per- and polyfluorinated substances (PFAS)—that, if released into the environment, have the potential to adversely affect drinking water resources. For example, the Waimānalo Gulch Sanitary Landfill generates approximately 3.6 million gallons of leachate annually that contains concentrations of heavy metals, chlorides, sodium, total dissolved solids, phenols, and amines well above their respective EPA drinking water maximum contaminant levels (MCLs). Heavy rainfall can exacerbate landfill leachate containment. Indeed, intense storms that occurred on O'ahu in December 2010 and January 2011 resulted in the generation of additional leachate at the Waimānalo Gulch Sanitary Landfill that ultimately gave rise to illegal discharges of municipal debris, medical waste, and leachate to the nearby Waimānalo Gulch stream and ultimately the Pacific Ocean. Leachate from the Proposed Landfill Site would constitute a significant source of contamination that could impact O'ahu's groundwater aquifer system.

O'ahu's groundwater is hydrogeologically-connected and groundwater is always in motion. Contamination in one part of the aquifer can spread to and impact other parts of the aquifer. Further, groundwater flow can be unpredictable and can move relatively

Dr. Roger Babcock, Jr.
December 17, 2024
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quickly (greater than ten feet per day in some instances). Because of this, contaminant migration along preferential flow paths will likely elude even a robust monitoring well network and undetected contaminants could make their way to drinking water production wells before any corrective action can occur. As a result, contamination from landfill leachate poses a considerable risk to both O'ahu's groundwater aquifer and drinking water resources. If such contamination were to occur, it could—as was the case for Red Hill—eventually cause BWS to shut down its water supply wells in the vicinity of the source of contamination at the landfill.

In sum, the No Pass Zone was established to protect O'ahu's drinking water from underground sources of contamination and there is a compelling basis upon which to expect that a landfill situation at the Proposed Landfill Site may impact the quality and/or quantity of the water resources used or expected to be used as drinking water. Accordingly, for the reasons provided in my November 16, 2022 letter (Lau, 2022) and reiterated above, I reaffirm my prior disapproval of the Proposed Landfill Site.

BWS is committed to safeguarding Hawaii's critical drinking water resources for present and future generations and continues to urge ENV to explore new landfill sites that are below the No Pass Zone. If you have any questions, please feel free to contact me at (808) 748-5061.

Very truly yours,

Ernest Y.W. Lau, P.E.
Manager and Chief Engineer

Attachments:

1. Lau, 2022. Response to November 3, 2022 letter regarding BWS' official position on the six potential landfill sites, November 16, 2022.
2. Babcock, 2022. Request for clarity on BWS' legal authority over landfill siting and whether that authority was exercised and if not exercised, when the City should seek a determination, November 3, 2022.
3. Christenson, Scott C. and Cozzarelli, Isabelle M. Cozzarelli. The Norman Landfill Environmental Research Site: What Happens to the Waste in Landfills? USGS Fact Sheet 040-03, August 2003

cc: The Honorable Rick Blangiardi, Mayor, City and County of Honolulu
Michael D. Formby, Managing Director, City and County of Honolulu
Michael O'Keefe, Deputy Director, Department of Environmental Services
Nā'ālehu Anthony, BWS Board Chair

