Click here to go to the staff report.

Th 15a

FORM FOR DISCLOSURE OF EX PARTE COMMUNICATIONS

Name or description of project, LCP, etc.:	Th 15a Application No. 3-10-023 (Santa Cruz Port District Dredging and beach Nourishment Project)
Date and time of receipt of communication:	3/27/12 11:00 am
Location of communication:	Board of Supervisor's Office, Santa Cruz, CA
Type of communication:	in-person meeting
Person(s) initiating communication:	Commissioner Dennis Smith Port Director Lisa Ekers
Person(s) receiving communication:	Mark Stone

Detailed substantive description of content of communication:
(Attach a copy of the complete text of any written material received.)

I met with the representatives of the Port District and they discussed the history of the Santa Cruz harbor with respect to dredging and the Corps of Engineers design issues as well as maintenance issues related to the littoral transport of sane to down-coast beaches as well as enhancements made to minimize effects on resources and stakeholders.

Date: 3/28/12 Signature of Commissioner: M. Stone

If the communication was provided at the same time to staff as it was provided to a Commissioner, the communication is not ex parte and this form does not need to be filled out.

If communication occurred within seven or more days in advance of the Commission hearing on the item that was the subject of the communication, complete this form and transmit it to the Executive Director within seven days of the communication. If it is reasonable to believe that the completed form will not arrive by U.S. mail at the Commission's main office prior to the commencement of the meeting, other means of delivery should be used; such as facsimile, overnight mail, or personal delivery by the Commissioner to the Executive Director at the meeting prior to the time that the hearing on the matter commences.

If communication occurred within seven days of the hearing, complete this form, provide the information orally on the record of the proceeding and provide the Executive Director with a copy of any written material that was part of the communication.

Th 15a

Craig, Susan@Coastal

From: Marian Olin [molin@santacruzharbor.org]
Sent: Tuesday, April 10, 2012 12:07 PM
To: Susan Craig
Cc: leker@santacruzharbor.org
Subject: Santa Cruz Port District Coastal Permit Application No. 3-10-023

Dear Susan:

As you know, the above referenced Coastal Permit Application is scheduled to be heard at the Coastal Commission hearing in Ventura, on Thursday April 12.

The purpose of this email is to advise you that we are in agreement with your staff report dated March 30, 2012, and request that the item (#15.a) be moved to the Commission's consent agenda.

Thank you.

Marian Olin, Administrative Services Manager Santa Cruz Port District
135 5th Avenue
Santa Cruz, CA 95062
(831) 475-6161

Th15a

Craig, Susan@Coastal

From: Marian Olin [molin@santacruzharbor.org]
Sent: Tuesday, April 10, 2012 9:08 AM
To: Susan Craig
Cc: Lisa Ekers
Subject: Santa Cruz Port District Application No. 3-10-023 -- Response to P. Matejcek's Email

Hi Susan:

I wanted to preliminarily respond to Patricia Matejcek's email, though I believe that the four major points summarized at the end of the email have already been adequately addressed.

1. Specificity of nomenclature: The Sampling and Analysis Plan submitted to regulators for approval each year defines specific areas of the harbor being tested and proposed for dredging. All storm drain locations and other features (such as the fuel pier) are clearly delineated. No dredging occurs until testing is complete. If material meets RWQCB and EPA Clean Water Act disposal standards, a dredging plan is developed that divides areas to be dredged into quadrants, to ensure compliance with all permit conditions such as volume and sediment composition. Fine grained material is not stable in the nearshore and travels to historic areas of repose (the mid-shelf mudbelt), where it recharges important benthic habitats.

2. Prioritization of Reconstruction of Upper Harbor Pipes:

In 2010, Port District preliminarily explored a Pre-Hazard Mitigation Grant (PMG) through CalEMA for potential bank stabilization in the watershed area north of the north harbor, fresh water retention, and culvert modification, with the purpose of reducing sedimentation of the north harbor and creating a fresh water basin in the watershed. Ms. Matejcek's email suggests that the District discontinued its work on the PMG due to the tsunami, which is incorrect.

The Port District was unable to pursue an application because the PMG requires that applicants (1) have jurisdiction over or rights to work on affected lands, (2) have an approved Local Hazard Mitigation Plan, and (3) contribute at least 25% of the project cost. The project being considered included the culverts which are partially on City property, the tidal reach which is on City and County property, and other sites located on City and private property upstream. The District is thus ineligible to serve as applicant/lead agency. The City does have an approved Local Hazard Mitigation Plan, so would be required to be lead agency. The cost estimate in 2010 was $4 million, with a local share of $1 million. None of the agencies (District, City or County) would be able to finance such an endeavor for the foreseeable future.

The District does have a continuing interest in reducing sedimentation from upstream sources. The District has sponsored the Arana Gulch Watershed Alliance (AGWA) in partnership with the City for many years. The AGWA coordinator retired in 2011, and we have been working with the Resource Conservation District on a cooperative arrangement to fill that role. AGWA was instrumental in accomplishing several upstream erosion and sediment control projects, sediment trap cleaning and revegetation work in the upper watershed, along with ensuring that outside projects (like the Caltrans Hwy 1 expansion work) are managed appropriately.

It is important to note that up to 90% of the sedimentation into the north harbor is contributed by sources far upstream of the culverts and tidal reach, as published by Barry Hecht of Balance Hydrologies ("Arana Gulch Watershed Enhancement Plan" 2002). Also, while the culverts may currently not be at the optimum elevation, they were designed for the conditions prevalent and according to the engineering principles and permit requirements at that time (1970's).

3 and 4 -- Sand Bypass System and Jetty Redesign: Both of these alternatives were studied in the Moffatt and Nichol "Dredging & Disposal Options Study (Phases 1 & 2)."

Please call me if you have any questions.

Marian Olin, Administrative Services Manager Santa Cruz Port District
135 5th Avenue
Santa Cruz, CA 95062
(831) 475-6161

Craig, Susan@Coastal

From: Marian Olin [molin@santacruzharbor.org]
Sent: Monday, April 09, 2012 10:12 AM
To: Susan Craig
Cc: Lisa Ekers
Subject: Santa Cruz Port District Permit Application 3-10-023 / Correspondence

Attachments: damonresponse.pdf

damonresponse.
pdf (104 KB)

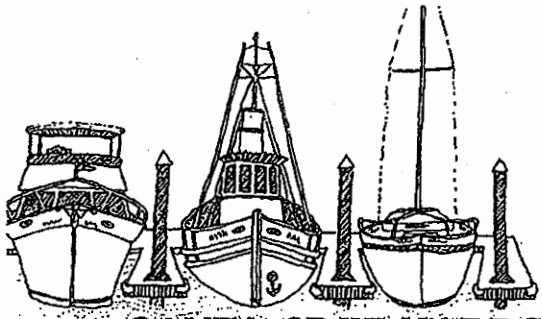
Hi Susan:

In reading through the staff report, there were a few letters from the public which allege that the Port District began dredging operations prior to permit issuance in November 2010. As you may recall, no dredging operations were conducted; however, we did start up the engines and pumped seawater through a newly installed pump to test the system.

Attached is a copy of the letter that Lisa Ekers sent to Richard Damon in response, which was copied to the Coastal Commission. This letter was not included in your staff report, but does address this issue.

Marian Olin, Administrative Services Manager Santa Cruz Port District
135 5th Avenue
Santa Cruz, CA 95062
(831) 475-6161

21



SANTA CRUZ HARBOR

Gateway to the Monterey Bay
National Marine Sanctuary

November 19, 2010

Mr Richard E. Damon, PC
125 Water Street, Suite D
Santa Cruz, California 95060

Subject: Santa Cruz Port District Dredging Operations

Dear Mr. Damon:

I received a copy of your letter dated November 15, 2010, to the California Coastal Commission. The purpose of this letter is to correct misinformation you were given regarding the Port District's operations on November 8, 2010.

The Port District received and installed a replacement pump for the dredge "Seabright" in October. The new pump was tested on November 8, 2010, by pumping seawater from the harbor entrance through the pipes and discharging it at Harbor Beach for approximately 20 minutes. No dredging work occurred, and none has been conducted since May 2010.

The Port District intends to commence dredging operations in November as authorized by the regulatory agencies. Please be assured we will conduct our operations in accordance with all permit conditions, and are actively investigating options to minimize the impacts upon the neighborhood.

Please contact Marian Olin, Administrative Services Manager, at (831) 475-6161 with any questions you or your client may have about dredging operations at the Santa Cruz Port District.

Sincerely,

Lisa A. Ekers, P.E.
Port Director

P:\Dredge\Letter R Damon 11.19.10.doc

Cc: Mr. Dan Carl, Central Coast District Manager, California Coastal Commission
Ms. Susan Craig, Coastal Planner, California Coastal Commission

Santa Cruz Port District
135 5th Ave., Santa Cruz, CA 95062 (831) 475-6161 FAX: (831) 475-9558
www.santacruzharbor.org
e-mail: scpd@santacruzharbor.org

Th15a

Craig, Susan@Coastal

From: Patricia Matejcek [pmatejcek831@gmail.com]
Sent: Friday, April 06, 2012 4:24 PM
To: Craig, Susan@Coastal
Cc: Patricia Matejcek
Subject: Application No. 3-10-023 (Santa Cruz Port District Dredging and Beach Nourishment Project)

Susan,

I have read the application for the renewal of the dredging permit for the Santa Cruz Port District which has been conducted under an extension for the last year and is desribed below, also the consultants' report and the staff report. Please accept my comments for the record.

DESCRIPTION: Renewal of five-year dredging permit to allow: 1) dredging of up to 1,280,000 cubic yards of entrance channel sediment (>80% sand) over the next five years with disposal into the nearshore environment, into the surf line, and on the dry beach at Harbor Beach/Twin Lakes State Beach; 2) dredging of up to 20,000 cubic yards of clean inner harbor sandy sediment (>80% sand) or up to 10,000 cubic yards per year of silts/clays (<80% sand) and 10,000 cubic yards/year of sandy sediment (>80% sand), at a rate of not more than 550 cubic yards of silts and clay per day, with disposal into the nearshore environment; 3) dredging of up to 35,000 cubic yards of inner harbor sediment with disposal at an upland site or at a federally approved offshore disposal site.

I am extremely disappointed that the renewal of this permit is not being utilized by the regulatory agencies as an opportunity to require significant improvements in the port's operation and maintenance. The staff report and Conditions will not result in any improvement to beach access, air quality, water quality in the National Marine Sanctuary, slip renters or area visitors for another 5-year period.

I appreciate that the consultants contacted numerous harbors south of Santa Cruz for their survey and even one in Australia that was brought to the local public's attention during the last permit renewal process by members of the local Surfrider chapter but they seem to have missed the most significant fact about the local harbor - that it is the only one constructed at the terminus of a watershed out of what had been a coastal lagoon. As such, it continues to serve as the "receiving body" of all waters and materials washed down from both the heavily urbanized (commercial and residencial) lands surrounding and upstream of it.

A significant source of the sediment in the upper/north harbor is the harbor infrastructure itself. The harbor

is aware of the fact that the large pipes that were installed in Arana Creek in the 2nd phase of harbor construction,
that is, for the upper/north harbor, are placed too low. For forty years these pipe have been causing head-cutting
and tidal scour in this watershed and that excess sediment has been depositing in the upper harbor, occluding
slips and requiring dredging.

The port district is aware of this and initiated a grant funding search to replace those pipes but that was derailed
by the "tsunami" and has not, to my knowledge, been re-started.

The grain size of the sediments generated by this scouring is not consistent with the grain size deposited on
Twin Lakes Beach by littoral drift and its contamination by present and historical urban contaminants make it
unsuitable for "beach nourishment".

This issue would be more transparent if the nomenclature for sections of the harbor were more precise and more
clear. This harbor extends approximately a mile inland and is surrounded by hills, so street and road runoff as
well as public works discharges are collected here. While there are testing requirements, because the language
defining harbor areas is so vague, it is difficult to truly establish where testing is done, which leave the results
in question.

Far more specific language than "north" or "upper" harbor or "harbor mouth" are needed. The ACOE typically
defines "reaches" in rivers under its jurisdiction for exactly this reason. The variability of uses along each section
of the harbor varies greatly and the nomenclature should reflect that, e.g., how far inland from the outermost tip of the
jetty is "the mouth"? Once one achieves landfall there's a fuel dock and a boat ramp and expansive, sloping,
paved parking. At the north end of the "lower end" on the east side is a boat yard and a commercial offloading
facility. The impacts to harbor waters from these varied uses are unlikely to be the same.

It does not appear that there have been any definitive studies to establish how far inland from the outer tip of the
jetty that "sand" and "kelp" is washed into the harbor, yet that is the basis for the harbor's permit to dump dredge
material on a heavily-used public beach. Nor have there been any definitive studies to establish the transport distance
for smaller grain size silts and sandstones washing in from Arana Creek, both from storm runoff as well as from tidal
scour. The banks on both side of this harbor are simply boulders piled against the cuts in the mudstone banks of
the historic lagoon; each wave, each boat wake, each tidal change scours out the exposed embankments

behind
and underneath the boulders. The risk of contamination is far higher with smaller grain size material, which is why
it generally is prohibited from being approved for "beach nourishment".

The problem with shoaling at the true mouth of the harbor can be laid directly to a faulty jetty design. Sand moves
through as well as around the jetty. The excessive disruption of downcoast transport of sand, which has vastly
increased the depth of Seabright Beach, is also occluding the mouth of the San Lorenzo River as well as starving
all beaches downcoast from the harbor. This has resulted in the loss of "pocket beaches" throughout the mid-county area, requiring armoring and sacrificing public access. The sand by-pass system utilized in Tweed Harbor, Australia, should be a Condition on this permit.

While commercial and recreational boating and marine safety are important, they can be achieved and theirt
economic benefits to the area maintained - or even improved - if these issues are addressed. Sea level rise will
force many changes in the operations and maintenance of the Santa Cruz Harbor and East Cliff Drive and it is the
responsibility of the regulatory agencies to help guide them.

These issues:
1. specificity of nomenclature
2. prioritization of reconstruction of upper harbor pipes
3. sand by-pass system
4. jetty re-design

could and should be part of the Conditions of this permit with 1, 2 and 3 to be completed in 2 years. The Coastal Commission and the other regulatory agencies should not waste this rare chance to improve Port
operations, boat owners' safety and public benefits when applications for permit removal are made.

Thank you for considering my comments.

Sincerely,
Patricia Matejcek

April 7, 2012

California Coastal Commission
725 Front Street, Ste. 300
Santa Cruz, CA 95060

PERMIT NUMBER: 3-10-023 / Santa Cruz Port District / Dredging
Twin Lakes State Beach

Dear Susan,

I am against the five-year dredging permit allowing the dredge pipe to be on the dry beach or at the surf line! The pipe needs to be submerged into the water offshore. This is not healthy to beachgoers and children who play near or on the pipe which is placed on the beach. This is a major health and safety concern to everyone near the beach and playing on the beach!

Please submerge the pipe into the water offshore!

Sincerely,

Rachelle Denton

April 6, 2012

To: California Coastal Commission
Susan Craig

From: Richard Rivoir

Re: Santa Cruz Port District 5 year renewal

In 2010 the Coastal Commission did not renew the Port District's 5 year permit and a waiver was issued until the Port District could find a better way to address public access and less use of the tractor on the beach. If that was the intent of the Coastal commission it appears, after reading the staff report, those concerns have still not been properly resolved.

The beach disposal, obstruction of the pipes and activity of the tractor seems unchanged.

The Port District is under tremendous financial constraints. It is a jewel and a valued community resource. It cannot function without dredging and is in dire need of financial support from other municipalities to continue its existence. The correct fix is to reconfigure the jetty which is cost prohibitive at this time.

The Port District appears to be trying to do the best job they can with the minimal money available, on their own, but they are not being directed to do anything different.

The Coastal Commission's charge is to increase coastal access and protect the coastline. If the disposal pipes were off shore it would replenish Twin Lakes Beach as well as the beaches down coast. During 2004 and 2005 I believe the pipe was required to be off shore as much as 75-85% of the time. There was a notable increase in sand down coast to Capitola and the Twin Lakes Beach replenished the same as every year by summer.

This provided a significant change for the public. The beach was free of obstruction, noise, odor, and hydrogen sulfide effects for the most part. It encouraged the public's use of this state park beach during the winter months.

In 1997 the beach dredge disposal was declared a public nuisance by the Monterey Bay Air Pollution Control Board. To resolve this issue the port district was required to do testing and for the first time required the pipes to be off shore.

In 2002 it was discovered those test results had not been applied to the correct standards and the actual hydrogen sulfide levels were shocking.

In 2003 the Monterey Bay Air Pollution Control District required constant monitoring.

In 2004 the Surfrider Foundation sponsored testing of the beach which reveled elevated levels of arsenic, cadmium and other heavy metals.

In 2005 the Santa Cruz County environmental health performed testing under the direction of County Supervisor Wormout which confirmed the elevated levels of arsenic and other heavy metals including tributyltin which comes from bottom paint, all found to be present on the sandy beach in front of the O'Neill building.

Today, the dredging disposal operation is considerably better than back in 2005. It still remains an unpleasant experience for the public wanting to use and enjoy the beach during the winter months.

My suggestions:

1. Encourage the Port District to add a second off shore disposal pipe.
2. limit the tractor activity, specifically, such as pushing the pipe in or out of the water as needed
3. require the Port District dredge monitor personell to inform the public that there are caution signs posted that they should read and they may want to relocate further down the beach or chose another beach during dredging. Currently the dredge crew tells the public that "it is safe, it is only seaweed, and it is being monitored." The fact is they are only monitoring hydrogen sulfide, not any other chemicals known to be found in a harbor channel and the hydrogen sulfide is a controlled substance that even at these levels is not recommended for young children, elderly, or someone with asthma.

Th15a

Lance King
5615 26th St. N., #1
Arlington, VA 22203

Re: Commission Meeting April 12, 2012
Agenda Item: 15 a.
Comments from: Lance King

April 9, 2012

Mr. Charles Lester
Executive Director
California Coastal Commission
45 Fremont Ave., Suite 2000
San Francisco, CA 94105

Re: Application No. 3-10-023 (Santa Cruz Small Craft Harbor Dredging)

Dear Mr. Lester:

My request is for the California Coastal Commission to revise the proposed Special Condition No. 9, first sentence, in the draft coastal development permit to achieve two objectives:

- Continued improvement in efforts to mitigate hydrogen sulfide pollution associated with disposal of dredge spoils, while assuring increased public access to Twin Lakes State Beach and Harbor Beach.

- Investigate means to reduce in the amount of sand and organic matter entering the harbor, which would reduce the need for dredging and associated impacts.

The Staff Report of Special Condition 9, sentence 1, presently reads:

9. Options Study. The Permittee shall further evaluate the options shown with a positive or superior score in Table 5 of the Options Study (page 30 of Exhibit C) with the goal of employing a method or variety of methods to reduce hydrogen sulfide releases and to reduce tractoring and pipeline handling operations on the beach to the maximum extent feasible."

Historical Analysis of Dredging and Disposal Operations

1. Research shows that the Santa Cruz Port District can reduce hydrogen sulfide(H2S) levels to comply with the Monterey Bay Unified Air Pollution District (MBUAPCD) nuisance prevention protocol when it exercises an *abundance of caution.* Port District records submitted to the Air District show that disposal took place through the underwater offshore pipeline 75% of the time in 2002-2003, 95.5% of the time 2003-2004, and 58.5% of the time in 2004-2005. The Port District reported successful beach replenishment, even when using the offshore pipeline 90% of the time.
2. The present system of moving pipelines with a tractor into the surf line came about following the Air District prosecution of the Port District pursuant to Notice of Violation No. 06-001 in 2006. The MBUAPCD found the Port District violated an emergency variance "by failing to stop dredging when a reading of greater than one (1) part per million of H2S.

3. The California Coastal Commission approved the movable pipelines as a mean to mitigate hydrogen sulfide pollution.
4. In the 2006-2007 dredging season, the Port District exercised an abundance, complying with the MBUAPCD H2S Nuisance Prevention Protocol. During that season the California Air Resources Board conducted independent monitoring of H2S and found the releases were at acceptable levels. At the same time, the California Department of Health Services (CDHS) conducted a Health Consultation evaluating H2S mitigation at Twin Lakes State Beach and adjacent to Santa Cruz Harbor..
5. The CDHS consultation under a cooperative agreement with the U.S. Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR). In their report dated June 6, 2007, the CDHS found no health risk based upon H2S monitoring results at and a review of various scientific studies.
6. In recommendations for further action, the CDHS service states that "port district, with the assistance of other regulatory agencies, ensure the dredging is performed offshore and under water as much as possible to dissipate the H2S".
7. The CDHS recommended that "the Port District should post additional signs on the beaches, warning of possible health implications during dredging."
8. CDHS did not dispute previous medical findings by Dr. Kaye Kilburn, professor of neurology at the University of Southern California, that several individuals he examined had neurological and cardiopulmonary impairment due to exposure to H2S at Twin Lakes State Beach during dredging operations. The adverse affects could have resulted from exposure years before adoption of the H2S nuisance prevention protocol by the MBUAPCD and before regular air pollution monitoring during the dredging season.
9. Since 2007, the Port District has reported more effective reduction of hydrogen sulfide but continued to shut down dredging when H2S levels exceeded the standards in the MBUAPCD.
10. In 2012, the Port District reported that additional improvements have been made by installation of a degasser collection box on top of the dredge and by use of a dry-zone diffuser at the end of the beach disposal pipeline. Port District staff advised Coastal Commission staff that there were fewer H2S Protocol compliance shutdowns in the recent months than in the previous season.
11. Data collection over several years of dredging in variable weather conditions will be necessary to provide a reliable evaluation concerning the effectiveness of the degasser and diffuser systems.
12. The Coastal Commission staff and members of the public have raised concerns about adverse effects of use of the tractor and movable pipelines on public access to the beaches.

Conclusion: The Options Study by the Port District should evaluate the yearly use of the offshore underwater disposal pipeline over the past ten years (2002-2012). This should include days of disposal offshore and through the movable pipelines since 2007.

Greater reliance on the offshore underwater pipeline would reduce use of the tractor and movable pipelines, improving public access to the beach and reducing noise pollution from the tractor. These benefits should be included in scoring dredging and disposal options.

Historical Background on the Need for Dredging:

1. Maintaining sufficient depths to allow year-round navigation of small craft through the entrance channel, inner harbor and upper harbor is problematic. This harbor is not a natural harbor, but rather a man made harbor built upon a former lagoon. Forces of nature deposit hundreds of thousands of cubic yards of sand mixed with organic matter in the entrance channel every year. Urban runoff containing silt, sand and various chemicals and metals flow into the upper harbor through Arana Gulch.
2. Annual dredging conducted by the Army Corps of Engineers was insufficient. The harbor was frequently closed to navigation for extended periods in winter months from the 1960's to the 1980's. Santa Cruz Port District reached an agreement with the Corps in the 1980's to take over responsibility for dredging on an almost continuous basis in the winter months.
3. Even with an aggressive dredging program, the Santa Cruz Small Craft Harbor has still been closed for periods ranging from days to weeks every winter over the past quarter century.
4. Regulation of dredging operations is complicated by the fact that a half dozen federal and state agencies enforcing dozens of laws and regulations focus on different issues associated with dredging operations. As you know, solutions to some dredging problems often appear very difficult or impossible to achieve.
5. Dredging has cost at least $40 million (2011 dollars) over the past several decades.
6. Future costs of dredging will continue to be a burden unless the amount of sand and organic matter deposited annually in the entrance channel can be reduced. Costs of dredging the North Harbor present an additional challenge unless the amount of silt, sand, chemicals and metals from the Arana Gulch Watershed can be reduced.

Conclusion:

Special Condition 9 should be revised to include a detailed study of design changes for jetties (extending jetties and potential construction of a T-jetty) and other means to reduce sand and organics in the entrance channel. Goals for significant reduction in dredging by 50,000 to 100,000 cubic yards should be evaluated.

It has been 20 years since the Corps of Engineers evaluated potential changes in harbor jetties. Updated studies are warranted in light of experience since 1992, as well as demonstrations projects and studies regarding coastal currents.

The Coastal Commission's Special Conditions should encourage the Port District and U.S. Army Corps of Engineers to explore funding for studies from the Water Resources and Development Act (WRDA), as part of the current discussions about division of dredging costs mandated by Congress.

Finally, the public needs to be brought into the Options Study process to increase prospects for greater understanding and cooperation among all the interested parties. Release of the staff report on the Santa Cruz Harbor dredging permit application during the holiday week (April 1-8) made it very difficult to review the hundreds of pages of documents. And there was no opportunity for a dialogue among interested parties.

Thank you for consideration of these proposals of revision of the draft permit.

Sincerely,

Lance King

CALIFORNIA COASTAL COMMISSION
CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060
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Th15a

Filed:	01/06/2012
180th day:	07/04/2012
Staff report prepared:	03/30/2012
Staff Report prepared by:	Susan Craig
Staff Report approved by:	Dan Carl
Hearing date:	04/12/2012

COASTAL DEVELOPMENT PERMIT APPLICATION

Application number.....**3-10-023, Santa Cruz Harbor Dredging**

Applicant.....Santa Cruz Port District

Project location .....Santa Cruz Harbor and Harbor Beach/Twin Lakes State Beach in the City of Santa Cruz and unincorporated Santa Cruz County.

Project description.....Renewal of five-year dredging permit to allow: 1) dredging of up to 1,280,000 cubic yards of entrance channel sediment (>80% sand) over the next five years with disposal into the nearshore environment, into the surf line, and on the dry beach at Harbor Beach/Twin Lakes State Beach; 2) dredging of up to 20,000 cubic yards of clean inner harbor sandy sediment (>80% sand) or up to 10,000 cubic yards per year of silts/clays (<80% sand) and 10,000 cubic yards/year of sandy sediment (>80% sand), at a rate of not more than 550 cubic yards of silts and clay per day, with disposal into the nearshore environment; 3) dredging of up to 35,000 cubic yards of inner harbor sediment with disposal at an upland site or at a federally approved offshore disposal site.

File documents.....Coastal Development Permit (CDP) and CDP Amendment files 3-05-065; 3-05-065-A2; 3-05-065-A3; 3-05-026; 3-00-034; 3-00-034-A1; 3-00-034-A2; 3-10-017-G; 3-06-025-G; 3-06-012-G; *Santa Cruz Harbor Dredging and Disposal Options Study, Phases 1 & 2*, by Moffatt & Nichol, December 2011; *The Dynamics of Fine-Grain Sediment Dredged from Santa Cruz Harbor* by Curt Storlazzi et al, May 2011; *Santa Cruz Port District Kelp Monitoring, Habitat Assessment and Aerial Photography Analysis Final Report 2008-10* by Sandoval and Associates Consulting Services, LLC, January 24, 2011; *Hydrogen Sulfide Nuisance Prevention Protocol* by Monterey Bay Unified Air Pollution Control District, December 9, 2010; *U.S. Geological Survey Study of the Fate of Mixed Grain Sediment Dredged from the Santa Cruz Harbor*, September 10, 2009; *Final Santa Cruz Harbor Dredge Management Plan* by Strelow Consulting, March 2009; *The Role of Mud in Regional Productivity and Species Diversity* by John Oliver, Moss Landing Marine Lab and Sea Engineering, Inc., January 2008; *2005 Santa Cruz Harbor Dredge*

Disposal Monitoring Results by Sea Engineering, Inc., June 27, 2005; *Monitoring of Coastal Contaminants Using Sand Crabs* by Dugan, J.E., et al, 2004; *Monitoring of Dredged Upper Santa Cruz Harbor Mixed Sand and Mud Sediment Released into the Nearshore Area of Santa Cruz*, California by Steve Watt and H.G. Greene, December 19, 2002.

Staff Recommendation ..**Approval with Conditions**

A.Staff Recommendation

1. Summary of Staff Recommendation

The Santa Cruz Port District has requested approval of a five-year permit to dredge and dispose of entrance channel and inner harbor sediments, with disposal of these sediments primarily onto the beach, into the surf zone, or through an offshore pipeline. The Coastal Act allows for the dredging of harbor waters in order to maintain depths necessary for navigation where there is no feasible less environmentally damaging alternative and where feasible mitigation measures have been provided to minimize adverse environmental effects. The proposed dredging activities will support Coastal Act priority coastal-dependent boating uses and will ensure that a large volume of sandy sediments will become available for beach replenishment, also a Coastal Act priority. Mitigation measures to minimize adverse environmental effects from the dredging activities include requiring that: 1) disposal of entrance channel sediments onto the beach or into the surf zone be consistent with the requirements of the Monterey Bay Air Pollution Control District's hydrogen sulfide protocol; 2) all dredge materials proposed for unconfined aquatic disposal be tested according to the requirements of the Army Corps of Engineers and U.S. Environmental Protection Agency; 3) disposal of up to 10,000 cubic yards per year of clean fine-grain inner harbor sediment through the offshore pipeline be done at a rate of not more than 550 cubic yards per day, similar to past approved volumes and protocols for which monitoring did not identify significant adverse impacts; 4) timing limitations to protect public access and to avoid impacts to steelhead be implemented, consistent with the requirements of the National Marine Fisheries Service. The project is also conditioned to require that the Port District further evaluate options of employing a method or a variety of methods to reduce hydrogen sulfide releases and to reduce tractor use and pipeline handling operations on the beach to the maximum extent feasible to reduce impacts to public access and recreation on the beach. Overall, and subject to the recommended conditions, the Port District's dredging operations/beach nourishment program is necessary and appropriate to protect priority uses, is essential to recreational and commercial boating activities, will avoid adverse environmental impacts to coastal marine resources and water quality, and will protect and enhance public access and recreation to the maximum extent feasible. Staff recommends that the **Commission approve a CDP with conditions**. The motion is found directly below.

2. Staff Recommendation on Coastal Development Permit

Staff recommends that the Commission, after public hearing, **approve** the proposed project subject to

the standard and special conditions below.

Motion: I move that the Commission approve coastal development permit number 3-10-023 pursuant to the staff recommendation. I recommend a yes vote.

Staff Recommendation of Approval: Staff recommends a **YES** vote. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of the Commissioners present.

Resolution to Approve the Permit: The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complies with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

Staff Report Contents

Exhibit G: Public Correspondence

B.Findings and Declarations

The Commission finds and declares as follows:

1. Project Background and Location

Harbor Background

The Santa Cruz Harbor (Harbor) is located in the City of Santa Cruz, at the northern end of Monterey Bay, between Harbor Beach and Twin Lakes and Seabright State Beaches,[1] and approximately 3,000 feet east (downcoast) of the San Lorenzo River mouth. The Harbor is a commercial fishing/small craft harbor with berthing facilities for approximately 920 boats, including dory ties and end-tie space. The proposed dredging sites include: 1) the harbor's entrance channel (i.e., between the two jetties) extending from the seaward end of the jetties to the fuel dock; and 2) the inner harbor, which consists of all portions of the harbor located north (inland) of the fuel dock. The inner harbor consists of two subareas: 1) the upper (or north) harbor, which is the most inland portion of the Harbor including all harbor facilities located north of the Murray Street Bridge; and 2) the lower (or south) harbor, which includes all harbor facilities located between the fuel dock extending inland to the Murray Street Bridge (see Exhibit A for a location map and for an aerial photograph of the Harbor).

The Santa Cruz Harbor fronts the Monterey Bay National Marine Sanctuary (Sanctuary) which extends south from a point in Marin County to Cambria Rock in San Luis Obispo County, and extends from high tide seaward typically about 35 miles offshore. The Sanctuary is the one of the nation's largest marine sanctuaries, protecting marine resources that include the nation's most expansive kelp forests, one of North America's largest underwater canyons, and the closest deep ocean environment to the continental United States.

The Harbor was initially constructed from April 1962 through January 1964, and was subsequently expanded into the upper portion of the former Woods Lagoon in 1972. Permanent jetties placed along the east and west sides of the Harbor's entrance channel provide year-round access to the Monterey Bay/Pacific Ocean. However, winter storms occasionally render the Harbor entrance impassable because of the Harbor's entrance configuration in relation to approaching swells, and for other related reasons. In total, the Harbor encompasses approximately 38 acres of land area and 52 acres of water area. Within these areas one can find a variety of public amenities including berths and dory ties for commercial and recreational boats, boat servicing operations, public boat launch, public restrooms and small craft docks, restaurants and shops, about 3 acres of sandy beach on the downcoast side of the jetties (i.e., Harbor Beach), and over 1,000 parking spaces that support marine related uses.

[1] Technically, both are units of Twin Lakes State Beach.

Overall, the Harbor facilitates ocean-related functions such as boat-launching, berthing for commercial vessels and recreational boats, boat repair areas, marine-related retail/commercial businesses, restaurants, sailing programs, a yacht club and boat sales. The majority of boat use at the Harbor is for recreational purposes, as opposed to commercial fishing, although a vibrant commercial fishing community operates out of the Harbor.

The entrance channel receives sediment primarily from littoral drift at the harbor mouth. Dredging is required because of the fairly constant easterly (downcoast) movement of sand along the coast and thus, across the harbor entrance. Ocean currents and wave conditions directly affect the amount of sandy sediment deposited into the entrance channel waters. Shoaling of the harbor mouth entrance can occur due to unavoidable natural littoral drift processes, which are then corrected by regular maintenance dredging. During the most recent ten-year period, entrance channel dredge volumes have averaged about 256,000 cubic yards per year, with a low of about 160,000 cubic yards during the 2004-05 dredge season and a high of about 457,000 cubic yards during the 2009-10 dredge season.

Arana Gulch Watershed

The upper (north) portion of the inner harbor is situated at the lower reaches of the Arana Gulch watershed. Historically, Arana Creek flowed into Woods Lagoon, but Woods Lagoon was converted into the Harbor, and Arana Creek now flows through culverts under the upper harbor parking area and into the upper harbor waters. Sediments originating from the Arana Gulch watershed have proven to be very problematic for the Harbor. On average, the Harbor receives approximately 1,000 to 15,000 cubic yards of sediment per year deposited via Arana Creek from the Arana Gulch watershed. During the 2005-06 winter season, which was a period of exceptionally high rainfall, the north harbor received over 40,000 cubic yards of sediment from Arana Creek, rendering portions of the north harbor impassable to boats. The upper (north) harbor receives sediment primarily from the Arana Gulch watershed, while the lower (south) harbor receives a combination of sediment from the entrance channel and the Arana Gulch watershed.

The Arana Gulch watershed drains a 3.5 square mile area. Arana Gulch has historically sustained steelhead spawning and rearing. Currently, available salmonid habitat in the watershed is considered poor in quality due to a number of limiting factors, including sedimentation. The Santa Cruz County Resource Conservation District (RCD) prepared an Arana Gulch Watershed Enhancement Plan (Plan) in 2002. The Plan includes an assessment of current sediment and salmonid fisheries conditions and recommends a series of restoration projects to repair individual sites or constraints in the Arana Gulch watershed. The Plan's objectives are to improve, protect, and increase accessibility to and use of steelhead habitat throughout the Arana Gulch watershed and to reduce erosion and sedimentation throughout the watershed. The Plan proposed a total of 18 restoration projects, rated from high to low priority. A number of projects have been implemented, reducing the amount of sediment that makes its way into the creek system and ultimately the north harbor by about 1,800 cubic yards/year (cy/yr). In addition to sediment reduction projects, several completed projects include fish ladder and fish passage enhancement programs. Prior to completion of the Plan, a number of other projects were completed under the direction of the RCD that reduced the amount of sediment entering the creek system by about

600 cy/yr.

In addition to the above projects, which are part of the Plan, the California Department of Fish and Game (CDFG) has previously granted a 5-year Streambed Alteration Permit to the Arana Gulch Watershed Alliance (AGWA) for regular clearance of a sediment basin at Harbor High School.[2] Between 1999 and 2006 this sediment basin was cleared four times, with about 200 cy of sediment removed each time for a total of 800 cy of sediment removed. Regular clearance of this sediment basin reduces sediment inputs into the creek system and ultimately the inner harbor.

Sediment Transport in Northern Monterey Bay

The Harbor lies within the Santa Cruz Littoral Cell, which extends from the Golden Gate Bridge in San Francisco, south to the Monterey Bay submarine canyon. The majority of sediment enters the littoral cell during winter rainstorms from November to March. The San Lorenzo River is a major contributor of sediment to northern Monterey Bay. The San Lorenzo River, which is located approximately half a mile west of the Santa Cruz Harbor, discharges an average of 278,000 cy of sediment per year to the Santa Cruz Bight. Approximately 73% (203,000 cy) of the River's annual discharge is estimated to be silt and clay sediment.

Sediments entering the ocean are sorted by the forces of waves and currents based on differences in grain size, density, and shape. Sediment in the Santa Cruz Littoral Cell is sorted into two basic categories at a cut-off grain diameter of 180 microns. Sediments larger than 180 microns consist of fine-sand and larger-grained sand; sediments smaller than 180 microns are categorized as fine sediment (silt and clay). The larger, sandy sediments travel in the littoral drift or are deposited on beaches in the Santa Cruz area. Fine clay and silt sediments are transported offshore to the continental shelf, where they are deposited in abundance along a midshelf mudbelt. The mudbelt extends from south of Santa Cruz to north of Half Moon Bay and is up to 30 meters thick on the continental shelf offshore of the San Lorenzo River.[3]

Permit History

The U.S. Army Corps of Engineers (ACOE), in accordance with its mandate for maintaining navigable harbors and inland waterways, as defined in Section 10 of the Rivers and Harbors Act, has authority over and responsibility for maintaining the federal channel at the Santa Cruz Harbor. Beginning in 1965, the ACOE was the first agency to conduct dredge operations at Santa Cruz Harbor. However, the ACOE handed over its responsibilities to maintain the federal channel to the Port District in 1988. Thus, the Port District is now responsible for dredging both entrance channel and inner harbor areas until the year

[2] Through the efforts of AGWA, a partnership was formed with the Port District, the City and County of Santa Cruz, and the Santa Cruz School District. The Port District constructed the necessary in-stream dewatering apparatus and paid for permits, the County's Public Works Department extracted the sediment, and the City's Public Works Department hauled the sediment to project sites for reuse. The CDFG Streambed Alteration Permit has expired and the Executive Director of AGWA retired in late 2011, leaving AGWA temporarily unstaffed. The Port District is currently coordinating with the RCD to ensure that AGWA's work continues and to renew the CDFG Streambed Alteration Permit to allow for regular clearance of this sediment basin.

[3] Sea Engineering, Inc., 2005. *2005 Santa Cruz Harbor Dredge Disposal Monitoring Results.* Santa Cruz, CA. 16 pp. plus Appendix.

2013, under an agreement between the Port District and ACOE.[4] As part of its historic dredging and disposal operations, the Port District has used (and proposes to continue using) a tractor to disperse clean beach sand to protect the dredge pipeline switches from erosion and wave run-up.

Dredge operations at the Harbor have previously been authorized by a series of Coastal Development Permits (CDPs) and Consistency Determinations (CDs). Some of these include CDP 3-81-140 for dredging between 1981 and 1983, CDP 3-84-13 for dredging between 1984 and 1986, and CD-12-81, CD-46-83, CD-59-84, and CD-31-85 for individual dredging episodes corresponding to the year of issuance. In order to better facilitate individual dredging episodes, the Commission authorized CDP 3-86-175 for the installation of a permanent onshore dredge disposal pipeline in 1986. The onshore disposal pipeline connects to the floating dredge barge and is located just under the sandy surface of the beach between 5th and 6th Avenues. From here, the Port District temporarily connects additional piping to route dredged materials to the dry beach and/or the surf line. In addition, CDP 3-86-175 required the Port District to submit, for review and approval by the Executive Director, a dredge operation and maintenance manual (see Exhibit B). The Port District fulfilled this condition and has subsequently submitted modifications which have been approved by the Executive Director. The Commission authorized a five-year maintenance dredge operation under CDP 3-95-067.

In October 2000, the Commission granted a five-year permit (CDP 3-00-034) that authorized the dredging of 10,000 cy/yr of sediment from the inner harbor and 350,000 cy/yr of sediment from the Harbor's entrance channel. CDP 3-00-034 authorized disposal of these sediments into the surfline at Harbor Beach/Twin Lakes State Beach, or through an offshore pipeline (about 100 yards offshore) when hydrogen sulfide from decaying seaweed was present in entrance channel sediments in quantities that would affect beachgoers or adjacent residents if the sediments were placed onto the beach or into the surfline. CDP 3-00-034 required that all dredged and disposed sediments consist of at least 80% sand, consistent with ACOE and U.S. Environmental Protection Agency (EPA) guidelines regarding dredging and beach replenishment.

In February 2001, the Commission approved an amendment (CDP 3-00-034-A1) to the Port District's five-year dredging and disposal permit. CDP 3-00-034-A1 allowed for the one-time dredging of 3,000 cy of sediment from the inner harbor, with disposal by means of the offshore pipeline during February and/or March 2001. This sediment averaged 42% sand and 58% silt/clay and, after chemical and biological testing, was determined by the ACOE and EPA to be suitable for unconfined aquatic disposal. The Port District had requested the amendment because it contended that the 80% sand determination was too restrictive and precluded the beneficial use of otherwise clean sediments, of which a high percentage constitute sandy material. The Port District had proposed the amendment as a "demonstration" project to determine if clean, fine-grain harbor sediments could be disposed of into the nearshore area in a manner beneficial to downcoast beaches and without harm to coastal resources.[5]

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[4] The ACOE and the Port District are in negotiations regarding the dredging responsibilities post 2013.

[5] According to letters from the EPA dated April 26, 2000 and December 15, 2000, the 80% sand standard is a "rule of thumb" guideline to be applied in situations where more detailed information is lacking. However, "it is not the only appropriate ratio." Regarding the 2001 demonstration project, the April 26, 2000 EPA letter states that the "EPA is pleased that the Harbor's evaluation efforts will provide information that could be used as a basis for documenting that a higher percent of fine grain materials may be discharged for

The 2001 demonstration project included a monitoring component[6] to determine the effects, if any, of the disposal of fine-grain dredged material into the nearshore environment. At the February 2001 Commission hearing, CDFG personnel strongly suggested that a neutral, nontoxic fluorescent dye be added to the dredged material, prior to disposal, for monitoring purposes. The Commission added this requirement to its approval of CDP 3-00-034-A1.[7] The 3,000 cy of sediment was dredged and disposed of into the nearshore environment in the early evening hours over a three-day period in late March 2001. The scientists performing the monitoring concluded, after complete integration and analyses of all the data types collected during the monitoring period, that the fine-grain material released into the nearshore environment did not significantly change, alter, or impact the beaches or nearshore marine benthic habitats in the study area.

In August 2003 the Commission approved a second amendment (CDP 3-00-034-A2) to the base dredging permit. CDP 3-00-034-A2 allowed for the yearly nearshore disposal of up to 3,000 cy of clean inner harbor sediment, consisting of between 50% and 80% sand, for the remaining two years of CDP 3-00-034. Requirements for lab testing of the fine-grain dredged material, according to all criteria[8] prescribed by ACOE and EPA regulations, remained in place. As with the original demonstration project, only "clean" dredged material (i.e., material deemed suitable for unconfined aquatic disposal by

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beach nourishment in a manner consistent with the Guidelines." The December 15, 2000 EPA letter states that there is flexibility within the Clean Water Act Guidelines that allows for discharge of finer material for beach nourishment purposes, provided that site-specific information is available to determine any beach nourishment benefits or significant adverse impacts. The EPA felt that the proposed demonstration project could provide the kind of site-specific information necessary for further evaluation. Therefore, the EPA did not object to the proposed demonstration project, provided that the provisions of the monitoring program were enforced and that the results of the monitoring program were made available to the ACOE, the EPA, and other relevant agencies.

