

SURFRIDER FOUNDATION, SAN FRANCISCO CHAPTER



A HISTORY OF COASTAL EROSION AT OCEAN BEACH

A historical review of coastal erosion episodes at San Francisco's Ocean Beach

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4/16/2012



Warm days have always brought city residents out to enjoy Ocean Beach. Early 1900's (San Francisco Public Library Historical Photo Collection)

Problems with coastal erosion are hardly new at Ocean Beach. Ever since the Great Highway was carved out of the sand dunes, there has been a struggle to protect the road from the powerful surf of the north Pacific. Over the years, The City has defended its shoreline boundary by dumping rocks, adding concrete fill, planting non-native dune grass and building seawalls. This work will review some of the historical records of coastal erosion at Ocean Beach and the various methods used by The City to protect its shoreline boundary. Along with a pictorial display we hope to foster a greater understanding and appreciation of some of the natural forces at work on San Francisco's coastline. Ultimately, it is our hope that a historical perspective may assist in guiding us toward choosing a more sensible approach to the erosion challenge we currently face at Sloat Blvd.

Below: A very early picture of the beach circa 1865. Nothing but miles of sand dunes (San Francisco Public Library Historical Photo

Collection)

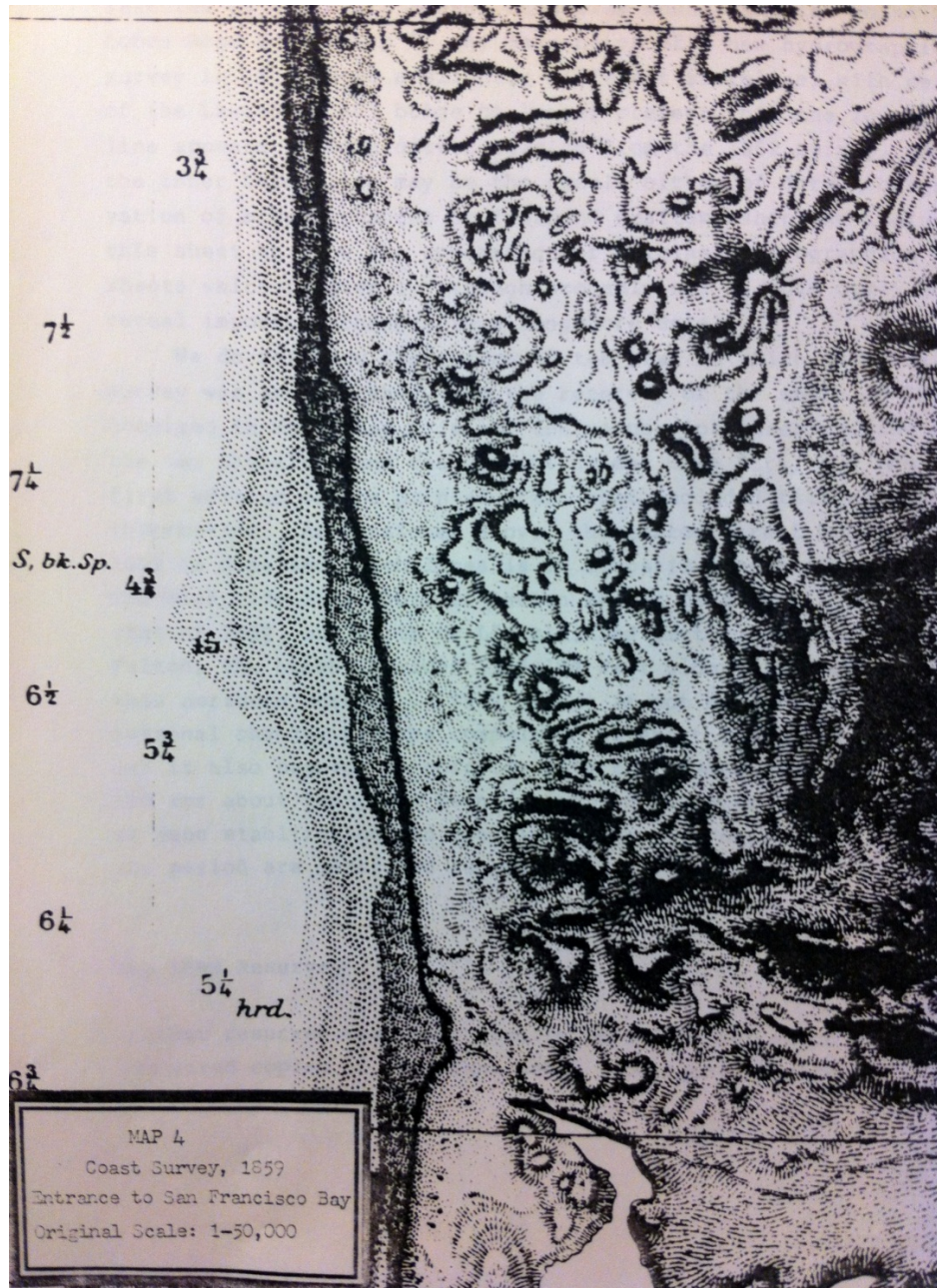


