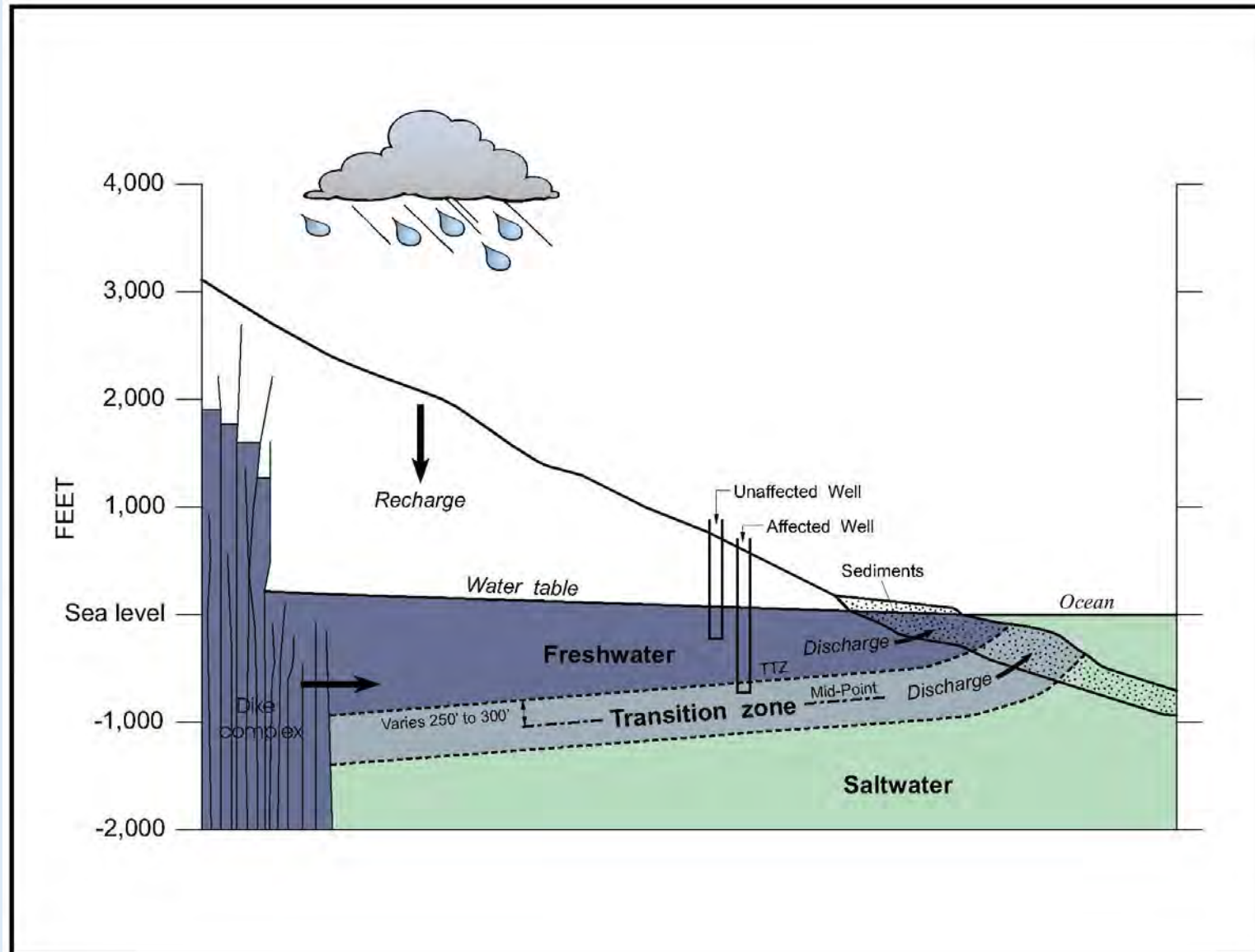


# Keauhou Aquifer Groundwater

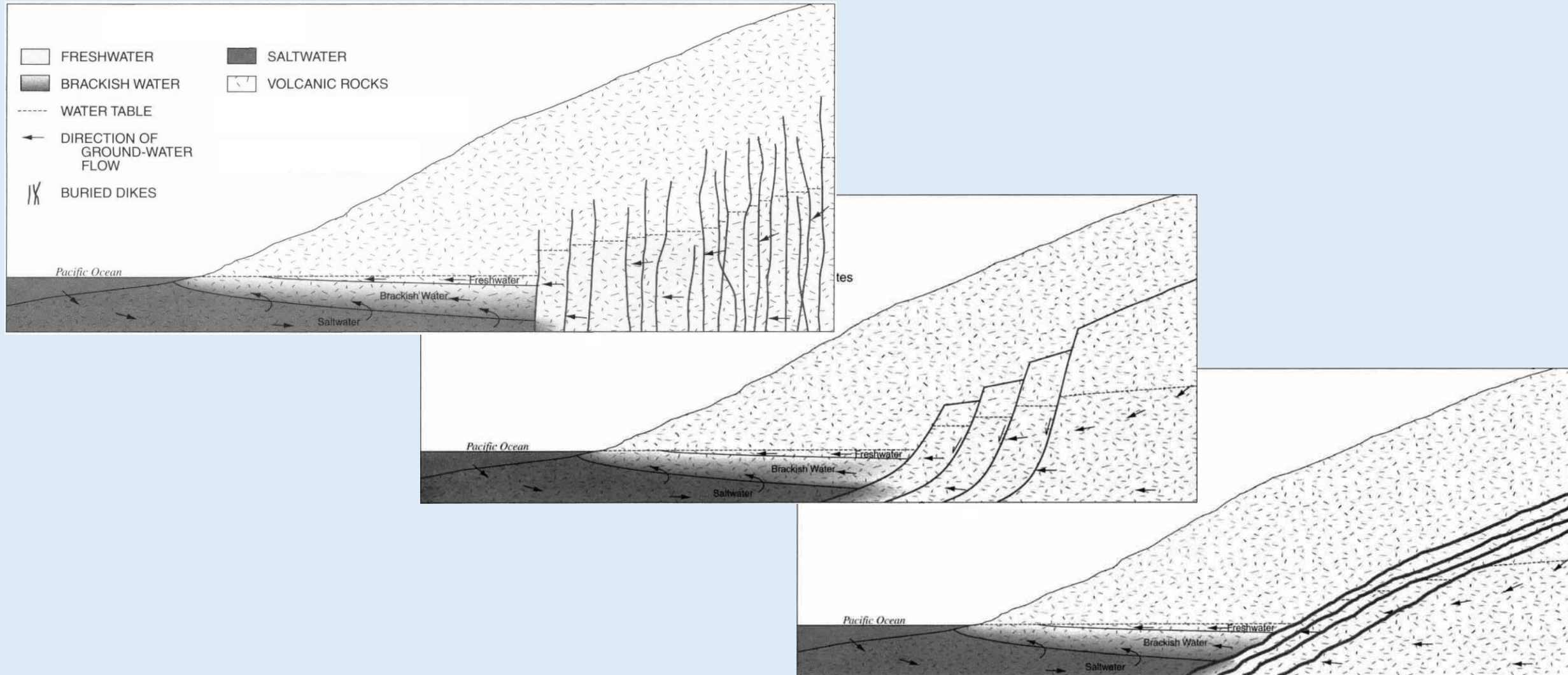
A context

# Standard Model of Hawaii Aquifer



# Features Common in Hawaii

Normally a combination of all