6 The 2001 monitoring program was designed and implemented by scientists from Moss Landing Marine Laboratories (MLML) to determine if sedimentary changes occurred on the beaches and nearshore benthic habitats in the vicinity of the Santa Cruz Harbor due to the retention of fine-grain dredged sediment. In addition to a comprehensive scientific literature review, a variety of data were collected from February 18, 2001 to April 14, 2001 to monitor the experimental dredging event and the natural processes occurring in the study area. Stream flow data were used to calculate sediment discharge estimates. Oceanographic swell information was downloaded to monitor wave conditions and to calculate littoral drift estimates. Over 300 sediment samples were collected and grain size analyses performed. Over 300 water samples were collected to observe changes in turbidity over time. Two separate geophysical surveys were executed to describe and quantify benthic habitats and sedimentary changes that may have occurred during the monitoring period. The scientists concluded, after complete integration and analyses of all the data types collected during the monitoring period, that the fine-grain material released into the nearshore environment did not significantly change, alter, or impact the beaches or nearshore marine benthic habitats in the study area.

7 The results of the dye tracking study in 2001 showed that dye was detected at most nearshore and beach stations at most time intervals. The overall dilution factor of the dye was very high at all stations, indicating that the high wave energy at the dredged material discharge point resulted in a rapid dilution of the discharge plume. This study also noted that dye is a tracer for the movement of water and not sediment, and cautioned that the results of the dye study should not be used to determine the movement and persistence of fine-grain dredged particles. In addition, Professor Gary Greene from MLML found that the use of fluorescent dye as a tool to determine if fine-grain sediment settles in the nearshore sandy areas is fundamentally flawed, and that the only way to determine if this occurs is to sample bottom sediments. In addition, the Commission's staff biologist agreed with these criticisms regarding use of dye as a sediment tracer and also stated that sediment sampling is the only analysis that will determine if fine-grain dredged sediments adversely impact the beaches or the nearshore subtidal benthic environment. For these reasons, the Commission has not required use of fluorescent dye as part of any monitoring programs required in subsequent CDPs or CDP amendments.

8 These criteria included testing for 1) metals; 2) pesticides and PCBs; 3) butylins; 4) organotins; 5) total and water soluble sulfides; 6) total solids/water content; 7) total volatile solids; 8) total organic carbon; and 9) grain size distribution.

the ACOE and the EPA), could be disposed of into the nearshore environment. Unlike CDP 3-00-034-A1, the EPA determined that the dredged material must consist of at least 50% sand to achieve the basic project purpose of beach nourishment. The Commission conditioned its approval of CDP 3-00-034-A2 to require the submission of a monitoring program[9] to determine if sedimentary changes occurred along the beaches and nearshore benthic habitats in the vicinity of the Harbor due to retention of fine-grain material.

In September 2005, the Commission approved CDP 3-05-026, which allowed for the dredging of approximately 10,000 cy of clean sediment from the inner harbor, consisting of 50.8% sand and 49.2% silt/clay, with disposal through the offshore pipeline into the nearshore environment during October 2005 only. The approval of this demonstration project also included an extensive monitoring program[10] to evaluate the impacts to the beach or local benthic environment due to fine-grain sediment disposal into the nearshore environment. The monitoring study results determined that there was no significant change in sediment sample mean grain-size or silt and clay percentage beyond the range of normal background conditions. The report further concluded that "strong evidence collected in three monitoring programs over the past 4.5 years indicates that the Santa Cruz Bight is a high-energy coastline that does not support the deposition of silt and clay sized particles…The results indicate that local wave and current energy are more than capable of efficiently transporting not only silt and clay sediment away from the SCH [Santa Cruz Harbor], but sand-sized material as well. This implies that the Santa Cruz Bight could accommodate a larger volume of inner SCH dredge sediment than is currently permitted."[11]

In October 2005 the Commission approved CDP 3-05-065, which represented a renewal of the five-year dredging permit to allow dredging and disposal of up to 350,000 cubic yards of entrance channel sediment (>80% sand) into the nearshore environment or into the beach zone/surf line at Harbor Beach/Twin Lakes State Beach, dredging and nearshore disposal of up to 10,000 cubic yards of inner harbor sediment, of which 3,000 cubic yards could consist of between 50% and 79% sand, and dredging of up to 10,000 cubic yards of inner harbor sediment (which could consist of <50% sand) with disposal

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[9] In 2004, all dredged and disposed inner harbor sediments consisted of at least 80% sand and thus were allowed under the base permit (CDP 3-00-034) and were not subject to monitoring requirements. In February and April 2005, 7,050 cy of material was dredged from the inner harbor and disposed of into the nearshore environment. Of this amount, 4,300 cy consisted of an average of 85% sand and 15% silt/clay, disposal of which was allowed under the base permit. A total of 2,750 cy of this inner harbor material consisted of an average of 71% sand and 29% silt/clay and was subject to a monitoring program required under CDP 3-00-034-A2. Results of the monitoring program (which was undertaken from February 10th to April 22nd) demonstrated that the discharge of fine-grain material did not cause any detectable changes in mean grain-size or silt and clay percentages beyond the range of normal winter background conditions.

[10] Dredging of the inner harbor took place between October 12th and October 31, 2005 between the hours of 6 p.m. and 10 p.m. An estimated 6,596 cubic yards of sediment composed of approximately 31% sand and 69% silt and clay was disposed of into the nearshore environment approximately 50 yards offshore of Twin Lakes Beach (the percentage of sand in this sediment was not equivalent to that described in the application for CDP 3-05-0626 and did not meet the EPA's nor the Commission's requirement of at least 50% sand composition for sediment disposed of into the nearshore environment). The monitoring program included beach and offshore sediment sampling, water quality measurements, beach monitoring observations, SCUBA diver observations, evaluation of nearshore waves and currents, multibeam bathymetry surveys (including GIS based benthic habitat maps), and numerical modeling.

[11] Sea Engineering, Inc. *Fall 2005 Inner Santa Cruz Harbor Dredge Disposal Monitoring Program,* May 12, 2006.

at an upland site or at a federally approved offshore disposal site, such as SF-14.[12]

On March 1, 2006, the Port District was granted an emergency permit (CDP 3-06-012-G), which allowed for the dredging and disposal of a maximum of 3,500 cubic yards of north (inner) harbor sediment between March 1, 2006 and March 23, 2006 only (23 days past the February 28th time limit in CDP 3-05-065). Disposal of the dredged material took place through the offshore pipeline only. Material was dredged from areas previously tested in 2005 and consisted of at least 80% sand.

On May 1, 2006, the Port District was granted another emergency permit (CDP 3-06-025-G) to allow dredging of the harbor's entrance channel through May 31, 2006 only (CDP 3-05-065 required entrance channel dredging to cease on April 30th of each year). The time extension for dredging was necessary due to unrelenting storms that took place during March and the first half of April 2006. The combination of massive sand transport into the entrance channel, mechanical difficulties in using the offshore pipeline, and restrictions on beach disposal due to hydrogen sulfide restrictions left the harbor with a backlog of greater than 100,000 cubic yards of sand in the entrance channel.[13]

On December 13, 2006, the Commission approved an amendment (CDP 3-05-065-A2)[14] to the base five-year dredging permit to allow: 1) dredging of inner harbor sediments during the months of July, August, September, and October (disposal of dredged sediment during July, August, and September would take place at an upland site or at SF-14); 2) disposal of inner harbor sediments through the offshore pipeline into the nearshore environment during the month of October during daylight or evening hours; 3) an increase the amount of sediment to be dredged from the inner harbor and disposed of at an upland site or SF-14 from 10,000 cubic yards annually to 35,000 cubic yards annually; 4) an increase in the nearshore disposal volume of inner harbor sediment from 10,000 cubic yards annually to an unlimited amount annually for sediment that consists of at least 80% sand (the amendment retained the 3,000 cubic yard annual maximum for nearshore disposal of inner harbor sediment consisting of between 50% and 79% sand), and; 5) modification of the dredge pipeline configuration at Twin Lakes State Beach to allow multiple discharge points (with only one discharge point being used at a time) approximately 25 yards offshore for entrance channel or inner harbor sediment consisting of at least 80% sand.

On October 7, 2009, the Commission approved an amendment (CDP 3-05-065-A3) to the Port District's

[12] SF-14 is an EPA designated site located in the outer waters of Monterey Bay.

[13] During the 2005-06 dredge season, the Port District needed to shut down entrance channel disposal operations on 34 days to prevent exceeding allowable hydrogen sulfide levels set by the Monterey Bay Unified Air Pollution Control District (Air District). This is the major reason why the Port District was issued an emergency permit (CDP 3-06-025-G) to allow dredging of the harbor's entrance channel through May 31, 2006 (one month past the April 30th required deadline for cessation of entrance channel dredging and disposal operations).

[14] In September 2006, an immaterial amendment (CDP 3-05-065-A1) was presented to the Commissioners. CDP 3-05-065-A1 was a request by the Port District to amend the base permit to allow dredging and disposal of inner harbor sediments during the month of October, including during October evenings (CDP 3-05-065 restricted dredging and disposal activities to a start date of November 1st and required all dredging and disposal activities to take place during daylight hours). The proposed amendment would also have removed the 10,000 cubic yard limit on the dredging of sediment from the inner harbor with disposal at an upland site or SF-14. Objections to the immaterial amendment were received and the immaterial amendment therefore did not become effective. The changes proposed by the immaterial amendment were incorporated into the CDP amendment CDP 3-05-065-A2.

base five-year dredging permit to allow for the one-time dredging of up to 12,000 cubic yards of fine-grained sediment (averaging 30% sand content, with the remainder consisting of silt and clay) from the inner harbor with disposal through the offshore pipeline into the nearshore environment on weekdays between 4:00 p.m. and 11:00 p.m. in October 2009 and between 8:00 a.m. and 5:00 p.m. from Monday through Thursday in November 2009, with the project terminating on November 19, 2009. The Port District proposed this amendment as a demonstration project to determine if clean, fine-grained harbor sediments can be disposed into the nearshore area in a manner beneficial to downcoast beaches and without harm to coastal resources. The Commission's approval included an extensive monitoring program to evaluate the impacts of the demonstration project on the beach and nearshore environment. The monitoring program was performed by staff from the U.S. Geological Service (USGS), who collected high resolution oceanographic and sediment geochemical measurements along the shoreline and on the continental shelf of northern Monterey Bay to monitor the fine-grain sediment dredged from the Harbor and discharged onto the inner shelf. Beach, water column, and seabed surveys were also undertaken to better understand the fate of the fine-grain sediment dredged from the Harbor and the potential consequences of disposing this type of material into the nearshore environment. The results of this study showed that there did not appear to be significant net deposition of mud from the Harbor's dredge-disposal operations because there was no shift to a finer grain-size class along the beach or on the inner shelf, and the oceanographic observations, model results, and laboratory analyses suggest that the predominantly mud-sized sediment dredged from the Harbor and discharged to the coastal ocean: (a) did not result in observable deposition of fine-grain sediment on the beach and inner continental shelf; (b) likely was advected alongshore to the east, then offshore to the southwest in the direction of the mid-shelf mud belt, and; (c) resulted in turbidity values lower than those values observed during a large wave event or a small flood of the San Lorenzo River.

In late winter and early spring of 2010, winter and spring storms coupled with high ocean energy caused deposition of higher than normal amounts of sandy material into the Harbor's entrance channel, creating unsafe conditions for boaters. On April 21, 2010, the Port District was granted an emergency permit (CDP 3-10-017-G), which allowed for an increase in the maximum amount of sandy material to be dredged from the entrance channel and disposed of onto the beach or into the nearshore environment to be increased from 350,000 cubic yards per dredge season (pursuant to CDP 3-05-065) to a maximum of 450,000 cubic yards for the 2009-10 dredge season only, and to allow entrance channel dredging and disposal operations to continue through May 14, 2010 (CDP 3-05-065 required that such dredging and disposal operations cease on April 30th).

The Port District's five-year permit (CDP 3-05-065) has an expiration date of October 18, 2010. On May 6, 2010, the Port District applied for renewal of the dredging and disposal permit (see project description below). Given the ongoing impacts to the public (e.g., public access and visual impacts arising from pipelines on the beach, the use of a tractor to move the pipelines around the beach and into the surf zone, the disposal of dredged material into the surf zone or the nearshore environment, hydrogen sulfide releases, etc.) from the extensive dredging and disposal operations the Port District undertakes each year, Commission staff requested that the Port District undertake a dredging and disposal options study to review the current dredging operations done at the Harbor, survey the dredging and disposal practices at other harbors, and determine if viable options exist to reduce the impacts from

dredging and disposal. Commission staff requested that the study be completed prior to issuance of another multiyear dredging and disposal permit by the Commission to the Port District. Port District staff agreed to undertake the study but noted that such a study would take many months to prepare. Given that it would not be possible to complete such a study before the permit expired in October 2010, the Commission granted a waiver (3-10-057-W) to the Port District in November 2010 to allow the Port District to continue maintenance dredging and disposal consistent with the terms of CDP 3-05-065 (as amended through and including amendment 3-05-065-A2) through March 15, 2011, with an allowance that this deadline could be extended for good cause by the Commission's Executive Director. The Executive Director determined that good cause for extending the waiver's coverage existed due to the tsunami of March 11, 2011, which caused a great amount of damage to the Harbor's infrastructure and hindered the Port District's ability to develop the required additional information, and authorized the continued maintenance dredging and disposal activities through the end of the 2011-12 dredge season (i.e. April 30, 2012). The final dredging and disposal options study was completed in December 2011 (see Section 3 below).

2. Project Description

The Port District has requested renewal of a five-year dredging permit to allow: 1) dredging of up to 1,280,000[15] cubic yards of entrance channel sediment (>80% sand) over the next five years with disposal into the offshore environment, into the surf line, or onto the dry beach at Harbor Beach/Twin Lakes State Beach; 2) dredging of up to 20,000 cubic yards of inner harbor sandy sediment (>80% sand) or up to 10,000 cubic yards per year of silts/clays (<80% sand) + 10,000 cubic yards/year of sandy sediment (>80% sand), at a rate of not more than 550 cubic yards of silts and clay per day, with disposal through the offshore pipeline into the nearshore environment; 3) dredging of up to 35,000 cubic yards of inner harbor sediment with disposal at an upland site or at a federally approved offshore disposal site. Special Conditions 1 and 2 describe the scope and timing of the proposed dredging and disposal activities allowed pursuant to this permit.

Sandy entrance channel dredged materials to be deposited directly onto the beach or into the surf line would travel from the dredge barge through a Commission approved (3-86-175) permanent pipeline that terminates at the harbor's east (downcoast) jetty. From here, the Port District would connect a flexible high-density polyethylene (HDPE) 16-inch surf line disposal pipeline, which has several valve connection points. The beach zone disposal pipeline would then be connected and moved to various

[15] Previous CDPs for entrance channel dredging typically placed a yearly maximum on the amount of sandy entrance channel sediment that could be dredged and disposed of into the beach zone/surf line or into the nearshore environment (since the 1990's, this maximum has been 350,000 cubic yards per year). The ACOE is expected to approve a 10-year permit later this year that would allow the Port District to dredge and dispose of up to 2,560,000 cubic yards of sandy sediments from the entrance channel over the next ten years, with no yearly maximum. The objective is to simplify the permitting process to avoid the need for emergency permits in years when weather and other factors lead to exceptionally high volumes of entrance channel sediment (such as the 2009/2010 dredge season when over 450,000 cubic yards were dredged from the entrance channel). This type of extreme dredging event should be balanced out over time by years in which the entrance channel dredging totals are lower than typical (such as in the 2004/2005 dredge season when only 160,333 cubic yards of sediment were dredged from the entrance channel). This CDP is for five years, not ten years. To align with the amounts projected to be approved under the ACOE permit, this Port District has applied to dredge and dispose of up to 1,280,000 cubic yards (half of the ACOE's ten-year amount) of entrance channel material over five years, with no yearly maximum.

portions of Harbor Beach/Twin Lakes State Beach by way of tractor in order to optimize beach replenishment.

The offshore disposal pipeline has been used yearly since 1997 to mitigate the odors of hydrogen sulfide that can occur when seaweed gets entrained into the sand in the harbor entrance during storm activity. The offshore disposal pipeline emanates from a Y-valve connection at the east jetty. From the east jetty pipe connection, the offshore pipe parallels the jetty out into the ocean to a point about 100 yards from the beach and terminates within the specified disposal zone (see Exhibit B for the location of the offshore and beach zone disposal pipelines and the disposal area). The offshore pipeline rests on the ocean floor and is secured by a 3,000 pound Danforth anchor that is marked with a buoy for safety. When the offshore pipeline needs to be unburied during dredging operations and at the end of the dredge season, it is filled with air and raised. The anchor has a pendant wire attached to a large float marker that acts as a pick-point for retrieval of the anchor. The offshore pipeline is a temporary feature and in general is placed at the beginning of the dredge season before October 1st, and remains in place until the end of the dredge season (April 30th), with removal of the pipeline required by May 15th of each year. The Port District proposes to use the offshore pipeline for disposal of entrance channel sediments to mitigate hydrogen sulfide odor in accordance with the Air District's "Hydrogen Sulfide Nuisance Prevention Protocol" (see discussion of this issue in the "Air Quality" section below). The Port District also proposes to use the offshore pipeline to dispose of clean inner harbor sediments as described above. The Sanctuary and the ACOE have both previously approved installation and use of the offshore disposal pipeline.

See Exhibit E and pages 22-24 of Exhibit G for photographs of the dredging and disposal activities.

3. Dredging and Disposal Options Study

The annual dredging activities, particularly in relation to the voluminous amount of entrance channel sediments that need to be dredged and disposed of yearly, create ongoing impacts to coastal resources, including public access and visual impacts arising from pipelines on the beach, the use of a tractor to move the pipelines around the beach and into the surf zone, the disposal of dredged material into the surf zone or the nearshore environment, hydrogen sulfide releases, etc. Commission staff requested that the Port District undertake a dredging and disposal options study to review the current dredging operations done at the Harbor, survey the dredging and disposal practices at other harbors, and determine if viable options to reduce the impacts from dredging and disposal exist. The final report, entitled *Santa Cruz Harbor – Dredging & Disposal Options Study (Phases 1 & 2)* (Options Study) was completed in December 2011 (see Exhibit C). The primary objectives of the study were to review the Port District's current entrance channel dredging and disposal activities, compare them to an industry standard by surveying other similar harbors, evaluate the benefits and potential adverse impacts of its current practices, and explore potential alternatives to the Port District's dredging and disposal activities. The scope of work for the study included: 1) reviewing the Port District's current dredging and disposal practices (which are described in the "Permit History" and "Project Description" sections above); 2) surveying and reviewing other urbanized harbors' dredging and disposal practices, and; 3) identifying and evaluating potential modifications to the Port District's current dredging and disposal

practices.

The Options Study surveyed 12 other harbors located in an urbanized setting and coastal environment similar to Santa Cruz Harbor. All these harbors had jettied entrance channels, significant littoral sediment transport, and the need to frequently dredge their entrance channels to maintain safe navigation. All except one[16] placed the dredged channel material on adjacent beaches, either on the dry beach or within the surf zone. Half of the surveyed harbors dredge their entrance channels annually or biannually, with the remainder dredging every 3 to 20 years. Santa Cruz Harbor is unique among these harbors in that the sedimentation processes over the winter season require continuous dredging (versus a one-time annual or biannual dredging event). Over half of the other harbors have experienced odors from decaying marine life and/or kelp in the dredge disposal materials placed on adjacent beaches, but not on an ongoing basis, and Santa Cruz Harbor is the only one of these harbors that is regulated by the Air District. The types of equipment used were very similar for all harbors, with the exception of Tweed River harbor in Australia, which uses a permanent sand bypass system that was constructed near the harbor entrance and operates year round[17] (see pages 15-17 of Exhibit C for additional harbor survey information).

The Options Study evaluated potential modifications to current dredging and disposal practices at the Santa Cruz Harbor that would achieve one or more of the following objectives: 1) reduce the incidence of hydrogen sulfide releases; 2) reduce the amount of flexible dredge discharge pipeline handling, re-handling of dredged entrance material, and beach grooming that requires tractor operations on the beach. Eight potential modifications were analyzed. Please see pages 20-32 of Exhibit C for a detailed description of each potential modification. The following is a brief description of each potential modification:

- **Seawater Spray System.** This system would include a spray nozzle that would discharge seawater as a fine mist over the dredged material, which would re-dissolve hydrogen sulfide and remove it from the air. The entrained hydrogen sulfide would then return with runoff to the ocean, and the dredged material would be placed in the dry beach zone. The principal shortcoming is the uncertainty surrounding the efficacy of the system, which can only be resolved by performing a series of investigations. Also, there may be an impact of the spray field on beach users.

- **Poor Boy Degasser.** This system would include a degasser (about 8 feet in diameter and 20 feet tall) inserted into the beach zone disposal pipeline that would separate hydrogen sulfide gas from the dredge slurry, and a "scrubber" to purge hydrogen sulfide captured by the degasser prior to its

[16] The one exception was Port Hueneme, which disposes of its dredged material at a confined aquatic disposal site due to contamination concerns.

[17] This sand bypass system was constructed in 2001 at a cost of $23.3M (in Australian currency). It excavates sand upcoast of the harbor entrance via a 1,476-foot-long "intake jetty" (a pier or trestle-like structure with submerged pumps), which collects sand trapped in a depression under the intake jetty with a series of ten submerged jet pumps. A slurry pit receives the sand slurry and concentrates the sand slurry to the required density. A sand transfer system draws sand from the slurry pit and pumps it through a 16-inch mm steel pipeline under the Tweed River to one of four outlets along downcoast beaches. The sand discharge system is similar to the Santa Cruz Harbor in that it is comprised of a combination of permanently installed and above-ground temporary pipelines. See pages 116-125 of Exhibit C for more information on the Tweed River harbor sand bypass system.

release into the air. The degasser and scrubber equipment would represent a visual intrusion onto the beach and the scrubber would require a separate power supply and blower to withdraw the hydrogen sulfide from the separator and pass it through the scrubber.

- **Degassing Eductor or Booster Pump.** These systems would provide either a degassing eductor on the dredge pump suction line, or a booster pump in the discharge pipeline to trap hydrogen sulfide. In either case a gas scrubber would be used to purge hydrogen sulfide back into the water next to the dredge. The Port District has purchased and implemented the use of an eductor this dredge season and believes it is having a positive effect: as of the date of this report**,** the Port District has experienced 5 protocol shutdowns related to hydrogen sulfide; as of last year at this time (when the eductor was not in use), the Port District had experienced more than 20 protocol shutdowns related to hydrogen sulfide.

- **Cutter-Head Sweeps.** The Port District's existing dredge would be refit as a cutter head and would perform cutter-head sweeps to "meter" dredge intake of organic matter (that may contain hydrogen sulfide) before placing the dredged material into the beach zone. The theory is that removing the sediment in a number of lifts and churning the material prior to pumping would reduce the dredge intake of decomposing vegetation, ultimately reducing the amount of hydrogen sulfide released when the dredged material is placed into the beach zone. Similar to the seawater spray system, there is uncertainty regarding the efficacy of the system, although the cutter head sweeps would not have spray field impacts on beach users. Also, cutter-head dredging would likely be less efficient in maintaining the entrance channel in an open state because a cutter-head dredge would be more impacted by wave action than the current dredge system, and there could be fouling of the cutter-head by kelp and other marine debris, and there could be potential fish entrainment issues.

- **Pre-Dredge Plowing or Jetting.** This would involve pre-dredge plowing or jetting to promote submerged release of organic matter/hydrogen sulfide before the entrance channel sediment is dredged and placed into the beach zone. The theory is that the buried pockets of decomposing vegetation can be dislodged and the trapped hydrogen sulfide released with the aid of a plow or jetting apparatus, which would be towed by a powerful work boat. The concern is that the pockets of decomposing vegetation are random and that the plowing or jetting may not intersect them, providing no benefit. In this regard, the systematic sweeping of the cutter-head provides a significant advantage over this method. Also, maneuvering the tow-boat may be challenging in tight channels.

- **Upcoast Sand Trap.** This modification would use a dredge at the beginning of each dredge season to dredge an excavation about 2,000 feet long just offshore of the harbor entrance, consisting of about 200,000 cubic yards of material, which would be disposed of one mile downcoast offshore of Corcoran Lagoon. The location of the disposal site should keep the sand in the littoral system, though the closest downcoast beaches to the harbor entrance may not see any benefit. The amount of sand removed from in front of the harbor entrance channel would likely reduce wave heights in that area, reducing the amount of sand that enters the entrance channel. In 1992 the ACOE studied this option but did not recommend it because the benefits (lower wave height and reduced entrance channel dredging through offshore trapping) would not offset the cost of the operation (estimated at

about $4.5 million per dredge season); also the offshore disposal site would be located in the Sanctuary and would require a permit from that agency. Further, while lower wave heights might benefit the Harbor, they are not necessarily a better outcome for surfing and other recreational use of the area. The greatest shortcoming to this option is that disposing sand at an offshore site would not provide assurance that the downcoast beaches would be nourished with sand, which could adversely impact recreational activities.

- **Extend Jetties.** The theory with this option is that extending the existing jetties on the upcoast and downcoast sides of the harbor's entrance channel would increase the depth over the shoal that forms at the mouth of the harbor and result in a decreased (but not eliminated) need for entrance channel dredging (i.e. more sandy material would bypass the entrance channel), but hydrogen sulfide and beach nourishment concerns could still be an issue. The cost of extending the jetties is expected to be well over $10 million, and a permit to construct the extended jetties would be required from the Sanctuary.

- **Offshore Pipeline.** This option would provide for the conversion to offshore disposal (i.e., no beach zone disposal) via a permanently anchored pipeline with multiple outlets. This option would completely address the hydrogen sulfide issue because all entrance channel dredged material would be disposed of in the ocean. However, the pipelines would need to be anchored and suspended from a trestle-like structure, which would be constructed in the surf zone, because the mobility of the sandy ocean bottom would otherwise expose non-anchored non-suspended pipelines to both physical damage, burial in sandy sediment, and plugging of the disposal tips.

- **Dry Zone Disposal Diffusers.** This option would be implemented with one or more of the preceding options. The conversion to dry-zone-only disposal of sandy entrance channel sediment would become possible by the effective control of hydrogen sulfide releases by one or more of the above methods. This modification would consist of a permanently buried pipeline in the dry zone of the beach with multiple outlet diffusers located on the beach between 5th Avenue and 7th Avenue. The outlet diffusers would be exposed on the dry beach, but they would be designed to maximize beach profile by using the dredged material to form a deposit around the diffuser. As the deposit would build around one diffuser, preparations would be made to activate the next diffuser. Further re-handling of the dredged beach material would largely be left to natural forces (i.e., the diffuser "fans" out the dredged material so that it spreads out more evenly on the beach instead of forming a deep pile of sand, which means there would be limited tractor use to move the dredged material around the beach). This option (in conjunction with one or more of the above methods to reduce hydrogen sulfide releases) would eliminate the need for surf line disposal (which involves the use of a tractor to push a discharge pipeline into the ocean and requires frequent repositioning of the pipeline in the water by the tractor to prevent shoal formation by the dredged sandy material) and would also eliminate the use of the fixed offshore pipeline disposal method for entrance channel material (the offshore pipeline would still be used to dispose of clean inner harbor sediments that are consist of less than 80% sand).

The Options Study summarized all of the above potential modifications and scored them as superior (1

to 5) or inferior (-1 to -5) relative the Port District's current dredging and disposal operation, based on a number of criteria, including how well an option reduces the release of hydrogen sulfide into the air, increases dry zone disposal of sandy dredged material, and reduces tractor operations, as well as the upfront costs and potential uncertainties and potential drawbacks of each option (see Tables 4 and 5 on pages 29-30 of Exhibit C). The options study concludes that the degasser options, especially the on-dredge eductor, show promise and should be explored further, and that the cutter-head and plowing/jetting options could also be considered as demonstration projects if the eductor degassing system does not perform well. The Port District has been using an eductor[18] on the dredge pump suction line during the current dredge season with some success. To date, the Port District has experienced only five Air District protocol shut-downs related to hydrogen sulfide. Last year at this time (without the use of the eductor) the Port District had experienced more than 20 protocol shut downs.

In addition to the eductor, the Port District has periodically[19] attached a disposal diffuser to the end of the dredge disposal pipeline during this dredge season for dry beach zone disposal. The diffuser fans the sandy dredged material out onto the beach (instead of the typical single stream of dredged material which comes out of the end of the pipeline when a diffuser is not employed, and which leads to a large mounding of dredged material on the beach that needs to be smoothed out and contoured by the tractor). Use of the diffuser has reduced the amount of tractoring operations needed because the dredged material does not form steep mounds on the beach.

The Options Study concludes with some initial recommendations to evaluate the potential for success for any of the above potential modifications, including: 1) adding coring and sulfide analyses to the yearly sediment sampling and testing program to determine the amount and distributions of sulfides to better analyze and develop potential operational models; 2) conducting simple laboratory or field tests of seawater scrubbing to minimize hydrogen sulfide releases, and; 3) gathering additional observations about vegetation management, including exploring the possibility of periodically raking the bottom of the entrance channel to remove large kelp or algal materials before they become buried and their decomposition forms hydrogen sulfide.

4. Coastal Development Permit Determination

A. Land Use Priorities

The Santa Cruz Harbor accommodates a number of coastal-related and coastal-dependant activities including commercial fishing and recreational boating. The proposed project includes maintenance dredging to remove accumulated sediment from the boat berthing areas and navigational channels. Coastal-dependent and coastal-related developments are among the highest priority Coastal Act uses.

[18] As described in the options study, this option uses a gas scrubber to purge the hydrogen sulfide that has been captured by the gas trap. The Port District, however, is not using a gas scrubber but instead is directing the hydrogen sulfide gas back into the entrance channel water (hydrogen sulfide is water soluble).

[19] The diffuser works best with the most coarse-grained sand. If less coarse-grained sand is present, and especially if this sand contains more organic material, the diffuser does not work as well.

1. Applicable Coastal Act Policies

The Coastal Act defines coastal-dependent and coastal-related as follows:

> ***Section 30101:*** *"Coastal-dependent development or use" means any development or use which requires a site on, or adjacent to, the sea to be able to function at all.*
>
> ***Section 30101.3:*** *"Coastal-related development" means any use that is dependent on a coastal-dependent development or use.*

Coastal Act Section 30001.5 states, in relevant part:

> ***30001.5:*** *The Legislature further finds and declares that the basic goals of the state for the coastal zone are to:*
>
> *(a) Protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources….*
>
> *(c) Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resources conservation principles and constitutionally protected rights of private property owners.*
>
> *(d) Assure priority for coastal-dependent and coastal-related development over other development on the coast…*

Coastal Act Sections 30234, 30234.5 and 30255 also provide:

> ***30234:*** *Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided. Proposed recreational boating facilities shall, where feasible, be designed and located in such a fashion as not to interfere with the needs of the commercial fishing industry.*
>
> ***30234.5:*** *The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.*
>
> ***30255:*** *Coastal-dependent developments shall have priority over other developments on or near the shoreline. Except as provided elsewhere in this division, coastal-dependent developments shall not be sited in a wetland. When appropriate, coastal-related developments should be accommodated within reasonable proximity to the coastal-dependent uses they support.*

The Santa Cruz Harbor is one of only six harbors located along the Central Coast, and is the primary recreational port in Monterey Bay. The Santa Cruz Port District maintains approximately 920 berths and dory ties within the Harbor, which are used by a variety of recreational and commercial boats.

Proposed dredging areas in the Harbor include areas where deposition routinely reduces depths in and around navigational channels and berthing areas. During extreme depositional events, vessels must time their maneuvers in and out of the Harbor with the tides. Maneuvering within the Harbor has also at times proved difficult during low tides when many vessels rest on the muddy bottom sediments. Continued sediment inflows can be anticipated. This can, at times, result in severe impairment of Harbor capacity and risk to vessels if no action is taken. No feasible alternatives to the proposed dredging have been identified.

Section 30234 of the Coastal Act provides that facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Section 30234.5 states that the economic, commercial, and recreational importance of fishing activities shall be recognized and protected. Commercial and recreational boating and fishing are coastal-dependent priority uses that cannot function without sufficient Harbor depths. Hence, the maintenance of adequate berthing and navigational depths in the Harbor is essential, and must be considered a high priority under the Coastal Act. Likewise, the temporary installation of an offshore dredge disposal pipeline and the beach/surf line pipeline serves to implement the maintenance of berthing and navigational depth, and, as such, are also considered high priorities under the Coastal Act.

The proposed dredging activities not only support coastal-dependent uses, but are integral to such uses and therefore have a priority under the Coastal Act. Accordingly, the Commission finds that the proposed project supports high priority coastal uses that are consistent with the land use priorities of the Coastal Act Section.

B. Air Quality

Section 30253(3) of the Coastal Act states:

> ***30253.*** *New development shall:*
>
> *(3) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Control Board as to each particular development.*

Hydrogen sulfide is a colorless, flammable gas, heavier than air, which at low concentrations smells like rotten eggs. Hydrogen sulfide is produced in nature primarily through the decomposition of dead plant and animal matter by anaerobic sulfur bacteria. Because it is heavier than air, hydrogen sulfide can accumulate in low-lying areas and in enclosed spaces. In entrance channel sediments, hydrogen sulfide is produced by decaying seaweed. The hydrogen sulfide from the decaying seaweed is released into the air when the sandy entrance channel material is placed onto the beach or into the surf zone for beach replenishment. Some entrance channel sediments contain a low concentration of seaweeds and thus produce little or no hydrogen sulfide odor when placed into the beach zone; other entrance channel sediments may contain a high concentration of seaweeds, resulting in higher amounts of hydrogen sulfide being released into the air when these sediments are deposited onto the beach or in the surf zone. The odor of hydrogen sulfide has been a major challenge for the Harbor as some beach users and Harbor neighbors complain that the odor is overwhelming, and in some cases makes people feel sick. Typical

complaints include respiratory symptoms of nose and throat irritation, cough, and signs of inflammation. Nausea is also a typical complaint.

The California Air Resources Board sets legal limits on outdoor air pollution in order to protect the health and welfare of Californians. The California state ambient air quality standard for hydrogen sulfide is 30 parts per billion (ppb) averaged over an hour (i.e., the average of a number of readings taken over an hour-long period must not exceed 30 ppb). Although high levels of hydrogen sulfide can be irritating and cause a variety of health effects, irritation and respiratory effects are not expected to occur at levels below 30 ppb, the Minimum Risk Level established by the US Agency for Toxic Substances and Disease Registry.

Commencing with the 1997 dredge season, the offshore disposal pipeline has been used on a yearly basis to mitigate the odors of hydrogen sulfide that can occur when seaweed gets entrained into the sand in the harbor entrance during storm activity. However, complaints regarding hydrogen sulfide odors and effects continued to be received from neighbors and local users of Harbor Beach/Twin Lakes State Beach during instances when entrance channel sediments were deposited onto the beach or into the surf line. In 2003, in response to these complaints, the Monterey Bay Unified Air Pollution Control District (Air District) developed a protocol for limiting the emissions of hydrogen sulfide from the Harbor's dredging operation. The protocol's development included substantial public review and input, including two public meetings. In October 2003, the Air District issued the final hydrogen sulfide protocol, which was appended to the Harbor's dredge operating permits. The protocol included installation of a hydrogen sulfide monitor to operate when the wind direction was onshore, and a wind instrument to provide an indication of wind direction. The protocol also requires conspicuous signage to advise the public of the dredge disposal operation and to warn the public of the possibility of hydrogen sulfide odors that might cause discomfort. The protocol also requires that the Port District keep a detailed log of all odor complaints received from the public.

During the 2003-04 dredging season, the Port District used the offshore pipeline to dispose of approximately 90% of the entrance channel sediments approximately 100 yards offshore; thus, during the 2003-04 dredging season, the beach zone pipeline was used only approximately 10% of the time. The result of this was dramatically reduced hydrogen sulfide emissions, no interference with the obligations of the Harbor in maintaining its entrance channel, and very few, if any, complaints from neighbors or surfers about hydrogen sulfide odors during the 2003-04 dredging season.[20]

The 2004-05 dredging season, however, was a markedly different experience. According to the Port District, there were unusual currents and wave conditions that forced the Port District to use the offshore

[20] However, the regular use of a single offshore discharge point for sandy entrance channel sediments has more often than not been problematic for a number of reasons. At times the offshore pipeline disposal point has become perennially shallow, resulting in shoaling that encroaches into the federal navigation channel, causing dredged material to reenter the entrance channel after being disposed of through the offshore pipeline. During the 2005-06 dredging season, the Port District had to cease using the offshore pipeline because of unsafe surf and depth limitations in the entrance channel. During two recent dredging seasons (2006-07 and 2007-08), the offshore pipeline regularly became plugged with heavy sand effluent, making the offshore pipeline unusable. Retrieving the pipeline to correct this situation involves a crew of four people entering the breaking surf on a work boat, which is a potentially dangerous condition. For these reasons, using the offshore pipeline to dispose of the vast majority of sandy entrance channel sediments is usually not feasible.

pipeline only approximately 58% of the time; 42% of the time the dredged material was placed into the beach zone. The Harbor's dredge operation repeatedly encountered pockets of hydrogen sulfide-producing materials that resulted in odorous emissions at levels never before measured or believed possible. In some instances, single readings of hydrogen sulfide recorded by the air monitor exceeded 3,000 ppb (normal background hydrogen sulfide levels in the Harbor area when dredging is *not* taking place have been measured at 3-5 ppb). Numerous complaints regarding hydrogen sulfide were received by the Port District, Commission staff, and the Air District during the 2004-05 dredging season.

Due to the unacceptable results of the 2004-05 dredging season regarding hydrogen sulfide emissions, the Air District found that the protocol needed to be amended to protect against the unpredictable conditions encountered during that dredge season. In 2005, the Air District required the following to be implemented when onshore winds exist and disposal of entrance channel sediments is taking place in the beach zone:

- Reduction of the air sampling interval from two minutes to one minute.
- Cessation of dredging when the air monitor records 15 ppb of hydrogen sulfide for four successive readings, or any single reading of 60 ppb or more.
- No restart after cessation until the following day.
- Adding a new "not to exceed" limit of 30 ppb for a one-hour average (State Air Board's existing standard for hydrogen sulfide). Violation of this limit would be enforced through the imposition of civil penalties.[21]

The Air District further amended the hydrogen sulfide protocol on December 9, 2010 to require termination of discharge of dredged material into the beach zone whenever the measured amount of hydrogen sulfide averages 10 ppb per hour, which is 1/3 of California's ambient air quality standard for hydrogen sulfide, and is also well below the level that irritation and respiratory effects are expected to occur (see Exhibit D for the amended protocol).

When offshore winds exist (typical in the a.m. hours), the Port District may deposit entrance channel dredged material into the surf zone to replenish Harbor Beach and Twin Lakes State Beach without air monitoring being undertaken. Air monitoring is also not required when entrance channel dredged material is disposed of through the offshore pipeline. All inner harbor dredged material is required to be disposed of through the offshore pipeline.

[21] On January 9, 2006, the Port District violated an Air District Hearing Board order, which had been issued to allow the Port District to continue dredging because of severe beach erosion from the storms at that time (this temporary Hearing Board order required the Port District to shut down beach disposal operations if an H_2S reading of 1 part per million or greater was reached; under ordinary protocol requirements the Port District is required to shut down beach disposal operations after four successive H_2S readings of 15 parts per billion (ppb) or greater, or for any single reading of 60 ppb or greater). The Port District continued to dredge and discharge entrance channel sediment onto the beach after air quality monitor readings that required shutdown of the dredging operation were exceeded. This was the only air quality violation during the 2005-06 dredge season. According to Air District staff, the violation was settled through the Air District's Mutual Settlement program. There have been no violations issued to the Port District by the Air District since the 2006 violation.

To further reduce nuisance level hydrogen sulfide odors that can occur when sandy entrance channel dredge sediments are disposed of into the beach zone, the Port District has implemented one of the options described in the Dredging and Disposal Options Study. Specifically, the Port District has installed an eductor (or a "degasser"), which is a collection box installed on the top of the dredge's intake pipe. The degasser collects any hydrogen sulfide gas that is present as the dredged material passes up the intake pipe. Then, because hydrogen sulfide is water soluble, the hydrogen sulfide is directed into the water next to the dredge. This degassing process reduces the amount of hydrogen sulfide that is released into the air when the dredged material is deposited onto the beach or into the surf zone. The degasser has been in use since the start of the dredge season in the fall of 2011. As of the March 22, 2012, the Port District has terminated beach zone dredge disposal five times per the requirements of the Air District's hydrogen sulfide protocol. Last dredge season, by season's end on April 30th, the Port District terminated beach zone disposal 27 times per protocol requirements. While the evidence at this point is empirical only, the degasser appears to be having a positive effect.

The Air District's hydrogen sulfide protocol requirements have greatly reduced the impacts to air quality from hydrogen sulfide released by sandy entrance channel dredged material placed in the beach zone. In the event the hydrogen sulfide protocol is further amended during the five-year scope of this permit, Special Condition 3 requires the Port District to submit the amended protocol to the Executive Director for review and approval. With this condition, the proposed project is consistent with Coastal Act Section 30253(3), which requires that the proposed dredging project be consistent with the requirements of the Air District and State Air Resources Board.

C. Marine Resources

1. Beach Replenishment

Coastal Act Section 30233 details the conditions under which dredging may be permitted and states:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following: (l) New or expanded port, energy, and coastal-dependent industrial facilities, including commercial fishing facilities.* ***(2) Maintaining existing, or restoring previously dredged, depths in existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps [emphasis added].*** *(3) In open coastal waters, other than wetlands, including streams, estuaries, and lakes, new or expanded boating facilities and the placement of structural pilings for public recreational piers that provide public access and recreational opportunities. (4) Incidental public service purposes, including but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines. (5) Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas. (6) Restoration purposes. (7) Nature study, aquaculture, or similar resource dependent activities.*

(b) Dredging and spoils disposal shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. ***Dredge spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches or into suitable long shore current systems. [emphasis added]…***

(d) Erosion control and flood control facilities constructed on watercourses can impede the movement of sediment and nutrients that would otherwise be carried by storm runoff into coastal waters. ***To facilitate the continued delivery of these sediments to the littoral zone, whenever feasible, the material removed from these facilities may be placed at appropriate points on the shoreline in accordance with other applicable provisions of this division, where feasible mitigation measures have been provided to minimize adverse environmental effects [emphasis added].*** *Aspects that shall be considered before issuing a coastal development permit for these purposes are the method of placement, time of year of placement, and sensitivity of the placement area.*

Section 30233 of the Coastal Act allows for the dredging of harbor waters in order to maintain depths necessary for navigation where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects. It also specifies that dredge spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches or into suitable long shore current systems, and also requires that dredge spoils be disposed of in a manner that avoids significant disruption to habitats and water circulation.