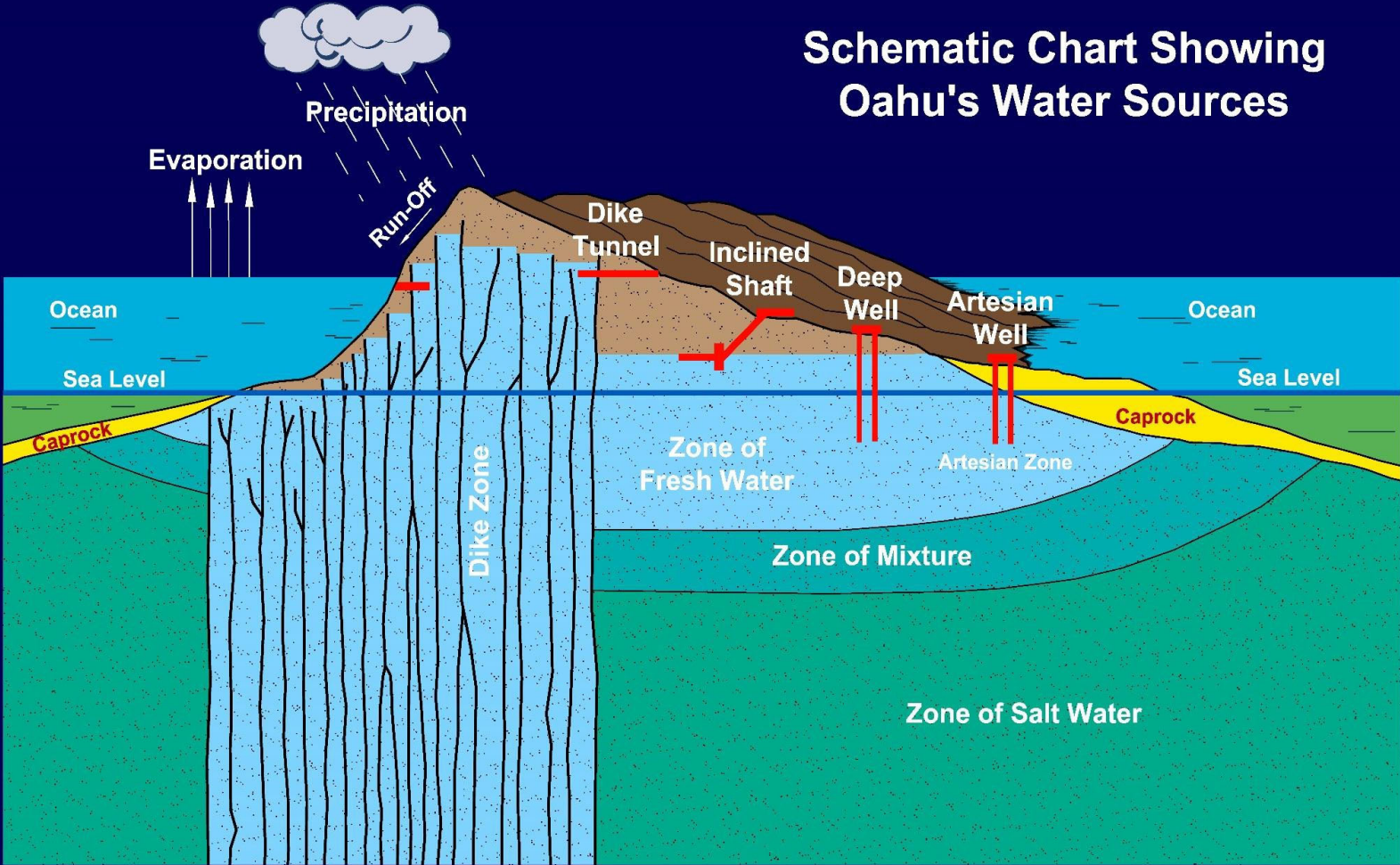


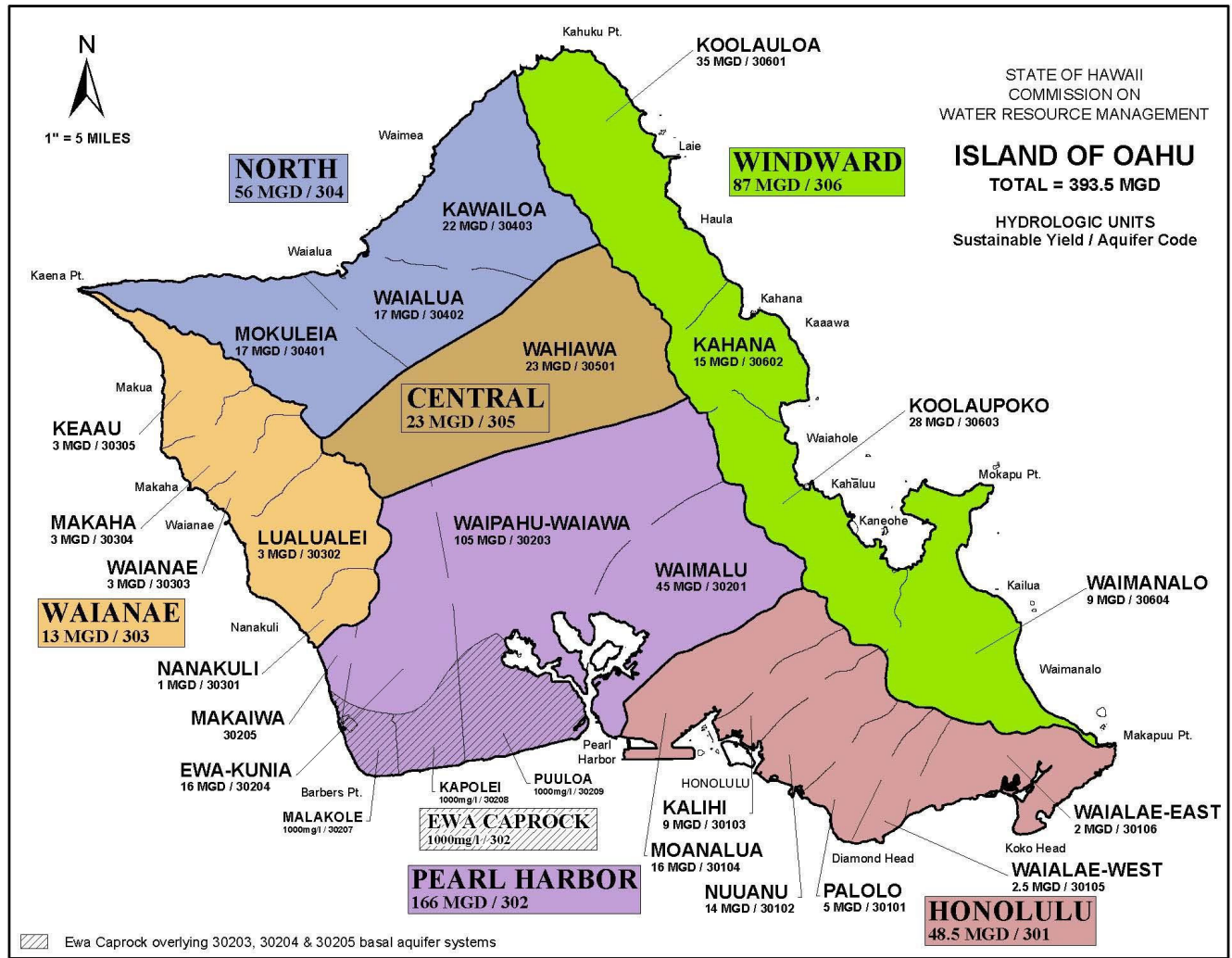
KEY POINTS OF CONCERN

- Oahu is 100% dependent on its groundwater aquifer for drinking water.
- Landfills contain contaminants that can enter groundwater.
- Landfills, once constructed will be there permanently.
- Preservation and protection of our precious and pure groundwater resources are essential to ensure water security for our future for generations to come.



Schematic Chart Showing Oahu's Water Sources





06/20/2018

Map Projection: Universal Transverse Mercator



LANDFILLS

- EPA has concluded that **all landfills eventually leak into the environment** (Fed. Reg. v. 53, no. 168, August 30, 1988)
- Christenson and Cozzarelli, US Geological Survey, August 2003
 - Although liners and leachate collection systems minimize leakage, **liners can fail** and leachate collections systems may not collect all the leachate that escapes from a landfill.
 - The **fate and transport of leachate in the environment**, from both old and new landfills, is a **potentially serious environmental problem**.