Pre-1900s

During the 1800's, well before the development of today's Sunset and Richmond districts, the Great Highway was essentially a sand trail cut through the dunes for horse driven modes of transportation. (Olmsted, 1979) The entire western half or so of San Francisco was essentially a no-man's land. In fact, the area was once referred to as "The Great Sand Waste." (LaBounty, 2002) The road that we know of today as the Great Highway began to take shape with the passage of the Outside Lands act of 1868. This legislation, passed by the San Francisco Board of Supervisors, set aside a large portion of western San Francisco for Golden Gate Park and officially designated the coastal trail along Ocean Beach as the Great Highway (Olmsted, 1979).

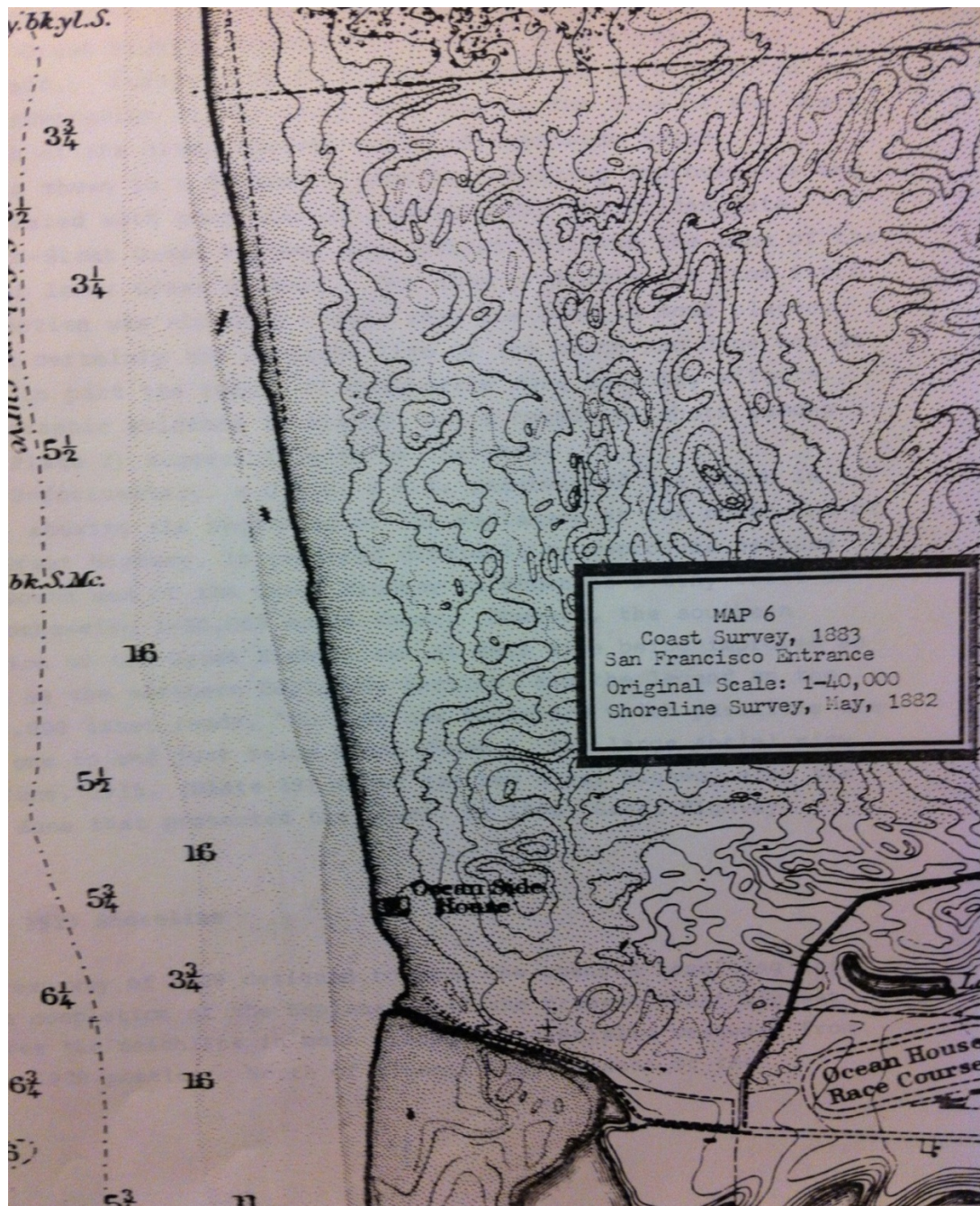
In the late 1800's, development began to blossom out at the north end of Ocean Beach. The Cliff House, built in 1863, was already on the map as a leisure destination. Soon, the Seal Rock House and Ocean Beach Pavilion were established nearby at the foot of Balboa Avenue. Then, in the 1880's and 90's more development occurred as Adolph Sutro built his great mansion and baths. All together, these attractions added up to heavy visitation at north Ocean Beach. At the south end of the beach there was only one significant structure, the Oceanside House. It was a roadhouse like the Seal Rock Inn, but was not as heavily visited (Dickson, 2003).