The proposed project represents a comprehensive program for operations and maintenance activities necessary to maintain and improve navigation channels and berthing areas for recreational boating and commercial fishing. Offshore and beach zone disposal sites have been established for beach replenishment. The offshore disposal site will allow sandy sediments to become available to nearby beaches within the Santa Cruz Littoral Cell. Disposal of sandy sediment directly into the beach zone will provide direct sand replenishment to Harbor Beach, and Twin Lakes State Beach, and other beaches downcoast from Black's Point (e.g., Santa Maria Cliffs/Corcoran Lagoon Beach, 26th Avenue Beach, etc.). The ACOE and the Sanctuary have approved these dredge disposal sites.

In addition to entrance channel dredged material, which is composed of greater than 80% sand, the proposed project includes the dredging and disposal of up to 20,000 cubic yards of clean inner harbor sediment, of which as much as 10,000 cubic yards could consist of silts/clays (<80% sand, with no lower limit on sand content (i.e. sand content could be zero)) through the offshore pipeline into the nearshore environment at a rate of not more than 550 cubic yards of silts and clay per day. As discussed above, sediments entering the ocean are sorted by the forces of waves and currents based on differences in grain-size, density, and shape. Sediment in the Santa Cruz Littoral Cell is sorted into two basic categories at a cut-off grain diameter of 180 microns. Sediments larger than 180 microns consist of fine-sand and larger-grained sand; sediments smaller than 180 microns are categorized as fine sediment (silt and clay). As explained in more detail below, studies have shown that the larger, sandy sediments travel in the littoral drift or are deposited on beaches in the Santa Cruz area, while Fine clay and silt sediments

are transported offshore to the continental shelf, where they are deposited in abundance along a midshelf mudbelt. Thus, the Commission anticipates that any sandy material present in the inner harbor sediment will be composed of sand that will become available for beach replenishment, while the remaining fine-grain material will be transported offshore to the midshelf mudbelt (see further discussion of this issue in the "Water Quality" and "Public Access" sections below).

The proposed dredging is an allowable use under Coastal Act Section 30233(a)(2), as it is designed to maintain existing depths within an existing navigational channel. One alternative to the proposed dredging project would be the construction of an upcoast sand trap each season, as described in the Options Study (see Exhibit C). This alternative is not feasible, however, given its estimated cost of $4.5 million, and it is unclear whether there is an appropriate offshore disposal site available even if this alternative were economically feasible. This option would also starve the beaches east of the Harbor of sand because the sand would accumulate in the trap. Given the infeasibility of the upcoast sand trap and the conditions in the Harbor that result in the deposition of large volumes of sediment that must be removed to maintain navigational depths, the proposed project is the only feasible alternative that accomplishes this purpose. Finally, as described in more detail below, the environmental impacts of the dredging project are expected to be temporary and generally insignificant.

Additionally, the project will ensure that a large volume of sandy sediments will become available for beach replenishment, either from the Santa Cruz Littoral Cell for sediments disposed of through the offshore disposal pipeline or directly to Harbor Beach and Twin Lakes State Beach from sediments disposed of into the beach zone. The project therefore is consistent with section 30233(b) and (d). Thus, the Commission finds that the proposed dredging project is consistent with Section 30233 of the Coastal Act.

2. Water Quality

Coastal Act Sections 30231 and 30232 state:

> **30231:** *The biological productivity and the quality of coastal waters, [..] appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment,…*
>
> **30232:** *Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.*

To date, prior to each dredge episode, the suitability of the proposed dredged material for disposal in any of the proposed aquatic locations has been evaluated by an interagency group consisting of representatives from the ACOE, the EPA, the Central Coast Regional Water Quality Control Board (RWQCB), the Commission, and the Sanctuary. Advisory to this interagency group are the U.S. Fish & Wildlife Service (FWS), the National Marine Fisheries Service (NMFS), and CDFG. The group has

considered chemical and biological testing results, as well as physical grain size analyses, submitted by the Port District. Since 1998, the interagency group has considered test results according to the guidelines within the testing manual entitled "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (the Inland Testing Manual or ITM, published in February, 1998 by the EPA and the ACOE). After considering test results, the group then tries to reach a consensus opinion as to whether or not the proposed dredged material is suitable for aquatic disposal. This process would continue under this CDP, as required under Special Conditions 4 through 6.

To be suitable for beach replenishment, sediment must not have unacceptable pollutant concentrations (i.e., they must be "clean" sediments),[22] and sediment must contain an acceptable composition of grain size. Historically, the commonly identified acceptable sediment grain size for nourishment purposes was considered sediment that was composed of at least 80% sand (and no more than 20% finer grained materials; also referred to as fines, mud, or silt), or sand composition within 10% of the composition of the sediment at the disposal site.[23] In the past, the Commission and EPA both used this rule of thumb when evaluating dredging projects. However, the EPA indicates that Clean Water Act (CWA) guidelines are flexible and can allow for nearshore discharge of finer material provided that site-specific information is available to determine no significant adverse impacts would result. Recent studies and monitoring at Santa Cruz have shown that an increased percentage of inner harbor fine-grained material, when placed at limited rates and volumes in the nearshore zone immediately east of the harbor mouth, does not cause adverse impacts to marine resources, and in fact, may benefit some benthic habitats.[24] In this case, the EPA indicates that the proposed limited discharge of fines in the nearshore environment is acceptable.

For entrance channel sediments, which have consistently been composed of approximately 90% sand, the required testing would be done on a rotational basis (i.e., periodic physical (grain size) and chemical testing would be done, with no testing in intervening years if the previous testing showed adequate grain size and no chemical contamination (chemical testing is not as critical for sandy sediments because chemical contaminants are much more likely to adhere to fine-grain sediments than sandy sediments)).

All inner harbor sediments proposed for unconfined aquatic disposal (either through the offshore pipeline or at the SF-14 federal offshore disposal site) would require yearly physical and chemical testing, as well as periodic biological testing. As proposed, up to 35,000 cy/yr of sediment dredged from the inner harbor could be disposed of at an upland site (such as a landfill site) or at the Elkhorn Slough as part of a proposed (but as yet unpermitted) restoration project.[25]

In the past, inner harbor sediment determined to be less than 50% sand was not eligible for unconfined aquatic disposal through the offshore pipeline; this material required disposal at SF-14 or at an upland

[22] The Commission has generally relied on EPA, ACOE, and RWQCB through their application of Clean Water Act requirements to help determine when sediments should be considered clean and thus suitable for nourishment and nearshore disposal.

[23] So, for example, dredged sediment containing 70% sand would be suitable at a disposal site with a composition of 60% sand, but it would not be acceptable at a location with 100% sand.

[24] See *The Role of Mud in Regional Productivity and Species Diversity* by John Oliver, Moss Landing Marine Laboratories, January 2008.

[25] And this CDP does not authorize placement of materials at that site absent a separate authorization allowing it.

site. As discussed above in the "Permit History" section, the Commission has previously authorized three demonstration projects (in 2001, 2005, and 2009) to determine if clean, fine-grained (50% sand content or less) harbor sediments can be disposed of into the nearshore area in a manner beneficial to downcoast beaches and without harm to coastal resources. Each of these demonstration projects included an extensive monitoring component. In all three cases, the monitoring study results determined that the fine-grain material released into the nearshore environment at a rate of up to 550 cubic yards per day did not significantly change, alter, or impact the beaches or nearshore marine benthic habitats in the study area. In addition, EPA staff has now clarified that disposal of clean fine-grain dredged material that is less than 50% sand is acceptable.[26]

Regarding inner harbor sediments, if the material dredged from the inner harbor consists of 80% sand or greater the Port District proposes to discharge of up to 20,000 cy/yr of this material through the offshore pipeline into the nearshore environment for beach replenishment. If the material to be dredged from the inner harbor is less than 80% sand, then the Port District proposes to dispose of 10,000 cy of silts and clays (sand content could be as low as zero[27]) along with up to 10,000 cy of sandy material through the offshore pipeline into the nearshore area at a rate not to exceed 550 cy[28] of silts and clay per day.

Anticipated water quality impacts of dredging and disposal occur through variables such as dissolved oxygen (DO), pH, salinity, total suspended solids (TSS), and turbidity. Turbidity near the dredging and disposal sites would increase because of additional TSS in the water column. DO levels in the water column would decrease during disposal events due to increased turbidity. Long-term changes in turbidity and dissolved oxygen can have an adverse effect on kelp beds. Kelp beds are found about 1 kilometer offshore of the proposed disposal area (see more discussion of kelp beds in the "Biological Resources" section below). Although increased turbidity and decreased dissolved oxygen levels are expected to occur as a result of dredge disposal, the pre-dredge-operation ambient water quality condition should return shortly after each dredging episode. This is supported by the findings of the previous three demonstration projects, which included nearshore disposal of fine-grain sediments. In the 2001 demonstration project, a strong turbidity signature was not identified in the water samples taken during the demonstration dredging event, nor was any odor or discoloration observed. In fact, the level of turbidity was found to be higher in water samples collected the day before the demonstration-dredging event began, due to intense rainstorms and flooding at that time. The highest turbidity values were located near the areas where runoff continued to occur by the mouths of the San Lorenzo River and Schwann Lagoon. The results of the 2005 demonstration project showed that, in general, turbidity

[26] The EPA had previously determined that any dredged sediment less than 50% sand was not eligible for beach replenishment (classified as "fill" under the CWA, and would instead have to be considered for "disposal" pursuant to the Ocean Dumping Act. However, the EPA has since determined that the location of the offshore pipeline where the inner harbor fine-grain sediment would be disposed of is not subject to the Ocean Dumping Act, but instead is fully inside the "baseline of the territorial sea," and therefore is only subject to the CWA. The CWA does allow for aquatic disposal of clean dredged sediment that is less than 50% sand (greater than 50% fines).

[27] The percentage of sand in the inner harbor sediments between 2000 and 2010 has ranged from 10% (90% silts and clays) to 98% (2% silts and clays).

[28] This volume is consistent with the amount of silts and clays (i.e., material less than 80% sand) that was disposed of through the offshore pipeline into the nearshore environment during the previous demonstration projects, with no reported adverse effects to the marine environment or the beach.

offshore of the Harbor was low for the entire monitoring program and a turbidity signature caused by inner harbor dredging could not be differentiated from normal background turbidity conditions. The results of the 2009 demonstration project show that turbidity was, in general higher during and after the dredging than before the dredging, but was still low to moderate in scale. By far the highest turbidities were seen during a storm event that occurred several weeks after the demonstration project was concluded. This study also concluded that plumes of sediment were detected in the water column during disposal and for a relatively short time period after disposal, but that natural mixing and currents quickly carried all the material in suspension in the water column to a point offshore where it could no longer be detected (i.e., the high-energy nearshore environment carried the fine material to deep water via waves, wind, and ocean currents).

As stated above, all inner harbor sediments proposed for unconfined aquatic disposal would require yearly physical and chemical testing, as well as occasional biological testing. The monitoring programs required for the three demonstration projects concluded that these projects resulted in no significant impacts to the marine environment. For these reasons, the Commission is not requiring additional monitoring programs for the proposed project as it relates to the disposal of up to 10,000 cy of fine-grain material through the offshore pipeline into the nearshore environment at a rate of not more than 550 cy per day because this is similar to past approved volumes and protocols for which monitoring did not identify significant adverse resource impacts.

In summary, the proposed dredging and disposal project is expected to have short-term adverse impacts on water quality, including a temporary increase in turbidity and a decrease in dissolved oxygen levels. However, the impact to these water quality variables is expected to be adverse but short-term and minor in magnitude and scope. Pre-dredge water conditions should recur shortly after each dredging and disposal episode. In addition, the conditions of this permit require evidence of approval from the RWQCB prior to dredge operations authorized under this permit.

To ensure that the proposed method and content of dredge spoil disposal is consistent with Federal, State, and local regulations regarding the protection of water quality, Special Conditions 4 and 6 require that the submission of specific dredge plans for each dredging episode to be undertaken during the term of this permit be accomplished with written evidence that the ACOE, RWQCB, EPA, and the Sanctuary have reviewed and approved the dredging operations or that no such approval is required. In addition, Special Condition 5 requires that testing of dredged material be done per the requirements of the EPA, ACOE, and RWQCB. Therefore, as conditioned, the project will include measures to ensure protection of water quality and marine resources in the Santa Cruz Harbor and thus the proposed project will be in conformance with Sections 30231 and 30232 of the Coastal Act.

3. Biological Resources

Sections 30230 and 30231 of the Coastal Act protect biological resources and state:

> ***30230:*** *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological*

productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

30231: *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

The Santa Cruz Harbor is connected to the Monterey Bay National Marine Sanctuary (Sanctuary). The Sanctuary encompasses over 5,300 square miles of protected marine waters and includes a diverse complex of marine habitats including deep sea, open ocean, kelp forests, sandy beaches, rocky seashore, estuaries and sloughs. These habitats support a variety of marine life including more than 345 species of fish, 94 species of seabirds, 26 species of marine mammals, 450 species of algae and one of the world's most diverse invertebrate populations.

Beginning in 1962, the Santa Cruz Harbor was developed in a coastal estuary known formerly as Woods Lagoon that formed at the base of the Arana Gulch watershed. Water originating from the Arana Gulch watershed drains into the harbor through Arana Creek that makes its way via four 72-inch culverts that extend beneath the inner harbor parking area. Except for the coastal salt marsh and brackish marsh habitat areas of Arana Creek to the north, the harbor is now essentially a manmade environment that is devoid of the natural estuarine habitat that once prevailed. The harbor is surrounded entirely by urban development. Thus, for the most part, the tidal waters of the harbor are an enclave that is surrounded by urban harbor development consisting of floating docks, riprap, roads and parking lots, boats, and various buildings. Nonetheless, some marine mammals, fish and seabirds make use of the urban aquatic and terrestrial environments provided in the Harbor.

Generally, the greatest potential for adverse environmental effects from dredged material discharge lies in the benthic environment. In this case, the subject benthic environment includes ocean bottom flora and fauna of the inner harbor area and also the sandy subtidal and intertidal areas off Harbor Beach/Twin Lakes State Beach. Under the proposed project, dredged material would be disposed of onto the beach or into the surf zone at Harbor Beach/Twin Lakes State Beach or through the offshore pipeline in the vicinity of the Harbor's east jetty. The substrate of the benthic environment in these locations consists of sandy beach and/or a sandy ocean bottom. These environments are dynamic and contain ever-changing habitats for a variety of benthic species.

More specifically, sandy beach areas included in the project area are very harsh environments, encompassing most of the rigors of the intertidal (high wave action, wide temperature range, periodic tidal exposure) with the addition of high abrasion levels and lack of firm substrate for attachment. Beach fauna exhibit the characteristics of communities in harsh environments, namely low species diversity but

large numbers of individuals of each species. Because meiofauna (organisms inhabiting the interstitial spaces between the sand grains) are a distinct fauna from the more obvious macrofauna, the distribution of meiofauna is strongly influenced by the grain size of the sand. If there is a significant silt component in the sediment, the interstitial spaces are filled by the silt particles, impacting the interstitial fauna. Under the proposed project, however, only entrance channel material that is greater than 80% sand would be eligible for disposal onto the beach or into the surf zone. No inner harbor sediments, which may contain a higher composition of fine-grain material, may be disposed of onto the beach or into the surf zone. For these reasons, the impacts to meiofauna will be temporary and less than significant.

Impacts to biological resources are anticipated to be similar to those associated with previously permitted annual dredge episodes. The primary impact to biological resources resulting from dredging occurs through the disturbance, transport, and destruction of benthic organisms on and in the material to be dredged. However, re-colonization by these organisms would occur over time. While, dredged material disposal may induce turbidity and cause stress on planktonic larvae and filter feeder organisms (e.g., worms and shellfish), such stress would be temporary.

The removal of sediment from dredge areas could have short-term, adverse impacts on fish and fish habitats by temporarily increasing the total suspended sediments in the water column and possibly decreasing dissolved oxygen levels during dredge operations. However, as proposed, dredging will be conducted using a hydraulic dredge, which removes and transports dredged material as liquid slurry, thereby minimizing disturbance and re-suspension of sediments at the dredge site. This will minimize adverse environmental impacts to marine and wildlife habitats and water circulation during dredging, consistent with Coastal Act requirements.

The tidewater goby (*Eucyclogobius newberryi*) is a federally listed endangered species and is state listed as a species of special concern. Tidewater gobies were known to occur in Woods Lagoon in 1984, but there have been no recent sightings. Past sampling and existing conditions in Arana Gulch indicate that the tidewater goby no longer inhabits Arana Gulch and that habitat for the species is lacking. The inner harbor salinity level is in excess of what could support the tidewater goby.

Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*) is a federally listed and state listed endangered species. The southern extent of CCC Coho salmon historically included the San Lorenzo River and Aptos Creek watersheds. Designated critical habitat for CCC coho salmon does not include the Santa Cruz Harbor or the adjoining Arana Gulch watershed. The National Marine Fisheries Services (NMFS) believes it is unlikely that coho salmon will be present in the project area and therefore the dredging activities are not expected to impact this species.

Central California steelhead trout (*Oncorhynchus mykiss*) is a federally and state listed threatened species. Arana Creek has supported steelhead passage in the past. NMFS has completed an informal consultation per the ACOE's request and has imposed certain timing restrictions for dredging of the inner harbor areas to protect salmonids. According to NMFS, limiting dredging to the daytime hours

will mitigate impacts to salmonids, which migrate at night[29] (see Special Condition 2). NMFS staff believes that entrainment of steelhead is unlikely due to the presence of screens on the hydraulic dredge and the fact that the Port District does not commence dredging activities until the head of the hydraulic dredge has been placed down into the sediment. NMFS considers the possibility of adverse effects to steelhead to be insignificant because best management practices (BMPs), including dredging methods and timing, will minimize impacts to this listed species, and because there is a low abundance of steelhead trout in the project area.

The North American green sturgeon (*Acipenser medirostris*) is a federally listed threatened species. The green sturgeon spawns in the upper Sacramento River and as juveniles they migrate downstream and live in the lower delta and bays for three to four years before entering the ocean. Designated critical habitat for the green sturgeon exists in bays and estuaries of the Monterey Bay, extending to the mean higher high water line. Therefore, the Santa Cruz Harbor is within the green sturgeon's critical habitat designation. NMFS considers the possibility of adverse effects to the green sturgeon to be insignificant because BMPs, including dredging methods and timing, will minimize impacts to this listed species, and because there is a low abundance of green sturgeon in the project area.

In addition to the dredging and disposal of sandy entrance channel sediments, the proposed permit would allow the dredging of up to 10,000 cubic yards of clean fine-grain sediment (with no lower limit of sand content) from the inner harbor, with disposal through the offshore pipeline into the nearshore environment at a rate of not more than 550 cubic yards per day. The amount of this material is minor when compared to the average 278,000 cubic yards of sediment per year the San Lorenzo River releases into the ocean approximately a half-mile from the harbor, of which approximately 203,000 cubic yards (or 73%) is estimated to be silt and clay sediment. As discussed above in the "Permit History" section, the Commission has previously approved three "demonstration" projects that included the dredging and disposal of fine-grain inner harbor material into the nearshore environment. These projects required extensive monitoring programs, the results of which showed that the discharge of fine-grain material released into the nearshore environment at a rate of 550 cubic yards per day did not significantly change, alter, or impact the beaches or nearshore marine benthic habitats in the study area.

Kelp beds occur less than 1 kilometer east of the nearshore disposal site off of Blacks Point, within the path of transported sediment. Due to the concern that the disposal of dredged silt and clay sediment may negatively affect kelp beds and at the request of NMFS, the Port District previously conducted a three-year baseline study of the kelp forests in the dredge disposal area.[30] Scuba surveys conducted annually 2008-10 showed no significant decrease in abundance or density among control and impact sites. However, the area off of Blacks Point did show a decrease in plant abundance, although this decrease was not statistically significant. NMFS is recommending that additional monitoring be done annually at control and impact sites to verify that the dredging and disposal of fine-grain material into the nearshore area is not significantly impacting the distribution and abundance of giant kelp. The ACOE does not

[29] Personal communication from Devin Best at NMFS to Susan Craig, Coastal Commission supervising coastal planner.

[30] *Santa Cruz Port District Kelp Monitoring, Habitat Assessment and Aerial Photography Analysis Final Report 2008-10* by Sandoval and Associates Consulting Services, LLC. January 24, 2011.

concur that additional monitoring is required to verify that dredging and disposal of fine-grain sediments is not having a significant impact on giant kelp. NMFS continues to request this additional monitoring and has requested a meeting with the appropriate ACOE Branch Chief and NMFS' Northern California Habitat Manager. This meeting is scheduled for March 27, 2012. See pages 1-16 of Exhibit F for NMFS and ACOE correspondence on this matter.

The Commission's senior staff ecologist, Dr. John Dixon, has reviewed the relevant information, including the kelp monitoring study and the demonstration studies and has determined that additional monitoring of kelp is not warranted. This determination is based on the fact that the three previous demonstration project studies showed that the fine-grain material disposed of into the nearshore environment did not result in significant changes in turbidity and sedimentation. Furthermore, the 2011 USGS report on the third 2009 demonstration project placed the limited fine-grained dredge disposal experiments in the context of almost 30 years of hourly meteorological, oceanographic, and fluvial forcing records. This historical context suggests that the 2009 fine-grained dredge disposal experiment occurred during more benign conditions than usually observed during that time of year, further suggesting that observations made during the 2009 experiment were towards the high end of potential impacts, even though few impacts were observed. The 2011 USGS report also clearly shows that a minor (compared to the 2009 winter, let alone the historical USGS river discharge records) San Lorenzo River flood just before the start of the 2009 fine-grained dredge disposal experiment released enough sediment to cause turbidity levels higher than were recorded during the 2009 fine-grained dredge disposal operations. Similarly, the large wave events following the fine-grained dredge disposal experiment caused higher turbidity levels than during the experiment. This suggests that any species in the area must have developed in an environment that has been periodically exposed to higher sediment loads and turbidity levels than experienced during the fine-grained dredge disposal operations. Also, other long-term studies regarding giant kelp have found that kelp density and abundance are dominantly controlled by El Niño/La Niña-driven variations in upwelling (which cause variations in temperature that affects kelp growth, upwelling driven recruitment, etc.) and storm waves that dislodge kelp holdfasts. It is therefore not clear how any additional monitoring would make a distinction among the different factors that contribute to changes in kelp density and abundance and thus positively link the changes to dredge disposal operations. For the above reasons, this approval is not conditioned to require additional kelp studies.

As part of the demonstration dredging project conducted in early 2005, the RWQCB required that the Port District conduct a study on the sand crab, *Emerita analoga,* to determine if there were any cumulative effects to this species due to the dredging and disposal of fine-grain inner harbor sediments into the nearshore environment. *E. analoga* is a dominant member of the sandy beach invertebrate community along much of the California coastline. This species is a suspension feeder that uses its plumose second antennae to sieve particles from the water. Populations of *E. analoga* have been used as bio-indicators in a number of studies because this species is known to bio-accumulate metals and hydocarbons.[31] *Emerita analoga* were collected from four sites, including three sites along Twin Lakes

[31] Dugan, J.E., G. Ichikawa and M. Stephenson. 2004. *Monitoring of Coastal Contaminants Using Sand Crabs.* Prepared for Central Coast Regional Water Quality Control Board. 35 pp.

State Beach and one from a reference sample several miles downcoast at Capitola Beach. Samples were collected both pre- and post-dredging and disposal. In addition, sample results were compared to the results from *E. analoga* tissue samples analyzed from Santa Cruz Main Beach and Scotts Creek Beach by CDFG in 2000 and 2001. Whole tissue analyses were performed for trace metals and percent solids, as well as analyses for polychlorinated biphenyl congeners (PCBs), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), percent lipids, and percent solids. In summary, analytical results for metals, organochlorine pesticides, PCBs and PAHs were generally similar between pre- and post-dredge sand crab tissues samples (i.e., there were low concentrations of contaminants in the sand crabs collected before dredging and disposal took place, and there was no increase in these low concentrations of pollutants in sand crabs collected post dredging and disposal). Furthermore, these results were comparable to, or had less concentration of contaminants, than the results from tissue samples analyzed by CDFG in 2000 and 2001. The results satisfied staff at the RWQCB that the disposal of fine-grain material into the nearshore environment in 2005 did not result in any significant bio-accumulation of pollutants in *E. analoga.*

In summary, impacts to biological resources are anticipated to be temporary and similar to those associated with previously permitted annual and demonstration dredging episodes. Special Condition 2 places timing limitations on dredge activities in the inner harbor to avoid impacts to salmonids, consistent with the requirements of NMFS. Also, the activities permitted under the proposed permit should not create any disturbance that would have an adverse effect on the green sturgeon. Furthermore, the tidewater goby appears to no longer inhabit the Arana Gulch area. Previous studies have shown that the disposal of fine-grain material into the nearshore environment subject to established and permitted protocols did not have a significant impact on nearby kelp beds. Thus, the proposed project, as conditioned, is consistent with Sections 30230 and 30231 of the Coastal Act regarding protection of species of special importance and maintenance of the biological productivity of coastal waters.

D. Public Access/Recreation

Coastal Act Section 30604(c) requires that every coastal development permit issued for new development between the nearest public road and the sea "shall include a specific finding that the development is in conformity with the public access and recreation policies of [Coastal Act] Chapter 3." The proposed project is located seaward of the first through public road.

Coastal Act Sections 30210 through 30214, as well as Sections 30221 and 30224, specifically protect public access and recreation. In particular:

> ***30210:*** *In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.*
>
> ***30211:*** *Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.*

30212 (a): *Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects….*

30213: *Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred.*

30214 (a): *The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case….*

30221: *Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.*

30224: *Increased recreational boating use of coastal waters shall be encouraged, in accordance with this division, [..] providing harbors of refuge, and by providing for new boating facilities in natural harbors, new protected water areas, and in areas dredged from dry land.*

In addition, Coastal Act Section 30240(b) requires that development not interfere with recreational areas:

30240(b): *Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

The Coastal Act requires public recreational access opportunities to be maximized, including lower cost visitor facilities and water-oriented activities (like recreational boating), and protects areas near and at the shoreline for this purpose. The Harbor provides public access and recreational opportunities of regional and statewide significance. These include boat launching, berthing for commercial vessels and recreational boats, boat repair areas, marine-related retail/commercial businesses, sailing programs, yacht club and boat sales. The proposed dredging project will strongly benefit public access and recreation by maintaining adequate water depths in the harbor's navigation channels. In addition, the vast majority of the dredged material will be composed of sand, which will become available for beach replenishment.

The dredge season is limited to primarily the fall and winter months of the year, not including weekends[32] (see Special Condition 2). Thus, there are no public access impacts from dredging and disposal activities during the peak visitor times of the year (i.e. Memorial Day through Labor Day or on weekends during the dredge season). While dredging and disposal of sandy entrance channel material between November 1st and April 30th provides for beach replenishment (which enhances public access)

[32] The Port District typically performs dredging and disposal operations Monday through Thursday, and only performs these activities on Fridays if absolutely necessary to maintain an open entrance channel.

and while the beach remains open to the public during the entire dredge season (see photos on pages 126-132 in Exhibit C), there are a number of adverse impacts to public access during these months that occur due to the dredging and disposal of entrance channel sediments onto the dry beach or into the surf zone. First, the flexible above-ground pipeline used to transport suitable dredge spoils to the dry beach zone or the surf zone creates, from time to time as it is moved about by a tractor, a modest impediment to pedestrian travel along or to Harbor Beach/Twin Lakes State Beach (State Parks, however, supports the proposed dredging project because it replenishes the beaches – see page 17 of Exhibit F). Also, the pipeline is generally 16 inches in diameter and may need to be traversed by persons walking across the beach. In order to minimize the impacts of the pipeline on public access, Special Condition 7 requires that, when not in use during the dredging season, the flexible pipeline will be pulled away from the surf line and placed at the base of the small bluff fronting East Cliff Drive.

Secondly, sandy entrance channel dredged material that is being disposed of directly onto the dry beach or into the surf zone can also create temporary impacts to beachgoers. This is because the sandy dredged material is pumped from the pipeline as slurry (i.e. a liquid mixture of water and insoluble sand material (see photos on page 8 of Exhibit E and pages 22-24 of Exhibit G)). Although the slurry material appears muddy due to its high water content, it is composed of greater than 80% sand. The sandy entrance channel dredged material placed on the dry beach or into the surf zone creates a temporary zone of slurry on the beach or in the surf zone, which makes those areas temporarily unusable by the public. However, with respect to the dry beach zone, the Port District cuts a channel in the sand with the use of a tractor to drain the water off the slurry to the ocean quickly and by the next day the beach disposal area appears similar to the surrounding beach (i.e., it returns quickly to a dry and sandy state). With respect to dredge disposal via the flexible pipeline into the surf zone or through the offshore pipeline about 100 yards offshore, this disposal causes a temporary disturbance to swimmers or surfers due to the presence of the flexible pipeline in the water and the slurry in the nearshore ocean waters. Again, the impacts to water quality that affect public access and recreation are temporary because the dredged material quickly disperses into ocean waters during the (mostly) fall and winter months when dredging and disposal are taking place and high energy ocean conditions are present. In addition, the materials form a sandbar that attracts surfers from far and wide during the dredge season, thus enhancing this aspect of recreational access.

Thirdly, the Port District operates a tractor on the beach to position and maintain the discharge pipeline on the beach and in the surf zone and to distribute dredged material on the dry beach such that it matches the contours of the existing beach. Tractor use on the beach and in the surf zone can cause intermittent, temporary disruption to coastal access for pedestrians, swimmers, or surfers. The Port District's Dredging Operations Manual (see Exhibit B) includes precautions and limits to be implemented when the tractor is in use, including limiting use of the tractor in the wet zone[33] to a maximum depth of 1½ feet of water,[34] limiting its use in contouring the beach to the minimum necessary, and having a "spotter" on the beach whenever tractor operations are conducted to advise the tractor operator of hazards, and to advise beach visitors of the tractor hazard. However, even given these

[33] To minimize potential impacts to water quality, the tractor uses a biodegradable hydraulic fluid.

[34] This depth may be momentarily exceeded due to wave action.

precautions and limitations, regular tractor use on the beach for up to six months of the year (excluding weekends) constitutes a public access impact.

Many of the above public access impacts could be avoided by discharging the sandy entrance channel sediment exclusively or almost exclusively through the offshore pipeline. However, the regular use of a single offshore discharge point for sandy entrance channel sediments has more often than not been problematic for a number of reasons. At times the offshore pipeline disposal point has become perennially shallow, resulting in shoaling that encroaches into the federal navigation channel, causing dredged material to reenter the entrance channel after being disposed of through the offshore pipeline. During the 2005-06 dredging season, the Port District had to cease using the offshore pipeline because of unsafe surf and depth limitations in the entrance channel. During two recent dredging seasons (2006-07 and 2007-08), the offshore pipeline regularly became plugged with heavy sand effluent, making the offshore pipeline unusable. Retrieving the pipeline to correct this situation involves a crew of four people entering the breaking surf on a work boat, which is a potentially dangerous condition. Of course additional offshore pipes could be added to diffuse deposition, and other measures adopted that might reduce these feasibility concerns (e.g., suspending outlets above sea floor, periodic jetting with water or air to avoid build up concentrations, etc.), but these measures are untested and may have other potential significant impacts. For these reasons, using the offshore pipeline to dispose of the vast majority of sandy entrance channel sediments is usually not feasible.

In sum, the above activities (the deposition of sandy entrance channel slurry on the beach or in the surf zone, use of the tractor to accomplish dredge disposal operations, and beach contouring) create impacts to public access on the beach during the dredge season. As discussed in the "Dredging and Disposal Options Study" section above, there are a number of modifications that have the potential to reduce the release of hydrogen sulfide into the atmosphere and reduce tractor operations on the beach (see Table 4 on page 29 of Exhibit C) and are expected to have a superior performance compared to current dredging and disposal operations (see Table 5 on page 30 of Exhibit C). Special Condition 9 requires that the Port District further study and evaluate these options over the course of the next five years, including performing experimental "demonstration" projects for these options as appropriate. This condition also requires that if the results of these evaluations are positive in terms of controlling the release of hydrogen sulfide into the air, reducing the use of the tractor on the beach, reducing the amount of above-ground pipeline on the beach, etc., and are otherwise feasible to implement, the Harbor shall include the option(s) as part of the project description in its application for renewal of the dredging and disposal permit five years hence.

The offshore pipeline (used to dispose of entrance channel material with a high organic (hydrogen sulfide) content and all inner harbor dredged material, regardless of grain size) is buried under the sand of Harbor Beach until approximately the mean high water line, where it daylights and runs adjacent to the east jetty. This pipeline presents little impact to beachgoers. Special Condition 7 ensures that the permanent portion of the offshore pipeline will continue to be buried until approximately the mean high water line during the dredge season, and that it be completely buried when not in regular active use (i.e. during the non-dredging season). Regarding the temporary portion of the offshore pipeline that extends into the water, Special Condition 2 requires removal of this portion of the pipeline by May 15th of each

year.

The Port District periodically receives requests from the Santa Cruz County Public Works Department and the California Department of Parks and Recreation during periods of extremely high surf or ocean swells to move beach sand (with the use of a tractor) to form a berm to protect State Parks' restrooms, which are directly adjacent to East Cliff Drive, and East Cliff Drive itself (and the utilities within the right-of-way) from flooding (see pages 17-18 of Exhibit F for correspondence from the County's Public Works Department and State Parks regarding this issue). Special Condition 8 requires that the Port District notify the Executive Director when such a request is received and that the tractor operations and amount of sand relocated to these areas are the minimum amount necessary to protect this public infrastructure from imminent threat of flooding while not impeding general public access to the beach.

In conclusion, the dredge program is necessary to protect Coastal Act priority coastal-dependent uses. Although the transport of dredged materials to the dry beach or the surf zone through the above-ground pipeline and the use of a tractor to implement the disposal activities impacts public access to Harbor Beach/Twin Lakes State Beach, the dredge program is essential to allow for commercial and recreational boating access, it has some positive impacts on public access through the beach replenishment components of the project, the public access impacts are relatively minor and limited in duration, and there do not appear to be feasible alternatives at this time that could reduce such impacts further. The permit is conditioned to minimize any possible continuous barrier effects due to these pipelines, and to implement changes (through Executive Director review and approval) that reduce impacts as such options become available. Additionally, the permit is conditioned to require additional evaluation of options that may greatly reduce the impacts of the current entrance channel dredge disposal operations that result from the release of hydrogen sulfide into the air, and from pipelines and tractor use on the beach. As conditioned, the proposed project would preserve public access and recreational opportunities and, as such, is consistent with the above-cited public access and recreational policies of the Coastal Act.

D. Other

Finally, Coastal Act Section 30620(c)(1) authorizes the Commission to require Applicants to reimburse the Commission for expenses incurred in processing CDP applications.[35] Thus, the Commission is authorized to require reimbursement for expenses incurred in defending its action on the pending CDP application in the event that the Commission's action is challenged by a party other than the Applicant. Therefore, consistent with Section 30620(c), the Commission imposes Special Condition 10 requiring reimbursement for any costs and attorneys fees that the Commission incurs in connection with the defense of any action brought by a party other than the Applicant challenging the approval or issuance of this permit.

5. Coastal Development Permit Conditions of Approval

[35] See also California Code of Regulations Title 14 Section 13055(g).

A. Standard Conditions

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the Permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.
2. **Expiration.** If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.
3. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.
4. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.
5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the Permittee to bind all future owners and possessors of the subject property to the terms and conditions.

B. Special Conditions

1. **Scope of Permit.** This five-year coastal development permit (commencing with the 2012-13 dredge season in the fall of 2012 and ending with the completion of the 2017-18 dredge season in the spring of 2018) authorizes the dredging and disposal of Harbor sediments as described in the Dredging Operations Manual (see Exhibit B) (including changes to it that are reviewed and approved by the Executive Director) and as follows:

   a) Dredging of a maximum of 1,280,000 cubic yards of entrance channel sediment (consisting of greater than 80% sand) with disposal through the offshore pipeline or onto the beach or into the surf zone at Harbor Beach/Twin Lakes State Beach. All disposal of entrance channel sediments onto the dry beach or into the surf zone shall be consistent with the requirements of the Monterey Bay Unified Air Pollution Control District, as noted in Special Condition 3 below and as described in Exhibit D.

   b) Annual dredging of up to 20,000 cubic yards of clean inner harbor sandy sediment (>80% sand) or up to 10,000 cubic yards per year of silts/clays (<80% sand) plus 10,000 cubic yards/year of sandy sediment (>80% sand), with disposal through the offshore pipeline into the nearshore environment at a rate of not more than 550 cubic yards of silts and clay per day.

   c) Annual dredging of up to 35,000 cubic yards of inner harbor sediment with disposal at an upland site or at a federally approved offshore disposal site.

   Minor adjustments to the above parameters may be allowed by the Executive Director if such adjustments: (1) are deemed reasonable and necessary; and (2) do not adversely impact coastal

resources.

2. **Timing of Dredging and Disposal.** All dredging and disposal activities will be conducted during daylight hours, Monday through Friday only. The following date limitations on dredging and disposal operations apply:

   a) Entrance channel dredging and disposal: November 1st to April 30th of each dredge season.

   b) Upper (north) harbor dredging and disposal:

      i) If the material from the north harbor is greater than 80% sand, then dredging with disposal into the nearshore environment is limited to between November 1st and April 30th of each dredge season.

      ii) If the material from the north harbor is less than 80% sand, then dredging with disposal into the nearshore environment is limited to between October 1st and February 28th of each dredge season.

   c) Lower (south) harbor dredging and nearshore disposal: November 1st to April 30th of each dredge season.

   d) For the inner harbor (comprised of the south and north harbors): if any disposal site (including an upland site) is being used, other than disposal through the offshore pipeline into the nearshore environment, dredging may take place between July 1st and April 30th of each dredge season.

   e) Installation of the offshore pipeline may take place no earlier than September 15th, with removal by May 15th of the following year.

   Minor adjustments to the above date and time limitations may be allowed by the Executive Director if such adjustments: (1) are deemed reasonable and necessary; and (2) do not adversely impact coastal resources.

3. **Air Quality.** All disposal of entrance channel sediments onto the dry beach or into the surf zone shall be consistent with the requirements of the Monterey Bay Unified Air Pollution Control District (Exhibit D. If the hydrogen sulfide protocol is amended by the Monterey Bay Unified Air Pollution Control District during the five-year term of this permit, the Permittee shall submit the amended protocol to the Executive Director for review and approval.

4. **Sampling Analysis Plan, Dredged Material Analysis, Dredging Operations Plan. PRIOR TO COMMENCEMENT OF INDIVIDUAL DREDGING EPISODES,** the Permittee shall submit to the Executive Director for review and approval:

   a) A Sampling Analysis Plan (SAP) describing sediment sampling locations and applicable testing protocols. The SAP must be approved by the Executive Director prior to sediment sampling.

   b) Dredged material analysis (chemical, physical, biological) as required by ACOE, EPA, and

RWQCB, as well as sampling and testing information.

c) A Dredging Operation Plan that includes plans showing the specific area(s) and volume(s) to be dredged.

5. **Testing Requirements.** All dredged materials shall be tested according to the requirements of the ACOE and EPA using the most current ACOE and EPA testing methods and/or procedures. All dredged materials proposed for unconfined aquatic disposal shall meet the RWQCB and EPA Clean Water Act disposal standards.

6. **Other Agency Requirements. PRIOR TO COMMENCEMENT OF DREDGING AND DISPOSAL OPERATIONS**, the Permittee shall submit to the Executive Director for review a copy of a valid permit, letter of permission, or evidence that no permit is necessary from the following agencies: Army Corps of Engineers, U.S. Environmental Protection Agency, Monterey Bay National Marine Sanctuary, Central Coast Regional Water Quality Control Board, California Department of Parks and Recreation, the City of Santa Cruz, and Santa Cruz County.

7. **Disposal Pipelines.** When not in use during the dredging season, the flexible above-ground surf line pipeline shall be removed from the beach area unless this is proven, to the Executive Director's satisfaction, to be infeasible, in which case it shall be pulled away from the surf line and placed at the base of the small bluff fronting East Cliff Drive in a manner most protective of public recreational access and public views. Regarding the permanent portion of the offshore pipeline, this pipeline shall be buried to a depth of at least 2 to 3 feet until approximately the mean high water line during the dredging season. This pipeline shall be buried completely to a depth of at least 2 to 3 feet during the non-dredging season. This permit does not authorize any riprap or other protective devices or measures to protect the permanent or temporary portions of any disposal pipeline.

8. **Notification of Berming.** The Permittee shall notify the Executive Director of any request from the California Department of Parks and Recreation or Santa Cruz County to move sand with the tractor to form a berm to protect East Cliff Drive and its associated infrastructure or to protect State Parks' public restrooms. Such berming activities shall be the minimum amount necessary to protect this public infrastructure from imminent threat of flooding while not impeding general public access to the beach. The notification shall describe the conditions that have rendered such a request necessary to protect public infrastructure, and shall not commence absent approval of the Executive Director.

9. **Options Study.** The Permittee shall further evaluate the options shown with a positive or superior score in Table 5 of the Options Study (page 30 of Exhibit C) with the goal of employing a method or variety of methods to reduce hydrogen sulfide releases and to reduce tractoring and pipeline handling operations on the beach to the maximum extent feasible. Such evaluation(s) may be accomplished as an experimental "demonstration" project or series of "demonstration" projects, each of which may require separate approval (subject to the Executive Director's determination). The Permittee will submit written results of such evaluations to the Executive Director for review and approval. If the results of these evaluations are positive in terms of controlling the release of hydrogen sulfide into the air, reducing the use of the tractor on the beach, reducing the amount of

above-ground pipeline on the beach, etc., and are otherwise feasible for the Permittee to implement and employ, the Permittee shall include the option(s) as part of the project description in its application for renewal of the dredging and disposal permit five years hence and, if feasible, add them to this current permit if directed by the Executive Director.

10. **Liability for Costs and Attorneys Fees.** The Permittee shall reimburse the Coastal Commission in full for all Coastal Commission costs and attorneys fees (including but not limited to such costs/fees that are: (1) charged by the Office of the Attorney General; and (2) required by a court that the Coastal Commission incurs in connection with the defense of any action brought by a party other than the Permittee against the Coastal Commission, its officers, employees, agents, successors and assigns challenging the approval or issuance of this permit. The Permittee shall reimburse the Coastal Commission within 60 days of being informed by the Executive Director of the amount of such costs/fees. The Coastal Commission retains complete authority to conduct and direct the defense of any such action against the Coastal Commission.

6. California Environmental Quality Act (CEQA)

Section 13096 of the California Code of Regulations requires that a specific finding be made in conjunction with coastal development permit applications showing the application to be consistent with any applicable requirements of CEQA. Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment.

The Santa Cruz Port District, acting as lead CEQA agency, found the proposed project to be categorically exempt per CEQA Section 15304(g). The Coastal Commission's review and analysis of land use proposals has been certified by the Secretary of Resources as being the functional equivalent of environmental review under CEQA. The Commission has reviewed the relevant coastal resource issues with the proposed project, and has identified appropriate and necessary modifications to address adverse impacts to such coastal resources. All public comments received to date have been addressed in the findings above. All above findings are incorporated herein in their entirety by reference.

The Commission finds that only as modified and conditioned by this permit will the proposed project avoid significant adverse effects on the environment within the meaning of CEQA. As such, there are no additional feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse environmental effects that approval of the proposed project, as modified, would have on the environment within the meaning of CEQA. If so modified, the proposed project will not result in any significant environmental effects for which feasible mitigation measures have not been employed consistent with CEQA Section 21080.5(d)(2)(A).