# What is Missing?

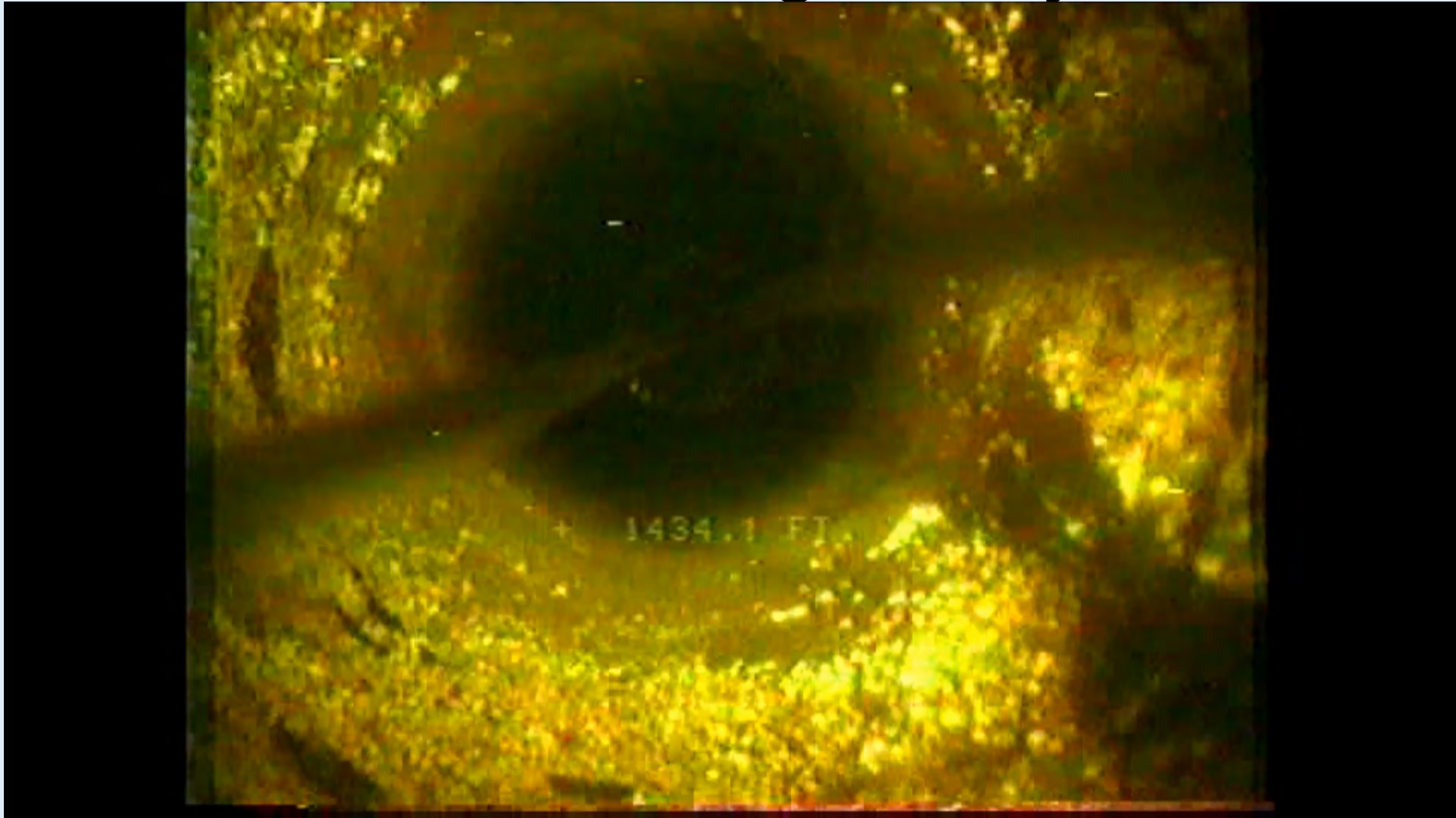
## Lateral Flow in Layers.

In most of the models discussed, the flow of recharge (rain or fog drip) is assumed to go straight down. It then gets behind an impounding feature that causes the high level water to form.

Recent discoveries have shown that there is a substantial flow both above and below sea level.

This brings the impact of future withdrawals into question.