During this time, there is very little in the way of written record about shoreline erosion. However, there are some interesting coast survey maps from that era.



(Olmsted, 1979)

What is noteworthy about the above map from 1859 is the area just west of north Lake Merced. Apparently, this is the site where the lake, then a lagoon, emptied into the ocean. When this map was made, there was no discernible connection between the two bodies of water. However, we do see a rather extensive area of erosion on the beach just northwest of the lake.



(Olmsted, 1979)

Here is another early map. This one is from 1883. It shows the same area of erosion noted in the 1859 map. However, in this survey, the Lake Merced outlet is clearly present. Indeed, it empties out to the sea somewhere in the Sloat area. Many have wondered whether our current erosion trend at Sloat may be part of a process that previously connected the lake to the ocean. So far, there doesn't seem to be a definitive explanation one way or the other on this account.

1900-1910

Public visitation to Ocean Beach continued to grow as the years went on. By the early 1900's there was an effort to improve and widen the Great Highway to accommodate the crowds. This is where we see some of the first photographic evidence of coastal erosion damage. In the 1907 photograph shown below, winter storms chewed away part of the recently widened road.



The wider the Great Highway, the more it crumbled, ca. 1907.

(Olmsted, 1979)

This photo features a powerful display of beach loss that comes from a major erosion event. Strong winter storms were the culprit. Large storm waves combined with high tides can remove massive amounts of sand from the shoreline, causing a radical drop in the elevation of a beach. (Gary Griggs, 2005)

The beginning of the 20th century was rough going for the section of road at north Ocean Beach. Certainly, there was a miscalculation as to how wide the Great Highway should be and at what distance it could safely be located from the water.

In the ensuing years, the ocean continued to threaten the road. There were other attempts to help contain the erosion process such as planting European dune grass but that strategy was also ineffective.



(San Francisco Public Library Historical Photo Collection)

North Ocean Beach 1914: Material from Mile Rock was used as erosion defense.

1910-1920

During the winter of 1914, a major storm came barreling down from Canada causing widespread coastal erosion up and down the entire west coast. (Freeman, 2011) Yet more sand was stripped from the beach at the north end. In the above photo we see evidence of the first attempt to protect the Great Highway with hard structure. Boulders from Mile Rock were dumped onto the beach. This effort was also unsuccessful as the stones were easily washed away. (Olmsted, 1979)

The 1914 storm was also a threat to another structure built on Ocean Beach.

The first Beach Chalet was built on the west side of the Great Highway in 1892. When it opened, it was a family friendly establishment that served visitors non-alcoholic beverages. It was also used as a comfort station for bathers, a change house and

observatory.