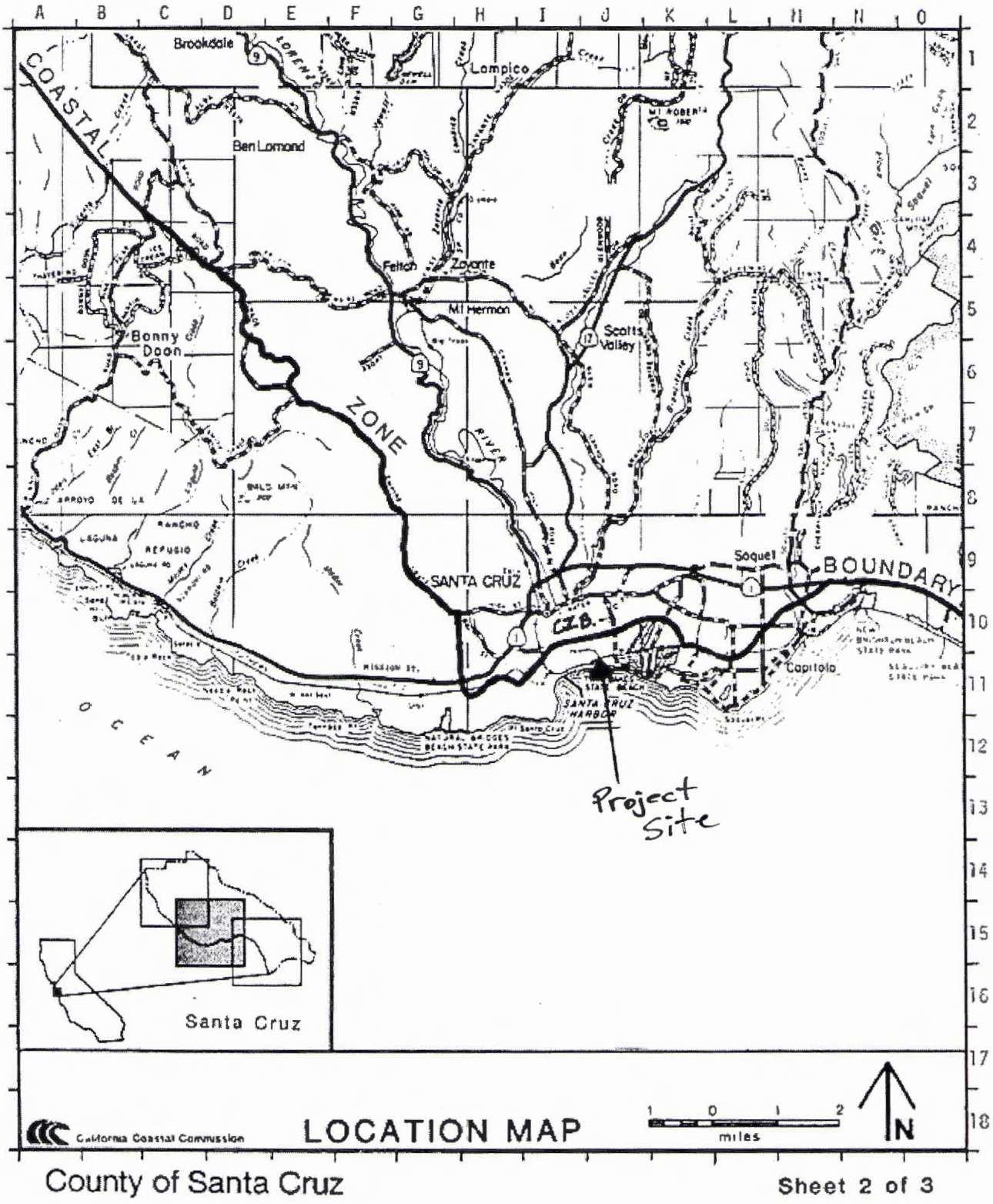
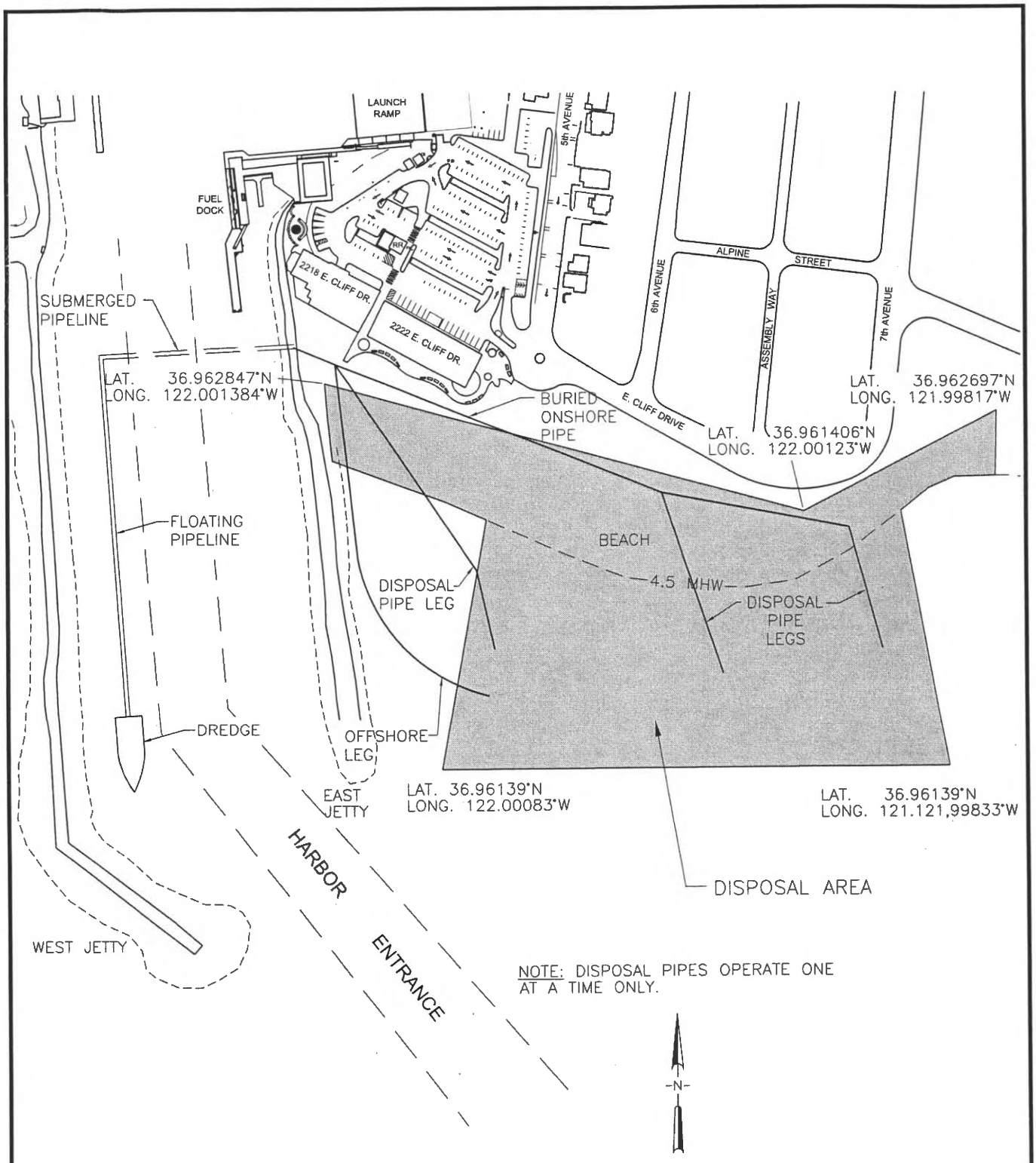


Exhibit A
1 of 2

Exhibit A
2 of 2



PURPOSE: TO MAINTENANCE DREDGE EXISTING ENTRANCE/FEDERAL CHANNEL & BERTHING AREAS IN THE NORTH AND SOUTH HARBORS

DATUM: MLLW

DISPOSAL SITE
ALTERNATIVE A

0 100 200 300 400
FEET

SANTA CRUZ PORT DISTRICT
135 5th AVENUE
SANTA CRUZ, CA 95062

IN: SANTA CRUZ SMALL CRAFT HARBOR
AT: NORTH AND SOUTH HARBOR
COUNTY OF: SANTA CRUZ

SHEET 11 OF 12 MARCH 15, 2012

OPERATIONS MANUAL

SANTA CRUZ HARBOR DREDGING PROGRAM

Prepared by:

Marian Olin, Dredge Program Manager

July 1995
Revised October 1, 1998
Revised March 6, 2000
Revised December 15, 2000
Revised December 12, 2001
Revised November 7, 2002
Updated Schedule February 27, 2004
Revised October 18, 2010

Santa Cruz Port District, 135 Fifth Avenue, Santa Cruz, CA 95062 (831) 475-6161
Port Director Lisa Ekers

TABLE OF CONTENTS

OPERATIONS MANUAL

SANTA CRUZ PORT DISTRICT DREDGING PROGRAM

SECTION I - PURPOSE OF DREDGE OPERATIONS MANUAL

The Dredge Operations Manual is intended to provide a thorough description of the daily and seasonal objectives and tasks which comprise the dredging program at Santa Cruz Harbor. It is intended to be a guide for employees; agency members; and, the general public. It is not an exhaustive account of any one element of the dredge program. Augmented information can be obtained in the following documents:

- 2009 Dredge Management Plan (http://www.santacruzharbor.org/dredgingStudiesAndReports.html)
- Demonstration Dredging Project Reports (http://www.santacruzharbor.org/dredgingStudiesAndReports.html)
- Various Agency permits available at the Santa Cruz Harbor office, 135 5th Ave., Santa Cruz, CA 95062, 831 475 6161, www.santacruzharbor.org

SECTION II – HISTORY OF THE SANTA CRUZ HARBOR DREDGING PROGRAM

Santa Cruz Harbor was constructed in 1963 as a joint venture between the Santa Cruz Port District and the United States Army Corps of Engineers. The Port District funded all of the improvements for Santa Cruz Harbor and 35% of the jetty and initial dredging improvements. The Corps of Engineers provided 65% of the jetty and original dredging improvements. Since its construction, the harbor has experienced extensive yearly shoaling of the harbor entrance. The Corps of Engineers, from 1965 through 1986, maintained the harbor channel by contract dredging services. Commencing November 1986, the Port District assumed operational dredging responsibility for Santa Cruz Harbor. The Port District now owns and operates its own dredging system. This manual outlines the methods and procedures which are employed in its operation. Comprehensive studies have been conducted on the shoaling phenomenon and possible solutions. Studies are referenced in the Port District's Dredge Management Plan available on the harbor's website http://www.santacruzharbor.org/dredgingStudiesAndReports.html. No possible solutions have obviated the need for yearly dredging.

SECTION III – FEDERAL CHANNEL DREDGING PROGRAM

A. General Dredging Objectives

Santa Cruz Harbor's mission is to provide a year round, useable and safe channel for transit in and out of the harbor for recreational, commercial traffic, and marine rescue service purposes, and to fulfill its mission as a "harbor of refuge."

Santa Cruz Harbor is designated by the State of California and by the U.S. Army Corps of Engineers as a "harbor of refuge," which means it serves mariners needing to find safe haven from storms or from other emergency circumstances they experience at sea.

The federal navigation channel is specified at 20 feet MLLW from station 24+00 at the southern reach to station 14+00 within the channel. Winter storm cycles usually do not allow this as a steady-state condition, but the harbor strives to maintain at least 14 ft MLLW as a controlling depth. Controlling depth is defined as the shallowest depth found within a designated channel.

Even when depths are achieved, the Santa Cruz Harbor entrance is still subject to breaking wave conditions during the heaviest winter storms.

Each year the dredge "Seabright" is scheduled to work 40 hour weeks commencing in November and ending April 30. The schedule can be increased or decreased depending on shoaling conditions. The current schedule is appended to this manual (A-1).

The operational approach to dredging is determined each day and each week by management with the Dredge Captain. Oftentimes, disposal considerations dictate dredging decisions (see Section B, Entrance Channel Sediment Disposal – General Objectives).

Dredging is strictly controlled and regulated by various state and federal agency permits (refer to Dredge Management Plan, pages 2-6).

B. Entrance Channel Sediment Disposal – General Objectives

The disposal of entrance sediment, which averages 90% sand (10% silts / clays), presents significant benefits and impacts on the receiving areas. The dredging program both deepens the federal channel and replenishes the beaches east of the harbor with sand.

The federal channel dredging operation averages 245,000 cubic yards of sediment per year over the last 10 years. In the 2009-10 dredging season, there was an enormous spike to 450,000 cubic yards. Whether this increase in sand is an anomalous spike or a trend is not known.

The disposal of hydraulically dredged sand from the entrance is a complex program, balancing a myriad of objectives. In general, these are:

- replenish harbor and state public beaches;
- protect bluffs and roads;

- protect dredge pipeline;
- protect public utilities (underground and aerial);
- protect park assets for Twin Lakes State Beach;
- Minimize impacts on beach visitors;
- comply with odor regulations ;
- contend with adverse currents / tides.

Three types of disposal methodologies are employed:

a. Anchored Offshore[1] – used when sediment is highly organic and odor control is paramount;

b. Surf-Line Disposal (wet zone) – used when sediment is organic and the offshore anchored pipe is not available or advisable. The surf line pipes are attached to the under sand pipe and moved into place daily by D5 tractor.

c. Dry Zone (above surf-line) – used for coarse sand with no organics, to build beach volume. Method of moving above ground pipes into place is the same as surf line option.

C. Specific Disposal Programs

Mitigate hydrogen sulfide (rotten egg smell) and comply with the Monterey Bay Unified Air Pollution Control District "MBUAPCD" regulatory protocol, which has specific threshold values that cannot be exceeded. (See 2006 MBUAPCD permit protocol.)

- Hydrogen sulfide is produced by the decay of trapped kelp in harbor entrance sediment;

- Hydrogen sulfide is water soluble. Accordingly, the Port District uses the following methods to reduce the odor emissions present in the discharge slurry:

Methods

  - Underwater discharge from articulating polyethylene pipes are moved into position daily, and adjusted as needed throughout the daily tidal cycle. Use Bulldozer as the moving force. The pipe can radiate from one or three beach-based positions from the east jetty to 9th Avenue (see appended graphic);

  - Use anchored offshore pipeline when ocean and climatic conditions allow (see appended graphic).

Protect landside assets

[1] Both anchored off shore discharge and surf line discharge are considered "nearshore discharge"

- Coastal bluffs: East Cliff Drive along the bluffs from 5th Avenue to 12th Avenue. Cliff areas east of 12th Ave.

- Utilities:
  - High volume sewer transmission line (County of Santa Cruz)
  - Power transmission lines / poles
  - Water utility poles / lines

- Structures – State Parks' restrooms.

- Port District underground (beach sand area) dredge transmission line.

- Raising the beach plain at 9th Avenue. This is the maneuvering area that enables the articulating polyethylene dredge pipe to be swing into place at the 9th Avenue disposal point. The Schwan Lake lagoon discharge tends to migrate west, laterally along the beach. In doing so, it erodes the height and width of the beach. This creates a large backwater lagoon, which blocks beach access and stymies corrective disposal procedures.

- Provide widened winter beach for area visitors. The winter beach would normally be very narrow with a negative slope back to the bluff / street.

Disposal Methodology for Coarse, Non-Organic Sand Disposal

- Pump coarse, non-organic (non-hydrogen sulfide producing) sediment above the surf-line. This builds beach volume and achieves all replenishment objectives.

- Level out (groom) area with bulldozer so there is a natural contour. Move any building sand pile toward the bluff area.

- Prevent sand slurry from running laterally or backward on the beach. Use bulldozer to make sand slurry run to ocean.

Prevent Sand Return to the Federal Channel

Deliver the dredged sand from the harbor in such a way that disposed sand does not return to the harbor or the federal navigation channel using the following methodology:

- Monitor current and observe the offshore pipe operation.

Precautions and limits to be used by the Port District in tractor use

- The bulldozer will use only biodegradable hydraulic fluid in case of a hydraulic leak (unless new tractor acquisition prohibits use of such product in machinery warranty).

- The Bulldozer will operate in the wet zone to a maximum depth of 1 ½ feet of water depth. Momentary exceedence of this depth may occur due to surge waves.

- The Bulldozer will be used to contour beach and shore up the sand. It will perform this function only then there is specific need to meet the objectives above.

- Normal tractor operations will take approximately 3 hours per day. However, wave and climatic conditions can push that need to nearly full-time during a 10-hour workday. The Port District will use all methods available to avoid continuous use of the tractor.

D. Beach Monitoring Programs

Whenever entrance dredging is conducted, a monitor team will be present on the discharge beach to provide safety and hydrogen sulfide emissions surveillance services.[2]

Tractor Safety
A spotter person will be present on the beach whenever tractor operations are conducted. The spotter will advise the tractor operator of hazards, and will advise beach visitors of tractor hazard.

Air Emissions Monitoring Protocol
Air monitoring protocols are set forth by the Monterey Bay Unified Air Pollution Control District "MBUAPCD" permit, and require a mobile hydrogen sulfide emissions sensor that is always downwind of the discharge outfall. The mobile sensor is normally mounted to a vehicle and a driver is assigned to track the wind.

A monitor is also assigned to track hydrogen sulfide emissions values, which are then transmitted electronically from the mobile station, to a beach control station located in the lifeguard tower on the beach. This is accomplished with computer monitoring equipment, which is located in a beach station adjacent to 5th Avenue on East Cliff Drive. The dredge leverman also has a video monitor for minute-by-minute information on hydrogen sulfide levels.

The beach control station monitor will call for immediate shutdown of operations if emissions begin to reach limit values. Once hydrogen sulfide levels subside, operations will be resumed or shut-down for the day, depending on specific protocol guidance.

E. Other Beach Protocols

1. The beach will be graded and groomed whenever unnatural contours occur near the disposal end of the dredge pipe. Beach drop-offs under the disposal pipe of more

[2] Inner-harbor dredging does not require hydrogen sulfide monitoring because no hydrogen sulfide emissions have been associated with this as part of dredging.

than 4' will be groomed to shallow contour. Large pools underneath the disposal end of the pipe will also be minimized. In general, the Port District will attempt to minimize the impact of the dredging disposal on the highly used public beach.

2. Each year, no dredging will take place on State Park property (east of 6th Avenue) from 5:00 pm on the Friday preceding Good Friday, to the Monday morning following the Monday after Easter Sunday. Dredging during this period can occur on the Port District beach area (west of 6th Avenue), or via the offshore anchored pipeline. However, the dredging operation will be terminated if too many beach user conflicts are encountered during this period.

3. The yearly dredge schedule is designed to avoid high-use recreational days by eliminating weekends, holidays, and by termination of all dredging by April 30, of each year. However, the Port District may request extended days into May if shoaling persists.

   No dredging equipment will be allowed on the beach, except between October 1 and May 15 of each year.

4. The permanent pipeline section on the beach shall be covered by at least three feet of sand at all times. This does not include the flexible section, which must articulate between the upland storage plane and the surf zone.

5. Broken pipelines shall receive immediate repair.

6. Noise will be kept to the minimum required to complete the job. All equipment will be kept in top condition. Engine, machinery, and equipment will be repaired immediately if a malfunction occurs.

7. Equipment on the beach shall be kept to a minimum and shall consist only of necessary spare pipes, 1 D-5 bulldozer and monitor vehicle.

8. Proper signage for public safety and information will be provided. An informational brochure will be available from the security guard.

9. Complaints from the public about the environmental impact of our dredging operation shall be referred to harbor management for immediate resolution.

10. Pipe Management: Flexible 18" high-density polyethylene pipe is used at the disposal end. This pipe will be moved into the surf zone each day by bulldozer. At the end of the day, the pipe will be moved back against the bluff where high surf action cannot get to it and cause it to move and become a hazard. The end of the pipe will be covered with sand each night so that it doesn't become an "attractive nuisance" for children and animals.

11. Any foreign objects found on Twin Lakes State Beach will be picked up by monitor / safety team members. If any debris is too large for handling, the team leader will call a supervisor for assistance. The harbor grounds crew can be employed to assist.

    Naturally occurring, organic material does not have to be removed. However, management in consultation with State Parks' management may address persistent organic accumulation.

F. Regulatory Permits

Permits pertaining to dredging are issued by the following agencies:

US Army Corps of Engineers (In close coordination with Region IX EPA)
- Permit 25179S Dec 2001-expires Dec 2011
- (Contact Debra O'Leary 415 5036807)

California Coastal Commission
- Permit CP 3-05-065 Nov 2005. Expires Nov. 2010
- New permit pends
- (contact Susan Craig 831 427 4891)

Monterey Bay National Marine Sanctuary.
- Authorization 201-038-A4 Nov 2005. Expires Nov 2010
- New Permit pends
- (contact Deirdre Whallen 831 647 4207)

California Regional Water Quality Control board (CRWQCB)
- Technically conditioned Water Quality 401 Certification amended June 2007
- Valid until amended.
- (contact Peter von Langen 805 549 3688)

California Department of Parks and Recreation
- October 2005-October 2010. New Permit pends.
- (contact Victor Roth 831 335 6385)

Monterey Bay Unified Air Pollution Control District.
- Permits 10247B 11427A
- (contact David Frisbey 831 647 9411)

SECTION IV – INNER-HARBOR DREDGING OBJECTIVES

A. Dredging Objectives

Inner-harbor dredging is extensively analyzed in the 2009 Dredge Management Plan.

The most serious phenomenon is sediment from the Arana Gulch watershed which settles in the north harbor and hazards navigation and berthing functions. Concurrently, ocean sediments are driven into the entrance, past Station 10+00 (fuel pier) and deposited in the south harbor. This problem is less critical than the Arana Gulch runoff.

A great deal of effort has been made since 1998 to understand and solve the deposition of inner-harbor sediment, because it can close both navigation channels, fairways, and berths. This, in turn, causes loss of function and destruction of float docks which are crushed at low tides when the sit on the harbor floor. The Port District has made a major effort in preventing such shoaling and in effectively removing such shoals when they do occur.

B. Disposal Methods

Disposal method is dictated by grain size, regulatory permits, and time of year. The March 2009 Dredge Mangement Plan is a comprehensive analysis and guide book for this program. (See references and electronic links.)

1. Nearshore Disposal Options

Note: Nearshore includes pipeline disposal using either anchored off shore pipe or surf line disposal.

Sediment 80% or greater sand content

The Port District has been allowed to place nearly all of its sandy material in the nearshore.

Sediment 50% to 79% sand content

The Port District has been limited by regulatory permits in how much silt and clay material it can discharge to the nearshore with material comprised of 50%-79% sand content. The current limit is 3,000 cubic yards of material per season.

Nearshore disposal of fine-grained sediment (<80% sand) is always conducted through the anchored, offshore pipeline. Discharge of silts and clays can cause turbidity in the surf-line. Tide cycles, wind direction and general weather conditions and beach visitorship can combine to create user conflicts. The Port District will monitor the beach to ensure user conflicts are mitigated. This can be done by cordoning off the beach area and not allowing swimming within 200 yards of the discharge. If swimmers do enter the water, the discharge operation will be shut down until they leave.

October Dredging Operations

In October, the Port District is allowed to dredge after sunset.[3] So, when it is able, the Port District will conduct nearshore dredging of the inner-harbor during this month.

Pending Permit Applications to Increase The Volume of Fine Grain Material That Can Be Discharged Into the Nearshore.

[3] Steelhead fish are a protected species. Night operations after October are not allowed in order to avoid predicted fish movement at night.

The Port District has conducted four demonstration projects in 1998, 2001, 2005 and 2009, to show that clean, fine-grained sediments can be placed in the nearshore (surf zone) at 7^{th} – 9^{th} Avenue. Analysis of these tests are summarized in the 2009 Dredge Management Plan; the complete studies are available on Santa Cruz Harbor's website http://www.santacruzharbor.org/dredgingStudiesAndReports.html.

The basic results of the demonstration projects are that no adverse nearshore impacts were observed at the rates of discharge used (550 cubic yards/day of silts and clays (<64 microns).

A request to increase the total yearly volume of fine-grained material allowed to be deposited in the surf zone (to 10,000 cubic yards per season) is pending in permit applications with all regulatory agencies.

Sediment Unsuitable For Nearshore Disposal
Current permits dictate that inner-harbor sediment not deemed suitable for nearshore disposal must be dredged using alternative means. These alternatives are more thoroughly analyzed in the 2009 Dredge Management Plan, and include:

2. **Clamshell bucket dredging by land-based crane, to landside holding area.**

   Sediment is placed in adjacent pens to dry. When dry, the material is trucked to a landfill or other site.

   This method can only reach approximately 70' to 90' from the edge of the land.

3. **Clamshell bucket dredging by land-based crane or hydraulic dredging, to barge.**

   Sediment is dredged to a barge. The material is then transported by barge to EPA-managed, offshore deep disposal site SF-14, located approximately 1 mile from Moss Landing. This alternative requires a 13-mile tug tow from Santa Cruz Harbor to SF-14. To date this method has never been employed by Santa Cruz Harbor.

4. **Other alternatives.**
   Sediment can be dredged hydraulically, or by land-based crane, to a landside drying plant. The material is dried to a point where is can be directly truck to a landfill or a restoration project. This method was used in fall of 2007 in the north harbor.

SECTION V – SEDIMENT TESTING

A. Entrance Dredging

The entrance historically collects sediment from ocean currents. The material averages 90% or greater sand content.

Because of the consistency of grain size and no toxicity signature, testing is being conducted bi-annually in even-numbered years and for Tier 1 grain size categorization

B. Inner-Harbor

In quadrants proposed for dredging, sediment that is 80% sand content or greater is tested for Tier 1 grain size.

Quadrants proposed for dredging which have grain sizes less than 80% sand content are tested for Tier 2 chemical panels and Tier 3 bio-assay tests as proscribed by latest U.S. Army Corps of Engineers / Environmental Protection Agency guidance.

The specifics of each year's testing are contained in the harbor's final proposed Sampling and Analysis Plan "SAP." A draft plan is submitted for each dredging area in May of each year. The plan is reviewed by regulatory agencies and amended as needed. The approved final plan is then executed by the Port District in June or early July.

A third party contractor conducts the field testing and delivers the sediment sample to lab(s) for analysis. The results are submitted by labs to contractor, and a full Sampling and Analysis report (SAR) is generated for all regulatory agencies for their review. Regulatory agencies then determine if dredging can or cannot go forward as proposed, or if changes need to be made to the dredge plan.

SECTION VI – DREDGING OPERATION REPORTS

The Port District will provide the following reports on the dredging operation to regulatory agencies:

A. Federal Navigation Channel

Before dredging can commence each season (approximately November 1), a survey of the federal channel depths relative to mean low low water "MLLW" datum is completed.

A "Notice of Commencement of Dredging" is submitted to the U.S. Army Corps of Engineers once dredging starts.

Each week, within seven days of the end of the dredging week (normally Thursday), the Port District provides a table of the daily volumes of material pumped from the entrance.

At the end of the season, the Port District will send a "Notice of Completion" and a hydrographic survey of the final depths in the federal channel, relative to MLLW datum, to the U.S. Army Corps of Engineers.

The MBUAPCD has specific reporting requirements for harbor hydrogen sulfide emissions. Requirements include a monthly report and daily reports, and specific reporting of any protocol shut-down events.

B. Inner-Harbor

Prior to commencing dredging, the Port District will provide to all permitting agencies hydrographic survey of depths in the intended dredging area(s), relative to MLLW datum. This is usually accomplished in the SAP proposal.

After dredging operations are completed, the Port District will provide permitting agencies with a hydrographic survey of final depths relative to MLLW datum.

SECTION VII – DREDGING MANAGEMENT – ORGANIZATION

A. PORT DIRECTOR

The Port Director and management team have responsibility for overall administration of the Santa Cruz Harbor dredging program. These elements include:

- Budgeting
- Legislative matters that affect dredging
- Regulatory permits, acquisition and compliance
- Long-term system (maintenance, rehabilitation, modernization)
- Crew acquisition and management
- Production and cost control
- Arana Gulch watershed programs
- Public relations
- Give guidance / direction to the Dredge Captain (see dredge operations components for a detailed list)

B. DREDGE CAPTAIN

The Dredge Captain is responsible for day-to-day operational conduct of dredging. The Port District objectives for the Dredge Captain position are:

- Efficient operation of the dredging system, including crew recruitment, organization and assignment
- Maintenance organization of plant, including short-term needs and longer-term planning
- Compliance with all regulatory conditions set forth for dredging operation
- Cost containment of operation
- Implementation of dredging programs, systems and policies set forth by management
- Ensure operation is conducted in a manner that provides for:

- Crew safety
- Compliance with all OSHA rules; best management practices; and specific Port District-directed mandated practices
- Public safety (beach visitors, boaters and general public)
- Equipment safety (dredge system equipment and Port District general assets)

- Provide management with information that:
  - is required and which assists in accomplishing all items listed above
  - facilitates timely budget input during the year in preparation for April 1 budget (typically adopted in February each year)

SECTION VIII – EQUIPMENT RESPONSIBILITIES

The dredge system is comprised of the following equipment:

- Dredge "Seabright" – 220 ton, 16" hydraulic suction dredge
- 8" dredge "Squirt"
- All ancillary dredging equipment -- pipe, floats, joints, anchors, skiff

The dredge crew also has the use of the following shared equipment:

- Workboat (46' "Dauntless")
- 18-ton Lorain crane
- 15,000 lb Liftall forklift
- 1-ton flatbed truck
- Bulldozer

Shared Equipment

The resources of the dredging operation are available to the marine maintenance department during the off-season or as needed.

The Dredge Captain has principal responsibility for equipment assigned to the dredge operation. During the off-dredging season, the Maintenance Supervisor will ensure that all shared equipment is serviced and maintained.

SECTION IX - WATER POLLUTION

Crew will report to Dredge Captain immediately any foreign substance spilled in the waters of the harbor or Monterey Bay. Dredge Captain will report immediately to the Harbormaster or Port Director who will, in turn, report to the Coast Guard and any other appropriate agency, including the Coastal Commission and the Monterey Bay National Marine Sanctuary.

In the absence of the Harbormaster and Port Director, the Dredge Captain will report the spill to the Coast Guard.

SECTION X - "SEABRIGHT" MAIN ENGINE RPM LIMITATIONS

The Caterpillar, model 3512, shall never exceed 1500 RPM. Any deviation above 1500 RPM will be reported to the Port Director with all available information surrounding such incident.

This restriction is placed on the dredge operation by the Monterey Bay Unified Air Pollution Control District permit #3815.

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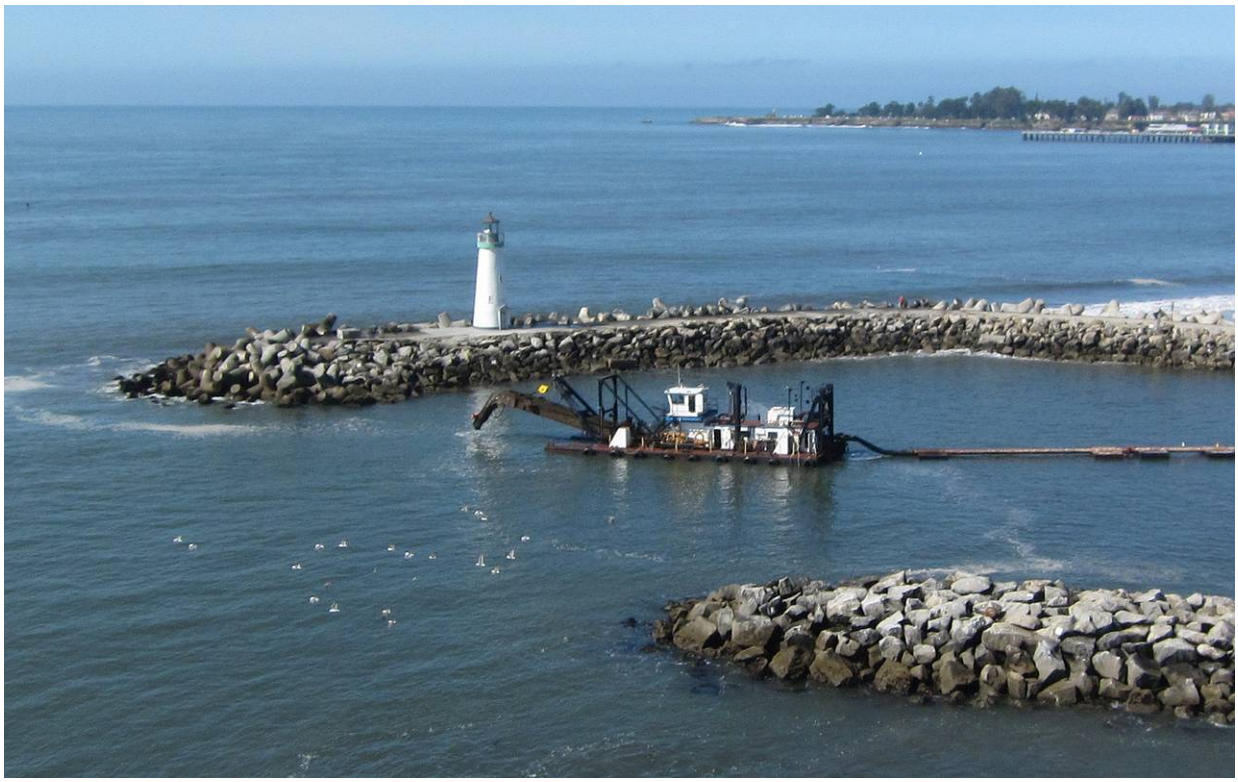
SANTA CRUZ HARBOR

DREDGING & DISPOSAL OPTIONS STUDY (Phases 1 & 2)



Prepared for:

Santa Cruz Port District
135 Fifth Avenue
Santa Cruz, CA 95062

Prepared by:

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2185 No California Blvd., Ste 500
Walnut Creek, CA 94596

KINNETIC LABORATORIES INCORPORATED
307 Washington Street
Santa Cruz, CA 95060

December 2011

M&N Job No: 7394

SANTA CRUZ HARBOR

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December 21, 2011

Marian Olin
Santa Cruz Port District
135, 5th Avenue
Santa Cruz, CA 95062

Subj: Final Report
Dredging and Disposal Options Study – Phases 1 & 2
M&N File No: 7394

Dear Ms. Olin:

We are pleased to provide you with the Final Report for the subject study. It has been a pleasure working with you and the District on this project, and we appreciate the opportunity to provide our services to the Port District.

We look forward to assisting the District on this or other projects in the future. Should you have any questions on the report, please contact me.

Sincerely,

MOFFATT & NICHOL

Dilip Trivedi, Dr.Eng., P.E
Principal / Project Manager

CONTENTS

APPENDICES

TABLES

FIGURES

1. INTRODUCTION

1.1 Background

This report provides a review of the current dredging/disposal practices at Santa Cruz Harbor, a survey of other harbors with similar characteristics as Santa Cruz Harbor, and an assessment of other potential options that could be implemented to augment or modify current practices. The objective of this study is to determine whether feasible and cost effective alternatives exist to maintain the Federal entrance channel and berths to its design and optimum navigable depths, while minimizing odorous sulfide releases and equipment operations and infrastructure on the east beach. A key aspect of the overall study was to gather information on the dredging and disposal practices at other similar harbors/marinas and compare them to those at Santa Cruz, and determine if viable options exist..

Santa Cruz Harbor is located at the northern end of Monterey Bay as presented in Figure 1. The Harbor has been in operation since 1964; the US Army Corps of Engineers maintained navigation via frequent dredging, but high sedimentation rates prevented year-round navigation access. In 1986, dredging practices changed, with the Port District maintaining year round access using its own dredge acquired in a joint venture between the Port District and U.S. Army Corps of Engineers. Due to the high rate of longshore transport from west to east, sand moves around the tip of the west jetty and deposits within the harbor entrance. The Santa Cruz Port District (District) dredges the channel and places material in the specified disposal zone east of the harbor on the beach or in adjacent nearshore and offshore areas, where the sand would have deposited in the absence of the harbor. This annual dredging is typically referred to as *bypassing,* which is a means to restore natural sand transport around an inlet. This is not unlike many other marinas, harbors or ports around the world, including several along the California coastline.

The District uses its two dredges to maintain the inner harbor and the entrance channel. However, the entrance channel sediment frequently contains decomposing organic material that can emit hydrogen sulfide (H_2S) gas, which has led to challenging issues related to nuisance odor. Local odor complaints resulted in a Health Consultation by the U.S. Department of Health and Human Services (2007), which found that there were no associated health risks. In response to complaints, however, the Monterey Bay Unified Air Pollution Control District issued a Hydrogen Sulfide Nuisance Prevention Protocol permit. The Port District's operational practices for placing sand directly on the east beach have been impacted by this permit protocol. The Santa Cruz Port District must now operate under strict emission limitations imposed by the Monterey Bay Unified Air Pollution Control District permit.

These limitations due to H_2S nuisance-level odor have significantly influenced operational practices and costs for by-passing sediments dredged from the harbor entrance. A method to dispose material in the nearshore (surf zone) minimizes H_2S emissions. The District has devised methods to address this issue by disposing material in the nearshore environment, below the tide line, because H_2S is water soluble. However, this requires anchoring operations by the Port workboat in the surf zone which can be risky depending upon surf conditions. This practice also does not place the sand immediately on the beach, which is optimal for beach replenishment. The District's operational practice is to place materials that are lower in sulfides directly on the beach, and to switch to offshore disposal when excessive sulfide emissions occur. Thus the District needs to carefully monitor air emissions during the dredging operations. In practice, air monitoring requires additional personnel and costs for the dredging operations and also results in frequent shutdowns of beach disposal for all day as required by the permits. Dredging operations thus are less efficient.

These methods have been implemented over the past several years with regulatory approvals for the dredging and disposal practices. At the same time, year-round safe passage for vessels in the entrance channel has been maintained for the most part. However, in light of the sensitive marine resources and public use of the beach, the State Coastal Commission asked the Port District to have its dredging and disposal practices evaluated by external experts, particularly the issues related to disposal practices associated with annual dredging. The District has also prepared several monitoring and marine resource evaluation studies to demonstrate that ongoing practices are not detrimental to the environment, and has also substantially modified its disposal strategy in recent years.

1.2 Purpose

The primary objectives of this study are to review the District's current entrance channel dredging and disposal practices, compare them to an industry standard by surveying other similar harbors, evaluate the benefits and potential adverse effects of its current practices, and explore potential alternatives to District's dredging/disposal practices.

1.3 Scope of Work

The Scope of Work for this study includes the following tasks:

1. *Review Santa Cruz Port District's Current Practices.* This task includes a review and assessment of current dredging/disposal practices at the harbor and regulatory requirements (dredging costs, regulatory oversight, and impacts on public use of beach and on marine resources).
2. *Survey and Review Dredging/Disposal Practices near Urbanized Areas for Other Harbors.* This task included conducting a survey of dredging/disposal practices at other harbors or marinas in an urban setting that have oceanographic conditions similar to Santa Cruz Harbor, and objectively compare Santa Cruz's current dredging and disposal practices to the other surveyed harbors.
3. *Identify and Evaluate Potential Modification Options to Current Practices.* This task includes identifying and evaluating potential modifications to current practices to reduce adverse effects on recreational and marine resources, and to improve efficiency and performance.

2. SUMMARY OF EXISTING CONDITIONS

The objective of this task is to review the dredging and disposal practices at Santa Cruz Harbor by meeting with District staff to summarize operational conditions, the location and occurrence of kelp and other fine grained material, and operational challenges associated with timing and location of dredging and disposal. In addition, dredging permit conditions from various agencies for Santa Cruz Harbor were reviewed and are summarized in this section.

One of the first steps to accomplishing the review is to understand the physical processes that drive the movement of sediments by using local knowledge and prior studies, and to evaluate the distribution and transport mechanism by which the source organics (kelp) enters the entrance channel sediment.

2.1 Physical Setting

Santa Cruz Harbor is located at the northern end of Monterey Bay, about 70 miles south of San Francisco. Due to its orientation, shoreline locations are exposed to varying degrees to waves arriving from several directions. The harbor is situated in an area of relatively high net littoral transport (between 300,000 and 500,000 cubic yards per year from west to east). This transport is the primary contributor of sand to the harbor entrance (USACE 1992).

The Harbor is designated by the State of California and by the federal government as a "harbor of refuge," which means it serves mariners needing to find safe haven from storms or from other emergency circumstances they experience at sea. Therefore, its mission is to provide a year round, useable and safe channel for transit in and out of the harbor for recreational, commercial traffic, and marine rescue service purposes.

The harbor, including the jetties and harbor entrance channel, was constructed in 1963 as a partnership between the US Army Corps of Engineers and the Port District. Since jetty construction, sand accumulates annually west of the west jetty (forming Seabright Beach), effectively becoming a sand trap area (see Figure 2). The downcoast beach (Twin Lakes Beach, see Figure 3) does not receive the sand that would otherwise move there, and annual bypassing is performed by the District. The sediment is allowed to come into the entrance channel and then dredged by the District's hydraulic dredge. Bypassing of the harbor entrance is essential to the maintenance of harbor facilities, as well as for the protection of the adjacent Twin Lakes State Beach, County roads and residential properties from damage by beach erosion.

The Inner harbor is also dredged periodically, but the sediment source is primarily upland from the local watersheds (Arana Gulch), and as such consists of a higher percentage of fine-grained sediment compared to the entrance channel. The San Lorenzo River, which is upcoast (west of harbor entrance), also contributes a significant amount of sediment including organics and debris to the entrance channel that affects the ability to bypass sand to the downcoast beaches.

Offshore, the Monterey Bay coast is a mix of sand and rocky habitats, including major kelp beds. The Santa Cruz Harbor is located adjacent to the Monterey Bay National Marine Sanctuary, which includes expansive kelp forests (see Figure 4). Although some individual kelp can persist for up to three years, the overall structure of the kelp forest is very dynamic. Kelp canopy cover varies seasonally. It is thickest in late summer and thins or disappears in winter when large swells and old age combine to remove weakened adults. Some of this kelp is then washed up along the shoreline, including within the harbor entrance and thus becomes the source of kelp detritus in the dredged material. During the following spring, the next

generation of kelp takes advantage of the thin canopy cover and increase in available light to grow rapidly.

Observations of terrestrial and marine organic debris from the river, in the coastal waters, and on nearby beaches were made during a major storm on March 24-25, 2011, including material that was transported downcoast from the sediment trap area (Seabright Beach). A more detailed summary of these observations are included in Appendix A. This storm raised the stage of the San Lorenzo River from a base flow of less than 70 cubic feet/sec to 10,000 cubic feet/sec and was discharging water laden with sediment, trees, timber, brush and other terrestrial debris into the coastal waters. The storm was accompanied by high surf which transported both terrestrial and marine organic matter along the beaches and presumably into the harbor entrance. The waves also cut a considerable amount of sand from the downcoast beach, most notably from immediately downcoast of the east jetty. Materials thrown over the breakwater from the upcoast sand trap area were predominantly of marine origin heavy with sea grasses and algae. The debris on the downcoast beach also was heavily of marine origin, containing a lot of kelp and other marine algae. Presumably, these observations are indicative of the organic materials that entered the harbor entrance along with sand from the upcoast area.