# Water Flowing in Layers







COMMISSION ON  
WATER RESOURCE MANAGEMENT

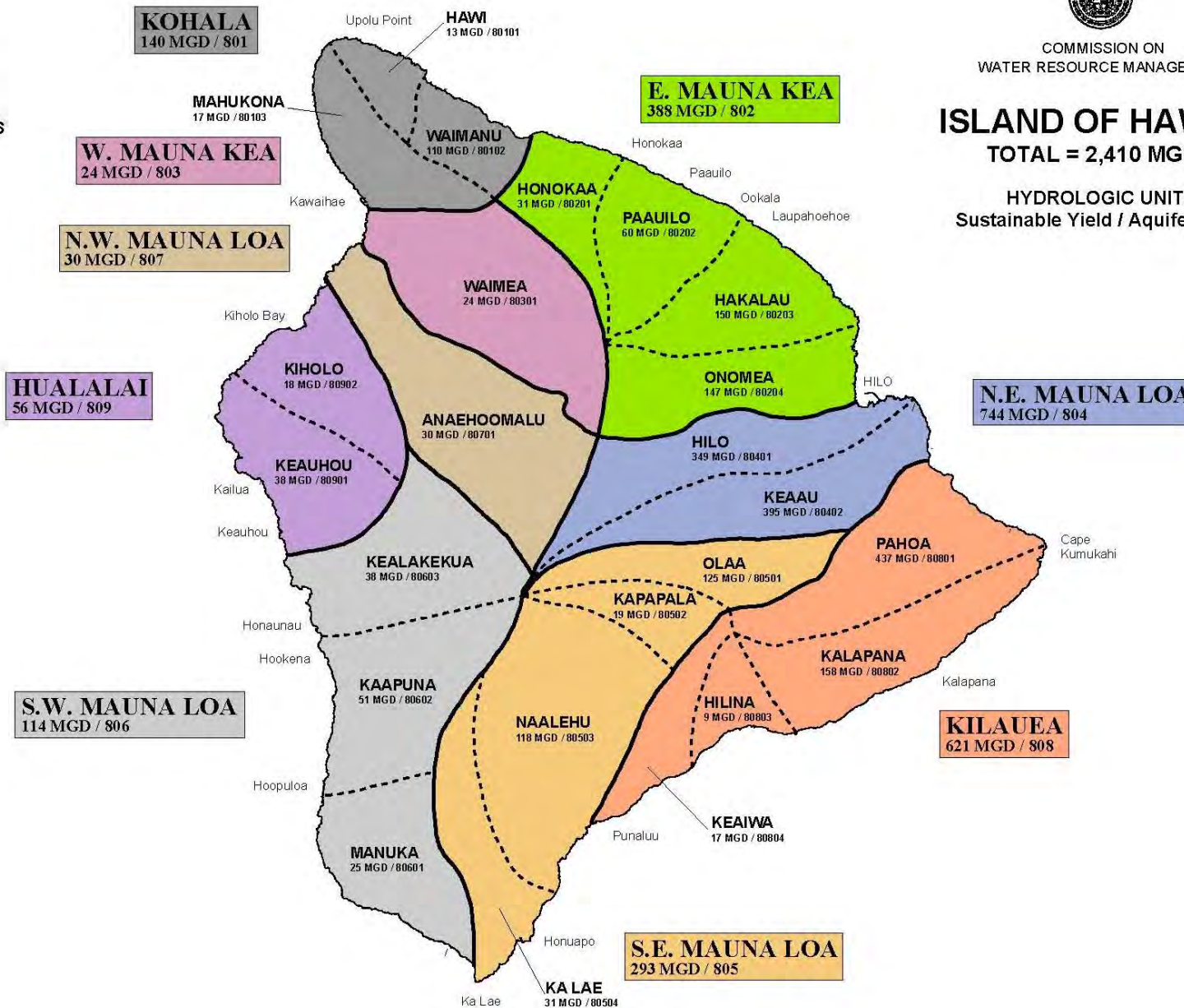
**ISLAND OF HAWAII**  
TOTAL = 2,410 MGD

HYDROLOGIC UNITS  
Sustainable Yield / Aquifer Code



# Aquifer Units

2 Dimensional



Map ID: 1010

08/28/2008

Map Projection: Universal Transverse Mercator



# Designation of Ground Water Management Area

§13-171-7 Ground water criteria for designation. In designating an area for ground water use regulation, the commission shall consider the following:

- (1) Whether an increase in water use or authorized planned use may cause the maximum rate of withdrawal from the ground water source to reach ninety percent of the sustainable yield of the proposed water management area;
- (2) That the rates, times, spatial patterns, or depths of existing withdrawals of ground water are endangering the stability or optimum development of the ground water body due to upconing or encroachment of salt water;
- (3) That the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses;
- (4) Whether excessive preventable waste of water is occurring;
- (5) There is an actual or threatened water quality degradation as determined by the department of health;
- (6) Serious disputes respecting the use of ground water resources are occurring;
- (7) Whether regulation is necessary to preserve the diminishing ground water supply for future needs, as evidenced by excessively declining ground water levels; or
- (8) Whether water development projects that have received any federal, state, or county approval may result, in the opinion of the commission, in one of the above conditions.

Notwithstanding an imminent designation of a water management area conditioned on a rise in the rate of ground water withdrawal to a level of ninety percent of the area's sustainable yield, the commission, when such level reaches the eighty percent level of the sustainable yield, may invite the participation of water users in the affected area to an informational hearing for the purposes of assessing the ground water situation and devising mitigative measures. [Eff. MAY 27 88] (Auth: HRS §174C-8) (Imp: HRS §§174C-5, 174C-44)