Above: The original Beach Chalet was located right on the beach. (San Francisco Public Library Historical Photo Collection)

By 1906, park records show the building's foundation was in need of repairs probably due to wave attack. (Freeman, 2011) Three years later, in 1909, a 300 foot long seawall was built to protect the structure. It consisted of concrete pilings sunk 15 feet into the sand. Completed in 1911, it was the first seawall to be built at Ocean Beach. However, it was virtually wiped out by the storm of 1914. The photo below shows the aftermath of that storm. Notice that there is yet more road failure due to

severe beach loss.



(Olmsted, 1979)

Miraculously, the Beach Chalet survived this storm. A few years later the building was wisely relocated well inland. (Freeman, 2011) This appears to be the first instance of the use of landward relocation as erosion response at Ocean Beach.

By 1915, the automobile was gaining in popularity. The beach had become a favored destination for the auto enthusiast. Combined with an improvement in public transportation from the inner city, development and visitation continued to expand at the north end of the Great Highway. (Dickson, 2003).

In order to protect the road more effectively, the construction of a much larger seawall was approved at this time. Maurice O'Shaughnessy, The City's master engineer, was put in charge. He was already famous for many successful civic projects at this point in his career. In his writings about accepting the job of taming Ocean Beach, he seemed to grasp the challenge that lay before him. He noted that the sea that lay beside the Cliff House "required military strategy to deal with the attacking force."

(Olmsted, 1979)

1920's



(San Francisco Public Library Historical Photo Collection)

O'Shaughnessy's Ocean Beach Esplanade and seawall was a success. Completed in 1928, the seawall project was accompanied by a fully paved version of the Great Highway. The seawall itself had an innovative design. It sported concrete stairs at its base which served to diffuse wave energy like a revetment. The bulk of the wall had a concave shape to deflect inbound surf back towards the sea. Overall, compared to the structure that protected the Beach Chalet, O'Shaughnessy's seawall was built with more attention to anchoring and reinforcement issues. To this day it survives, virtually damage free. (Olmsted, 1979) The above photo is from 1920 when the seawall was half complete. Notice the difference in the width of the beach since the storm of 1914. An enormous amount of sand had returned to the area after six years.

Erosion and beach buildup - also known as accretion - are endemic processes to Ocean Beach. (Kingerly, 1998) Compared to nearby shorelines, Ocean Beach has a rather dramatic display of these forces. Here at the mouth of the Golden Gate, we have the confluence of several unique features. The hydrology of SF Bay is composed of numerous river systems that drain into the Delta. An enormous quantity of sand and silt make their way into the bay. Strong tidal currents then transport this material out to the Pacific.

Once outside the coastal headlands, the sediments are dispersed by our strong sea breezes, wave action, and long shore currents. All together these factors interact with and affect Ocean Beach, causing it to change in size and shape as well as shifting the position of its high tide line. (Battalio, 1996)

1930's

The 1930s had a number of winters with powerful storms that brought problems to the newly paved Great Highway. With the north end now apparently in an accretion cycle, trouble spots began to appear at the south end. The Taraval Street area was hit particularly hard during this decade. Waves damaged a new pedestrian underpass and threatened to overtake the road. A seawall was constructed, but had to be repaired twice due to storm damage.



The original seawall at Taraval with storm damage (Olmsted, 1979)

It wasn't until 1941 when a third seawall was constructed that the Taraval area was stabilized. The new structure consisted of a three sided sheet pile wall anchored deep into the sand. The top was fitted with a concrete cap. (Kingerly, 1998) This seawall, while fairly successful at protecting the road and underpass, did need reinforcement. Concrete debris and construction fill were placed on the beach in front of and behind the structure. (Olmsted, 1979) Unfortunately, the practice of dumping concrete debris on Ocean Beach became an accepted tool in combating erosion.



Construction of the Taraval Seawall (Olmsted, 1979). This structure can still be found today partially buried under the sand. Notice the use of construction debris as fill to stabilize the dunes.

1940's

In the 1940s, The Great Highway was threatened once again. This time the problem was at Rivera Street. Instead of constructing another seawall, a makeshift revetment made of tombstones was dumped on the beach. The gravestones came from the Laurel Hill cemetery after it had recently closed due to pressure from developers. (San Francisco Public Library Historical Photo Collection) This picture looks eerily similar to the present-day shoreline at Sloat.