2.2 Coastal Processes

The harbor is exposed to Northern Hemisphere swell, Southern Hemisphere swell, and seas generated by local winds, which result in a high net littoral transport. Because the harbor is sheltered by Point Santa Cruz to the west and by Point Cypress at the south end of Monterey Bay, waves arriving at the harbor entrance have refracted considerably, with most waves arriving at the site from the southwest (between 200 and 230 degrees) with heights significantly reduced from their deep water values.

The nearshore area is located within the boundary of the Monterey Bay National Marine Sanctuary (MBNMS). The beach areas adjacent to the mean high water line are either Port District property or state (Twin Lakes State Beach), which is owned and managed by the California Department of Parks and Recreation with a permit for use issued to the Port District. The Port District leases tidelands and submerged lands from State Lands.

The Santa Cruz Small Craft Harbor lies within the Santa Cruz littoral cell, which extends from Pillar Point in Half Moon Bay south to the Monterey Bay submarine canyon. The majority of sediment enters the littoral cell through major rivers and local tributaries during winter rainstorms occurring primarily from November to March. While the absolute values for sediment sources, sediment sinks, and sediment transport rates are not fully understood, researchers agree that there is a net deficit of sand in the system (Sea Engineering and Moss Landing Marine Laboratories 2008).

Nearshore sediment transport in the northern Monterey Bay is driven by waves and wave induced currents (M&N 1978, USACE 1992). Sediments entering the ocean are sorted by the forces of waves and currents based on differences in grain size, density, and shape. Sediments larger than 180 microns travel in the littoral drift, or are deposited on beaches in the Santa Cruz area. Fine clay and silt sediments are transported offshore to the continental shelf, where they are deposited in abundance along a mid-shelf mud belt. The high-energy nature of the coastline (especially in the winter months from November to April) is of sufficient magnitude to suspend the majority of silt and clay sediment delivered to the study area.

The primary sediment transport direction is southeastward past the harbor because the primary source of waves is from the northwest (Northern Hemisphere swell). During January,

February, and March, local seas tend to cause a reversal, similar to that found for the Southern Hemisphere swell, but of significantly weaker magnitude (M&N 1978).

USACE (1992) cites several previous studies which developed estimates of sediment transport; these ranged from 61,500 to 500,000 CY per year. Recent estimates indicate that an average of approximately 262,000 CY of sand is transported southeastward past the Santa Cruz Harbor every year as littoral drift (Sea Engineering and Moss Landing Marine Laboratories 2008). Much of this deposits within the entrance channel. Other modes of shoaling are via leakage through voids in the entrance channel jetties, wind transport over the jetties, and seasonal influx. These have been estimated to be 13,000 CY, 7,000 CY, and 10,000 CY per year, respectively (USACE 1992). The sum total of sediment input to the harbor entrance is nearly 300,000 CY per year. About 80% of this shoaling occurs between December and April.

A review of survey records provided by the District shows that between May and November of 2010, the entrance channel shoaled by about 4 feet. However, a single 12 day period between December 14th and 26th resulted in shoaling of 5 to 10 feet within the entrance channel, which resulted in closure of the entrance channel for a brief period until depths were restored by dredging. Discussions with Port staff also confirmed that individual storm events between December and April have a high transport potential. Therefore, dredging activities have to continue through the winter as opposed to a one-time dredge episode for the entire entrance channel.

2.3 Dredging and Disposal Operations

The current dredging system (Figures 5 through 8) for the harbor entrance consists of a floating hydraulic dredge system that is owned by the Santa Cruz Port District. It has operated since 1986, from November to April of each year by Port District crew. During the most recent 10-year period, dredge volumes have averaged approximately 270,000 cubic yards per year. Current permits authorize dredging of the entrance channel to a design depth of 22 feet below mean lower low water (MLLW).

Dredged material from the harbor entrance and federal channel is primarily disposed onto the beach east of the harbor or in the adjacent near shore area. Sediments dredged from the harbor entrance and inner harbor differ in composition and presence of organic material. Materials dredged from the entrance and channel are typically composed of material with a content of 80% or greater sand. Decaying organic material (kelp and sea-grass) also is found in these sediments, which can produce unpleasant odors because of the release of H_2S as it decays. When the dredged material consists of coarse sand that is free of organics, it is placed higher up on the beach to increase the usable recreational beach. Onshore disposal occurs on the beach (dry zone) or below the surf line (within the surf zone) along Harbor Beach and Twin Lakes State Beach (Figure 8) from the east harbor jetty to approximately 12th Avenue. Additionally, the Port District, when asked by the County of Santa Cruz or State Parks, will re-supply the beach with sand if severe storms threaten 7th Avenue or East Cliff Drive.

However, in order to protect against odor emissions, even in predictably organic-free sand, the Port District discharges sandy material in the surf zone and nearshore sites over 98% of the time (SC Port District 2010). This often requires use of a tractor to push sand up on the receiving beach. The surf zone and nearshore disposal allows the water-soluble H_2S sufficient residence time to off-gas underwater. Nearshore disposal extends approximately 200 feet seaward of the water line, by use of an unanchored disposal pipeline. Dredged material is pumped through a submerged 16-inch pipe that runs most of the length of the harbor and then

along a 1,500 foot stretch of beach from the east harbor jetty to 12th Avenue. Current practice is to have most of this pipe buried in the sand along the upper beach with the flexible end moved by a bulldozer to access different points on the beach as necessary for sand placement. A second line controlled by valves goes out along the eastern breakwater and out to a buried anchor submerged offshore in the surf zone for nearshore placement. This movable flexible pipeline is stored at the base of the beach beneath East Cliff Drive roadway. Various discharge points between 5th Avenue and 12th Avenue can be accessed to best utilize wind, wave and tide conditions.

From 1997 to 2007, surfzone and nearshore disposal occurred via an unanchored pipeline traversing the beach and surfzone east of the Harbor at Twin Lakes Beach, to a location approximately 70 yards from the shoreline. The District also maintains an anchored offshore discharge line off the beach, but safety issues related to tending the pipe, the pipe burying itself, pipeline breakages, and shoaling of offshore areas including the navigation channel prevent the pipe from being continuously offshore. In December 2006, the California Coastal Commission approved the multiple pipeline configuration which formalized the disposal practices which had historically occurred between the east harbor jetty to 12th Avenue. A drawing depicting various disposal options for this pipeline is provided in Appendix B. Each of the three configurations allow multiple discharge points. Only one pipeline configuration and discharge point was in use at any one time. The pipes could be pushed directly into the ocean approximately 200 feet seaward, thereby accomplishing the H_2S suppression. The reconfigured offshore pipelines were not to be anchored to the seafloor, but were installed and pushed into the water on a daily basis. The discharge point is monitored and adjusted throughout each day of operation to ensure adequate water depth.

The purpose of this pipeline configuration is to provide the Port District with the flexibility to respond quickly to changing oceanographic conditions to reduce the amount of beach discharge to a minimal amount in order to comply with the Air Board's hydrogen sulfide protocol. In addition, these non-anchored pipelines were able to place sediment where it would reduce the opportunity for material to re-enter the harbor mouth, which has been a problem periodically with the anchored offshore disposal pipeline placed immediately east of the jetty. Finally, this configuration eliminates the downtime caused by the anchored pipe being constantly buried by its own heavy sand discharge.

The dredging operation requires the Port District to operate a D5-type tractor on Harbor Beach and on Twin Lakes State Beach to position and maintain the discharge pipes. The District also operates the tractor on the beach to: 1) protect the existing, permanent discharge pipe, 2) establish a discharge zone for onshore disposal at Harbor Beach, and 3) push sand to the upper beach after placement near the tide line, and 4) create a flow line for storm drainage from Schwann Lagoon as needed. The Coastal Commission has cited concerns that tractor operations can cause intermittent, temporary disruption to coastal access for pedestrians, swimmers, and/or surfers.

2.4 Monitoring of Hydrogen Sulfide Emissions / Odor

The Monterey Bay Unified Air Pollution Control District (MBUAPCD) has set a nuisance prevention protocol for discretionary dredging of 10 ppb H_2S on a 1-hour rolling average in the air at the boundary of the beach downwind of the discharge point, in response to complaints by neighbors about odor. If, during disposal operations, the 1-hour rolling average exceeds 10 ppb, surf zone disposal must shut down for the day, but may resume using the offshore disposal pipe. A shutdown can also occur if the emissions exceed the state's nuisance level of 30 ppb on a 1-hour rolling average. If the beach zone discharge is stopped as a result of either of the two situations mentioned, monitoring shall continue until the readings are below 10 ppb

rolling average and stay there for at least 10 minutes. If the beach discharge is terminated due to exceeding H_2S levels, the harbor district must contact the air district by fax, informing them of the termination, and include the following details: the readings that triggered the termination, the times the levels were exceeded, the time when beach discharge flow actually stopped, and all readings occurring until they returned to below 10 ppb. The District has two people on the beach with special, low-detection-limit handheld sensors linked to a computer by radio in the lifeguard stand with a third person to monitor air quality for hydrogen sulfide continuously while the dredge is in operation. Operations are frequently shut down when they hit hot spots in the harbor entrance that typically produce hydrogen sulfide emissions in excess of protocol or nuisance level limits.

The MBUAPCD permit also provides for an emergency declaration, which allows hydrogen sulfide emissions up to the state nuisance standard of 30 ppb for a one-hour rolling average. If that were to occur, the District must notify the MBUAPCD that an emergency situation exists (e.g., shoaled entrance conditions or other emergency situation), and that dredging will be performed under emergency provisions of the District's permit.

2.5 Summary Of Permit Conditions

Santa Cruz Harbor, under a 1986 Memorandum of Agreement with the U.S. Army Corps of Engineers, has maintained channel depths in the federal navigation channel using jointly-acquired dredging equipment. Entrance dredging and/or disposal require permits or authorizations from:

- U.S. Army Corps of Engineers / U.S. Environmental Protection Agency
- California Coastal Commission (CCC)
- California Regional Water Quality Control Board (RWQCB)
- State of California Department of Parks and Recreation
- Monterey Bay Unified Air Pollution Control District (APCD)
- Monterey Bay National Marine Sanctuary - The MBNMS does not regulate dredging, but the disposal of dredged materials into the Sanctuary is subject to MBNMS authorization.

Permits differ in their emphasis, but generally the Port District is permitted to place dredged sediment east of the harbor, onto the beach or in the surfline (underwater), or at permitted upland disposal sites. The limit on entrance volume is 350,000 CY per year (CY/yr) and the majority of the sediment must have a minimum 80% sand content. This volume has been exceeded only once (2009-2010). There is currently a 10,000 CY/yr limit on inner harbor sediment with 80+% sand content, and a 3,000 CY limit on fine-grained material (50% to 79% sand content), though permits that increase annual volume but restrict the daily disposal rate of fine-grained material are pending. If additional disposal capacity is needed, the permit also allows up to 35,000 CY/yr of upland disposal at other permitted site(s).

Since the entrance channel sediment is mostly sand, the amount of sediment characterization is typically limited to physical (grain-size) tests on surface grab samples. As a result, very little data exists on the depth and pattern of organics, which is the primary cause of the H_2S issue when placing the material on the beach.

A summary of the entrance dredging and disposal restrictions and allowable construction window (timing) from these permits is provided below in Table 1 (Strelow 2009 and PN 2010-00015S).

Table 1A. Permit Conditions Summary

Agency	Permit Conditions Relevant to Study	Timing
USACE	*Starting in the 2011-2012 season, permit modifications based on conditions described in USACE's Public Notice, and as summarized in Table 1B and Table 1C, is anticipated*	*See Table 1B and 1C below*
CCC	*A 5-year Coastal Commission permit with the same conditions as included in the USACE's public notice referenced above is pending*	*See Table 1B and 1C below*
CA RWQCB	Similar to USACE for entrance material. Inner harbor same as Coastal Commission.	No conditions
Dept of Parks and Recreation	Allows disposal of dredged Harbor materials onto portions of Twin Lakes State Beach through a surf line pipeline and for the temporary placement of related dredging equipment over portions of Twin Lakes State Beach. Incorporates provisions of Coastal Commission permit.	No disposal on Twin Lakes State Beach 1 week before and 1 week after Easter
APCD	Places limits on hydrogen sulfide emissions	During disposal
MBNMS	Provides consultation to USACE and restricts placement within Sanctuary limits defined disposal zone.	November 1 to April 30

Table 1B. USACE Permit Condition Summary for Federal Entrance Channel Dredging

Project Description

Dredge Santa Cruz Harbor federal entrance channel per 1958 legislative authority, and 1986 Cooperative Agreement between USACE and Santa Cruz Port District. Authorized depth ranges from 20-ft below MLLW near mouth to 15-ft below MLLW near the fuel dock. An additional 2-ft of overdepth is also allowed.

Material Classification:

Sandy (80% sand or greater)

Volume and Disposal Area Restrictions:

2,560,000 CY over 10 year's total. Disposal restricted to Nearshore Zone (littoral zone and on beach between East Jetty and 9th Avenue)

Disposal Timing Restrictions:

November 1 through April 30 of each year

Table 1C. USACE Permit Condition Summary for Inner-Harbor Dredging

Project Description:

Dredge North Harbor (Murray St Bridge to Arana Gulch culverts) and South Harbor (fuel dock to Murray St Bridge). Authorized depth ranges from 15-ft below MLLW near the launch ramp to 10-ft below MLLW further north, except immediately in front of Arana Gulch culverts where it is 16-ft below MLLW. An additional 2-ft of overdepth is also allowed.

Material Classification:

Varies based on location and timing, including:

- Type A (80% or greater sand)
- Type B (less than 80% sand)

Volume and Disposal Area Restrictions:

550,000 CY over 10 years total, with following additional restrictions:

- Nearshore Zone
    - Up to 20,000 CY/yr of Type A material, or
    - Up to 10,000 CY/yr of silts/clays + 10,000 CY/yr of sand, at a rate not more than 550 CY of silts and clays per day
- Upland (any permitted site) or Offshore (SF-14)
    - Up to 35,000 CY/yr (material restrictions based on disposal site permits)

Disposal Timing Restrictions:

- Nearshore Zone
    - November 1 through April 30 for Type A material
    - October 1 through February 28 for Type B material
- Upland (any permitted site) or Offshore (SF-14)
    - Dredging restricted to November 1 through April 30 for Entrance Channel
    - Dredging restricted to July 1 through April 30

3. SURVEY OF OTHER HARBORS / MARINAS

3.1 Survey Method

An initial task of this study was to conduct a survey of dredging/disposal practices at other harbors or marinas in urban settings that have oceanographic conditions similar to Santa Cruz Harbor.

Several marinas/ports/harbors in California which have jettied entrances, and known bypassing projects were contacted, and a Survey Questionnaire was sent to their representatives. The objective of the survey questionnaire was to gather information including dominant coastal processes, dredging demand, and dredging/disposal practices at these marinas/harbors, such that their dredging and disposal practices could be compared to the practices at Santa Cruz Harbor. The primary questions addressed the following criteria:

1. Coastal harbor providing year-round berthing for vessels at least 12' in draft
2. Near urbanized areas
    - Proximity to residential areas
    - Proximity to recreational/visitor-serving areas
3. Surrounding beaches subject to littoral drift and erosion
    - Beach nourishment required
    - Bluff erosion or other potential threat(s) to structures and resources
4. Channel depth maintenance method(s)
    - Recurring dredging/disposal
    - Permanent mechanical system (e.g. sand bypass)
    - Passive/structural system (e.g. jetties)
    - Ancilliary equipment used in operation
5. Dredging and disposal required
    - Frequency of dredging needs / volume dredged
    - Dredging/disposal regulated
6. Type of regulation if not in California, or lack of regulation (i.e. water quality, air quality, National Marine Sanctuary, Fish and Wildlife, etc.)

The results of the survey have been provided in Appendix C to this report, and a summary of the results is shown in Table 2. The table is coded based on the similarities (or differences) between the specific harbors/marinas and Santa Cruz Harbor. No shading or border indicates that the other harbor/marina has very similar conditions, dredging, and/or disposal practices as Santa Cruz Harbor. A shaded box with a dashed border indicates a partial similarity and a shaded box with a bold border indicates dissimilarity.

	Santa Cruz Harbor	Harbor/Marina (Listed from North to South Along California Coast)											Tweed Harbor, Australia
		Morro Bay Harbor	Santa Barbara Harbor	Ventura Harbor	Channel Islands Harbor	Port of Hueneme	Marina Del Rey	King Harbor	Newport Harbor	Dana Point Harbor	Oceanside Harbor	Mission Bay	
Coastal harbor providing year-round berthing for vessels at least 10' in draft	*yes*	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Jettied entrance channel	*yes*	yes	yes (attached breakwater)	yes (and detached breakwater)	yes	yes	yes (and detached breakwater)	yes (attached breakwater)	yes	yes (attached breakwater)	yes	yes	yes
In close proximity to residential area	*yes*	partially	yes	yes	yes	no	yes	yes	yes	yes	partially	yes	yes
In close proximity to recreational/visitor serving area	*yes*	yes	yes	yes	yes	partially	yes	yes	yes	yes	yes	yes	yes
Surrounding beaches subject to littoral drift and erosion	*yes*	no (littoral drift is bi directional, only have seasonal erosion)	yes	yes (upcoast beach)	yes	yes	yes	yes	yes	yes	yes	no (San Diego River feeds downcoast beaches)	yes
Entrance channel depth maintenance method	*recurring dredging*	recurring dredging	recurring dredging	recurring dredging	recurring dredging, entrance sand trap	recurring dredging	recurring dredging	recurring dredging	recurring dredging	recurring dredging	recurring dredging	recurring dredging	permanent sand bypassing, (following initial dredging)
Entrance channel dredging frequency	*annually*	annually	annually	annually	every two years	> 20 years	3-5 years	> 10 years	> 10 years	> 10 years	annually	> 20 years	year-round
Entrance channel dredge volume (cubic yards)	>200,000	80,000-140,000	>200,000	>200,000	1,000,000	<80,000	140,000-200,000	<80,000	<80,000	<80,000	140,000-200,000	>200,000	>200,000
Dredge material placed on downcoast beaches	*yes*	yes (placed on beaches both to north and south of harbor)	yes	yes*	yes	no (dredge material placed in CAD site); but CAD site material went to downcoast beach	yes*	yes	entrance channel material disposed offshore; inner bay mat'l placed on beach	yes*	yes	no (placed on upcoast beach)	yes
Dredge material discharge location on beach	*dry beach and surfzone*	surfzone	dry beach and surfzone	surfzone	dry beach and surfzone (?)	N/A for entrance channel dredge material, but CAD site material went to downcoast beach	dry beach (and nearshore)	surfzone	dry beach (inner bay material - very small quantities)	dry beach	dry beach and surfzone	dry beach	dry beach and surfzone
Odor present during dredge material discharge on adjacent beaches	*yes*	yes	yes	yes	no	N/A	no	no	yes - (inner bay dredge material)	yes	yes	yes	no mention of odor
Type of dredge operation	*hydraulic*	hydraulic, hopper, clamshell, barge-mounted excavator	hydraulic	hydraulic, clamshell, hopper	hydraulic	hydraulic	hydraulic, clamshell	hydraulic, clamshell	clamshell	hydraulic, clamshell	hydraulic	hydraulic	sand bypassing
Type of Permanent Mechanical system (if any)	*none*	none	none	none	none	none	none	none	none	none	none	none	sand bypassing system - intake jetty and discharge pipes network

* and also offshore open ocean disposal and/or other. Ventura Harbor places fine-grain material in Santa Clara River mouth when river flowing.

Key
- Very similar to Santa Cruz Harbor conditions or operations
- Partially similar / relevant to Santa Cruz Harbor conditions or operations
- Not similar to Santa Cruz Harbor conditions or operations

3.2 Survey Results

Twelve harbors/marinas were surveyed to understand their dredging and disposal practices and to glean any potential practices that could be implemented at Santa Cruz Harbor. Many of the surveyed harbors/marinas have dredging and disposal practices similar to Santa Cruz. The primary similarities are:

- Sediment from longshore littoral transport deposits within harbor/marina entrances;
- Harbor/marina entrances need to be dredged on a recurring basis to maintain safe navigational passage;
- Entrance channels are protected by jetties;
- Dredge material is used for sand nourishment on beaches adjacent to the harbor/marina;
- Use of hydraulic dredge equipment.

All of these harbors had similar urban settings and coastal environments to Santa Cruz Harbor. All had jettied entrance channels, significant littoral sediment transport, and the need to frequently dredge their entrance channels to maintain safe navigation. All except one placed the channel dredged material on adjacent beaches, either on the dry beach or within the surfzone. (The one exception was Port of Hueneme which disposed their dredge material at a confined aquatic disposal (CAD) site due to contamination concerns. Material dredged to create the CAD site was deposited on a downcoast beach).

Half of the harbors surveyed dredge their entrance channels on an annual or bi-annual basis. The types of equipment used were very similar for all harbors, with the exception of Tweed River Harbor in Australia, which had a significantly different bypassing operation. In 2001, a permanent sand bypass system that operates year round was constructed near the harbor entrance; it excavates sand upcoast of the harbor entrance via an “intake jetty” (a pier with submerged pumps) and pipes the slurry under the harbor entrance to downcoast beaches. The system is comprised of a 450 meter long “intake jetty” (pier) which collects sand trapped in a depression under the jetty with a series of ten submerged jet pumps. A slurry pit receives the sand slurry and concentrates the sand slurry to the required density. A sand transfer system draws sand from the slurry pit and pumps it through a 400 mm steel pipeline under the Tweed River to one of four outlets along downcoast beaches. The sand discharge system is similar to Santa Cruz Harbor in that it is comprised of a combination of permanently installed and above-ground temporary pipe. The system also provides for moving sand from time to time using trailer suction dredges. The construction cost of the system was $23.3M (in 2001, Australian currency). A paper with further information about the Tweed River Harbor bypass system is provided in Appendix C.

Over time, many of the other harbors (over half) have experienced decaying marine life and/or kelp in their dredge disposal on adjacent beaches, but not on an ongoing basis. Two of the harbors cited the source of odor to be from decaying kelp. Santa Cruz Harbor is unique in that the sedimentation processes over the winter season require continuous dredging (versus a one-time, annual dredging event) and the fact that the odor from decaying marine life is regulated by the Air Pollution Control District.

3.3 Evaluate Current Dredging / Disposal Practice at Santa Cruz Harbor

The objective of this task was to evaluate current and future dredging needs as well as the ongoing disposal practices in light of the findings from the Task 1 survey, and objectively assess benefits (or adverse effects) of current practices. Evaluation criteria for the assessment included:

- Maintaining Santa Cruz Harbor's federal navigation channel to design depths and in the safest condition practical to ensure year-round access and refuge for recreational and commercial vessels.
- Maintaining safe passage year-round for marine rescue service providers,
- Accomplishing beach nourishment to the maximum extent practicable,
- Preserving or enhancing coastal access to the maximum extent practicable,
- Protecting marine resources to the maximum extent practicable,
- Ensuring that hydrogen sulfide emissions do not exceed levels allowed by the Monterey Bay Unified Air Pollution Control District.

The current dredging and bypassing operations at Santa Cruz Harbor fulfill two important objectives:

- Providing **safe harbor** and **navigation** to boaters; maintaining access to the harbor during winter months provides continued use of the harbor as a "harbor of refuge." This provides year round, useable and safe access to Monterey Bay for recreational, commercial, and marine rescue service purposes.
- Providing **recreational** uses by continuing the alongshore transport of sand meant for beaches downcoast of the harbor entrance (Twin Lakes Beach). Beach nourishment also facilitates beach recovery from seasonal erosion and storm damage.

Of particular interest to regulatory agencies are the impacts that the dredging and disposal operations could have on recreational users on the beach and in the water. During dredging and disposal operations, the beach remains open to the public. Beach nourishment operations are carried out November through April with minimal perceived impacts to public access, since the beach is less frequently used during these months due to inclement weather and/or wave conditions. Temporary, localized disruptions to full public use of the beach occur when the tractor is relocating the end of the discharge pipeline to abate odor issues. The pipeline configuration, both onshore and offshore, are well marked for safety purposes and do not permanently inhibit access or use of to the beach. Photographs showing recreational users on the beach during nourishment operations are provided in Appendix D.

Based on a review of the literature, site visits, meetings with Port District staff, and experience from other projects, an assessment of the Santa Cruz Harbor dredge and disposal practices is provided in Table 3.

Table 3. Assessment of Current Operations at Santa Cruz Harbor

Criteria	Assessment of Current Operations
Maintain federal navigation channel to design depths and in safest condition practical to ensure year-round access and refuge for recreational and commercial vessels	Current annual dredging operation strives to maintain 14 ft MLW as a minimum controlling depth through the dredging season, including frequency, duration, and timing need to continue to achieve this criteria
Maintain safe passage year-round for marine rescue service providers	Current annual dredging operations, including frequency, duration, and timing need to continue to achieve this criteria
Accomplish beach nourishment to the maximum extent practicable	Onshore and surfzone discharges achieve this criteria; however, the organics and subsequent H_2S emissions result in some nearshore disposal that may not immediately benefit Twin Lakes State Beach
Preserve or enhance coastal access to the maximum extent practicable	Coastal access is preserved and enhanced by nourishing the beach with dredged sand (bypassing). The organics and subsequent H_2S emissions during discharge operations require realignment of the pipe via dozers, which temporarily affects public use of the beach in localized areas. H2S mitigation measures result in some nearshore disposal operations that may not immediately benefit Twin Lakes State Beach
Protect marine resources to the maximum extent practicable	No issues have been identified
Hydrogen sulfide emissions do not exceed levels allowed by the Monterey Bay Unified Air Pollution Control District	Although this is unpredictable because of the nature of deposition of organics, current annual operations do achieve this criteria by discharging sediment into surfzone or nearshore areas

4. POTENTIAL MODIFICATIONS TO CURRENT PRACTICES

This section presents a description of potential modifications to current dredging/disposal practices. The modifications are intended to improve the entrance channel maintenance dredging operation by achieving one or more of the following objectives:

A. Reduce the incidence of above threshold releases of Hydrogen Sulfide that trigger MBUAPCD protocol shut-down of dredging operations.

B. Reduce the amount of flexible dredge discharge pipeline handling that requires dozer operation on the east beach.

C. Reduce the need for dredged material rehandling and beach grooming that requires dozer operation on the east beach.

These objectives are implicitly recognized by the Operations Manual of the Santa Cruz Harbor Dredging Program, but are highlighted here because the potential modifications target elements of the dredging operation being reviewed by the Coastal Commission as part the Port District's 5-year permit renewal. In achieving these objectives the Port also hopes to enhance the efficiency of the entrance channel dredging operation to achieve greater economy without compromising safety. Furthermore the modifications must be coordinated with the Port's Inner Harbor Dredging which utilizes the same dredge plant at certain times and is also covered by the Port's Maintenance Dredging Permit.

The modifications that seek to reduce the release of hydrogen sulfide are particularly significant since two of the currently practiced disposal methodologies, anchored offshore and surf line (wet zone), which were developed to mitigate the hydrogen sulfide releases, also increased dozer operations on the beach. Hence if the hydrogen sulfide releases are reduced, an additional benefit will be a reduction in dozer operations. Further reduction in dozer operation should be possible based on the proposed modification of the dry zone (above surf-line) discharge methodology. The increase in the amount of dredged sand placed in the dry zone is desirable because it furthers the Port's (and the Coastal Commission's) goals of enhancing recreational access and protecting coastal bluffs from erosion along the beach east of the harbor.

The following descriptions of the potential modifications include the theory of operation, required equipment acquisition, an order of magnitude upfront cost, and recurring operations and maintenance cost estimates, and a brief discussion of risks associated with implementation of the modification. A subsequent comparison of the various modifications with the current practices may be used to determine if any modifications warrant further consideration. The modifications are categorized as follows:

Type A: Reduce Incidence of Hydrogen Sulfide Releases

Type B: Reduce Discharge Pipeline Handling Related Dozer Operations

Type C: Reduce Material Re-Handling/Grooming Related Dozer Operations

4.1 Description of Potential Modifications

4.1.1 Seawater Spray System

Concept: Provide seawater spray system to take up hydrogen sulfide at discharge point (Type A) and move discharge point to dry zone (Type B/C).

The Seawater Spray system consists of the following major components (see Figure 9):

- Screened seawater intake located close to the dredge suction to minimize concerns over seawater intake impacts
- Pump unit on dredge with requisite pipelining to deliver seawater to dredged material discharge point (on the dry beach)
- Spray nozzle to discharge seawater as a fine mist over the dredged material discharge

The theory of operation is that the hydrogen sulfide entrained in the dredged slurry, which volatilizes upon discharge and then travels downwind, will instead be re-dissolved by the seawater mist blanketing the discharge. The entrained hydrogen sulfide will then return with the run-off to the Bay. The system can be allowed to run continuously, or be activated intermittently by the leverman on the dredge when encountering a "pocket" likely to contain hydrogen sulfide.

The sizing of the system components will largely depend on the level of hydrogen sulfide in the dredge material and the efficacy with which the sprayer mist entrains the gas. This system will require additional investigation, first in the lab, then in field, to determine its efficacy. The sizing of the equipment will also be dependent on such tests. For concept level analysis, it is assumed that the capacity will be roughly equivalent to fire (3" pipe / 2 1/2" hose) flows.

The principal advantage of the system is its simplicity, which allows testing and eventual implementation at relatively low costs and can be utilized on an as-needed basis.

The principal short-coming is the uncertainty surrounding the efficacy of the system, which can only be resolved by performing a series of investigations. Further concern may surround the impact of the spray field on beach users, and of the seawater mist on downwind receptors.

The upfront cost consists of equipment purchase and installation for the seawater pump on the dredge, the delivery piping which could "piggy-back" on the dredge pipeline, and the sprayer apparatus at the point of discharge. The cost allowance is estimated to be $137,000. The recurring cost is the incremental cost upon the current dredge operation to operate and maintain the seawater spray system. This cost is very approximate, with operations and maintenance estimated at $110,000 per year.

4.1.2 Poor Boy Degasser

Concept: Provide "Poor Boy" Degasser in discharge pipeline to trap hydrogen sulfide (Type A) and move discharge point to dry zone (Type B/C)

The Poor Boy Degasser system consists of the following major components (see Figure 10):

- A 'poor boy' degasser (also known as a Mud-Gas separator or gas-buster for separating gas from drilling muds or similar slurries) inserted in the dredged material disposal pipeline, on-shore.
- A hydroxide (or equivalent) scrubber to purge Hydrogen Sulfide from the gas stream captured by the separator prior to release.

The theory of operation is that the hydrogen sulfide entrained in the dredged slurry when present in sufficient quantity to cause downwind problems can be separated from the slurry by a series of baffles in a large tank and captured by a gas scrubber. As with the spray system, it can be allowed to run continuously, or be activated intermittently on an as-needed basis.

The sizing of the system components will largely depend on the level of hydrogen sulfide in the dredged material. The sizing of the poor boy degasser is on the upper limit of typical equipment used in the drilling industry, being a tall cylinder about 8 ft in diameter and 20 ft tall, and the hydrogen sulfide scrubber is a specialized form of standard industrial gas scrubbers. If intermittent operation of the separator/scrubber is practical given the infrequent occurrence of excessive release of hydrogen sulfide, the limiting equipment may be suitable for brief periods of operation. In this case, the dredge pipeline will have to be outfitted to redirect the flow to the separator/scrubber when necessary.

The principal advantage of the system is its ability to capture hydrogen sulfide and prevent its release, but at an increased technologic sophistication that translates into greater cost for testing and eventual implementation. While the separator involves no moving parts, the scrubber requires considerable attention to insure proper operation (charging with fresh chemicals and disposal of spent liquor). The separator and scrubber equipment also represent a visual intrusion on the beach and the scrubber will require a power supply and blower to withdraw the hydrogen sulfide from the separator and pass it through the scrubber.

The equivalent to this system discussed in the Phase 1 study is the use of a hopper barge anchored in the entrance channel with a submerged dredged material discharge in its bin to minimize the release of hydrogen sulfide. The hopper bin when full will require rehandling of the dredged material by a separate pump/discharge pipeline. The bin may need to be covered to prevent release of hydrogen sulfide from the bin if it cannot be kept in solution. In this case, the scrubber will likely be needed as well.

The upfront cost consists of equipment purchase and installation for the poor-boy separator and the scrubber, including the tie-in piping to the dredge pipeline. The cost allowance is estimated to be $327,000. The recurring cost is the incremental cost upon the current dredge operation to operate and maintain the separator/scrubber, including scrubber chemicals. This cost is very approximately $185,000 per year.

4.1.3 Degassing Eductor or Booster Pump

Concept: Provide degassing eductor on the dredge pump suction line, or a booster pump in the discharge pipeline to trap hydrogen sulfide (Type A) and move discharge point to dry zone (Type B/C)

- The degasser system consists of the following alternatives with the respective major components (See Figure 11):

Alternate A: Eductor on Dredge Pump Suction Line

- Gas trap on dredge suction line in front of the pump with vacuum assist.
- Gas scrubber to purge hydrogen sulfide from the gas stream captured by the trap.

Alternate B: Booster Pump in Discharge Pipeline

- YOKOTA type air-water separating pump adapted for “mud-sand slurry, seawater” application.
- Gas scrubber to purge hydrogen sulfide from the gas stream captured by the separator.

The theory of operation for eductor Alternate A on the dredge is that the entrained gas at depth greatly expands in volume under the pump section and can be more easily separated from the slurry by a suitably configured box trap just in front of the pump. The box trap has a separate pump that maintains a suction on the trap to pull off the separated gas. The hydrogen sulfide can then be captured by a gas scrubber, or through underwater disposal as hydrogen sulfide is water soluble..

The theory of operation of the booster pump Alternate B on shore uses the process of centrifugal separation that naturally occurs in the impellor pump to advantage. The patented YOKOTA slurry pump incorporates an interlocked air-water separating impellor. The hydrogen sulfide gas can be stripped off and captured by a gas scrubber. As with the previous systems, it can be allowed to run continuously or activated intermittently on an as-needed basis..

The sizing of the system components will largely depend on the level of hydrogen sulfide in the dredged material. The sizing of the YOKOTA pump in particular is on the upper limit of the available capacity for slurry transfer, but the sizing is further complicated by its use as a booster in the existing pipeline (when no booster is actually required based on pipeline losses). The booster pump will require a power source; either a new suitably sized electric drop for an electric driven pump, or a diesel fuel system for a diesel driven pump. Scrubber limitations similar to those discussed for the poor boy degasser apply as well.

The principal advantage of the system is similar to the previous systems – ability to capture hydrogen sulfide and prevent its release. The eductor or the booster pump, and the scrubber will require regular attention. The booster pump may offer a lesser visual intrusion on the beach than the poor boy degasser, but the booster pump operation will produce another form of intrusion, particularly if a diesel driven pump is selected. The dredge-mounted eductor avoids any visual or other impact on the beach.

Although the YOKOTA pump has not been developed as a prime mover for a dredging plant, its capability may be considered in the event that the Port is considering a replacement dredge, or a major rebuild of its current plant. An eductor on the dredge suction line is common in the dredging industry, but the separated gas is normally vented to the atmosphere, not an option in this case. Subsea gas release may be an option, but this depends on the ability of sea water to "scrub" the gas before it surfaces. Further study and testing would be necessary to prove the method out.

The upfront cost consists of equipment purchase and installation for the separator (the eductor for Alternate A and the booster pump for Alternate B) and the scrubber, including the tie-in piping to the dredge pipeline. The cost allowance for the eductor is estimated to be $245,000, and for the booster pump $499,000. The recurring cost is an incremental cost upon the current dredging operation to operate and maintain the separator/scrubber, including scrubber chemicals. This cost is very approximately $185,000 per year for Alternate A and $203,000 for Alternate B.

4.1.4 Cutter-Head Sweeps

Concept: Perform cutter head sweeps in order to "meter" dredge intake of organic matter/ hydrogen sulfide (Type A) and move discharge point to dry zone (Type B/C)

The cutter head sweeps system consists of the following major components (See Figure 12):

- A cutter head dredge, which includes the option to refit the Port's existing dredge as a cutter head.

The theory of operation is that removing sediment in a number of lifts, and churning the material prior to pumping, will reduce the dredge intake of decomposing vegetation and hydrogen sulfide that apparently is responsible for the hydrogen sulfide releases.

They depth of the dredge face and hence the number of sweeps is based on the Seabright's capability with a cutter head (or a comparable contract dredge could be brought in to test the concept). Empirical testing involves the conduct of sweeping operations and correlation with the results of hydrogen sulfide monitoring. Substantial reduction in the number of Hydrogen Sulfide monitoring over threshold readings would be deemed a successful outcome.

The principal advantage of the system is similar to that of the seawater spray system – relative simplicity. However, the short-coming is similar as well – uncertainty surrounding the efficacy of the system, though the cutter head sweeps do not bring with it the spray field impacts on beach users or downwind receptors.

An additional concern is the impact of conducting cutter head sweeps on the efficiency of maintaining the channel; the current dredging practice which emphasizes potholing with the snorkel and suction pipe is less impacted by wave action as compared to cutter suction dredges, which are most effective where wave exposure is limited. Additionally, fouling of the cutterhead by kelp and other marine debris, as well as potential fish entrainment issues, could possibly emerge as potential issues.

The upfront cost consists of installing the original cutter head (the original equipment is assumed to be operational) on Seabright. The cost allowance is estimated to be $41,000. The recurring cost is the incremental cost upon the current dredge operation for Seabright to function as a cutter head dredge for which we would apply an estimated increase of around 20%, or very approximately $260,000 per year. If the port elects to use a contract cutter head dredge to conduct the testing rather than re-fit the Seabright, then the upfront costs would likely be greater since the contract cost would be in addition to the re-fit cost in the event the testing proves successful.

4.1.5 Pre-Dredge Plowing or Jetting

Concept: Perform predredge plowing or jetting to promote submerged release of organic matter/hydrogen sulfide (Type A) and move discharge point to dry zone (Type B/C)

The pre-dredge plowing (or jetting) system consists of the following major components (See Figure 13):

- A sufficiently powerful work boat to tow a plow (or equipped with powerful jetting pumps).
- A subsea plow capable of reaching the required depth (or jetting apparatus).

The theory of operation is that buried pockets of decomposing vegetation can be dislodged and the trapped hydrogen sulfide can be released with the aid of the plow or the jetting apparatus. The disturbed sediment is expected to be sufficiently free of hydrogen sulfide to avoid a serious release following dredging.

The sizing of the system components and the proper plowing (or jetting) technique would be based on empirical testing. Plowing (or jetting) operations would be conducted prior to dredging, and correlated with the results of hydrogen sulfide monitoring. A successful outcome would be judged in the same manner as for the cutter head sweeps

The principal advantage of the system is similar to that of the cutter head sweeps in dispersing concentrations of subsea pockets of hydrogen sulfide prior to dredging. However, the concern

is that the occurrence of pockets of decomposing vegetation is random and that the plowing (or jetting) pattern may not intersect them, resulting in no benefit. In that regard, the systematic sweeping of the cutter head provides a significant advantage. Furthermore, the ability to plow deeply into sediments or obtain substantial release of hydrogen sulfide by deep jetting needs to be validated.

The pros of plowing are that it is a continuous process and probably more economical over longer distances. The cons are that it is more difficult to maneuver and position in tight channels and it will likely require a larger tow vessel than is currently available to the Port unless a small plow and many more passes are substituted.

The pros of jetting are that it can be more easily positioned in the channel and adjacent to structures and can probably be conducted to greater sediment depths in a single pass than plowing. The cons are that it is probably slower than plowing, will require a bigger vessel and crew, and will have a smaller weather window in which to operate.

An option to consider is combining the above into a jet-assisted plow operation, and to limit the plowing and/or jetting to periods of time immediately after storms that typically bring detritus to the entrance channel, or when the mature kelp beds offshore start breaking up.

The upfront cost consists of equipment purchase and installation on a suitable workboat. The Dauntless is assumed to be adequate, in which case the cost allowance is estimated to be $163,000. The recurring cost is the incremental cost upon the current dredge operation for Dauntless to perform the plowing (or jetting) function for (an assumed) 26 days in addition to her other duties (and assumes there is sufficient "standby" time in her current schedule for this to occur). This cost is very approximately $148,000 per year.

4.1.6 Upcoast Sand Trap

Concept: Restore Upcoast Sand Trap and Continue Dredging of Sand Trap (See Figure 14)

The restoration of the Upcoast Sand Trap and subsequent single phase maintenance dredging was studied by the Corps of Engineers (most recently) in their 1992 Reconnaissance Report. This modification would use a hopper or clamshell dredge at the beginning of each dredge season to dredge an excavation roughly 2000 feet long between the 15 foot and 25 foot (MLLW) contours just offshore of the harbor entrance (see Figure 14). Annually about 200,000 cubic yards of sand would be removed from the trap and disposed of one mile to the east in an area between the 15 foot and 20 foot contours near Corcoran Lagoon. The disposal site is expected to be dispersive and close enough to shore to keep sand in the littoral system though it is not certain that the recreational beach between the east jetty and Blackpoint will see any immediate benefit. It is expected that the amount of sand removed from the sand trap area in front of the harbor would reduce wave heights at the entrance and the amount of sand currently dredged from the entrance channel itself by the Port.

The benefits and costs analysis provided by the Corps for this alternative did not result in a favorable recommendation for Federal participation in the project. The benefits attributed to improved navigation (through lower wave height) and reduced entrance channel dredging by the Port (through offshore trapping) do not offset the cost of the offshore trap operation. Furthermore, the alternative is based on an offshore disposal operation at a dispersive site that lies within the Monterey Bay National Marine Sanctuary. The costs would be considerably greater if the site could not be permitted, or if sand placement on the east beach is required, necessitating double handling of the material. And should the matter of hydrogen sulfide control become an issue during dredging of the offshore sand trap or the Port's continued

maintenance dredging of the entrance, the costs would increase further still, as the issue was not addressed in the Corp's alternative analysis.

However, the greatest shortcoming is that the Upcoast Sand Trap with disposal at the dispersive offshore site does not provide assurance that the east beaches will be nourished to the extent deemed necessary by the Coastal Commission to provide the desired public recreational benefit and protection to the coastal bluff. Furthermore, the beach provides protection for important public infrastructure – East Cliff Drive and a wastewater force main, water lines, and electric lines within its right of way.

The upfront cost consists of contract dredging of the Upcoast Sand Trap at the start of the dredging season. The recurring cost consists of the same at the beginning of each successive season. The cost allowance per dredging season is estimated to be $4,584,000, with dredge mobilization representing a substantial portion of the cost. Savings to the Port through a reduction of annual entrance channel dredging are difficult to estimate, but given an average Port dredging quantity of 250,000 cubic yards and assuming that roughly 350,000 cubic yards of sandy material bypasses the entrance, the Port is still likely to trap (and dredge) over 100,000 cubic yards annually. This dredging requirement will bring the hydrogen sulfide and beach nourishment concerns along with it, and a proportional share of the current dredging costs that are reflected in the above estimate.

4.1.7 Extend Jetties

Concept: Extend Jetties to Reduce Entrance Channel Maintenance Need

The extension of the entrance jetties as a means of reducing the maintenance dredging within the entrance channel conducted by the Port was also studied by the Corps. The theory of operation is that the extended jetties, while not eliminating the requirement for maintenance dredging, would increase the depth over the shoal that forms at the mouth of the harbor and result in a decreased need for dredging within the entrance channel (i.e. more material would be permitted to bypass the entrance naturally).