- Landfill liners and cover systems are designed to contain leachate and control emissions, but **even the best-designed systems will fail at some point unless they are replaced or the waste is removed** (EPA's 2020 Interim Guidance, December 18, 2020).
- Waimanalo Gulch Landfill generates about 3.6 MG leachate annually (9,800 GPD) * Landfills in higher rainfall areas can yield higher leachate volumes.



LANDFILL LEACHATE AND GROUNDWATER ANALYSIS

Analyte	Waimanalo Gulch Leachate Ash SMP*	Waimanalo Gulch GW MW-14*	BWS Honouliuli Wells I	BWS Beretania Low Service
pH	6.52	6.64	7.12	8.20
Aluminum	9,600 ppb	No data	ND	ND
Arsenic	9.0 ppb	No data	ND	ND
Barium	710 ppb	No data	ND	2 ppb
Calcium	3,000 ppm	87 ppm	28 ppm	12 ppm
Cadmium	1,300 ppb	No data	ND	ND
Chromium	320 ppb	No data	1.3 ppb	1.7 ppb
Chloride	22,000 ppm	920 ppm	156 ppm	73 ppm

*Ref. Waimanalo Gulch Sanitary Landfill First Semi-Annual 2021 Groundwater and Leachate Monitoring Report, August 23, 2021

No data = no test results; ND = tested and not detected



LANDFILL LEACHATE AND GROUNDWATER ANALYSIS – CONT.

