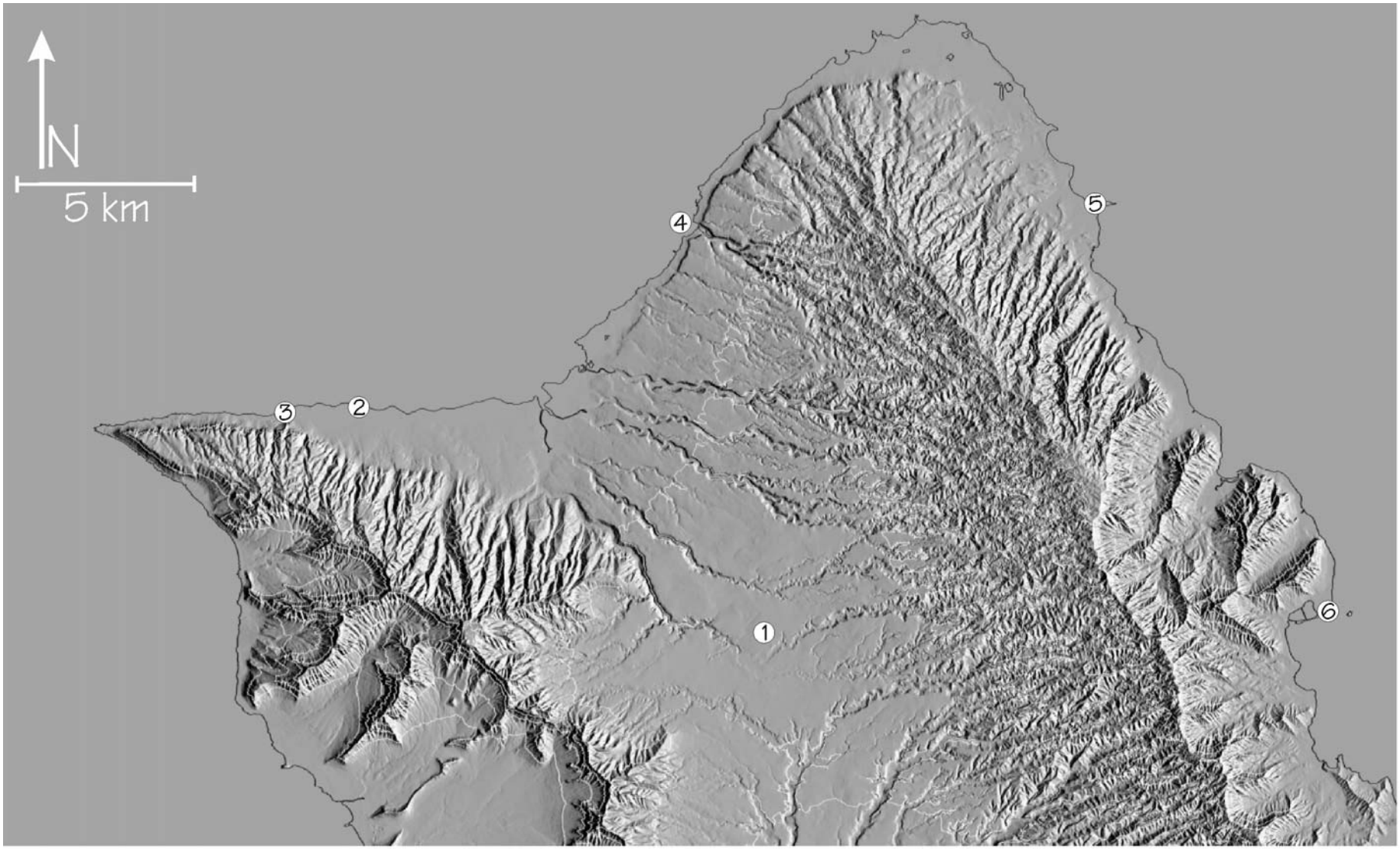


Central O'ahu/North Shore Field Trip

Name: _____

Intro. Geology Field Trip to Central O‘ahu and the North Shore

We will see parts of both the Wai‘anae and Ko‘olau mountain ranges, as well as sedimentary and oceanic deposits that have developed on their flanks. Both Wai‘anae and Ko‘olau are the eroded remnants of old shield volcanoes.. Wai‘anae literally means *mullet water*, presumably a reference to good mullet fishing here. Ko‘olau means *windward*, referring to its location relative to the prevailing tradewinds. Since olden days, islands have been divided into moku (districts) that typically had prominent geographic features as boundaries. For example Ka‘ena (*the heat*) Point separates the Waialua (*two waters*) and Wai‘anae moku. Moku in turn are divided into ahupua‘a, which are typically pie-shaped, extending from the mountains to the ocean. Place name definitions and ‘ōlelo no‘eau (legends or sayings) presented in this field guide come from Place Names of Hawaii by Pukui, Elbert, and Mookini, and from Sites of Oahu by Sterling and Summers.

Stop 1, Kūkaniloko (Wahiawā ahupua‘a, Wahiawā district) - *there is uncertainty about what the meaning of this place name is other than it is an ancient chiefly name. This is one of only two locations in Hawai‘i where children of chiefs were born (the other was on Kaua‘i) Kūkaniloko may have been established as a royal birthing place as long ago as the 12th century. Fortunately, W.W. Goodale of the Waialua Sugar Plantation as well as the Daughters of Hawai‘i made sure that this place was protected and not plowed over for agriculture. This is the geographic center of O‘ahu and for that reason also important***:** These are some very sacred stones - please don’t walk on them. In fact, this is a very sacred place as a whole, so enter with respect and reverence. In olden days, us commoners wouldn’t have been allowed to even get near.

1. Look at the soil color along the road. What element is contributing to this color?