The Corp's investigation did not include a benefits and costs analysis of this alternative since the apparent cost of the jetty extensions so overwhelmed the benefits that the Corps removed the alternative from further consideration. In addition, the Port's maintenance dredging of the entrance probably is not eliminated entirely and the matter of hydrogen sulfide and beach nourishment concerns could still be an issue.

Given the prior dismissal of this plan, and recognizing that technical studies well beyond the scope of this study would be necessary to provide even a conceptual design for the jetty extensions, a cost estimate has not been generated. However, based on prior experience in similar coastal settings, the initial construction cost, assuming 500 feet of new jetty extension, is expected to be well over $10 million. It should be emphasized, however, that even if this option shows potential promise from a performance standpoint, the issues associated with permitting and building permanent structures in the Marine Sanctuary, without the benefit of eliminating the ongoing dredging, would overwhelm any performance benefits that could be gained.

4.1.8 Offshore Pipeline

Concept: Provide Offshore Disposal via Permanently Anchored Pipeline with Multiple Outlets (See Figures 15 & 16)

The conversion to offshore disposal via a permanently anchored pipeline would allow permanent offshore disposal, thereby controlling the hydrogen sulfide odor problem. The

modification consists of a permanently buried pipeline in the dry zone of the beach that turns seaward in the vicinity of the 6th (or 7th) Avenue and proceeds to daylight on a trestle out over the surf zone to a depth of approximately 15 ft MLLW (see Figures 15 & 16). The pipeline is anchored to the trestle above the surf, which is preferable to shallow burial in the surf zone because the mobility of the sandy bottom exposes the pipeline to both physical damage and plugging. The distribution pipe on the trestle would be outfitted with a number of submerged outlet pipes to discharge slurry at various depths depending on beach nourishment requirements. The outlets would be designed (and selected by the dredge operator) to maximize dredged material disposal as high on the beach as practical while minimizing the release of hydrogen sulfide, and the need to re-handle the material with dozers to build dry beach. But since the method facilitates offshore disposal to control the hydrogen sulfide odor problem, more dredged material will likely use the offshore method, with less material placed on the dry beach, thus increasing the need for rehandling the material with dozers.

In any case, the outlets are all located within the permitted disposal area boundary to facilitate permitting of the trestle, and although the trestle may receive careful scrutiny by the Coastal Commission, any adverse impacts on beach users should be offset by a reduction in the objectionable hydrogen sulfide releases and those dozer operations on the beach that are related to pipeline outlet manipulation.

The upfront costs consist of trestle and pipeline construction. Construction through the surf zone is particularly challenging and costly because a temporary construction trestle will likely be needed to place the pipeline supports. The cost allowance is estimated to be $1,692,000. The recurring cost is the incremental cost upon the current dredge operation to operate and maintain the trestle and multiport pipeline which may be offset by potential saving due to reduced dozer operation. This cost has not been estimated but should very approximately be a wash with current costs (reduced pipeline manipulation costs offset by increased beach material handling costs).

4.1.9 Dry-Zone Disposal Diffusers

Concept: Provide Dry-Zone Disposal via Permanently Installed Pipeline with Multiple Discharge Diffusers (see Figures 17 & 18).

The conversion to dry-zone disposal via a permanently installed pipeline would become possible by the effective control of the hydrogen sulfide releases. The modification consists of a permanently buried pipeline in the dry zone of the beach with multiple outlet diffusers located between the 5th Ave and 7th Ave (see Figures 17 & 18). The outlet diffusers will, of necessity, be exposed on the dry beach, but they will be designed (and selected by the dredge operator) to maximize beach profile build up using the settling characteristics of the dredged material to form a delta deposit around the diffuser. As the deposit builds around one diffuser and overlays the preceding, preparations can be made to activate the subsequent diffuser. Further re-handling of the beach material will largely be left to natural forces as the material will be discharged as high on the beach as practical. Re-handling or grooming of the beach deposit should only be required on special occasions.

This modification is intended to be provided in conjunction with any of the preceding modifications that reduce the release of hydrogen sulfide sufficiently to permit abandonment of the offshore and surf-line disposal methods.

The upfront cost consists of construction of the outlet diffusers on the existing burred pipeline. The cost allowance to fabricate and install 8 diffusers is estimated to be approximately $240,000. The recurring cost is the incremental cost upon the current dredging operation to operate and maintain the outlet diffusers. These recurring costs have not been estimated as

they are likely to be a cost saving due to the reduction in dozer operation made possible by the associated Hydrogen Sulfide control method with which the dry beach disposal is linked. The amount of savings can be better estimated once a preliminary diffuser design is developed.

4.2 Evaluation of the Potential Modifications

A summary of the Potential Modifications is presented on Table 4.

An evaluation of the potential modifications in which they are scored as superior (1 to 5) or inferior (-1 to -5) relative to the current practice (0 implies no change) for the eight comparison criteria is presented on Table 5. The highest score represents the best potential improvement; a negative score suggests that the Port is better served by the current practice than it would be by the potential modification.

The evaluation indicates that the degassing eductor on the dredge with the hydrogen sulfide scrubber offers the best potential improvement in performance. The upcoast sand trap and the jetty extension received a negative score and further consideration of these modifications appear unwarranted.

In deciding whether to proceed with the testing of the highest ranked (or other) potential modification, the Port District should proceed with the appropriate investigations to help ensure a successful outcome.

If a solution is found to permanently control the hydrogen sulfide problem, then the Port may consider the installation of the permanent dry beach disposal diffuser system to take full advantage of the odor control improvement, and address the tractor operation issue. This way forward should not only allow the Port to improve the efficiency of its entrance channel dredging operation, but enhance its ability to nourish the east beach and satisfy objectives for public access and protection of East Cliff Drive and other essential public infrastructure within its right of way.

Table 4: Summary of Potential Modifications to Existing Practices

	MODIFICATION								
	1. Seawater Spray System	**2. Poor Boy Degasser**	**3A. Degassing Eductor**	**3B. Degassing Booster Pump**	**4. Cutter-Head Sweeps**	**5. Pre-Dredge Plowing or Jetting**	**6. Upcoast Sand Trap**	**7. Extend Jetties**	**8. Offshore Disposal Pipeline**
Type	A B C	A B C	A B C	ABC	A B C	A B C			A B
Schematic Figure	9	10	11	11	12	13	14	-	15, 16
Pros	Reduces H_2S release; Increases dry zone dispersal; Reduces tractor operations						Reduces channel dredging	Reduces H_2S release; Increases dry zone dispersal; Reduces tractor operations	Reduces H_2S release
Cons / Uncertainties	H_2S scrubbing efficacy; Aesthetics	Degasser capacity; H_2S trapping efficacy; Aesthetics	H_2S trapping efficacy	Booster pump capacity; Booster pump operation	H_2S dispersal efficacy; Feasibility in swells	H_2S dispersal efficacy	Beach nourishment efficacy; H_2S release reduction; Permittability	Beach nourishment efficacy; Permittability; Dredging still needed	Beach nourishment efficacy; Aesthetics; Permittability
Upfront costs[(1)] ($1,000's)	$137	$327	$245	$490	$41	$163	$4,584 (See 3)	>$10,000	$1,692
Annual recurring cost [(2)] ($1,000's)	$110	$185	$185	$203	$260	$148	$4,584 (See 3)	(See 4)	(See 5)

1) Very preliminary estimate of cost in 2011 dollars. Soft costs (environmental, permitting, engineering, contract administration) not included

2) Very preliminary estimate of net increment to current channel maintenance dredging program for annual cost of conducting modified operation, includes potential savings allowance on account of reduced dredging volume or beach dozer operation, in 2011 dollars.

3) Assumes contract dredge for initial (and annual) dredging of offshore trap, and reduced volume of Port's annual channel dredging volume.

4) Costs not estimated. Modification requires further study to prepare cost estimate.

5) Costs expected to be small incremental change.

Table 5: Evaluation of Potential Modifications to Existing Practices

		MODIFICATION								
		1. Seawater Spray System	2. Poor Boy Degasser	3A. Degassing Eductor	3B. Degassing Booster Pump	4. Cutter-Head Sweeps	5. Pre-Dredge Plowing or Jetting	6. Upcoast Sand Trap	7. Extend Jetties	8. Offshore Disposal Pipeline
CRITERIA	Increase days of entrance channel navigation	+2	+4	+4	+4	+2	+2	+4	+4	+2
	Increase nourishment of down coast beaches	+3	+4	+4	+4	+3	+3	-4	-2	+2
	Decrease dozer operation on beaches	+3	+4	+4	+4	+3	+3	+2	+2	+2
	Decrease hydrogen sulfide releases	+2	+4	+4	+4	+3	+2	+2	+2	+3
	Decrease impact on Monterey Bay Habitat	+3	+4	+4	+4	+3	+3	-5	-3	-1
	Decrease cost maintenance dredging	-2	-2	-2	-3	-3	-2	-5	0	0
	Upfront costs/risks	-2	-3	-2	-3	-1	-2	-5	-5	-5
	Enhance permit ability	+1	-2	+5	+1	+3	+3	-3	-5	1
	TOTAL	+10	+13	+21	+15	+13	+12	-14	-7	+4

Expected performance relative to current practice

Superior	No Change	Inferior
+5	0	-5

5. SUMMARY & RECOMMENDATIONS

The current dredging and bypassing operations at Santa Cruz Harbor fulfill two important objectives:

- Providing **safe harbor** and **navigation** to boaters; maintaining access to the harbor during winter months provides continued use of the harbor as a "harbor of refuge." This provides year round, useable and safe access to Monterey Bay for recreational, commercial, and marine rescue service purposes.
- Providing **recreational** uses by continuing the alongshore transport of sand meant for beaches downcoast of the harbor entrance (Twin Lakes Beach). Beach nourishment also facilitates beach recovery from seasonal erosion and storm damage.

A review of current dredging/disposal practices was carried out by the Moffatt Nichol project team for the Santa Cruz Port District at the request of the California Coastal Commission. Present practices involve dredging sediment from the entrance and reuse of these coarser grained sediments for beach replenishment downcoast on the harbor beach and the Twin Lakes State Beach. Air emissions of hydrogen sulfides from the beach replenishment operation have been a particular challenge for the Port District. Strict emission limitations imposed by the Monterey Bay Unified Air Pollution Control District have significantly influenced operational practices and costs for by-pass sediment dredging at the harbor entrance. Smaller volumes of finer sediment from the upper harbor have been disposed of in the surf zone east of the harbor jetty as previous studies and a recent study by the United States Geological Survey (Storlazzi et al., 2011) have established that these fine sediments do not accumulate locally on the shoreline and/or inner shelf but are effectively moved offshore. Dredging operations are guided by the Operations Manual, Santa Cruz Harbor Dredging Program (SC Port District, 2010).

The dredging and bypassing methods employed by the Santa Cruz Harbor District are comparable to practices at other harbors. Practices implemented at Santa Cruz Harbor over the past several years with regulatory approvals have met all of the Harbor's criteria including maintenance of a year-round safe passage for vessels, provide necessary beach nourishment, meet strict hydrogen sulfide air emission requirements, and maximize and preserve coastal access and marine resources. Of particular interest to regulatory agencies are the impacts that the dredging and disposal operations could have on recreational users on the beach and in the water. During dredging and disposal operations, the beach remains open to the public. Beach nourishment operations are carried out November through April with minimal perceived impacts to public access, since the beach is less frequently used during these months due to inclement weather and/or wave conditions. Temporary, localized disruptions to full public use of the beach occur when the tractor is relocating the end of the discharge pipeline to abate odor issues. The pipeline configurations, both onshore and offshore, are well marked for safety purposes and do not inhibit access or use of the beach.

Nevertheless, hydrogen sulfide air emission practices have been costly to implement and have significantly affected the efficiency of dredging operations by reducing daily production rates. Eight potential modifications to current practices have been identified and considered in this present study. If the ongoing issues associated with nuisance odors and public perception of the District's practices continues, the District may want to explore implementation of one or more of the high-ranking potential modifications. The degasser options, especially the on-dredge eductor, shows promise and should be explored further with vendors of such systems. As demonstration projects, the cutter-head and plowing/jetting options could also be considered if the eductor type degassing system does not perform well.

Initial recommendations to evaluate the potential for success for any of the modifications include the following:

- Add coring and sulfide analyses to the sediment sampling and testing program in the entrance and upcoast sediment trap areas to determine the amount and distribution of sulfides present, to better analyze and develop potential operational modifications.
- Quantify kinetics of sulfide reactions with seawater and conduct simple laboratory and field tests of seawater scrubbing to minimize hydrogen sulfide releases.
- Gather additional observations about vegetation management, including exploring the possibility of periodic raking of the entrance bottom to remove large kelp or algae materials before burial and hydrogen sulfide formation.

6. REFERENCES

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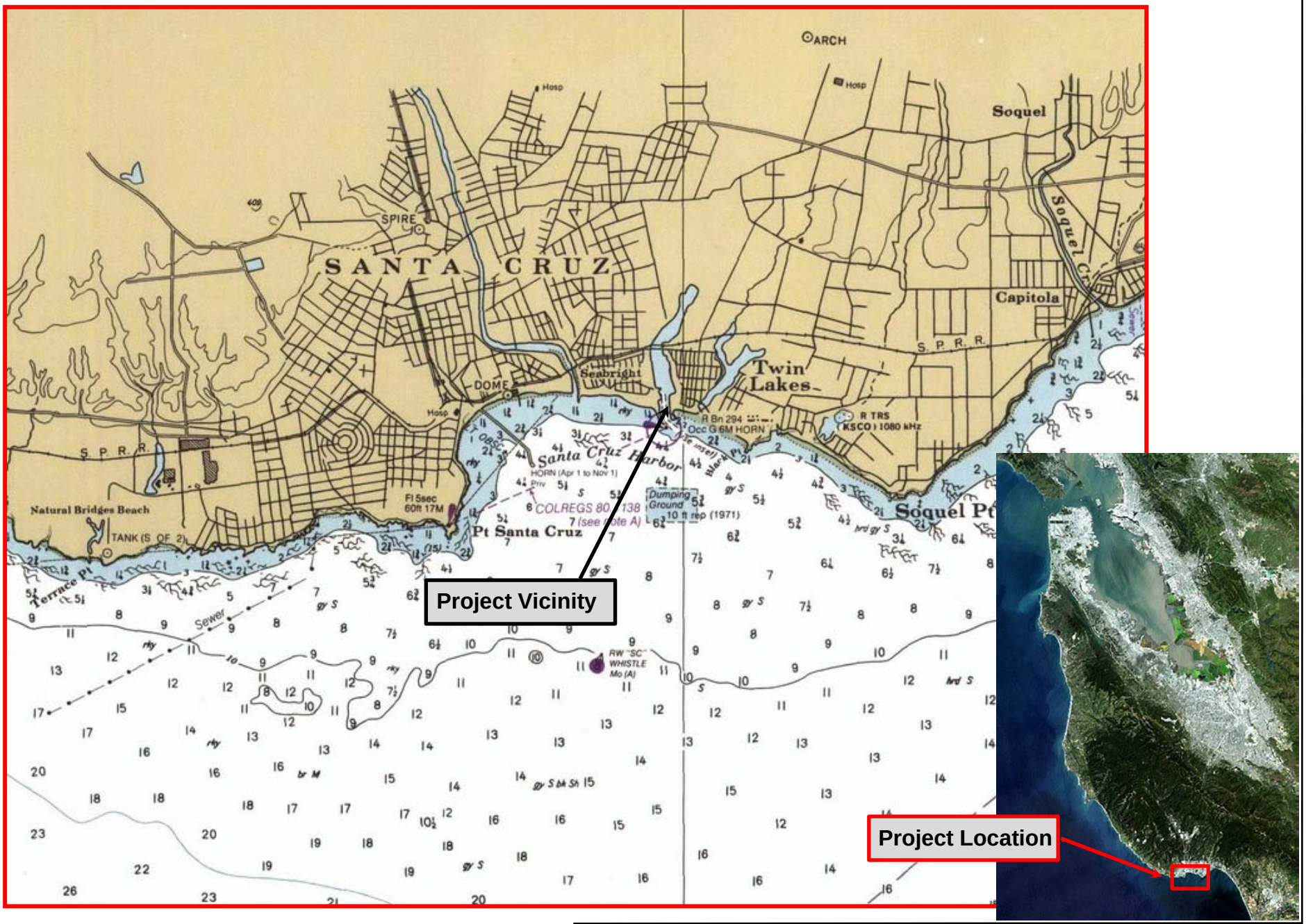
FIGURES



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WALNUT CREEK, CALIFORNIA

Figure 1:
Project Location & Vicinity

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Figure 2:
Santa Cruz Harbor Looking West

Obliques by Kinnetic Laboratories

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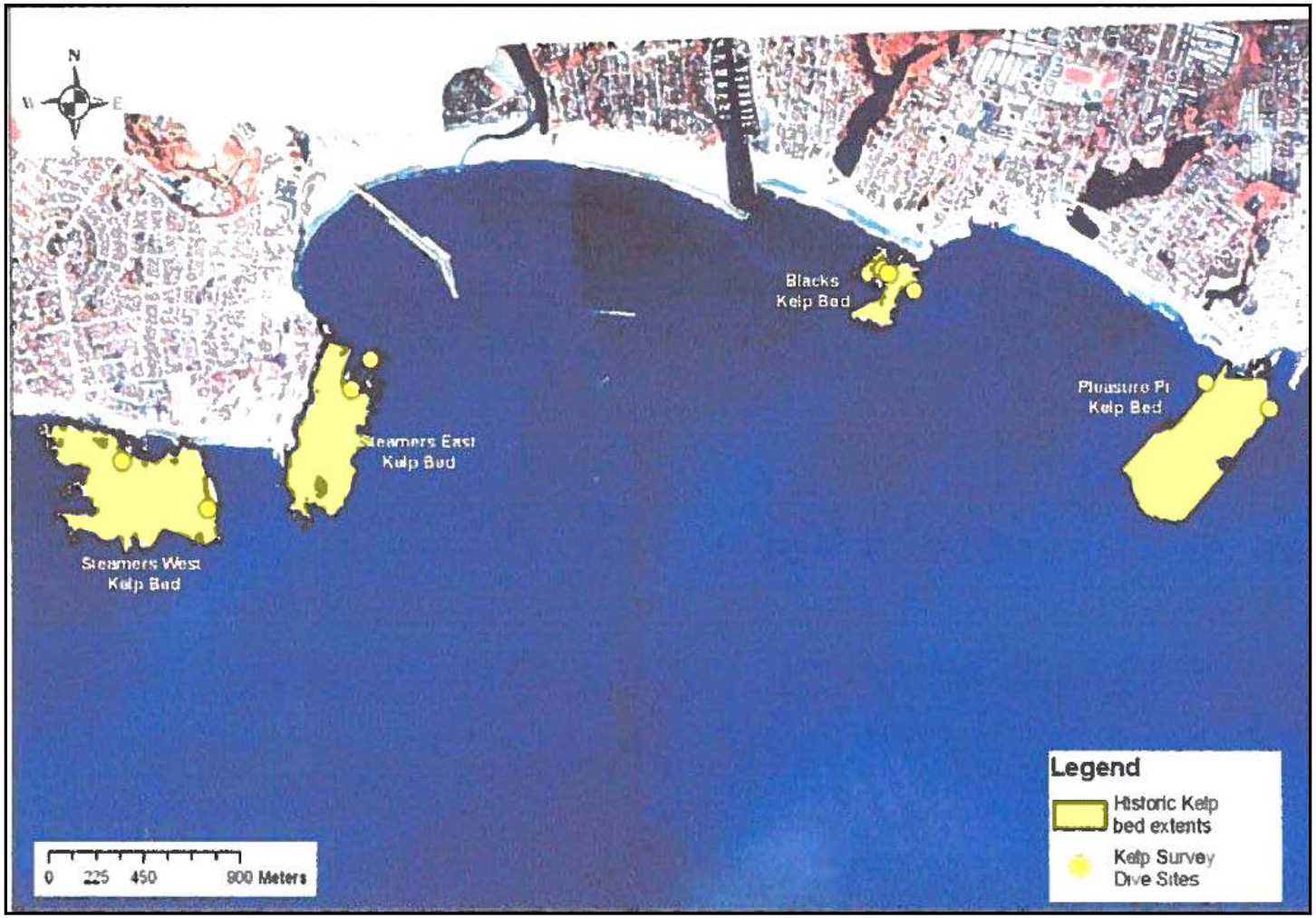
Figure 3: Twin Lakes Beach



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WALNUT CREEK, CALIFORNIA

Figure 4. Location of Nearby Kelp Beds (Sandoval Assoc., 2011)

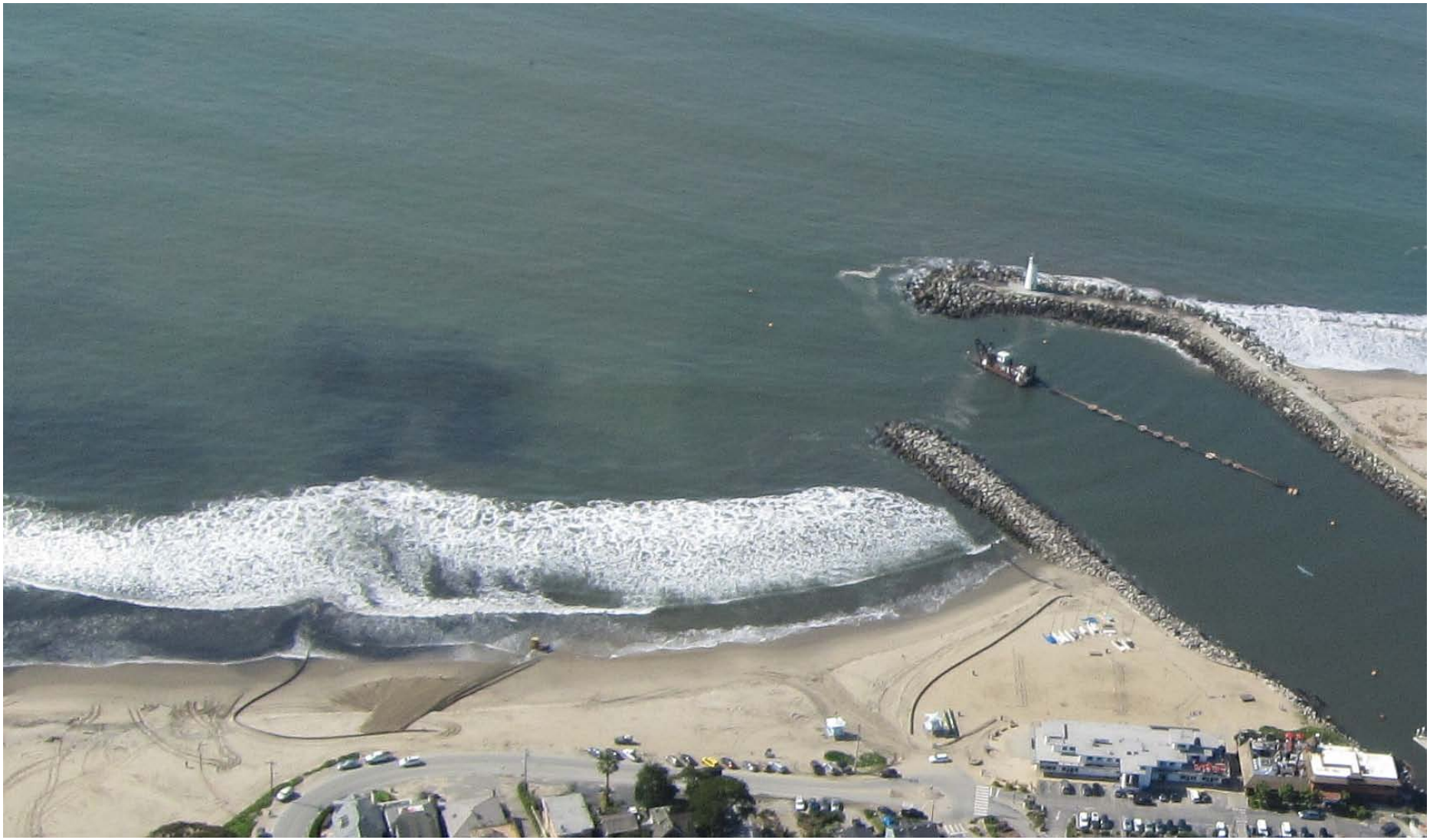

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Figure 5: Dredging Operations at Santa Cruz Harbor

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Figure 6. Beach Disposal

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Figure 7. Sand Placement on Beach

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Figure 8: Sand Moved to Upper Beach via Dozers

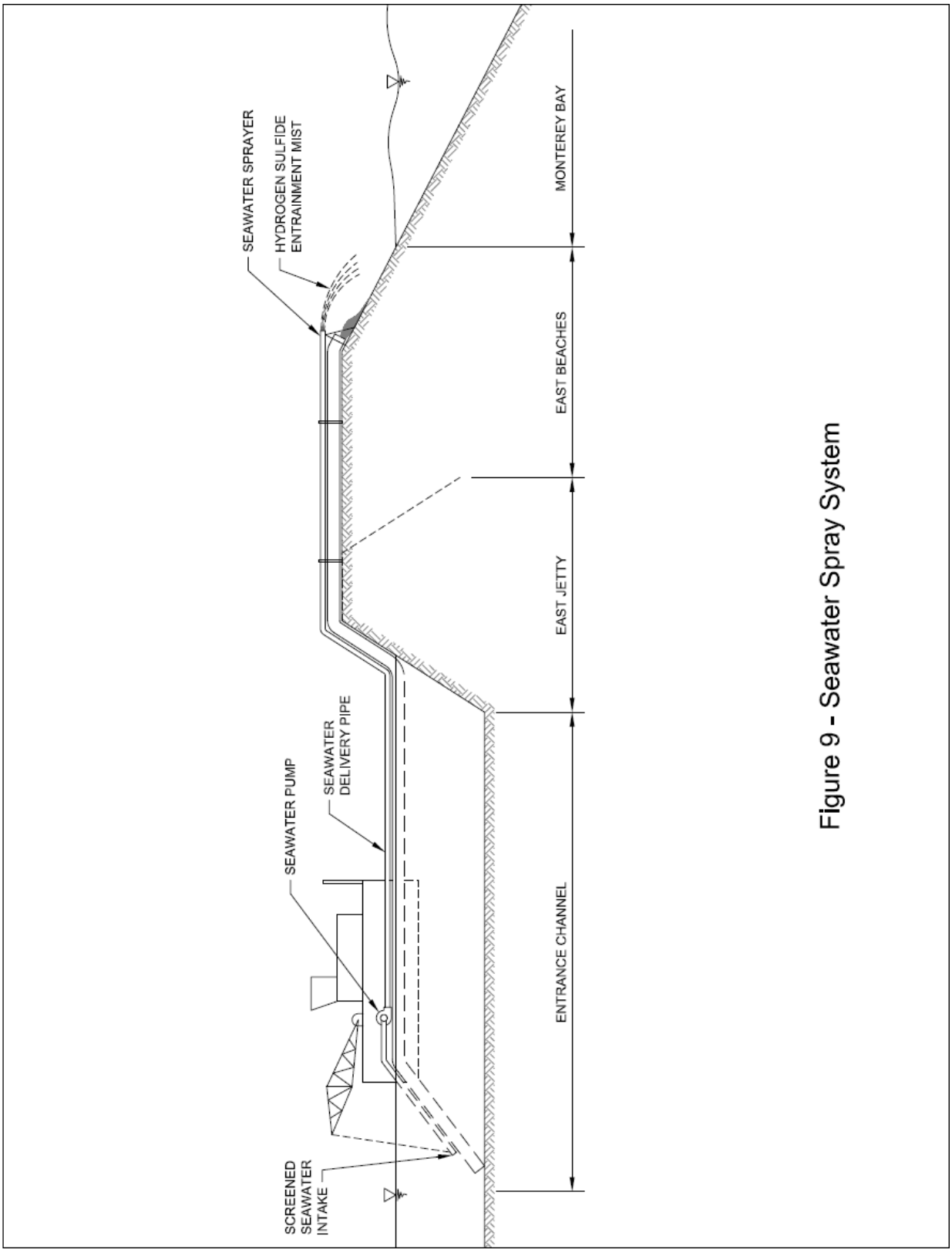


Figure 9 - Seawater Spray System

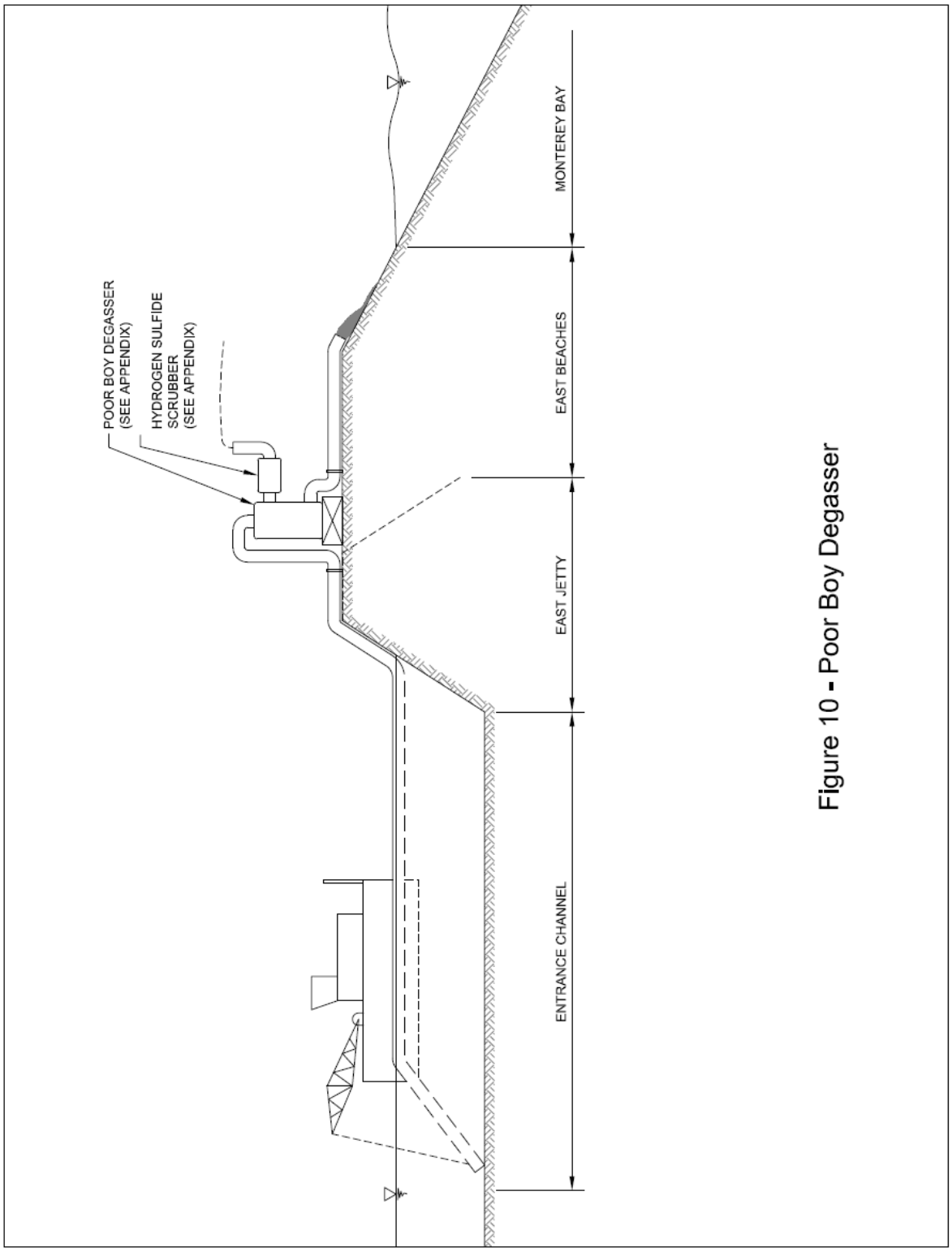


Figure 10 - Poor Boy Degasser

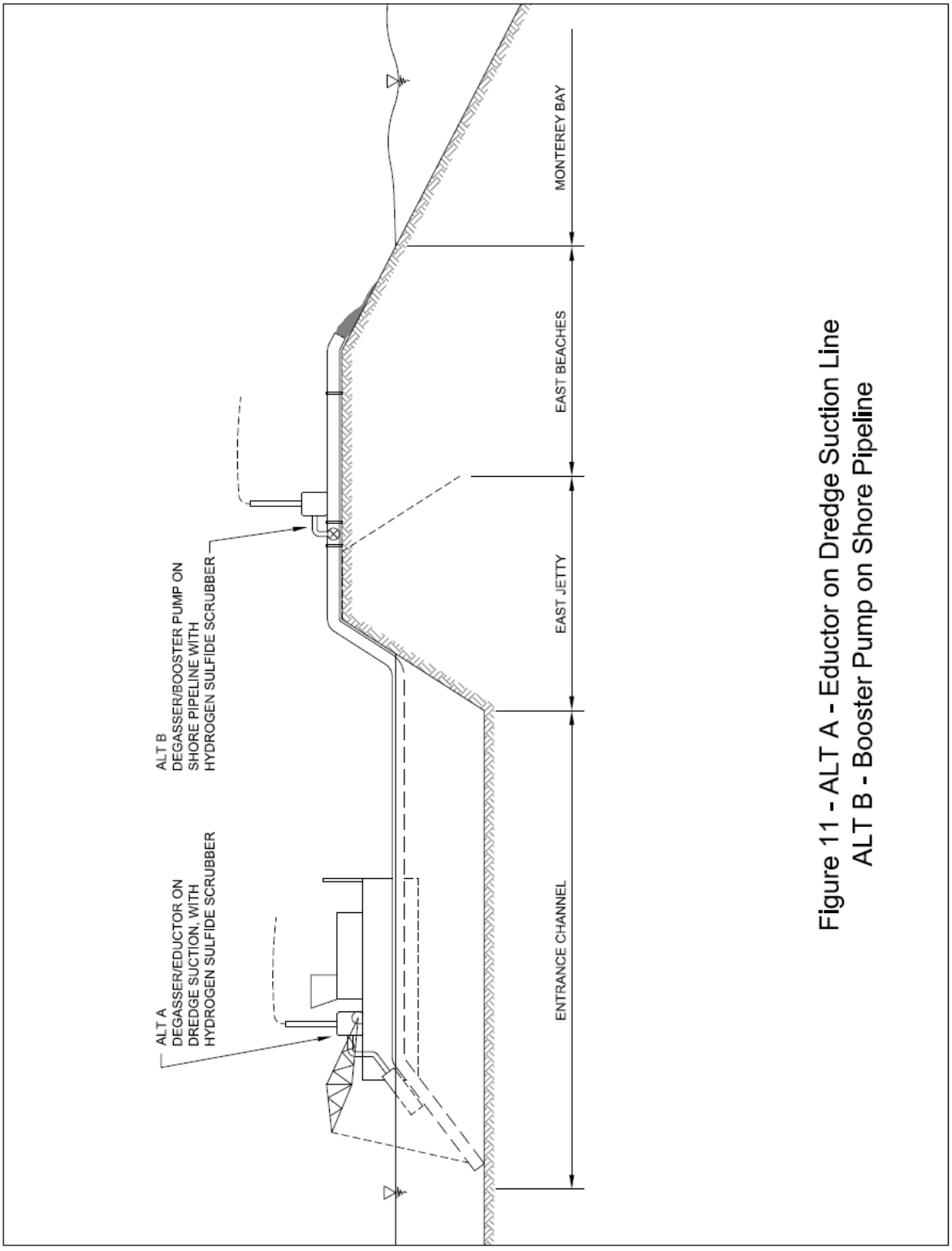


Figure 11 - ALT A - Eductor on Dredge Suction Line
ALT B - Booster Pump on Shore Pipeline