Analyte	Waimanalo Gulch Leachate Ash SMP*	Waimanalo Gulch GW MW-14*	BWS Honouliuli Wells I	BWS Beretania Low Service
Copper	880 ppb	No data	13 ppb	2.8 ppb
Iron	180,000 ppb	No data	2 ppb	2 ppb
Lead	14 ppb	No data	ND	ND
Mercury	2 ppb	No data	ND	ND
Nickel	4,400 ppb	No data	ND	ND
Potassium	2,000 ppm	17 ppm	4.6 ppm	3.6 ppm
Sodium	8,400 ppm	380 ppm	63 ppm	35 ppm
Total dissolved solids	45,000 ppm	1,900 ppm	573 ppm	267 ppm

*Ref. Waimanalo Gulch Sanitary Landfill First Semi-Annual 2021 Groundwater and Leachate Monitoring Report, August 23, 2021

No data = no test results; ND = tested and not detected



LANDFILL LEACHATE AND GROUNDWATER ANALYSIS – CONT.

Analyte	Waimanalo Gulch Leachate Ash SMP*	Waimanalo Gulch GW MW-14*	BWS Honouliuli Wells I	BWS Beretania Low Service
Vanadium	160 ppb	No data	26 ppb	21 ppb
Zinc	1,900 ppb	No data	ND	ND
2-butanone (MEK)	120 ppb	No data	ND	ND
Dinoseb	2.0 ppb	No data	ND	ND
Toluene	No data	0.19 ppb	ND	ND
3-methyl phenol	770 ppb	No data	No data	No data
4-methyl phenol	770 ppb	No data	No data	No data
N-nitroso-di-n-propylamine	12 ppb	No data	No data	No data

*Ref. Waimanalo Gulch Sanitary Landfill First Semi-Annual 2021 Groundwater and Leachate Monitoring Report, August 23, 2021

No data = no test results; ND = tested and not detected



LANDFILL LEACHATE AND GROUNDWATER ANALYSIS – CONT.

Analyte	Waimanalo Gulch Leachate Ash SMP*	Waimanalo Gulch GW MW-14*	BWS Honouliuli Wells I	BWS Beretania Low Service
N-Nitrosomethylethylamine	68 ppb	No data	No data	No data
Phenol	290 ppb	No data	No data	No data

*Ref. Waimanalo Gulch Sanitary Landfill First Semi-Annual 2021 Groundwater and Leachate Monitoring Report, August 23, 2021

No data = no test results; ND = tested and not detected



Average PFAS Concentrations in Different Types of Landfill Leachate Reported in Published Studies

Landfill type	Country	Mean PFAS Range (ng/L)	References
MSW landfill	USA	BDL* – 17,710	Solo-Gabriele et al., 2020; Lang et al., 2017; Huset et al., 2011
MSW landfill	Germany	BDL* – 2,968	Busch et al., 2010
MSW landfill	Spain	BDL* – 840.5	Fuertes et al., 2017
MSW landfill	Canada	BDL* – 8,700	Benskin et al., 2012
MSW landfill	Australia	BDL* – 1,700	Gallen et al., 2017
MSW landfill	China	BDL* – 41,600	Yan et al., 2015

Landfill type	Country	Mean PFAS Range (ng/L)	References
Ash monofill	USA	BDL* – 742	Solo-Gabriele et al., 2020
C&D debris landfill	USA	BDL* – 4,630	Solo-Gabriele et al., 2020

*BDL = below detection limit; ng/L = nanograms per liter

Source: EPA's 2020 Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances (Interim Guidance for Public Comment December 18, 2020)



Table 2.2: Summary of Literature Study - PFOA & PFOS Concentrations in Landfill Leachate