2. Look at the big stones along the road. Are they related at all to the soil? Explain.

3. Geologically, how did the birthing stones get to their present positions?

4. Were they once part of ‘a‘ā or pāhoehoe flows (or maybe some of either)? How would you tell?

5. Are these stones from Ko‘olau or Wai‘anae volcano? What are two ways you could tell?

From here we will cross over the saddle between Waiʻanae and Koʻolau, and head down to the North shore. Soon the road becomes windy (the scene of many tragic car crashes), and there is a steep gulch off to our left. This is Kaukonahua gulch, and it is essentially the boundary between Waiʻanae and Koʻolau. The exact contact is exposed at a number of locations along the bottom of the gulch, and usually consists of weathered Waiʻanae lavas dipping (sloping) northeast grading upward into soil and/or sediments, and in turn overlain by Koʻolau lavas dipping northwest. Unfortunately, it is really humbug to get down to these outcrops. Kaukonahua either means (to) place fat, or place his testicles, referring to a man cutting off his testicles in order to leap better - ouch, he must have really wanted to leap! Kaukonahua stream has its headwaters in the central, upper Koʻolau range, flows all the way across the saddle between Koʻolau and Waiʻanae, and enters the ocean at Waialua. This circuitous route is a distance of 53 km (33 miles), making Kaukonahua Stream the longest in Hawaiʻi.

Stop 2, Mokulēʻia Beach Park (Kawaihāpai ahupuaʻa, Waialua district). *Mokulēʻia means island or region of abundance, or encircled island or region. Kawaihāpai (lifted water - referring to some springs) is mauka of the beach. Two kahuna prayed to the gods for water during a drought, and water was miraculously "lifted" either from below or within a cloud that appeared suddenly (the stories differ), to feed the springs. This is also a place where "menehune lights", strange lights over the water, are seen. Perhaps it is phosphorescence, perhaps it is menehune fishing* **:**