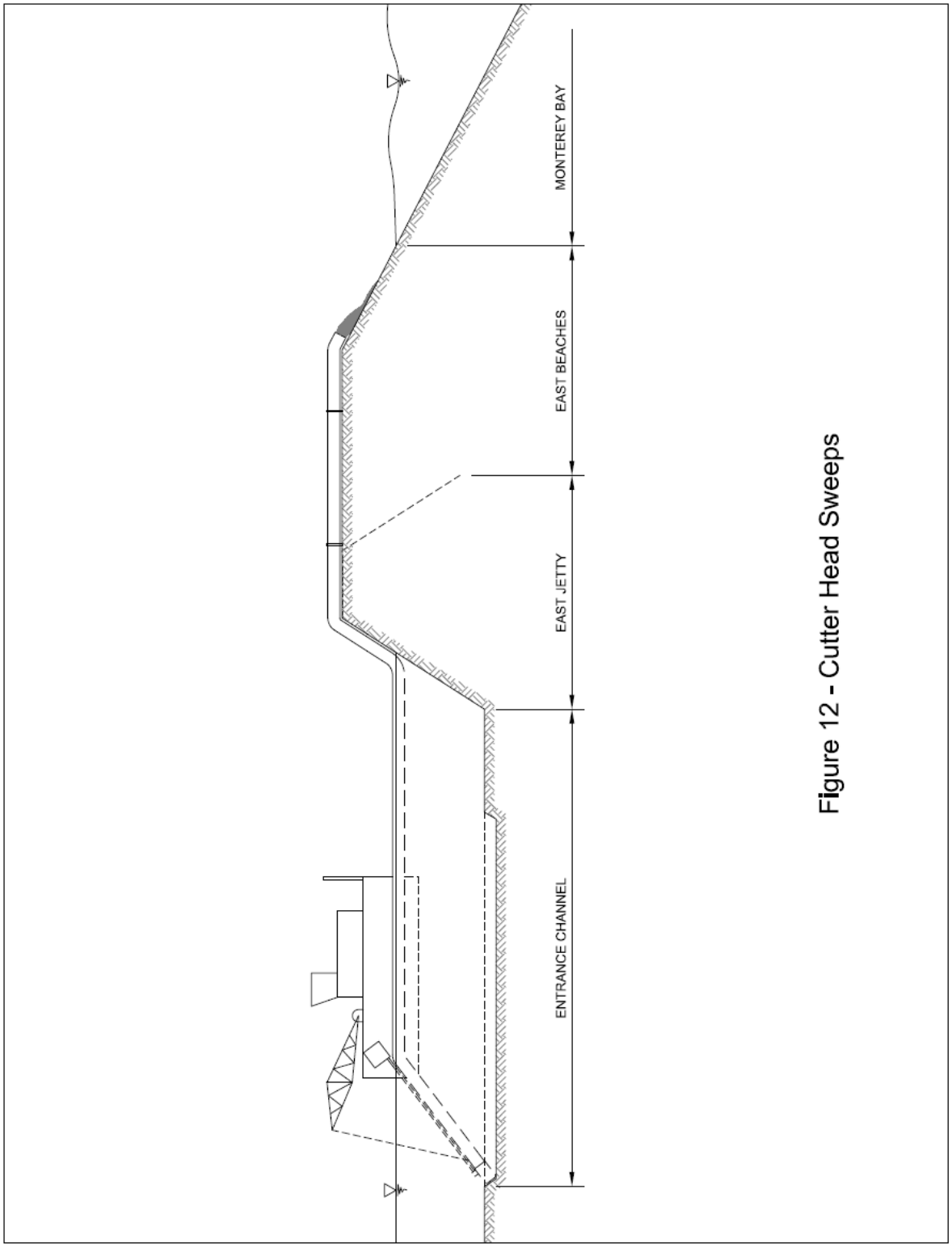


Figure 12 - Cutter Head Sweeps

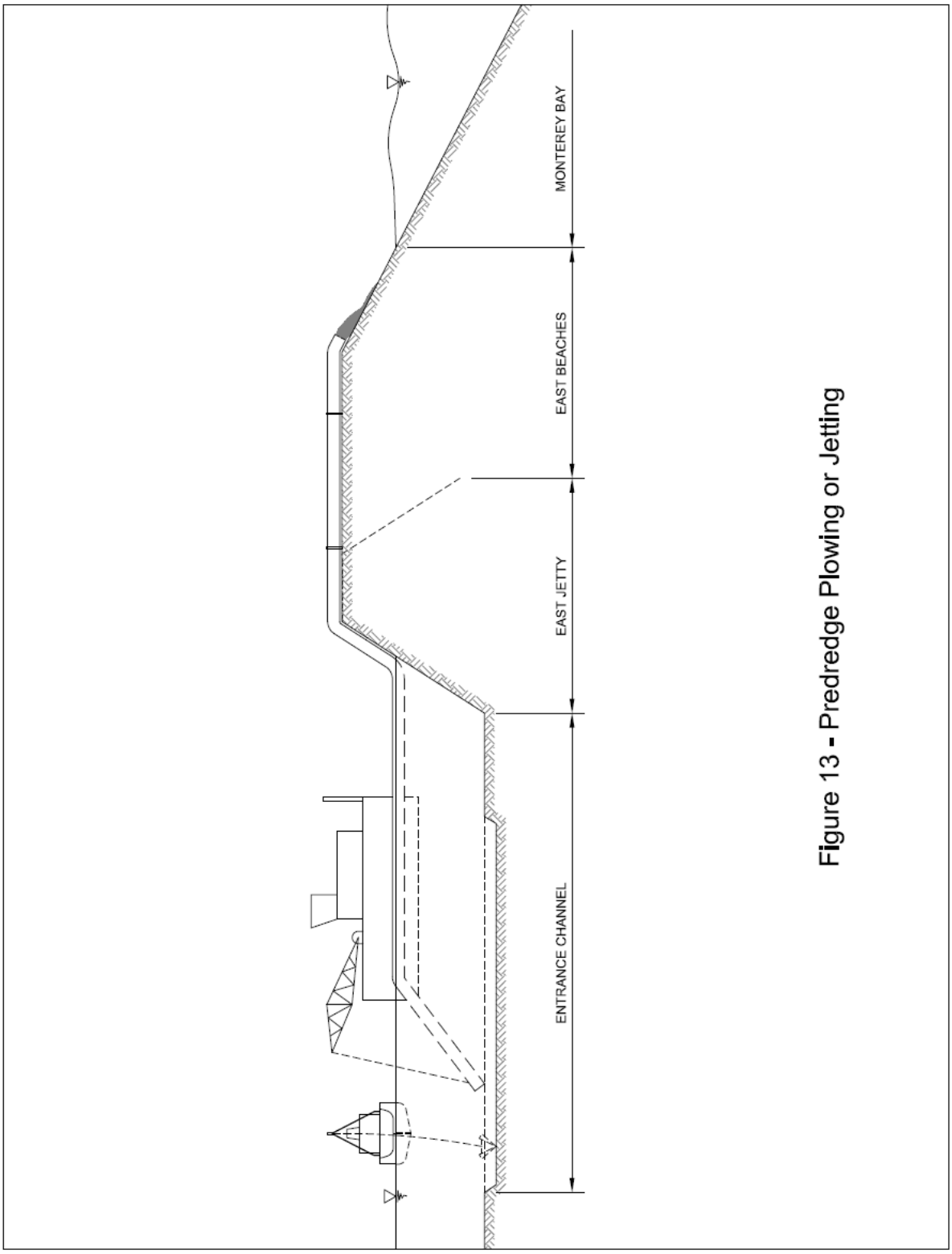


Figure 13 - Predredge Plowing or Jetting

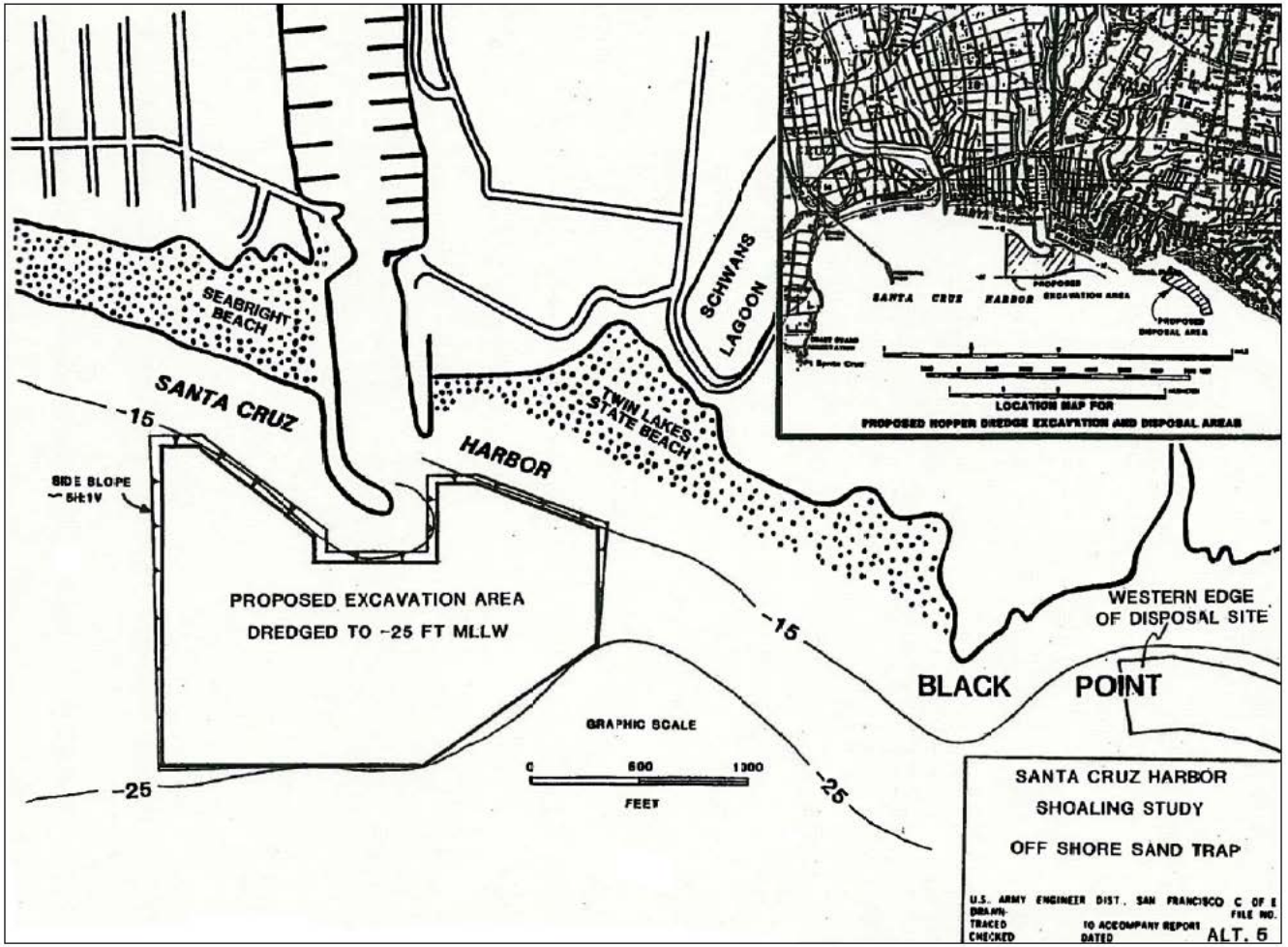


Figure 14 - Restore Upcoast Sand Trap with Downcoast Offshore Disposal Site

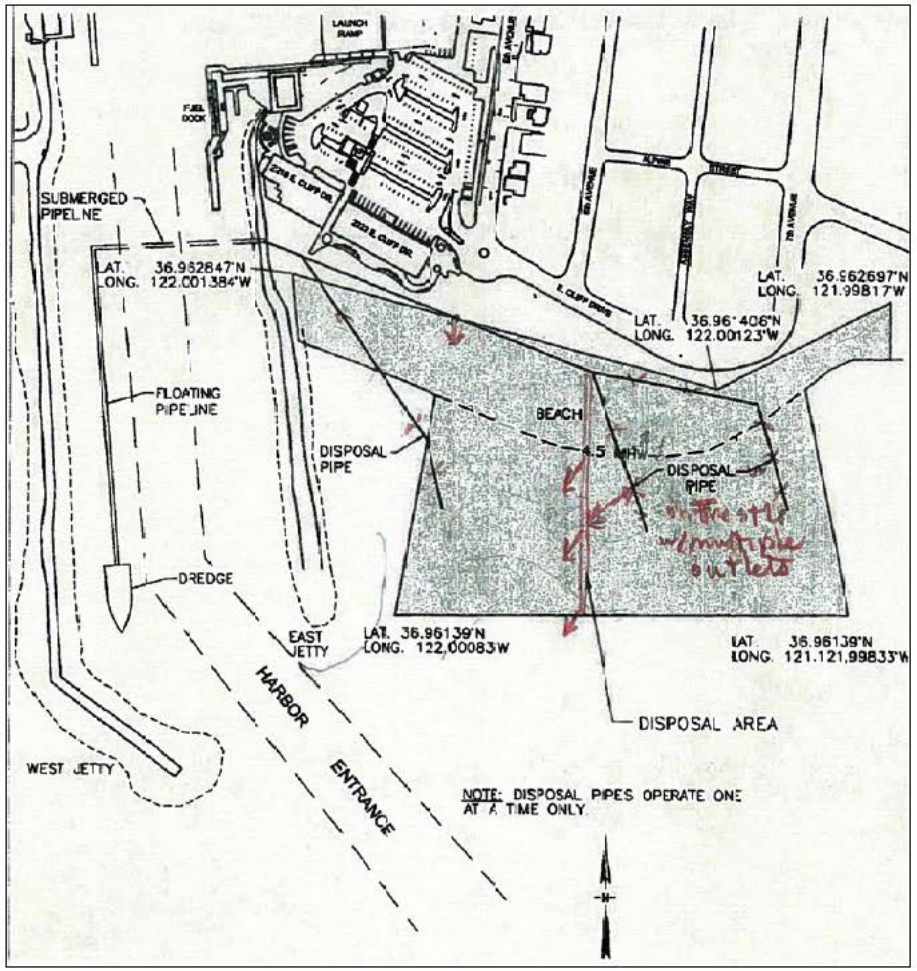


Figure 15 - Offshore Disposal Pipeline Plan

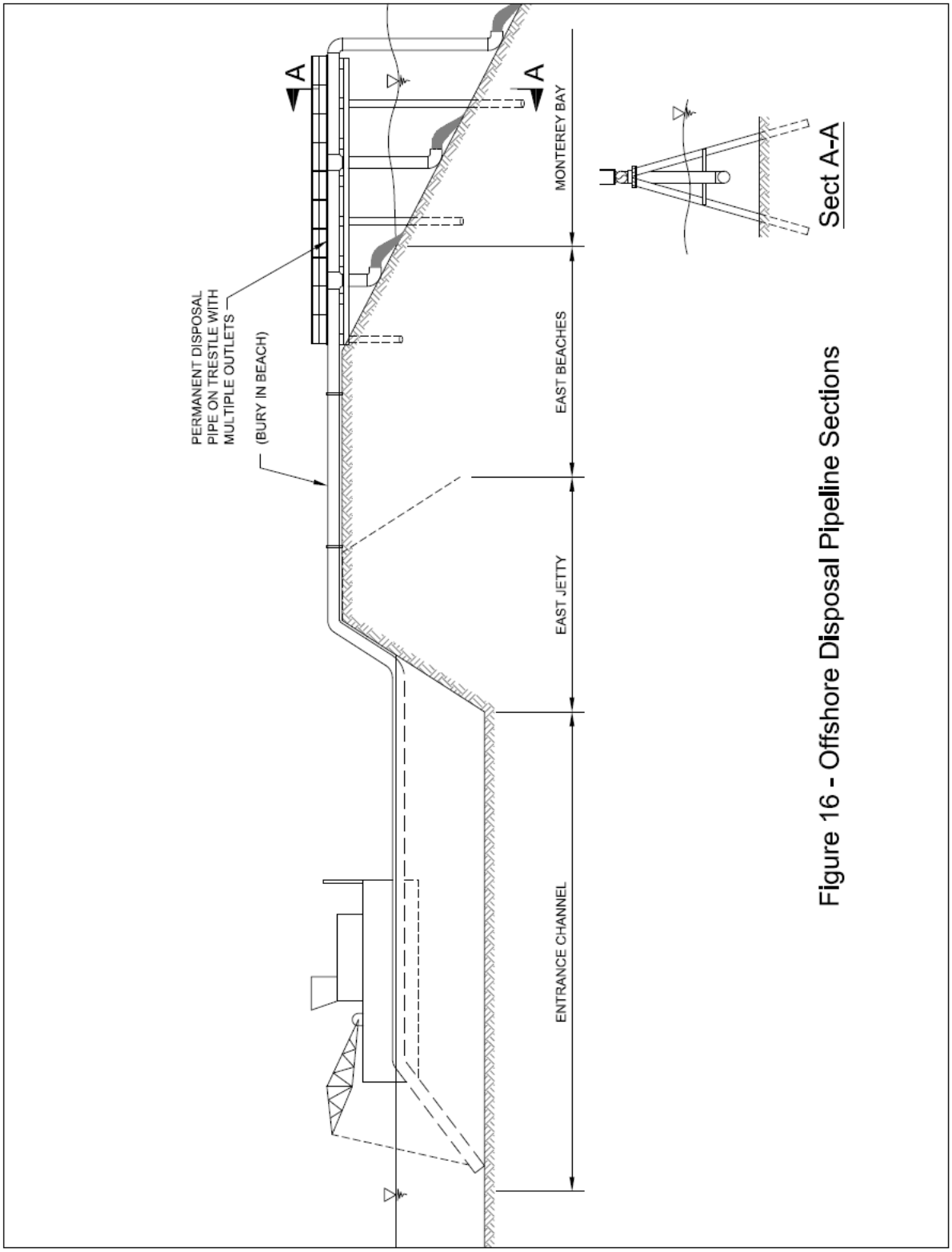


Figure 16 - Offshore Disposal Pipeline Sections

Fig 17 - Dry Zone Disposal Plan

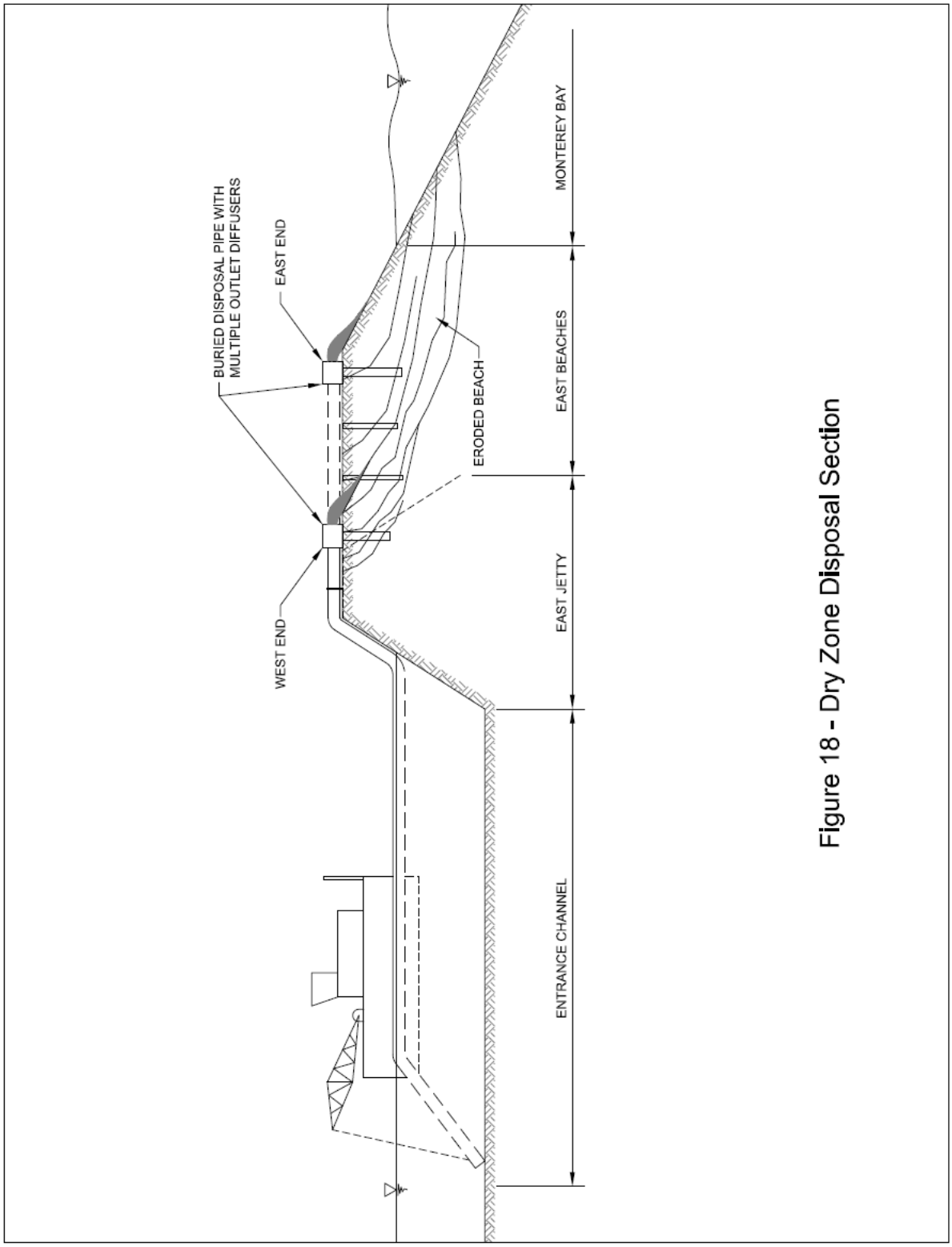


Figure 18 - Dry Zone Disposal Section

APPENDIX A

VEGETATION OBSERVATIONS AT SANTA CRUZ HARBOR

(STORM OF MARCH 24-25, 2011)

APPENDIX C

VEGETATION OBSERVATIONS AT SANTA CRUZ HARBOR

STORM OF MARCH 24-25, 2011

Kinnetic Laboratories, Inc.

Observations of vegetation in nearshore drift and deposited along the shoreline near and around Santa Cruz Harbor was performed on 24 March during the storm of 24-25 March 2011 (Figure 1). Obvious terrestrial wood debris was observed discharged at the mouth of the San Lorenzo River (Figure 2). The combination of storm and tidal surge caused erosion of newly placed sand east (downcoast) of the jetty (Figure 3) and deposited a mix of terrestrial and marine organic debris along the beach face (Figure 4). Giant kelp (*Macrocystis pyrifera*) fragments comprised a large percentage of the organic debris washed up on the beach downcoast of the harbor mouth (Figure 5).

A representative sample of organic debris was collected from material thrown by storm waves over the west jetty breakwater from the upcoast sand trap area (Figures 6 and 7). A subsample of material was taken from the sample and divided into major components (Figure 8). These components consisted surfgrass (Figure 9), red algae (Figure 10), brown algae (Figure 11), and terrestrial debris (Figure 12).

Two species of surfgrass, *Phyllospadix scouleri* (Scouler's surfgrass) and *P. torreyi* (Torrey's surfgrass), are commonly found along Santa Cruz County shorelines. *P. scouleri* has a thicker blade than *P. torreyi*. The subsample of surfgrass is likely to contain both species and comprised approximately 25 to 30% of the total debris mixture (Figure 9). Eelgrass, *Zostera marina*, is sometimes mistaken for surfgrass but no eelgrass was found in the collected debris. Eelgrass beds within Monterey Bay are limited to the estuarine environment of Elkhorn Slough and its entrance to the bay (CDFG, 2010). Both surfgrass (*Phyllospadix sp.*) and eelgrass (*Zostera sp.*) are prohibited species under California Ocean Sport Fishing Regulations (CDFG, 2011 and SIMoN, 2011) and may not be cut or disturbed.

Various red algae comprised approximately 25 to 30% of the total debris mixture (Figure 10). Various brown algae, though primarily *M. pyrifera*, comprised approximately 30% of the total debris mixture (Figure 11). Organic debris from terrestrial sources comprised approximately 5 to 10% of the total debris mixture with willow and oak leaves being the most common component of this fraction.

None of the surfgrass or algal species encountered during this survey are listed or proposed for listing as endangered or threatened under the Federal or California Endangered Species Acts. Nor are any listed as threatened species by the World Conservation Union (formerly the International Union for the Conservation of Nature) (SIMoN, 2011).

REFERENCES

CDFG (California Department of Fish and Game), 2010. Status of the Fisheries Report an Update Through 2008. Report to the California Fish and Game Commission as directed by the Marine Life Management Act of 1998. Prepared by the California Department of Fish and Game Marine Region, August 2010. page 16-5.

CDFG (California Department of Fish and Game), 2011. Ocean Sport Fishing Regulations – Effective March 1, 2011 through February 28, 2012. page 56.

SIMoN (Sanctuary Integrated Monitoring Network), 2011. Monterey Bay National Marine Sanctuary Special Status Species, www.sanctuarysimon.org/monterey/sections/specialSpecies/.

Figure 1. Storm of March 24-25, 2011

Figure 2. Vegetation Discharged Off the San Lorenzo River

Figure 3. Erosion of Newly Placed Sand at Beach East of Jetty, March 24, 2011.

Figure 4. Organic Debris Deposited at Downcoast Beach

Figure 5. Beached Organic Debris Downcoast of the Harbor Mouth with a Large Percentage of Giant Kelp

Figure 6. **Representative Sample of Organic Debris Collected from Material Thrown Over the Breakwater by Storm Surge is Comprised of a Mixture of Marine Algal Fragments, Surfgrass, and Miscellaneous Terrestrial Plants.**

Figure 7. Close-up Image of Representative Sample of Organic Debris.

Figure 8. **Representative Sample of Organic Debris (left) and Subsample Divided into Distinct Piles of the Main Components (right). The Larger Component Piles are Roughly Proportional to Their Contribution of the Total Debris Mixture.**

Figure 9. Surfgrass Component of Divided Organic Debris Subsample.

Figure 10. Red Algae Component of Divided Organic Debris Subsample.

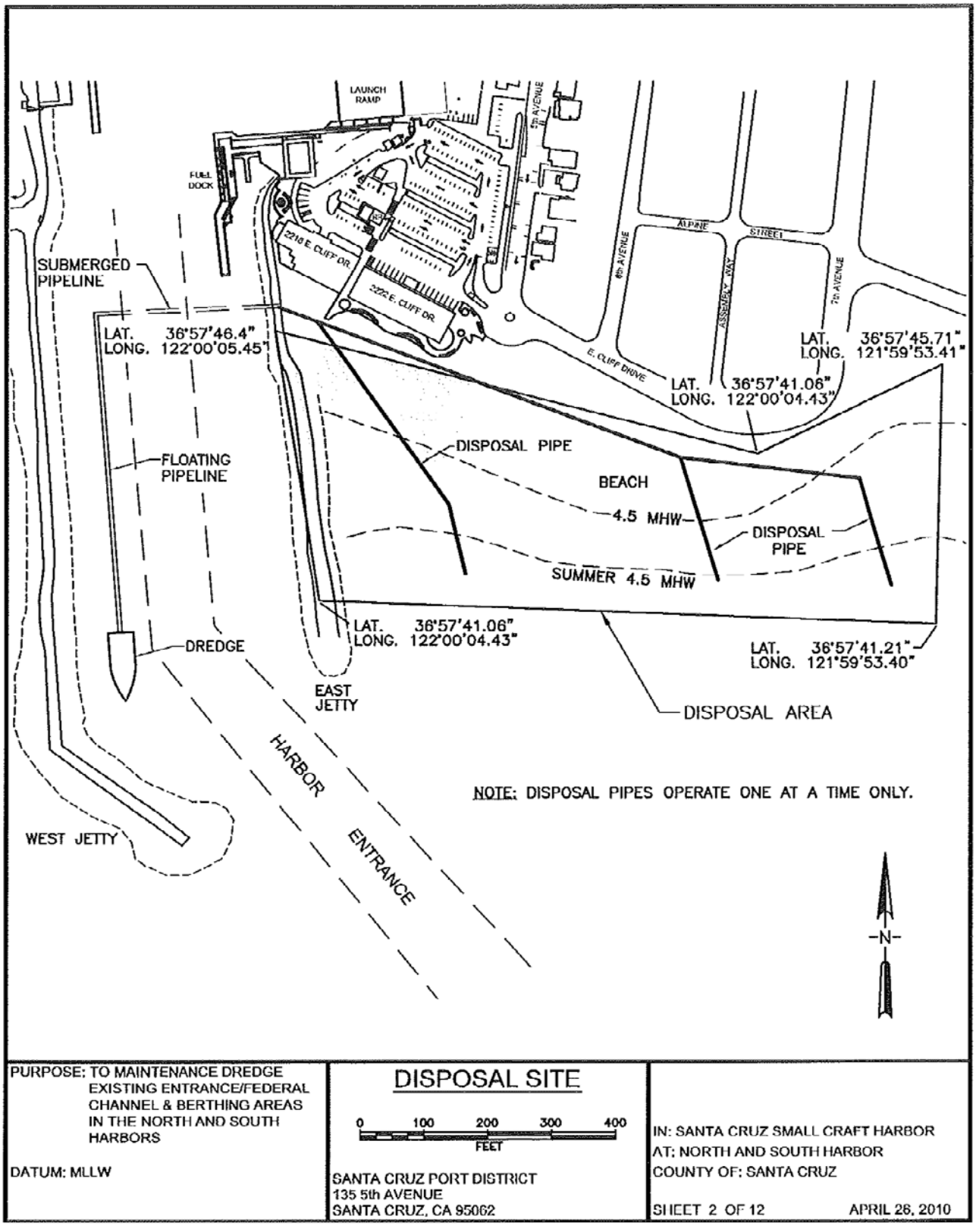
Figure 11. **Brown Algae, including Giant Kelp, Component of Divided Organic Debris Subsample.**

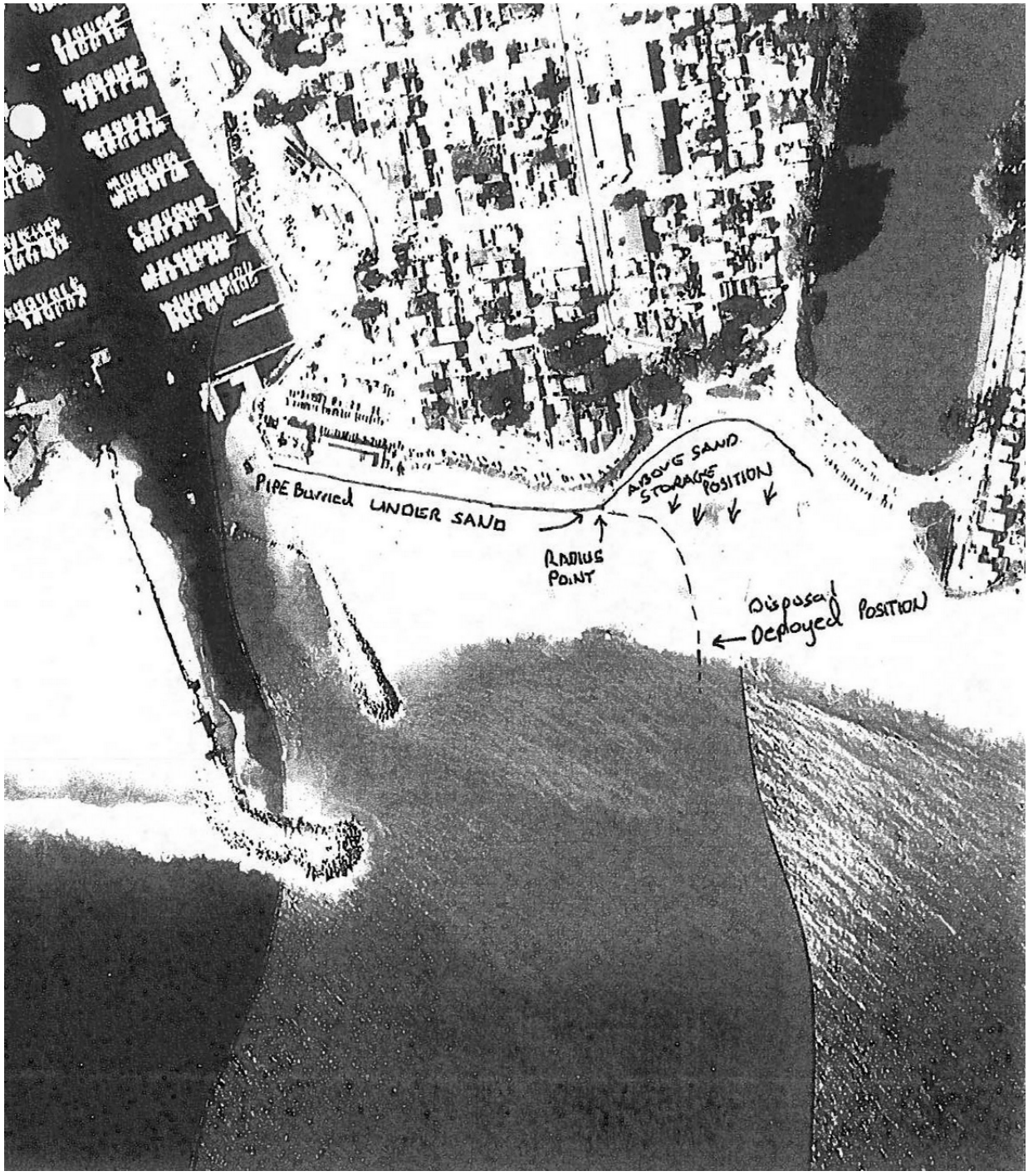
Figure 12. Terrestrial Component of Divided Organic Debris Subsample.

APPENDIX B

DREDGED MATERIAL DISPOSAL PIPELINE LAYOUT

(Santa Cruz Port District, 2010)


LAUNCH RAMP
FUEL DOCK
5th AVENUE
ALPINE
STREET
4th AVENUE
ASSEMBLY WAY
7th AVENUE
2218 E. CLIFF DR.
2222 E. CLIFF DR.
E. CLIFF DRIVE
SUBMERGED PIPELINE
LAT. 36°57'46.4"
LONG. 122°00'05.45"
LAT. 36°57'45.71"
LONG. 121°59'53.41"
LAT. 36°57'41.06"
LONG. 122°00'04.43"
FLOATING PIPELINE
DISPOSAL PIPE
BEACH
4.5 MHW
DISPOSAL PIPE
SUMMER 4.5 MHW
LAT. 36°57'41.06"
LONG. 122°00'04.43"
LAT. 36°57'41.21"
LONG. 121°59'53.40"
DREDGE
EAST JETTY
DISPOSAL AREA
HARBOR ENTRANCE
NOTE: DISPOSAL PIPES OPERATE ONE AT A TIME ONLY.
WEST JETTY
-N-
PURPOSE: TO MAINTENANCE DREDGE EXISTING ENTRANCE/FEDERAL CHANNEL & BERTHING AREAS IN THE NORTH AND SOUTH HARBORS
DATUM: MLLW
DISPOSAL SITE
0 100 200 300 400
FEET
SANTA CRUZ PORT DISTRICT
135 5th AVENUE
SANTA CRUZ, CA 95062
IN: SANTA CRUZ SMALL CRAFT HARBOR
AT: NORTH AND SOUTH HARBOR
COUNTY OF: SANTA CRUZ
SHEET 2 OF 12
APRIL 26, 2010


PIPE Buried UNDER SAND
RADIUS POINT
ABOVE SAND STORAGE POSITION
Disposal Deployed POSITION

APPENDIX C

SURVEY OF OTHER HARBORS / MARINAS

Summary Sheets and Completed Survey Forms for Each Harbor/Marina

Morro Bay Harbor

Morro Bay, CA
Owner: City of Morro Bay
Website: http://www.morro-bay.ca.us/index.aspx?nid=144

Summary:

- Annual dredging of entrance channel;
- Dredge material discharged on beaches to the north and south, in surf zone;
- Dredge equipment used: hydraulic, hopper, clamshell.

Survey contact:
Eric Endersby, Harbor Operations Manager, City of Morro Bay
EEndersby@morro-bay.ca.us

Morro Bay Harbor

Eric Endersby
4-11-11
via phone interview

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

Federal/Corps dredging.

- ☐ <80,000 CY
- ☒ 80,000 – 140,000 CY - annual
- ☐ 140,000 – 200,000 CY
- ☒ >200,000 CY - periodic (>5 yrs) when do entire harbor

(2) What is the average frequency of dredge episodes?

- ☒ Annually - entrance channel + "Wave entrance improvement proj." (deepening outside entrance channel)
- ☐ 1-3 years
- ☐ 3-5 years
- ☒ >5 years - Fall 2009-2010 dredged entire harbor ~300K cy w/ Fed. ARRA fun

(3) Is the entire marina dredged in one episode?

- ☒ No
- ☐ Yes

If no, please explain: entrance channel sep. frequency needed than rest of harbor.

(4) Marina dredging is completed:

- ☒ Mechanically
- ☒ Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) barge mounted excavator (AIS); hopper dredge - split hull disposal - beach to south (Morro Strand); hydraulic pipeline - beach to north.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☒ Scow –
- ☐ Crane
- ☐ Bulldozer
- ☐ Other
- ☐ Crane
- ☒ Booster Pump
- ☐ Toyo Pump

(6) Dredging duration is:

☒ <1 month – annual w/ hopper ☐ < 6 months
☒ <3 months - when doing entire harbor ☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft ☐ < 15 ft
☐ < 12ft ☒ > 15 ft – "Wave improvement" area = -40
entrance channel = -20'
inner (after turn corner) = -14

(8) Where is dredge material disposed of?

☒ Nearshore waters ☒ Downstream beach – Surf zone } ie. place mat'l both to South & north of harbor
☐ Offshore waters (outside of littoral zone) ☒ Other – "upcoast" beach 2surf zone }

(9) Are there organics present in the dredge material?

☐ No ☒ Yes

If Yes please provide percentage and/or sediment testing reports.
- decayed kelp.

(10) Have there ever been issues with odor during dredge operations?

☐ No ☒ Yes - periodically throughout disposal timeframe (Oct-Feb).

If Yes please describe Surfer's Complained. Relatively Sparsely-used beaches (housing only at northern end of beach discharge sites). Educated surfer's on what was going on.

(11) Do you have a permanent sand by-passing system?

☒ No ☐ Yes

If Yes please describe _____

_____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft ☒ 8 – 14 ft
☒ 14 – 20 ft ☒ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☒ No- only get seasonal effects. ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☒ Yes

Location: both sides of harbor

(15) Is the littoral transport rate along the shoreline known?

☒ No ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: both ways/directions (possibly tied to seasons)

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☒ No ☐ Yes

If Yes please describe _____

_____

If you feel that there are any additional details which have not been provided above please feel free to comments below:

_____

_____

_____

_____

_____

_____

_____

Santa Barbara Harbor

Santa Barbara, CA
Owner: City of Santa Barbara
Website: http://www.santabarbaraca.gov/Government/Departments/Waterfront/index.htm

Summary:

- Annual dredging of entrance channel;
- Dredge material discharged on downcoast beaches, in surf zone and occasionally on dry beach;
- Dredge equipment used: hydraulic.

Survey contact:
Karl Trieberg, Waterfront Facilities Manager, City of Santa Barbara
KTrieberg@SantaBarbaraCA.gov

Santa Barbara Harbor

Karl Trieberg
4-1-11

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☐ <80,000 CY
- ☐ 80,000 – 140,000 CY
- ☐ 140,000 – 200,000 CY
- ☒ >200,000 CY

(2) What is the average frequency of dredge episodes?

- ☒ Annually
- ☐ 1-3 years
- ☐ 3-5 years
- ☐ >5 years

(3) Is the entire marina dredged in one episode?

- ☒ No
- ☐ Yes

If no, please explain:

Santa Barbara Harbor is dredged annually in two cycles, spring and fall.

(4) Marina dredging is completed:

- ☐ Mechanically
- ☒ Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) Cutterhead

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☐ Scow
- ☒ Crane
- ☒ Bulldozer
- ☒ Other Excavator, barge, dredge tender, AWD heavy lift
- ☐ Crane
- ☐ Booster Pump
- ☐ Toyo Pump

(6) Dredging duration is:

- ☐ <1 month
- ☒ <3 months
- ☐ < 6 months
- ☐ < 9 months
- ☐ > 9 months

(7) Maintenance Dredging Depth is:

- ☐ < 10 ft
- ☐ < 12ft
- ☐ < 15 ft
- ☒ > 15 ft

(8) Where is dredge material disposed of?

- ☐ Nearshore waters
- ☐ Offshore waters (outside of littoral zone)
- ☒ Downstream beach (usually surf zone, but Sometimes higher up on beach.)
- ☐ Other _____

(9) Are there organics present in the dredge material?

- ☐ No
- ☒ Yes

Very minor but some kelp and other marine detritus.

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

- ☐ No
- ☒ Yes

If Yes please describe Occasionally dredge picks up decomposing organic material that smells bad at discharge site.

(11) Do you have a permanent sand by-passing system?

- ☒ No
- ☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

- ☒ 2 – 8 ft
- ☐ 8 – 14 ft

☐ 14 – 20 ft ☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☒ No ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☒ No ☐ Yes

Location: _____

(15) Is the littoral transport rate along the shoreline known?

☐ No ☒ Yes

Rate: 320,000 c.y. per year

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: West to east

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☒ No ☐ Yes

If Yes please describe _____

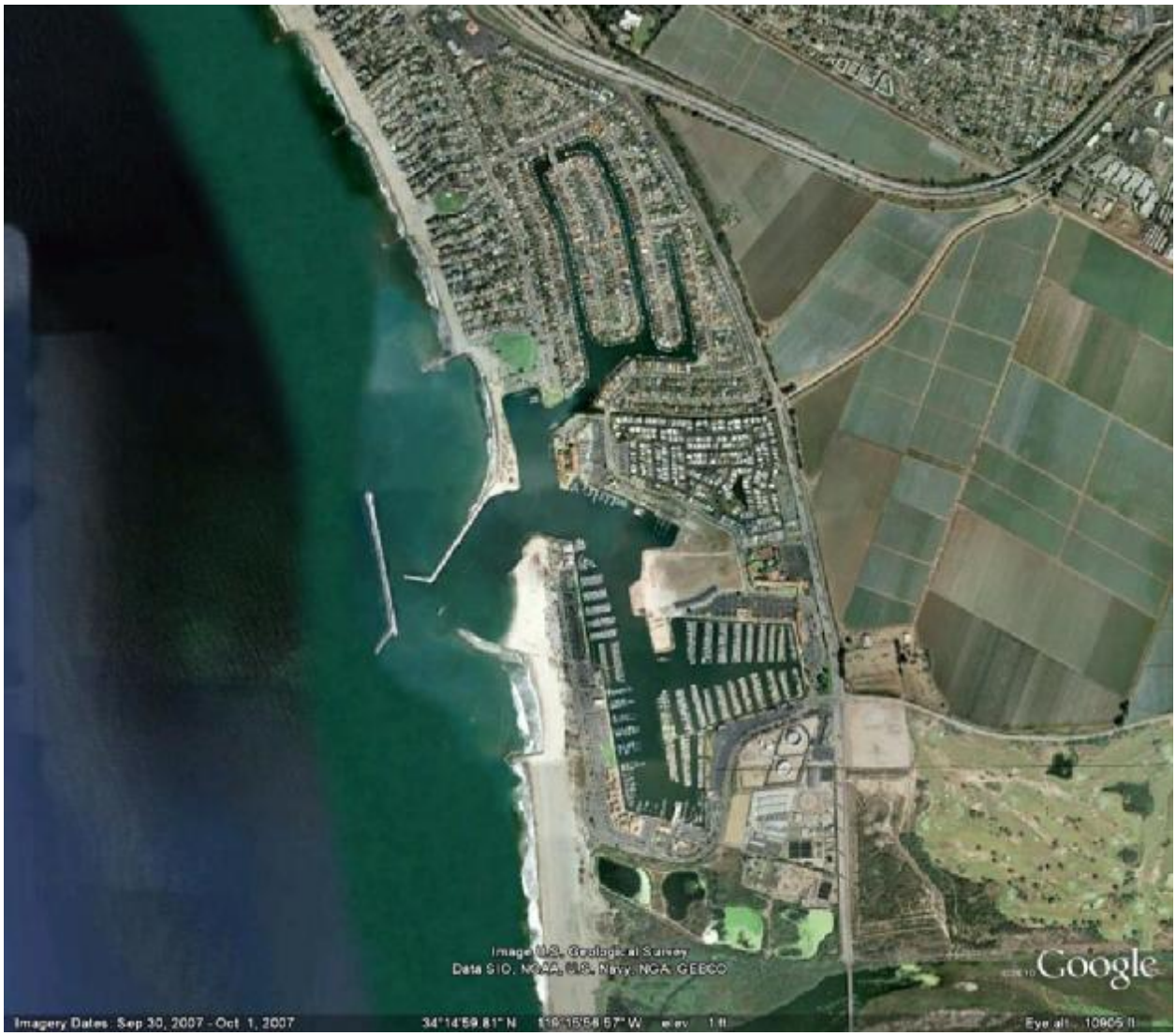
If you feel that there are any additional details which have not been provided above please feel free to comments below:

Ventura Harbor

Ventura, CA
Owner: Ventura Port District
Website: http://www.venturaharbor.com/index.html

Summary:

- Annual dredging of entrance channel;
- Entrance channel dredge material discharged on downcoast beaches, in surf zone;
- Inner harbor fine-grain material disposed in vicinity of mouth of Santa Clara River when river is flowing;
- Dredge equipment used: hydraulic, hopper, clamshell.



Survey contact:
Richard Parsons, Dredging Program Manager, Ventura Port District
rwpdredging@hotmail.com

Ventura Harbor

Richard Parsons - 4/11/11
Ventura Port District
via phone interview

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- [x] <80,000 CY - Port District dredging - inner harbor
- [ ] 80,000 – 140,000 CY
- [ ] 140,000 – 200,000 CY
- [x] >200,000 CY - Federal project (entrance channel + sand trap to north)

(2) What is the average frequency of dredge episodes?

- [x] Annually - Fed proj.
- [x] 1-3 years - Port District inner harbor
- [ ] 3-5 years
- [ ] >5 years

(3) Is the entire marina dredged in one episode?

- [x] No
- [ ] Yes

If no, please explain: Fed and Port District projects separate. Focus on shoaled areas.

(4) Marina dredging is completed:

- [x] Mechanically (sometimes) - Hopper, Clamshell
- [x] Hydraulically (usually) - Cutterhead

Type (e.g. Suction, Cutterhead, Clamshell, etc.)

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- [x] Scow (Dump w/ clamshell op)
- [ ] Crane
- [ ] Bulldozer
- [ ] Other no screens on hydr. discharge pipes.
- [ ] Crane
- [ ] Booster Pump
- [ ] Toyo Pump

(6) Dredging duration is:

☒ <1 month
☒ <3 months
} varies

☐ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☐ < 15 ft
☒ > 15 ft – Fed proj = -20' to -40'
Inner harbor = -18'

(8) Where is dredge material disposed of?

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☒ Downstream beach
☒ Other * Fed Proj.: South Beach + McGrath Beach (surf zone disposal.

(9) Are there organics present in the dredge material? – have experienced Arundo (large reeds) in harbor – raked/removed from bottom sep from dredging + disposed upland

☒ No / not significant
☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

☐ No
☒ Yes

If Yes please describe odor detected, but did not receive complaints from public – no residences / businesses along beaches/discharge sites.

(11) Do you have a permanent sand by-passing system?

☒ No
☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft – usually
☐ 14 – 20 ft
☐ 8 – 14 ft
☒ >20 ft – sometimes.

* Inner harbor mat'l fine-grain – Port District places mat'l in vicinity of mouth of Santa Clara River – only when river is flowing. (to south of harbor entrance)

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ☒ Yes

Location: upcoast (to north) — Pierpoint - groin field.

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☒ Yes

Location: downcoast beach (when over-nourished)

(15) Is the littoral transport rate along the shoreline known?

☐ No ☒ Yes

Rate: avg ~600K cy/year

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: west to east (~north to south)

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☒ Yes

If Yes please describe Surfer's Point (to north) — beach nourishment

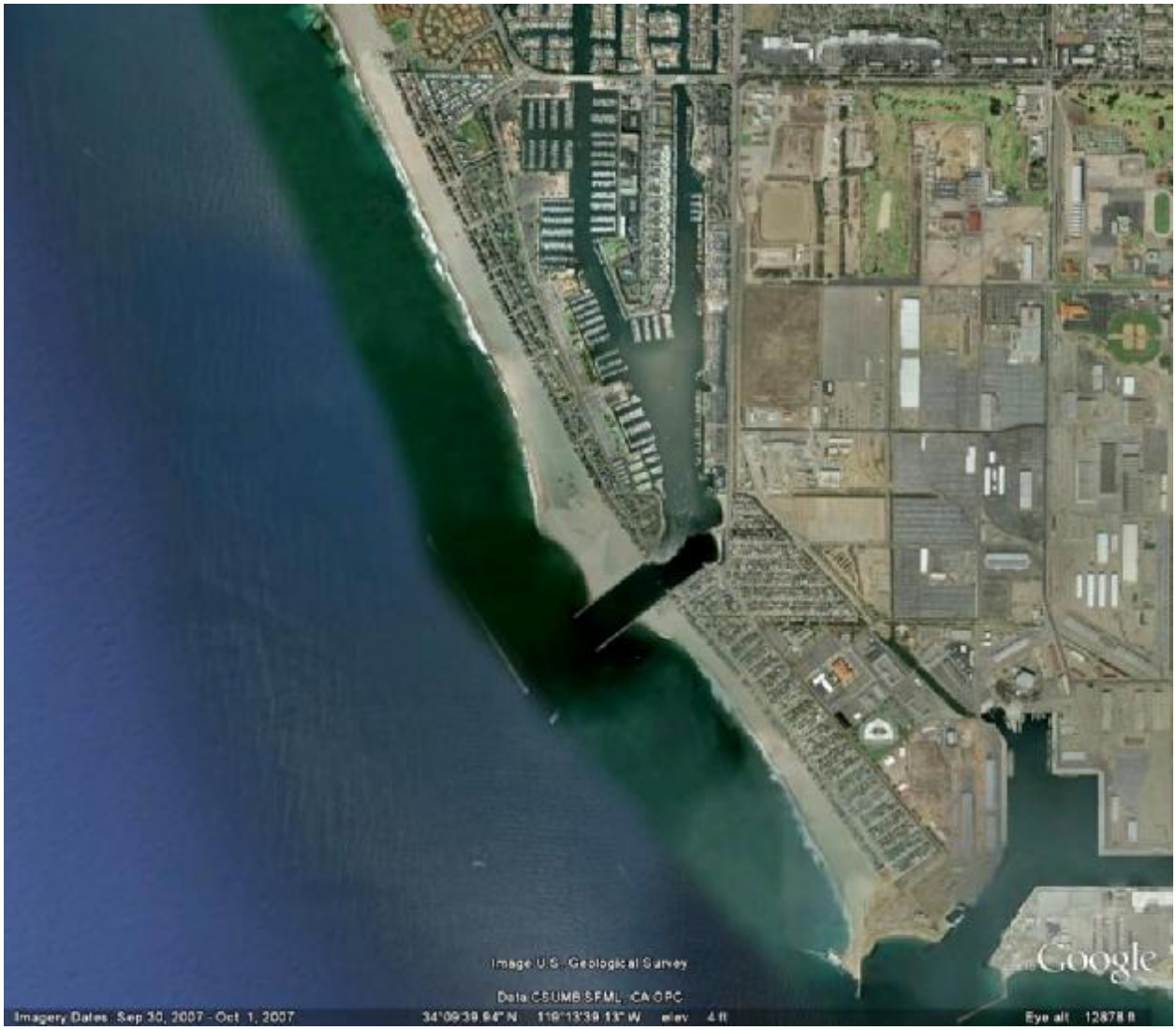
If you feel that there are any additional details which have not been provided above please feel free to comments below:

Channel Islands Harbor

Oxnard, CA
Owner: County of Ventura
Website: http://www.channelislandsharbor.org/index.html

Summary:

- Bi-annual (every two years) dredging of entrance channel and sand trap to north of harbor;
- Dredge material discharged on downcoast beaches, including beach downcoast of Port of Hueneme (i.e. bypass Port of Hueneme);
- Dredge equipment used: hydraulic.