Source Cited	Location/ Region	Sample Size	PFOA			PFOS		
			EPA Drinking Water MCL = 4 ng/L			EPA Drinking Water MCL = 4 ng/L		
			Detection Frequency %	Concentration Range(ng/l)	Median (ng/l)	Detection Frequency %	Concentration Range(ng/l)	Median (ng/l)
1. Huset, et al (2011)	USA	5	100	380 - 1,000	490	100	56-160	97
2. Allred, et al (2015)	USA	6	100	150 - 5,000	1,055	100	25 - 590	155
3. Lang, et al (2017)	USA	87	100	30 - 5,000	590	96	3-800	99
4. Benskin, et al (2012)	Canada	5	100	210 - 1,500	520	100	80 - 4,400	390
5. Kallenborn, et al (2004)	Nordic Countries	NA	NA	90-501	230	NA	30 - 190	80
6. Bossi, et al (2008)	Denmark	NA	NA	0 - 6	3	NA	0 - 4	NA
7. Woldegiorgis, et al (2008)	Sweden	NA	NA	40 - 1,000	540	NA	30 - 1,500	550
8. Busch, et al (2010)	Germany	20	95	0 - 926	57	100	0 - 235	3
9. Fuertes, et al (2017)	Spain	6	100	200 - 585	437	17	0 - 44	NA
10. Gullen, et al (2016)	Australia	17	100	19 - 2,100	450	89	0 - 100	31
11. Gullen, et al (2017)	Australia	97	64	17 - 7,500	600	65	13 - 2,700	220
12. Yan, et al (2015)	China	6	100	281 - 214,000	2,260	100	1,150 - 6,020	1,740

Source: Michigan Waste & Recycling Association Statewide Study on Landfill Leachate PFOA and PFOS Impact on Water Resource Recovery Facility Influent, Technical Report Completed in Collaboration with Michigan Department of Environmental Quality, March 1, 2019 (Second Revision March 6, 2019)



PFAS IN WAIMANALO GULCH LANDFILL

Appendix 7: Landfill Leachate Data
LF #1 (Waimanalo Gulch Landfill)

Field Study of PFASs in Hawai'i

Sample: WGLF E-6

Compound	Pre-TOPs Leachate (ng/L)	% Makeup
5:3 FTCA ⁻	26,000	40%
PFBS ⁻	14,000	22%
PFHxA ⁻	9,600	15%
PFPeA ⁻	4,400	7%
PFOA ⁻	3,200	5%
Other	7,464	12%
Total:	64,664	100%

PFBA ⁻	2,800
PFHpA ⁻	1,300
7:3 FTCA ⁻	980
3:3 FTCA ⁻	820
PFHxS ⁻	620
6:2 FTS ⁻	420
PFPeS ⁻	190
PFOS ⁻	150
PFNA ⁻	110
PFMPA ⁻	45
PFDA ⁻	29

Sample: WGLF 4-B

Compound	Pre-TOPs Leachate (ng/L)	% Makeup
5:3 FTCA ⁻	8,500	21%
PFHxA ⁻	6,200	15%
PFBA ⁻	5,800	14%
PFPeA ⁻	4,400	11%
PFBS ⁻	3,200	8%
Other	12,518	31%
Total:	40,618	100%

PFOA ⁻	2,900
PFHxS ⁻	2,900
PFOS ⁻	1,800
7:3 FTCA ⁻	1,700
PFHpA ⁻	1,500
6:2 FTS ⁻	640
PFPeS ⁻	440
3:3 FTCA ⁻	330
PFNA ⁻	140
8:2 FTS ⁻	79
PFDA ⁻	46
PFHpS ⁻	43

Sample: WGLF-ASH

Compound	Pre-TOPs Leachate (ng/L)	% Makeup
PFHxA ⁻	4,700	36%
PFPeA ⁻	3,100	24%
PFBA ⁻	1,400	11%
5:3 FTCA ⁻	1,300	10%
PFBS ⁻	870	6.7%
Other	1,600	12%
Total:	12,970	100%

PFHpA ⁻	730
PFOA ⁻	540
3:3 FTCA ⁻	180
7:3 FTCA ⁻	150





BWS NO-PASS ZONE

November 28, 2020

www.boardofwatersupply.com

OAHU'S GROUNDWATER BODIES AND CAPROCK

- Oahu is 598 square miles
- About 461 square miles of Oahu (77% of the island) are inland of the caprock
- About 137 square miles (23% of the island) are covered by caprock



