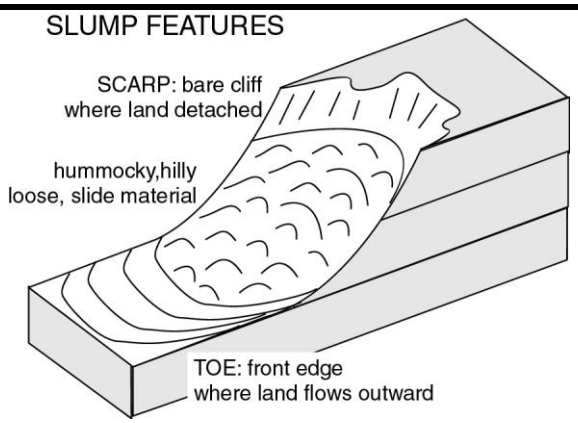
San Francisco Coastal Geology Field Class – GEOL 21A
FIELD DAY 2 EXERCISES

FORT FUNSTON WORKSHEET

Viewing Platform – Landslide

Look at the valley just south of the viewing platform. You will descend into that valley to reach the beach. The valley is the result of a large landslide. The platform on which you're standing used to continue southward, but a large section of it separated and slumped/slid down to the beach. Landslides and slumps are common along California coastlines, because the waves continually erode back the sea cliff and the rocks that make up the cliff walls are soft and easily erodable. When the sea cliff is undercut from below, and the cliff rocks are saturated with water, landslides occur.



CHALLENGE: How big was this landslide? (estimate width, depth, and height)

CHALLENGE: Is this area uplifting or subsiding? What's your evidence?

Beach – 100 feet north of trail – looking up at the sea cliff

When you get to the bottom of the valley (the toe of the slump), continue along the beach northwards until you get to the northern edge of the slump. Look from a distance at the layers of rock in the sea cliff. Notice that they are not completely horizontal (though they would have been when formed). Something has caused the beds to tilt.

CHALLENGE: In which direction are the beds tilting (dipping)? [In which direction would water run if poured on the surface of one of the beds?]

CHALLENGE: Why do you think the rocks are tilted that direction? What caused it?

There is one white layer of rock that stands out from all the rest. Follow that layer of rock north with your eye. Very close to where you are, there is a large fault breaking the cliff in half.

CHALLENGE: What's the motion along the fault?

DRAW PICTURE

Daly City Sewer Outlet

Locate and closely examine a sample of the white rock layer (from the cliff debris). **CHALLENGE**: What is this rock? How old is it? How do geologists know?

At the Sewer Outlet, step back and observe the different layers of sandstones, mudstones, and conglomerates, piled atop each other and comprising the cliff wall. Look at the cliff wall and notice that each bed represents a migration of sea level eastward or westward. Each of these distinct beds formed during different sea levels, either due to changing amounts of coastal uplift or glaciations. The story of those changes for the last million years is recorded in the cliff wall. **CHALLENGE**: Are these older or younger than the Marine Terrace? Look for beds that indicate sea level was higher and lower.

How is the cliff face eroding? What's contributing to its erosion? What evidence do you see of its erosion? Would you build on top?

MUSSEL ROCK COASTAL EROSION AND PLANNING

CHALLENGE: How big was this landslide? (estimate width, depth, and height)

Look at the attempts that local landowners use to prevent seacliff erosion. Any attempt to prevent erosion is really only an effort to deflect that erosion to somewhere else – usually to unprotected neighboring regions or down deep below the surface (undercutting hillsides from below). Can you see such evidence here? Describe all coastal erosion protection strategies you see residents using.

ROCKAWAY BEACH OBSERVATION DATA SHEET

For each site, complete the following data table with observations of the beach, its sand, and the surrounding rocks. Also collect and label a sample.