Rivera Street 1944 (San Francisco Public Library Historical Photo Collection)

Meanwhile at the north end of the beach, there was plenty of sand between the Great Highway and the water. In fact, the size of north Ocean Beach in the 1940s looks quite close to what we have today.



The Ocean Beach Esplanade 1942 (San Francisco Public Library Historical Photo Collection)

1950-1980

The next 40 years appears to have been one of relative stability for Ocean Beach erosion. However, it is well known that in the early-mid 1970s, the surf had frequently reached the stairs of O'Shaughnessy's esplanade. Fortunately, no damage was registered. The beach in this area has since entered into another cycle of accretion. (Jeff E. Hansen, 2010)

Erosion damage isn't noted again until 1984. In an article published August 3rd of that year in the newspaper SF Progress, one lane of the Great Highway had to be closed at Ortega Street due to part of the road collapsing onto the beach. SFDPW planned to add rip rap (concrete rubble) to the shoreline, but never carried through. There were bigger plans in the making. The Ortega Street closure occurred right when the entire Great Highway and dune system were undergoing a major renovation. The Westside Storage and Transport Project took more than a decade to complete. It resulted in a new four lane Great Highway with a giant sewer tunnel placed underneath it. There was a new jogging path put in on the east side of the road, and freshly planted dunes on the beach. In the middle of the beach, another seawall was added between Noriega and Santiago Streets. This addressed the Ortega Street issue. In the end, the massive project culminated in the construction of the new Oceanside Treatment Plant at the southern reaches of Sloat Boulevard. It is this wastewater infrastructure that has set up the erosion challenge we face today at Sloat.



Sloat Area Beach 1952 – plenty of sandy shoreline once existed in the Sloat area. (San Francisco Public Library Historical Photo Collection)

Conclusion

Over the years, there have been numerous instances of coastal erosion damage at Ocean Beach. Whether it was the Great Highway, the first Beach Chalet and or some of the initial seawalls, everything placed on the beach has been threatened by the erosion at some point. In order protect its seaside development, The City has employed a variety of methods including the dumping of rocks, the building of seawalls, planting dune grass, and the use of concrete debris. The use of these practices continues to the present day.

(Olmsted, 1979) Above: An historical snapshot of high tide positions

Hopefully, this review has shown that proper setback from the ocean is important when considering coastal development. Certainly, ignoring this last point has proven to be a serious mistake at Ocean Beach. One can only imagine what the total cost figure would be of all the erosion damage over the years. In today's dollars, the sum would no doubt be staggering, well into the tens of millions.

Regarding our present erosion challenge at Sloat, we have a case of history repeating itself, and then some. Many of the traditional strategies have been attempted and failed: artificial dunes made of fill, non-native dune grass planting, and quarry stone revetments. We have even tried some experimental concepts such as sand nourishment from onshore and offshore sources. Since 1996, nearly ten million dollars of taxpayer money¹ has been spent on this problem with the results being neither infrastructure security nor beach preservation. A National Park's shoreline remains blighted by rock and debris.

However, the situation at Sloat is also new. This is the first time our erosion response strategy appears to have permanently destroyed an entire stretch of beach. In previous cases of erosion, beach regeneration or accretion has taken place. This is not happening at Sloat. Much of the area's shoreline remains completely submerged as wave reflection off the revetment is creating a scouring effect, inhibiting accretion. (Jeff E. Hansen, 2010). What is worse is that the erosion hotspot also seems to be spreading to adjacent areas.

The above set of facts combined with coastal science and the historical record have led us to the conclusion that the best way to solve the erosion hotspot at Sloat is through a managed retreat strategy. Managed Retreat at Sloat would be the phased pull back of infrastructure away from the ocean. With such a plan both infrastructure security and beach restoration can be attained.

No doubt, the challenge we face is daunting. Any fix is likely to be expensive. However, Surfrider remains positive about the future. The SPUR Ocean Beach Master Plan process currently underway has brought all the key government agencies to the same table, along with the non-profit community and the greater public. A plan for infrastructure relocation and setback is now being considered. We have a collaborative process with our best science advising us, the historical record at our back and the will to solve this issue. We see this time as a golden opportunity to not only restore the beach at Sloat, but also to help the city chart a new course for erosion response at Ocean Beach.

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¹ Combined estimate spent by DPW, Army Corps of Engineers, USGS, NPS and other agencies.

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