1. What is the rock that outcrops right at the edge of the water? (don't get washed away)

2. How does this rock compare to the beach sand?

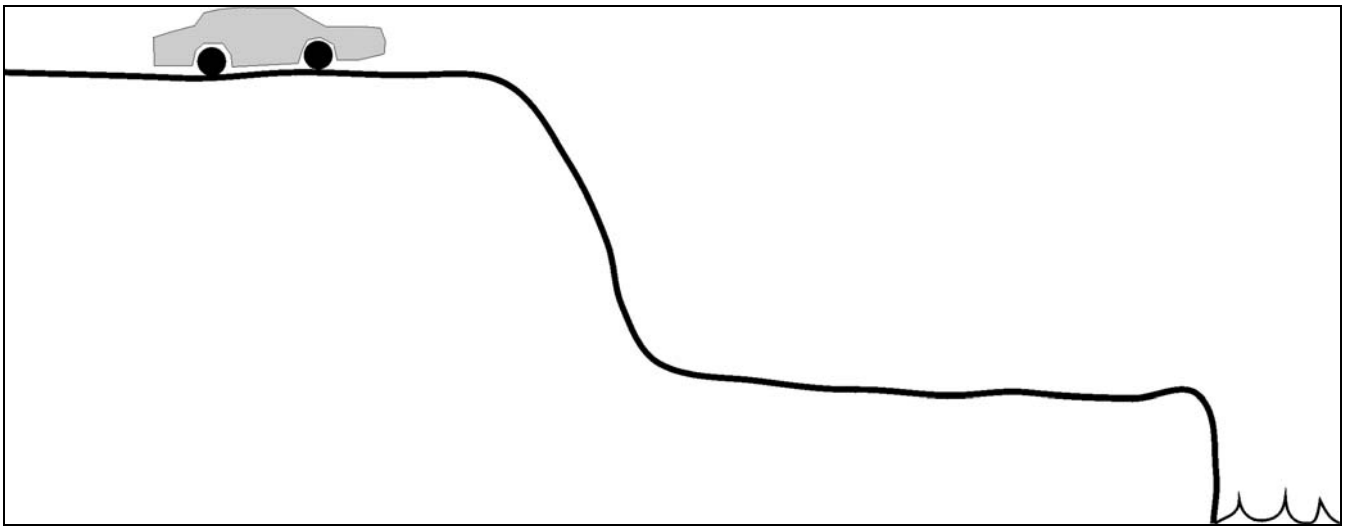
3. Which formed first, the rock or the sand?

4. Looking off to the right, you can see the profile of Koʻolau volcano. What is its slope?

5. Is this slope constant all the way to the ocean? If not, describe how it changes, and why this might be the case.

Stop 3, At the end of the paved road (Kaʻena ahupuaʻa, Waialua district). Watch out for nails!!:

1. Draw a cross section in the box from the limestone up to the parking area. Make it reasonably to scale and label all the layers you come across.



2. What environments and or processes formed each layer?

4. Check out the limestone (as long as huge waves aren't crashing over it). Notice that there are lots of fossils in it. What does this limestone tell you about past sea levels?

Stop 4, Waimea Bay (Waimea ahupua‘a, Waialua district). *Waimea means reddish water, probably alluding to the fact that it commonly carries a lot of red soil washed down from above. Waimea Bay is a famous surfing place, and it was such even in olden times. It was said that the people here liked to ride huge waves up the stream when it was swollen. This must have been in winter time because that’s both when the waves are big and when the stream is most likely to have cut through the beach to allow a continuous upstream ride (sounds like fun)***:**

1. Taking care not to be hit by cars, look at the scar from the rockfall that occurred April 7, 2007.
a) What color is most of the exposed rock?

b) What color is fresh, broken basalt?

c) What do the colors you see tell you about why this landslide occurred?

2. From the beach, look off to the west where you can see the profile of Wai‘anae volcano. What is its slope?

3. Is this slope constant all the way to the ocean? If not, describe how it changes, and why this might be the case.

4. Where the stream enters the ocean there is a battle going on between the ocean building up the beach and the stream cutting through it. Who’s winning at the moment?

5. Walk across the beach and check out the big thick flow on the far side of the bay. Is it an ʻaʻā or pāhoehoe flow? How do you tell?