SITE OBSERVER:				
DATE and time				
Temperature	Relative Humidity	Wind Speed	Wind direction (from?)	Clouds/clarity
Estimated tidal height (from tide tables):				
Estimated tidal current (circle): Flood | High Tide | Ebb | Low Tide				
Maximum wave height (estimate)		Direction waves are coming from (circle): North | South | Variable		
Estimated longshore current direction: North | South | Variable				
Beach sand composition (estimate %) – listed in order from most to least resistant: Quartz | Chert | Magnetite | Feldspar | Shells | Granite | Black nonmagnetic | Plastic/Debris				
Beach sand size (estimate %): Mud (<1/16 mm) | Fine Sand | Medium Sand | Coarse Sand | Gravel (>2 mm)				
From the above compositional data only, does this sand appear to have been transported a great distance?		**From the above size data only**, does this sand appear to have been transported a great distance?		
Back of beach material: Sand Dunes | Cliff | Lagoon | Other – describe:				
Rocks in cliff (circle): Mudstones | Sandstones | Serpentinite| Chert | Basalt | Granite | Other – describe:				
What do the rocks in the cliff say about the past environment (be sure to look for rock type AND fossils, if possible)?				
Using all **above data** as evidence, indicate source of this beach sand.				
Local sources %	Longshore transport from rivers %	Local biologic reef %	Other (describe below): %	
CHALLENGE: At the quarry, what is the primary rock that has been mined in this area in the past? What is it used for?				

PACIFICA STATE BEACH OBSERVATION DATA SHEET

For each site, complete the following data table with observations of the beach, its sand, and the surrounding rocks. Also collect and label a sample.

SITE OBSERVER:			
DATE and time			
Estimated longshore current direction: North | South | Variable			
Beach sand composition (estimate %) – listed in order from most to least resistant: Quartz | Chert | Magnetite | Feldspar | Shells | Granite | Black nonmagnetic | Plastic/Debris			
Beach sand size (estimate %): Mud (<1/16 mm) | Fine Sand | Medium Sand | Coarse Sand | Gravel (>2 mm)			
From the above compositional data only, does this sand appear to have been transported a great distance?		**From the above size data only**, does this sand appear to have been transported a great distance?	
Using all **above data** as evidence, indicate source of this beach sand.			
Local sources %	Longshore transport from rivers %	Local biologic reef %	Other (describe below): %
CHALLENGE QUESTION: Review the City Planning information for this area. What evidence do you see about the before and after effects of local development?			

GRAY WHALE COVE OBSERVATION DATA SHEET

For each site, complete the following data table with observations of the beach, its sand, and the surrounding rocks. Also collect and label a sample.

SITE
OBSERVER:

DATE
and time

Temperature	Relative Humidity	Wind Speed	Wind direction (from?)	Clouds/clarity

Estimated tidal height
(from tide tables):

Estimated tidal current (circle): Flood | High Tide | Ebb | Low Tide

Maximum wave height
(estimate)

Direction waves are
coming from (circle): North | South | Variable

Estimated longshore current direction: North | South | Variable

Beach sand composition (estimate %) – listed in order from most to least resistant:
Quartz | Chert | Magnetite | Feldspar | Shells | Granite | Black nonmagnetic | Plastic/Debris

Beach sand size (estimate %): Mud (<1/16 mm) | Fine Sand | Medium Sand | Coarse Sand | Gravel (>2 mm)

From the above compositional data only, does this sand appear to have been transported a great distance?

From the above size data only, does this sand appear to have been transported a great distance?

Back of beach material: Sand Dunes | Cliff | Lagoon | Other – describe:

Rocks in cliff (circle): Mudstones | Sandstones | Serpentinite | Chert | Basalt | Granite | Other – describe:

What do the rocks in the cliff say about the past environment (be sure to look for rock type AND fossils, if possible)?

Using all **<u>above data</u>** as evidence, indicate source of this beach sand.

Local sources	Longshore transport from rivers	Local biologic reef	Other (describe below):
%	%	%	%

CHALLENGE: Describe and sketch the texture of the Montara Granite (Use back to draw a more thorough sketch of the granite and all its features).

CHALLENGE: Where else in the Bay Area could you travel to find the same granite as here in Montara?