Ref. Izuka, Engott, Rotzoll, Bassiouni, Johnson, Miller and Mair, Volcanic aquifers of Hawai'i—Hydrogeology, water budgets, and conceptual models, Scientific Investigations Report 2015-5164, United States Geological Survey, 2015



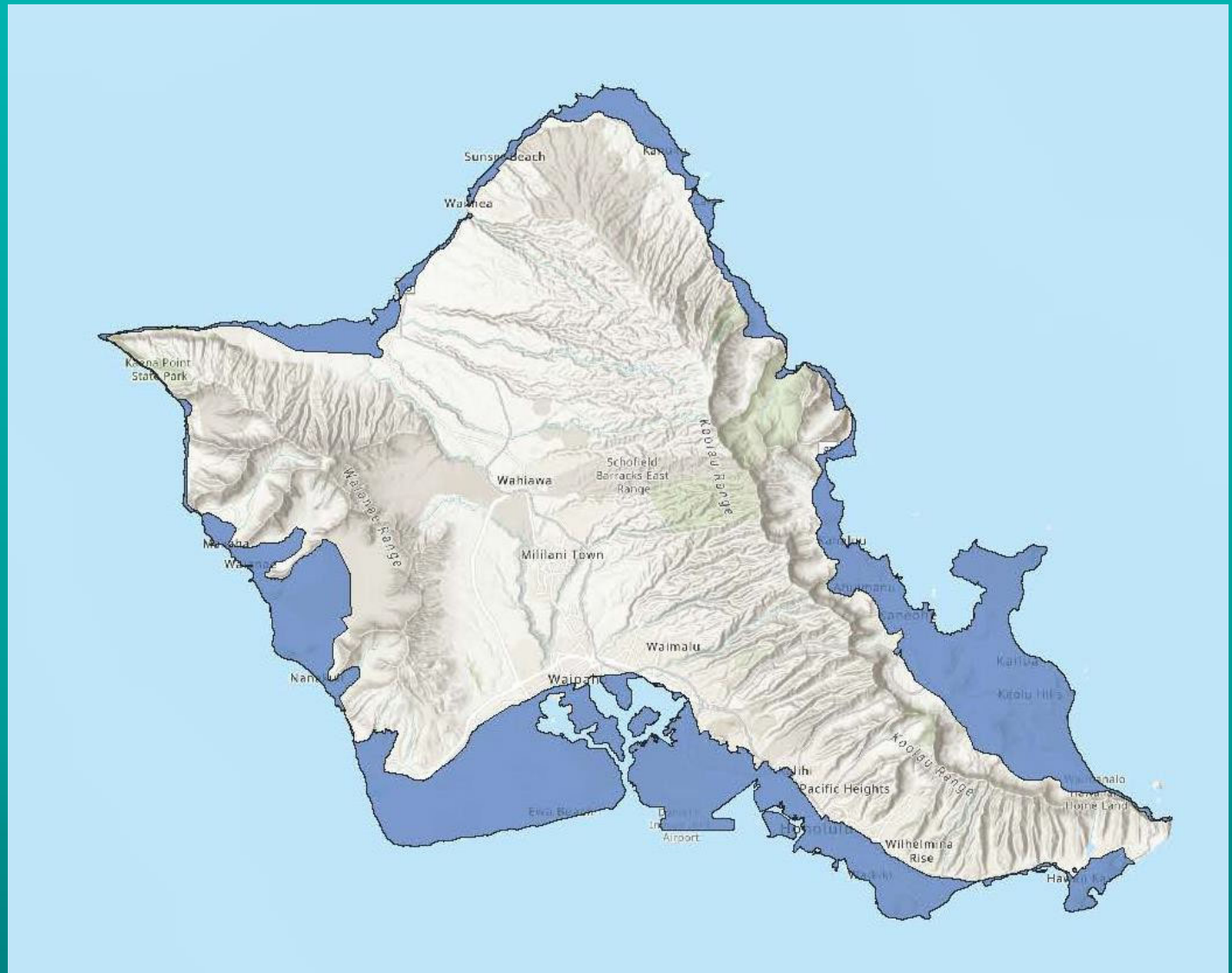
BWS “No Pass Zone”

Established December 9, 1982 (Resolution 502, 1982).