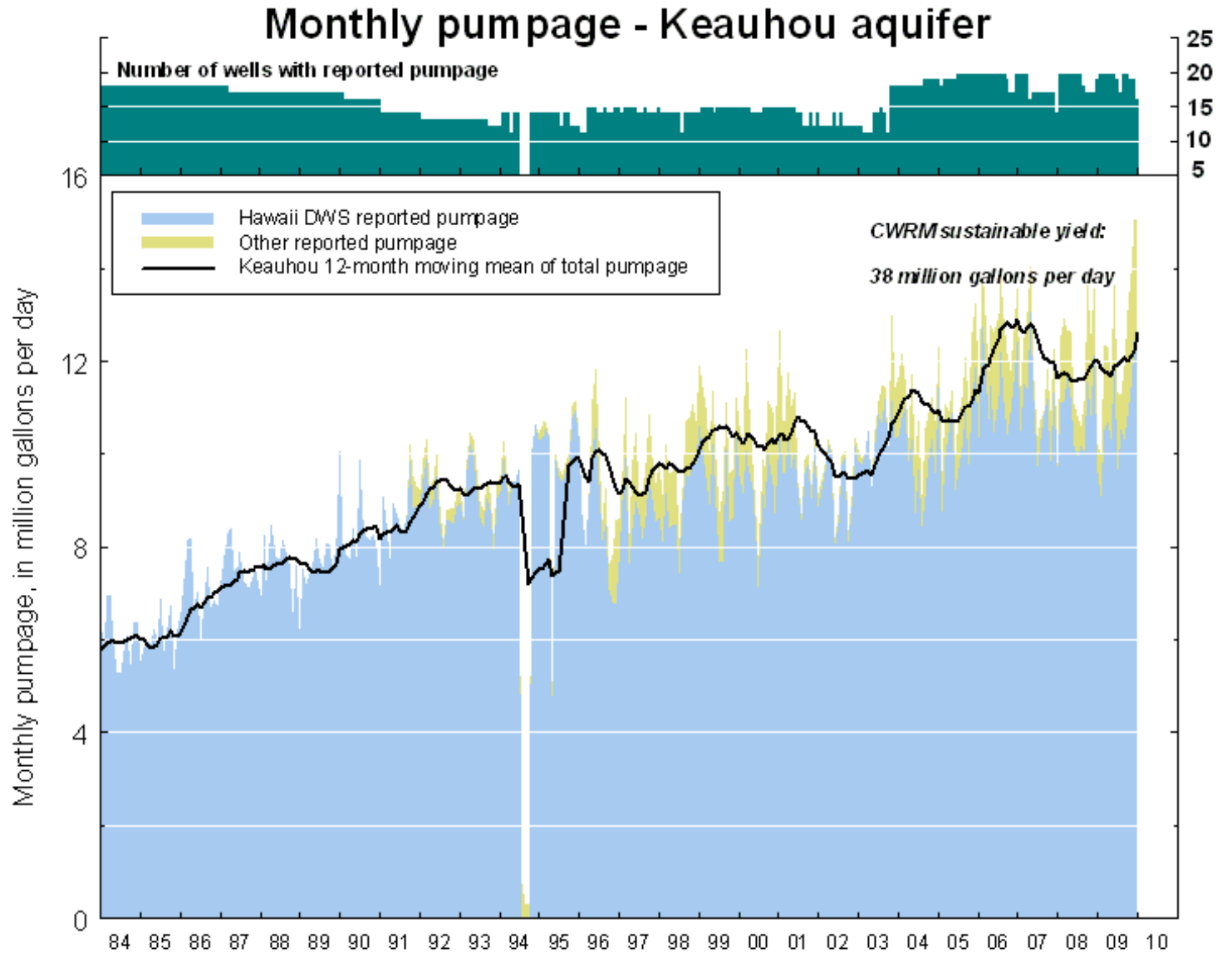


1984 5 MGD  
2009 12 MGD (peak in 07)

25 Years

280,000 gallon a day  
increase per year.

Using the 38 MGD  
Sustainable yield it will take  
more than 80 years to



# Why do Questions, Volume and Time matter?

1. Everything to do with water is related to flow and time.
2. The scale of the Keauhou aquifer is large.
3. The actual flow and migration of high level water to the ocean is not known.
4. Effects will present slowly over time
5. Slow presentation, provided adequate observation and baselines, will allow adjustments to preserve the resources.
6. Primary impacts of ground water withdraw are highly reversible as demonstrated in the Kahalu'u shaft and well system.

# What is needed?

It is generally accepted that there are no negative impacts happening today. Now is the time to ensure we undertake the necessary monitoring of the aquifer. This will take a commitment to observation and exploration to better understand how the system works. There will also need to be an agreement and clear plan as to how to handle issues should they arise.

Thank You