6. How do the number, size, and shape of vesicles vary from the top to the bottom of this flow? Can you think of an explanation for this?

7. How do you think that the large rock out in the water (*called Kalakoi - a place where old-time Hawaiians used to watch for fish*) is related to this thick flow?

8. How fresh does the top surface of the flow under the thick flow look? What does it tell you about the amount of time that passed between the eruptions of the two flows?

9. Around on the inland side of the outcrop, can you find a place where mechanical weathering has taken advantage of pre-existing weaknesses in the rock? Describe what has happened.

From here we will drive NE then SW, passing quite a ways inland of Kahuku (the projection) Pt., the northernmost tip of Oʻahu.

Stop 5, Laniloa and Lāʻie Point (Lāʻie ahupuaʻa, Koʻolauloa district). *Laniloa (tall majesty) is the hill, and Lāʻie (ʻie leaf) is the nearby town and the point of land. Looking eastward, check out the spectacular view of the koʻolau part of Koʻolau. From here you can sometimes see all the way to Makapuʻu, at the easternmost end of Oʻahu. Between here and there are Puʻu*

*Kānehoalani, behind Kualoa, which will be our last stop of the day, and Mōkapu, the peninsula on the far side of Kāneʻohe Bay, made up of mostly of rejuvenation stage volcanics***:**

1. What kind of rock makes up Laniloa? Be as specific as you can and maybe even use a hand lens.

2. Check out the cool island (Kukuihoʻolua) with the tunnel through it. Does it look as if the cutting of the tunnel (by waves) utilized natural discontinuities in the rock or did it just happen at a random location?

3. Look at how jagged the rocks are just above, and right at sea level. What processes are contributing to this jaggedness?

From here will drive southeast along the mostly narrow coastal plain between the Koʻolau mountains and the ocean. Notice the wide fringing reef offshore and the narrow beaches. These aspects are common for the wind-facing shores of tropical and sub-tropical islands. Such places can support large populations because of the abundant rains mauka and the abundant reefs makai. Among the places we will pass are Hauʻula (red hau tree), Punaluʻu (spring that is dived for), Kahana (cutting) - a large bay and even larger valley, and Kaʻaʻawa (the wrasse fish).

Stop 6, Kualoa Park (Kualoa ahupuaʻa, Koʻolaupoko district). *Kualoa means long back, and in olden times was very sacred. The high peak directly inland is Kānehoalani (male royal companion), a god ancestor of Pele. Farther inland, is a triangular-shaped peak, Puʻuʻōhulehule. Puʻuʻōhulehule means the joining-of-waves peak, which is very appropriate because it looks like the pointy wave that forms when waves from two directions meet. Geologically, Puʻuʻōhulehule marks the axis of Koʻolau Volcano's NE rift zone; from Kualoa, the flows between Puʻuʻōhulehule and here are dipping towards us whereas the flows on the other side of Puʻuʻōhulehule are dipping away from us. Puʻuʻōhulehule itself contains many dikes, which helps explain why it is so high-standing.*

1. Can you find any evidence that the coastline has retreated landward?

2. Has the strange little barrier out in the water helped at all?

3. Look back along the coastline towards where we've driven from (to the left as you look out to the ocean). How much beach can you see in front of the houses?

4. If you assume that the park is the natural coastline, what might explain the difference between beach width at the park and beach width at the houses?

5. Compare the rocks that make up Kānehoalani, the hills inland, and Mokoli‘i the little island offshore. Are they different or similar?

6. Based on your answer to #5, how did Mokoli‘i form?

7. *This was our last stop. From here we will continue driving along the coast, but it won't be the open ocean coast. Instead it will be the coast of Kāne‘ohe (bamboo husband) Bay. Additionally, the valleys we will be driving past (Hakipu‘u - broken hill, Waikāne - water made by Kāne, Waiāhole - water of the āhole fish, Waihe‘e - octopus water or slippery water, etc.) are mostly much bigger than those we drove by on our way to this stop. What might explain this difference?*