Amended BWS Rules and Regulations Section 3- 301 to add definition and establishment of “No Pass Zone” and outlining an appeals procedure from decisions of the Manager relative to the “No Pass Zone“

Blue = Pass Zone

White = No Pass Zone



EXPLANATION

- 20 — Potentiometric contour—Shows altitude at which water level would have stood in tightly cased wells. Contour interval, in feet, is variable. Datum is sea level. Dates of measurements variable.
- 275 Representative water level for area, in feet above sea level
- 200 Point water level, in feet above sea level
- ➔ Direction of ground-water movement
- Boundary of ground-water area
- Boundary of ground-water subarea

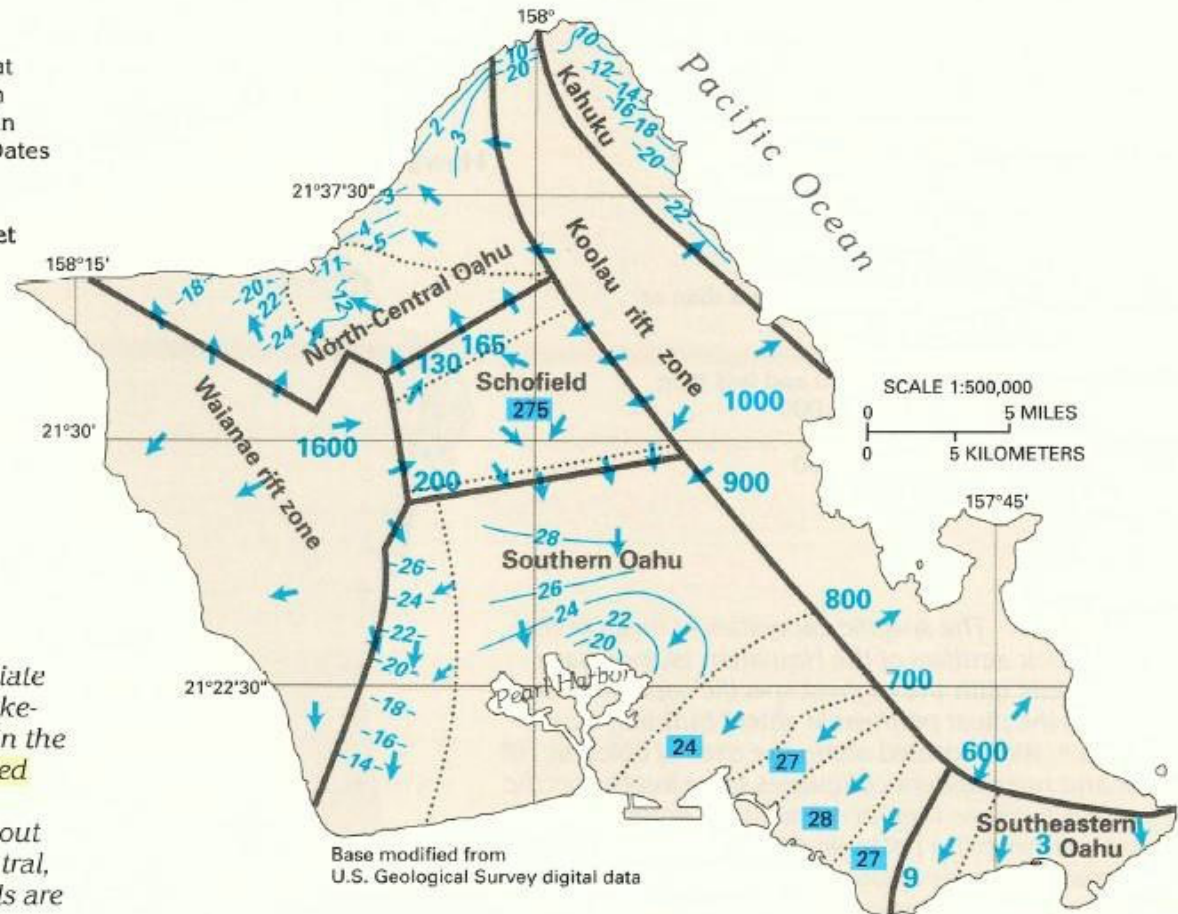


Figure 56. Water-level data help to differentiate the seven major ground-water areas of Oahu. Dike-impounded water is prevalent at high altitudes in the Koolau and the Waianae rift zones. Dikes or buried ridges hold ground water at a high level in the Schofield area. Freshwater lenses occur throughout the Kahuku and the southeastern, the north-central, and the southern Oahu areas, where water levels are generally less than 30 feet above sea level.

Base modified from
U.S. Geological Survey digital data

Modified from Nichols and others, 1996



BWS PASS, NO-PASS ZONE GUIDELINES

- The Pass/No-Pass Zone delineation maps are used as guidelines for Groundwater Protection in implementing Section 3-301 Waste Disposal Facilities, BWS Rules and Regulations.
- The Pass zone represents areas overlain by thick “caprock” (unconsolidated and consolidated sediments, corals and weathered volcanic rock) above the permeable volcanic rock aquifers.
- The No Pass zone represents areas over the freshwater aquifer with a smaller or nonexistent caprock.
- The Pass/No-Pass zone delineation is based upon hydrogeologic literature research and data analysis by the BWS Hydrology-Geology Branch. Requests for reconsideration of No-Pass line locations should be based on technical data including boring logs which indicate that the proposed waste disposal facility in the "No Pass Zone" would not contaminate groundwater resources used or expected to be used for domestic water supplies.



CHAPTER III: PROTECTION, DEVELOPMENT AND CONSERVATION OF WATER RESOURCES

SEC. 3-301: WASTE DISPOSAL FACILITIES

1. All plans proposing the following waste disposal facilities must have the written approval of the Manager:¹
 1. Sewage disposal systems.
 1. (1) Cesspools.
 2. (2) Septic tank systems.
 3. (3) Individual household aerobic treatment units.
 2. Disposal wells.
 3. **Sanitary landfills.**
 4. Refuse disposal dumps.
 5. Sewage treatment plants.
 6. Stabilization ponds.
 7. Any other wastewater disposal facilities.
2. The Department may establish "No Pass Zones" which shall be delineated on "No Pass Zone" maps. These maps shall be used as guidelines in implementing this Section.

Footnote: ¹ Per March 6, 1989 BWS-DOH Agreement to Regulate the Ground Disposal of Wastes on Oahu. DOH will APPROVE/DISAPPROVE waste disposal facilities with consideration of BWS's advice. The Agreement was in response to the DOH adoption of Ch. 11-62, and Ch. 11-23, HAR.



3. The Manager may at his discretion, withhold his approval, if there is any basis to expect that the operation of the proposed waste disposal facility and any wastewater therefrom may to any degree affect the quality and/or quantity of water resources used or expected to be used for domestic water.
4. If the Manager disapproves a proposal, he shall inform the applicant in writing of the facts and reasons upon which his disapproval is based and afford the applicant an opportunity for an informal appeal hearing. Any applicant who is aggrieved by the Manager's decision and desires reconsideration of such decision shall petition the Manager in writing within 30 days from the date of receiving such decision. The applicant should base his request for reconsideration on pertinent technical data, including boring logs which indicate that the proposed waste disposal facility in the "No Pass Zone" would not contaminate groundwater resources used or expected to be used for domestic water supplies. If after the hearing, the request for reconsideration is disapproved by the Manager, the applicant may appeal the decision to the Board, which shall have the power to affirm, modify or reverse the decision of the Manager so appealed from. Such appeal shall be taken within 30 days after the final decision of the Manager.

[Eff 5/10/76; am, renum and comp BWS Res. No. 427, 1976; am and renum BWS Res. No. 502, 1982]



KEY POINTS OF CONCERN

- Oahu is 100% dependent on its groundwater aquifer for drinking water.
- Landfills contain contaminants that can enter groundwater.
- Landfills, once constructed will be there permanently.
- Preservation and protection of our precious and pure groundwater resources are essential to ensure water security for our future for generations to come.





*BWS Monitoring Well Installation, February 2024
Source: Honolulu Star-Advertiser*

Source Water Protection Plan's Guiding Principle

Prevention of sources from degradation is always preferable to mitigation and clean-up, thus **reducing risk** is the **foundation** of our Source Water Protection Plan