Survey contact:
Jack Peveler, Harbor Master, County of Ventura
Jack.Peveler@ventura.org

Channel Islands Harbor

Jack Peveler
4-15-11

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☐ <80,000 CY
- ☐ 80,000 – 140,000 CY
- ☐ 140,000 – 200,000 CY
- ☐ >200,000 CY ***(1,000,000 CY)***

(2) What is the average frequency of dredge episodes?

- ☐ Annually
- ☐ 1-3 years (***every two years)***
- ☐ 3-5 years
- ☐ >5 years

(3) Is the entire marina dredged in one episode?

- ☐ No
- ☐ Yes

If no, please explain: *The outer harbor sand trap and channel entrance*

(4) Marina dredging is completed:

- ☐ Mechanically
- ☐ ***xx Hydraulic suction cutterhead***

Type (e.g. Suction, Cutterhead, Clamshell, etc.) _____

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☐ Scow
- ☐ Crane
- ☐ Bulldozer ***xxx***
- ☐ Other _____
- ☐ Crane
- ☐ Booster Pump
- ☐ Toyo Pump

(6) Dredging duration is:

- ☐ <1 month
- ☐ <3 months ***XXX***
- ☐ < 6 months
- ☐ < 9 months
- ☐ > 9 months

(7) Maintenance Dredging Depth is:

- ☐ < 10 ft
- ☐ < 12ft
- ☐ < 15 ft
- ☐ > 15 ft ***35' sand trap -20' entrance channel***

(8) Where is dredge material disposed of?

- ☐ Nearshore waters
- ☐ Offshore waters (outside of littoral zone)
- ☐ Downstream beach ***XXX*** on beach - acts as feeder beach for downcoast area
- ☐ Other _____

(9) Are there organics present in the dredge material?

- ☐ No ***XXX***
- ☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

- ☐ No ***XXX***
- ☐ Yes

If Yes please describe _____

_____

(11) Do you have a permanent sand by-passing system?

- ☐ No ***XXX***
- ☐ Yes

If Yes please describe _____

_____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

- ☐ 2 – 8 ft ***XXX***
- ☐ 14 – 20 ft
- ☐ 8 – 14 ft
- ☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ***XXX*** ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☐ Yes ***XXX***

Location: ***Sand trap, north of entrance channel***

(15) Is the littoral transport rate along the shoreline known?

☐ No ***XXX*** ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☐ Longshore Direction: North to south longshore

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☐ Yes

If Yes please describe The process was developed as a down coast erosion control measure

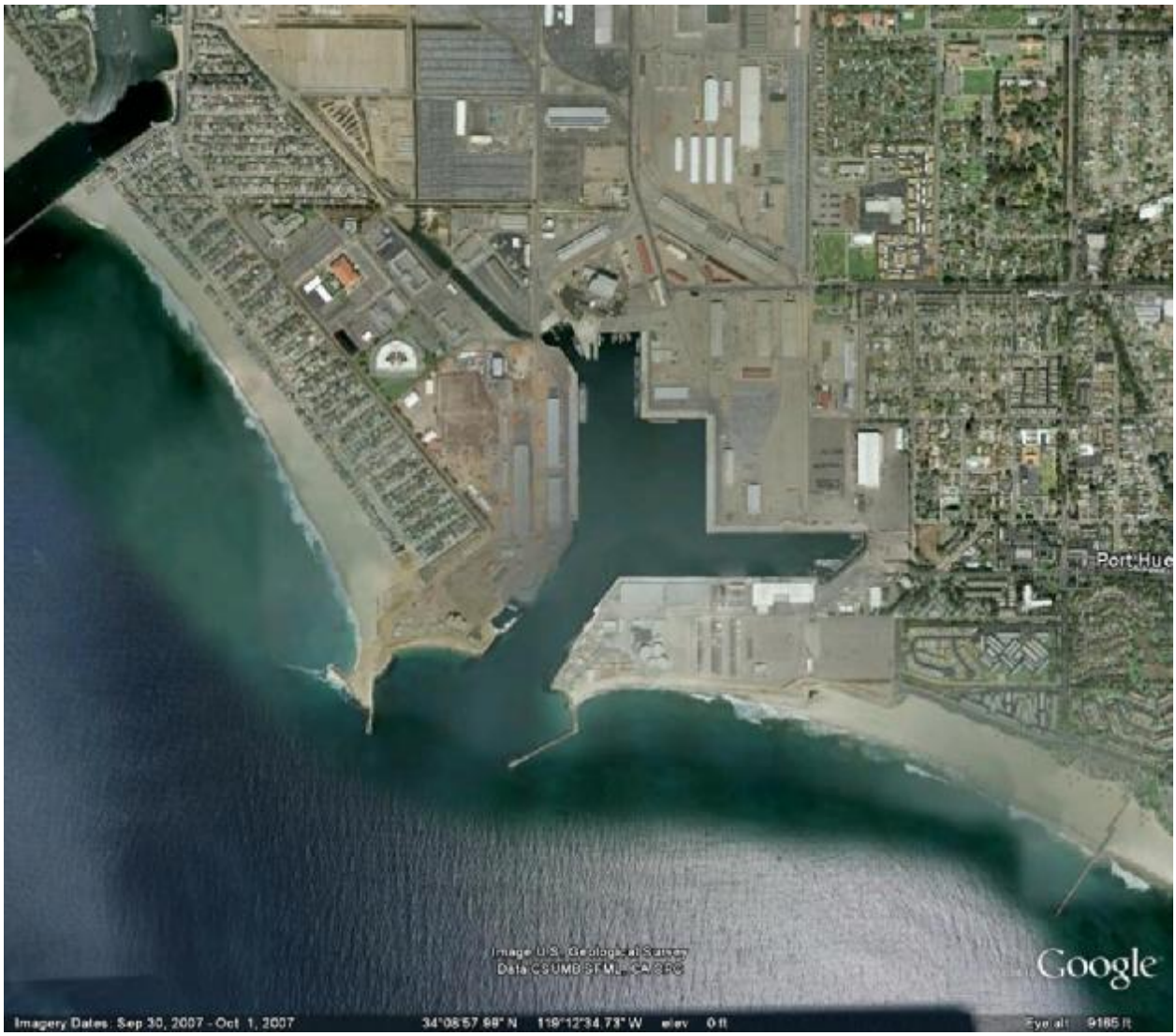
If you feel that there are any additional details which have not been provided above please feel free to comments below:

Port of Hueneme

Port Hueneme, CA
Owner: Oxnard Port District (and Navy)
Website: http://www.portofhueneme.org/home.php

Summary:

- Naval/commercial harbor – no recreational vessels;
- Very infrequent dredging (~every twenty years) because of offshore submarine canyon and upcoast Channel Islands Harbor dredging;
- Harbor dredge material disposed in Confined Aquatic Disposal (CAD) site within Port;
- CAD site dredge material disposed on downcoast beach.



Survey contact:
Chris Birkelo, Director of Engineering, Port of Hueneme
cbirkelo@portofhueneme.org

Port Hueneme

Chris Birkelo
4/7/11
via phone interview

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- [x] <80,000 CY
- [ ] 80,000 – 140,000 CY
- [ ] 140,000 – 200,000 CY
- [ ] >200,000 CY

(2) What is the average frequency of dredge episodes?

- [ ] Annually
- [ ] 1-3 years
- [ ] 3-5 years
- [x] >5 years

- just did 1st maintenance dredge in >20 yrs
- don't accrete in entrance channel because of nearby offshore submarine canyon.

(3) Is the entire marina dredged in one episode?

- [x] No
- [ ] Yes

If no, please explain: _____

(4) Marina dredging is completed:

- [ ] Mechanically
- [ ] Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) _____

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- [ ] Scow
- [ ] Crane
- [ ] Bulldozer
- [ ] Other _____
- [ ] Crane
- [ ] Booster Pump
- [ ] Toyo Pump

(6) Dredging duration is:

☐ <1 month
☐ <3 months
☐ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☐ < 15 ft
☐ > 15 ft

(8) Where is dredge material disposed of?

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☐ Downstream beach
☒ Other CAD Site

(9) Are there organics present in the dredge material?

☐ No
☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

☐ No N/A
☐ Yes

If Yes please describe _____

_____

(11) Do you have a permanent sand by-passing system?

☒ No
☐ Yes

If Yes please describe _____

_____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☐ 2 – 8 ft
☐ 14 – 20 ft
☐ 8 – 14 ft
☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☐ Yes

Location: _____

(15) Is the littoral transport rate along the shoreline known?

☐ No ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☐ Longshore Direction: _____

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☐ Yes

If Yes please describe _____

If you feel that there are any additional details which have not been provided above please feel free to comments below:

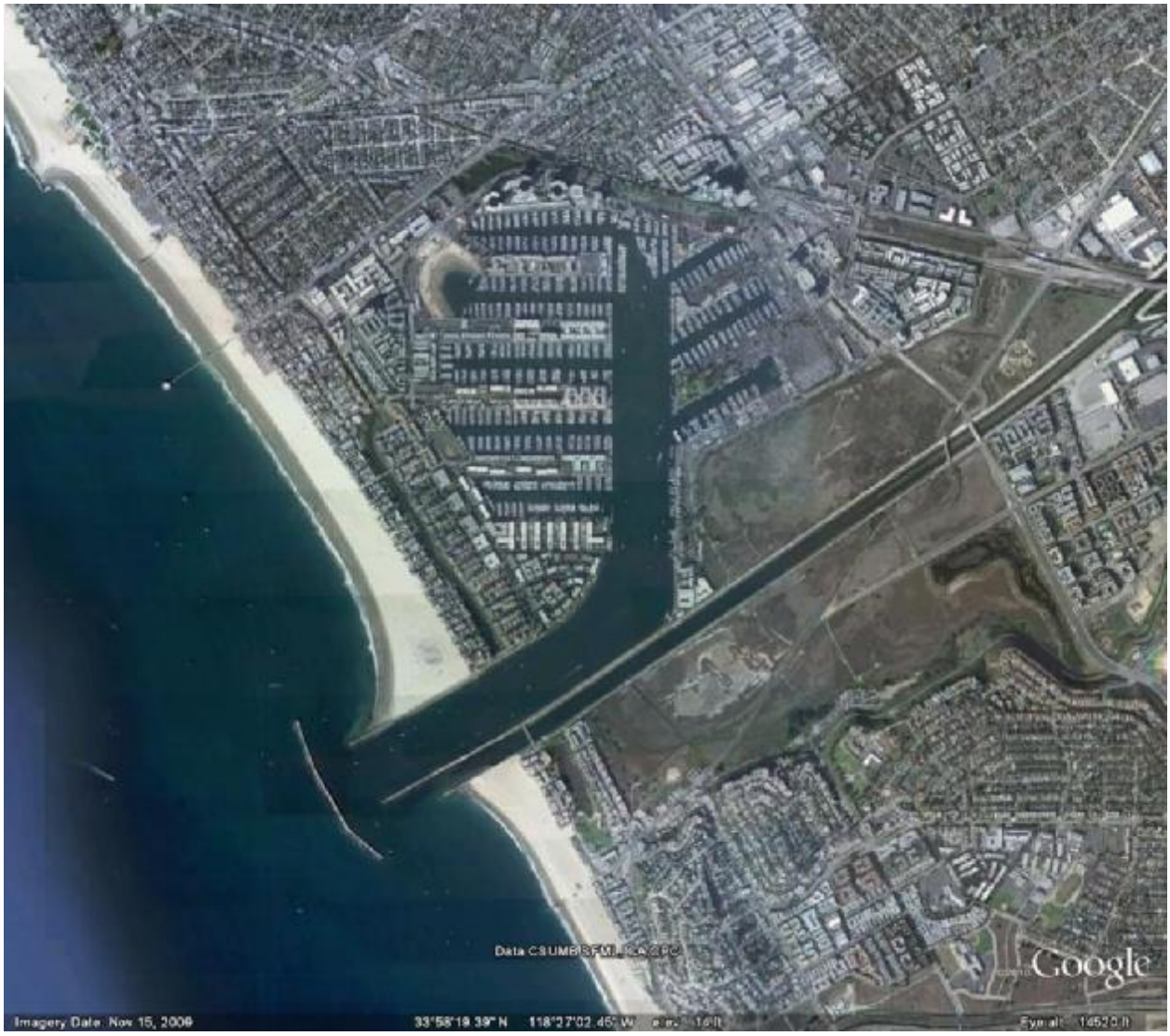
Channel Is. Harbor entrance channel dredging — they "bypass" Port Hueneme by placing dredge mat'l on beach South of P.H. jetty.

Marina del Rey Harbor

Marina del Rey, CA
Owner: Los Angeles County
Website: http://beaches.lacounty.gov/wps/portal/dbh/mdr/ and
http://www.visitmarinadelrey.com/about-the-marina

Summary:

- Dredging of entrance channel every 3-5 years;
- Dredge material discharged on downcoast beaches, on dry beach, in nearshore, and offshore;
- Dredge equipment used: hydraulic, clamshell.



Survey contact:
Cesar Espinosa, L.A. County Dept Beaches and Harbors
CEspinosa@bh.lacounty.gov

Marina del Rey

Cesar Espinosa
4-5-11

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☐ <80,000 CY
- ☐ 80,000 – 140,000 CY
- **X** 140,000 – 200,000 CY
- ☐ >200,000 CY

(2) What is the average frequency of dredge episodes?

- ☐ Annually
- ☐ 1-3 years
- **X** 3-5 years
- ☐ >5 years

(3) Is the entire marina dredged in one episode?

- **X** No
- ☐ Yes

If no, please explain: Dredging of the Marina depends on how much sediment is present at the entrance to the harbor, and available funds.

(4) Marina dredging is completed:

- **X** Mechanically
- **X** Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) Both methods have been used in Marina del Rey, Hydraulic and Clamshell.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- **X** Scow
- **X** Crane
- **X** Bulldozer
- ☐ Other loaders, work and crew boats, and various trucks.
- **X** Crane
- **X** Booster Pump
- ☐ Toyo Pump

(6) Dredging duration is:

- ☐ <1 month
- ☐ < 6 months

X <3 months

☐ < 9 months

☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft

☐ < 12ft

☐ < 15 ft

X > 15 ft

(8) Where is dredge material disposed of?

X Nearshore waters

X Offshore waters (outside of littoral zone)

X Downstream beach

X Other Clean material is disposed at Dockweiler State Beach and nearshore. Contaminated material needs site that will take contaminated sediments. (POLB)

(9) Are there organics present in the dredge material?

X No

☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

X No

☐ Yes

If Yes please describe _____

(11) Do you have a permanent sand by-passing system?

X No

☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

X 2 – 8 ft

☐ 8 – 14 ft

☐ 14 – 20 ft ☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

X No ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No **X** Yes

Location: Sand trap at N. Jetty

(15) Is the littoral transport rate along the shoreline known?

X No ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

X Longshore Direction: North to South observed

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

X No ☐ Yes

If Yes please describe _____

_____

If you feel that there are any additional details which have not been provided above please feel free to comments below:

_____

_____

_____

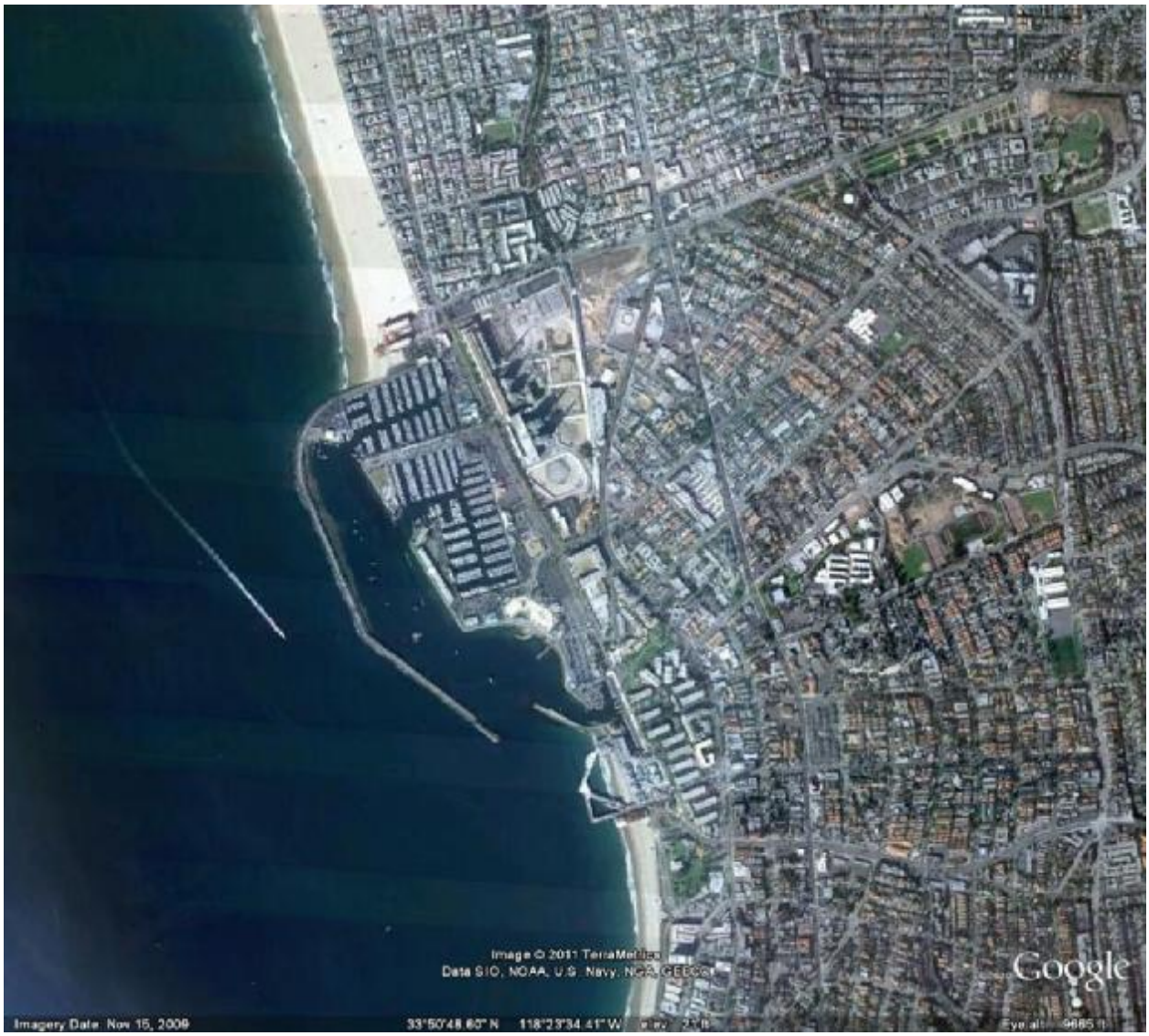
_____

King Harbor

Redondo Beach, CA
Owner: City of Redondo Beach
Website: http://www.redondo.org/depts/hbt/harbor/default.asp

Summary:

- Infrequent dredging;
- Dredge material discharged on downcoast beach, in surf zone;
- Dredge equipment used: hydraulic, clamshell.



Survey contact:
James Allen, City of Redondo Beach

King Harbor - James Allen, City of Redondo Beach
3/30/11 - via telephone.

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- [x] <80,000 CY
- [ ] 80,000 – 140,000 CY
- [ ] 140,000 – 200,000 CY
- [ ] >200,000 CY

(2) What is the average frequency of dredge episodes?

- [ ] Annually
- [ ] 1-3 years
- [ ] 3-5 years
- [x] >5 years – last dredging in 2004 & 1989.

(3) Is the entire marina dredged in one episode?

- [x] No – South end entrance basin – 10ft sand bar at south end. and area on inside of breakwater (sediment comes over + thru porous breakwater)
- [ ] Yes

If no, please explain:

(4) Marina dredging is completed:

- [x] Mechanically
- [x] Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) have done both ways:
1) Mechanical-onto scow-then barged to beach + pumped on shore
2) hydraulic pipeline all the way from harbor to beach.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- [x] Scow
- [ ] Crane
- [ ] Bulldozer
- [ ] Other depends on occasion (see above)
- [ ] Crane
- [x] Booster Pump
- [ ] Toyo Pump

(6) Dredging duration is:

☐ <1 month
☐ <3 months
☒ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☒ < 15 ft
☐ > 15 ft

(8) Where is dredge material disposed of?

~150 yds*

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☒ Downstream beach - South of pier (near residences)
☐ Other _____

(9) Are there organics present in the dredge material?

screened
storm drain + power plant discharge - very clean water coming in

☒ No
☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

☒ No
☐ Yes

If Yes please describe but sediment discharged in tidal zone, not higher up on beach.

(11) Do you have a permanent sand by-passing system?

☒ No
☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft
☐ 14 – 20 ft
☐ 8 – 14 ft
☐ >20 ft

* KG note: looks like >> 150 yds from Google Earth

Seasonal - County pushes sand to erosional spot (~150 yds South of Pier)

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☒ No ☒ Yes
Location: ~150 yds South of pier

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☒ Yes
Location: upstream beach + pass

(15) Is the littoral transport rate along the shoreline known?

☒ No ? ☐ Yes
Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☐ Longshore Direction: _____
☐ Cross-shore ☐ Mixed ☒ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☒ Yes

If Yes please describe two groins - south of erosion area
1 2 one non-existent & the other relatively new - "doesn't seem to be doing anything"

If you feel that there are any additional details which have not been provided above please feel free to comments below:

- need to dredge again soon; trying to drum up funding to do this.

Newport Harbor

Newport Beach, CA
Owner: City of Newport Beach (and County of Orange for Newport Dunes Marina - Upper Newport Bay)
Website: http://www.newportbeachca.gov/index.aspx?page=148

Summary:

- Infrequent dredging of entrance channel;
- Entrance channel dredge material disposed offshore;
- Dredge equipment used: clamshell.

Survey contact:
Chris Miller, Harbor Resources Manager, City of Newport Beach
CMiller@city.newport-beach.ca.us

Newport Harbor

Chris Miller
City of Newport Beach
4/7/11
via phone interview

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- [x] <80,000 CY - 2003 (~43K cy)
- [x] 80,000 – 140,000 CY - 1981 (~82 Kcy)
- [ ] 140,000 – 200,000 CY
- [ ] >200,000 CY

(2) What is the average frequency of dredge episodes?

- [ ] Annually
- [ ] 1-3 years
- [ ] 3-5 years
- [x] >5 years (every ~30 years in entrance channel)

(3) Is the entire marina dredged in one episode?

- [x] No
- [ ] Yes

If no, please explain: Corps - entrance channel & lower bay Fed channel*; Corps - Upper Bay = separate proj.* City / homeowners under docks - RGP 54 permits (typically 500-600 cy)

(4) Marina dredging is completed:

- [x] Mechanically* - Corps dredging
- [x] Hydraulically = local/under docks

Type (e.g. Suction, Cutterhead, Clamshell, etc.) * Corps dredging = Clamshell & then barge/scow to LA-3 offshore disposal.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- [x] Scow
- [ ] Crane
- [ ] Bulldozer
- [ ] Other _____
- [ ] Crane
- [ ] Booster Pump
- [ ] Toyo Pump

(6) Dredging duration is:

☐ <1 month
☐ <3 months
☐ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☒ < 15 ft - other channels.
☒ > 15 ft - main channel

(8) Where is dredge material disposed of?

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☐ Downstream beach
☒ Other Corps-entrance channel mat'l to LA-5
local - under docks mat'l to adjacent beach.

(9) Are there organics present in the dredge material?

☐ No
☒ Yes – very dark dredge mat'l from under docks; likely organic mat'l is from ~~Chollas~~ San Diego River watershed.

If Yes please provide percentage and/or sediment testing reports. ____

(10) Have there ever been issues with odor during dredge operations?

☐ No
☒ Yes

If Yes please describe Smell when mat'l placed on local beaches; smell goes away w/in a few days + sand bleaches out w/in a couple weeks. Residents do not complain (people seem to understand process)

(11) Do you have a permanent sand by-passing system?

☐ No
☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft
☐ 14 – 20 ft
☐ 8 – 14 ft
☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☒ No ☐ Yes

Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☒ No Current dredging needs are from mat'l coming from watershed. ☐ Yes

Location: _____

(15) Is the littoral transport rate along the shoreline known?

☒ No ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: north to South

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☒ Yes

If Yes please describe existing groin fields on upcoast beach & some backpassing.

If you feel that there are any additional details which have not been provided above please feel free to comments below:

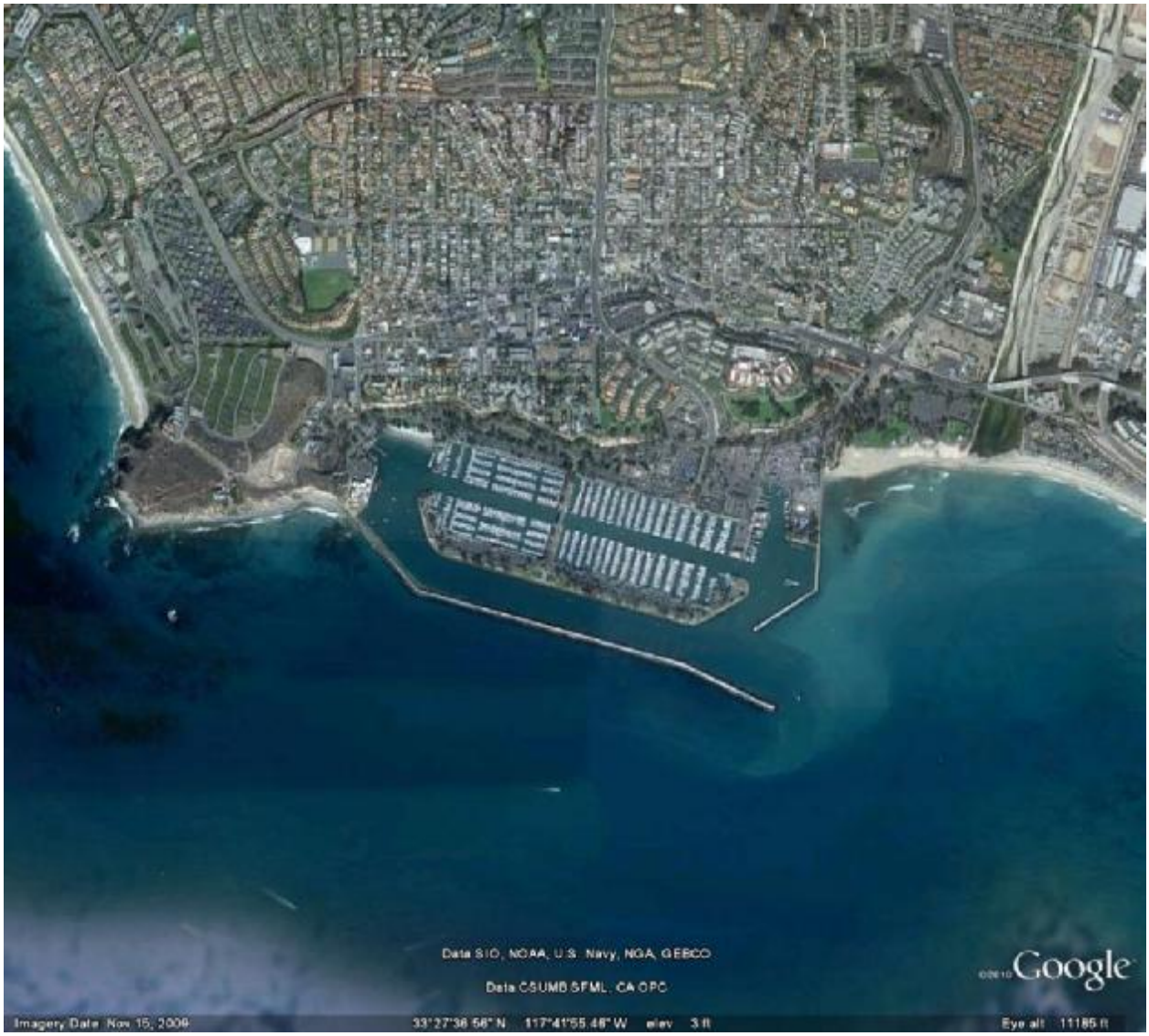
A few years ago, dredged ~7,500 cy w/in bay harbor (fronting condos complex). Placed mat'l on China Cove & Corona del Mar beaches. Let mat'l dry out & trucked to beaches. No smell. "People putting towels on it the very next day".

Dana Point Harbor

Dana Point, CA
Owner: County of Orange
Website: http://www.ocgov.com/ocgov/OC%20Dana%20Point%20Harbor

Summary:

- Infrequent dredging;
- Dredge material discharged at downcoast beach and small beach within harbor (on dry beach) and offshore;
- Dredge equipment used: hydraulic and clamshell.



Survey contact:
David Rocha, Orange County Dana Point Harbor Department
DRocha@ocdph.com

Dana Point Harbor

David Rocha
4-7-11

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☒ <80,000 CY
- ☐ 80,000 – 140,000 CY
- ☐ 140,000 – 200,000 CY
- ☐ >200,000 CY

(2) What is the average frequency of dredge episodes?

- ☐ Annually
- ☐ 1-3 years
- ☐ 3-5 years
- ☒ >5 years

(3) Is the entire marina dredged in one episode?

- ☒ No
- ☐ Yes

If no, please explain: Funding is not available to dredge entire harbor.

(4) Marina dredging is completed:

- ☒ Mechanically
- ☒ Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) Some portions by clam shell crain majority by hydraulic suction cutterhead

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☒ Scow
- ☐ Crane
- ☒ Bulldozer
- ☐ Crane
- ☒ Booster Pump
- ☐ Toyo Pump
- ☒ Other 2 miles of pipeline and tenders and tug

(6) Dredging duration is:

- ☐ <1 month
- ☐ <3 months
- ☒ < 6 months
- ☐ < 9 months
- ☐ > 9 months

(7) Maintenance Dredging Depth is:

- ☐ < 10 ft
- ☐ < 12ft
- ☒ < 15 ft
- ☐ > 15 ft

(8) Where is dredge material disposed of?

- ☐ Nearshore waters
- ☒ Offshore waters (outside of littoral zone)
- ☒ Downstream beach
- ☐ Other _____

(9) Are there organics present in the dredge material?

- ☐ No
- ☒ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

- ☐ No
- ☒ Yes -

If Yes please describe **Had issue with sand from anaerobic zone the odor stopped in approximately 4 days after pumping was completed. Sand dried to white color.**

See attached media contact info.

(11) Do you have a permanent sand by-passing system?

- ☒ No
- ☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

- ☒ 2 – 8 ft
- ☐ 8 – 14 ft

☐ 14 – 20 ft ☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ☒ Yes

Location: Capo Beach down coast of the harbor

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☒ No ☐ Yes

Location: _____

(15) Is the littoral transport rate along the shoreline known?

☒ No ☒ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: north to south (west to east)

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☒ Yes

If Yes please describe As part of the last two dredguing cycles , there has been beach nourishment operations on Capo Beach(downcoast) and Babay Beach(Within the Dana Point Harbor)

If you feel that there are any additional details which have not been provided above please feel free to comments below:

COUNTY OF ORANGE
OC DANA POINT HARBOR

Brad Gross, Director
24650 Dana Point Harbor Drive
Dana Point, CA 92629
Telephone: (949) 923-2236
Fax: (949) 923-3792

FOR IMMEDIATE ATTENTION

OC DANA POINT HARBOR NEWS MEDIA/BOARD OFFICE CONTACT

TO: Media Contact List

FROM: Lisa Smith, Deputy Director

STAFF MEMBER CONTACTED: Lisa Smith, Deputy Director

DATE/TIME OF CONTACT: November 14, 2008

MEDIA INVOLVED: The OC Register

MEDIA REPRESENTATIVE/PHONE NO. Chris Danes 949-492-5135

Nature of Communication/Request:

To understand why the current pumping of sand onto Capo Beach has a foul odor and looks black.

Information Provided:

Explained the sand will stop omitting a foul odor and the appearance will improve once it has had a chance to dry. The sand on Baby Beach had the same smell and appearance until approximately 4 days after pumping was completed. Explained the testing that occurred prior to the dredging by SD Regional Water Quality Control Board and the Army Corps of Engineers, the testing that goes on during the dredging by the OC Health Department and OC Environmental Resource Services for bacteria, in addition to the testing occurring to verify consistency with original testing. All tests are performed according to the SD Water Quality Control Board and Army Corps of Engineers standards.

Chris indicated he would call back if he had additional questions.

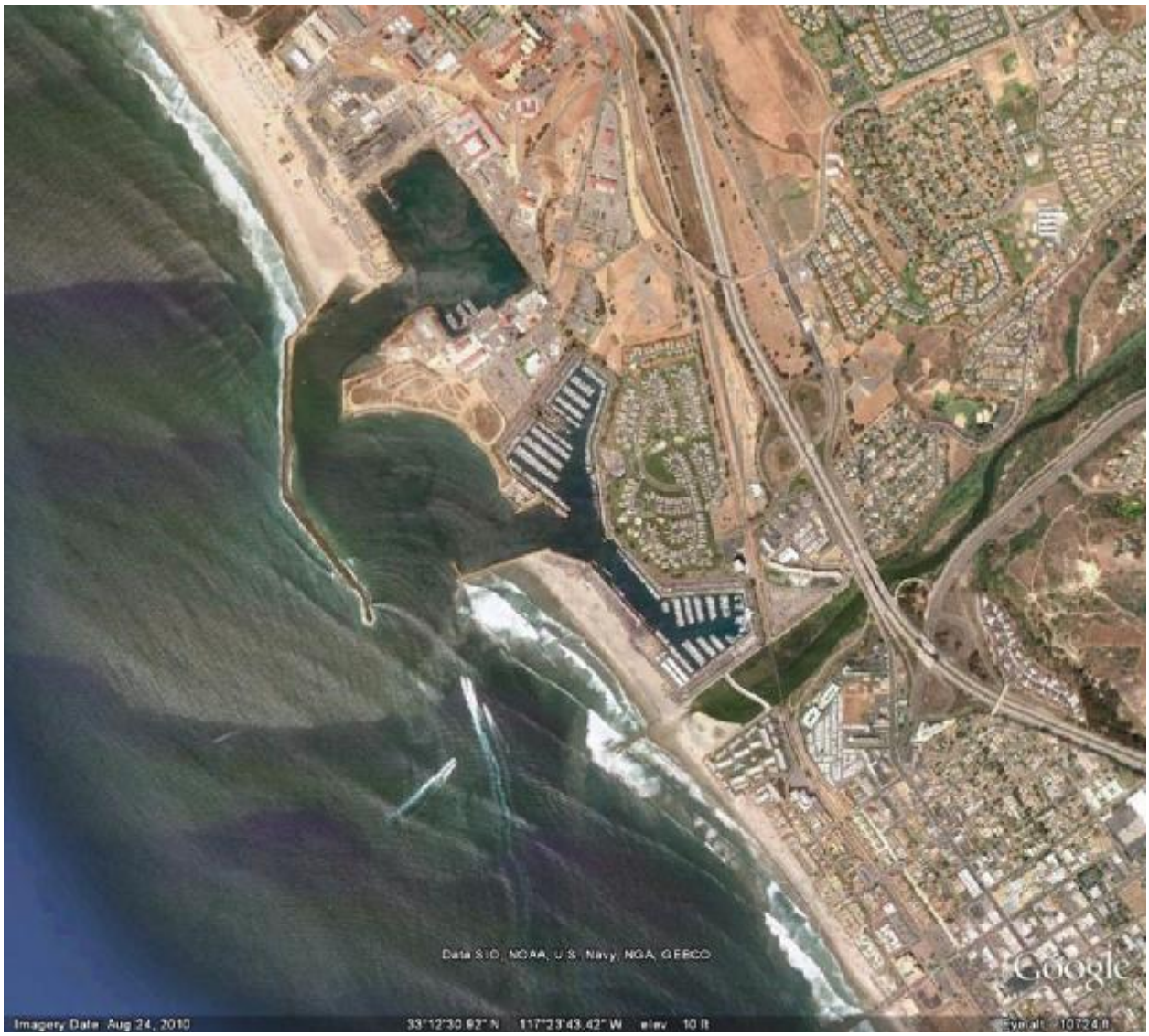
ADDITIONAL COPIES SENT TO: Brad Gross, Director
OC Dana Point Harbor

Oceanside Harbor

Oceanside, CA
Owner: Oceanside Harbor District
Website: http://www.ci.oceanside.ca.us/Datarelation.aspx?Content=204

Summary:

- Annual dredging of entrance channel;
- Dredge material discharged at downcoast beach, in surf zone and on dry beach;
- Dredge equipment used: hydraulic.



Survey contact:
Frank Quan, Oceanside Harbor District,
FQuan@ci.oceanside.ca.us

Oceanside Harbor

Frank Quan
3-30-11

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

☐ <80,000 CY
☐ 80,000 – 140,000 CY
☒ 140,000 – 200,000 CY
☐ >200,000 CY

(2) What is the average frequency of dredge episodes?

☒ Annually
☐ 1-3 years
☐ 3-5 years
☐ >5 years

(3) Is the entire marina dredged in one episode?

☒ No
☐ Yes

If no, please explain: Only the entrance channel is dredged.

(4) Marina dredging is completed:

☐ Mechanically
☒ Hydraulically

Type (e.g. Suction, Cutterhead, Clamshell, etc.) Dredging in Oceanside is an Army Corps of Engineers project and is awarded to the lowest responsible bidder.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

☒ Scow
☒ Crane
☒ Bulldozer
☐ Other
☒ Crane
☒ Booster Pump
☐ Toyo Pump

(6) Dredging duration is:

☒ <1 month
☐ <3 months
☐ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☐ < 15 ft
☒ > 15 ft

(8) Where is dredge material disposed of?

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☒ Downstream beach
☐ Other _____

(9) Are there organics present in the dredge material?

☐ No
☒ Yes - marine life

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

☐ No
☒ Yes

If Yes please describe Several complaints from seasonal residents every year.

(11) Do you have a permanent sand by-passing system?

☒ No
☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft ☐ 8 – 14 ft

☐ 14 – 20 ft ☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ☒ Yes

Location: Entire length of city.

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☐ Yes

Location: _____

(15) Is the littoral transport rate along the shoreline known?

☒ No ☐ Yes

Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☐ Longshore Direction: _____

☐ Cross-shore ☐ Mixed ☒ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ☒ Yes

If Yes please describe Sand replenishment

If you feel that there are any additional details which have not been provided above please feel free to comments below:

Mission Bay

San Diego, CA
Owner: City of San Diego
Website: http://www.sandiego.gov/park-and-recreation/parks/missionbay/

Summary:

- Infrequent dredging;
- Dredge material discharged at upcoast beach, on dry beach;
- Dredge equipment used: hydraulic.

Survey contact:
Paul Jacob, Parks and Recreation Dept, City of San Diego
PJacob@sandiego.gov

Mission Bay ~~Mission Bay~~ Paul Jacob~~s~~ - 4/6/11
City of San Diego Parks + Rec Dept *
via phone interview

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☐ <80,000 CY
- ☐ 80,000 – 140,000 CY
- ☐ 140,000 – 200,000 CY
- ☒ >200,000 CY ——— 550K cy

(2) What is the average frequency of dredge episodes?

- ☐ Annually
- ☐ 1-3 years
- ☐ 3-5 years
- ☒ >5 years @ since 1984

(3) Is the entire marina dredged in one episode?

- ☐ No
- ☒ Yes

If no, please explain: entrance channel, Mariner's Basin, Quervo Basin, et al
~~can't~~ did not area where funding not enough

(4) Marina dredging is completed:

- ☐ Mechanically
- ☒ Hydraulically (on Ocean)

Type (e.g. Suction, Cutterhead, Clamshell, etc.) Suction / cutterhead
placed on Mission Beach (up to 2 miles) near residences

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☐ Scow
- ☐ Crane
- ☐ Bulldozer
- ☐ Other no other eqpmt
- ☐ Crane
- ☐ Booster Pump
- ☐ Toyo Pump

(6) Dredging duration is:

* Parks + Rec Dept responsible for dredging inland of bridge; Corps responsible for seaward of bridge.

☐ <1 month
☒ <3 months
☐ < 6 months
☐ < 9 months
☐ > 9 months

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☐ < 15 ft
☒ > 15 ft

shore face slope 10:1 to toe to +12' MS above MHTL constrained by board scuppers on inland side

(8) Where is dredge material disposed of?

☐ Nearshore waters
☒ ~~Downstream~~ Upcoast beach – north of entrance channel *
☒ Other

(9) Are there organics present in the dredge material?

☐ No
☒ Yes

If Yes please provide percentage and/or sediment testing reports. – not quantified

(10) Have there ever been issues with odor during dredge operations?

☐ No
☒ Yes

If Yes please describe Smell lasted a couple of days, episodically during discharge on beach ~~for~~ over ~4 weeks, discharge period! Smell went away completely quickly after construction completed.

(11) Do you have a permanent sand by-passing system?

☒ No
☐ Yes

If Yes please describe _____

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☒ 2 – 8 ft
☐ 8 – 14 ft
☐ 14 – 20 ft
☐ >20 ft

* not enough area on downcoast beach to place dredge quantity.

although Mission Beach did get nourishment sand as part of SANDAG project.

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☒ No – San Diego River feeds downcoast beaches (e.g. Ocean Beach)

☐ Yes
Location: _____

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No

☒ Yes – but mat'l does get thru jetty.
Location: _____

(15) Is the littoral transport rate along the shoreline known?

☒ No

☐ Yes
Rate: _____

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: north to south

☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☒ No (SANDAG)

☐ Yes

If Yes please describe _____

_____

If you feel that there are any additional details which have not been provided above please feel free to comments below:

_____

_____

_____

_____

_____

_____

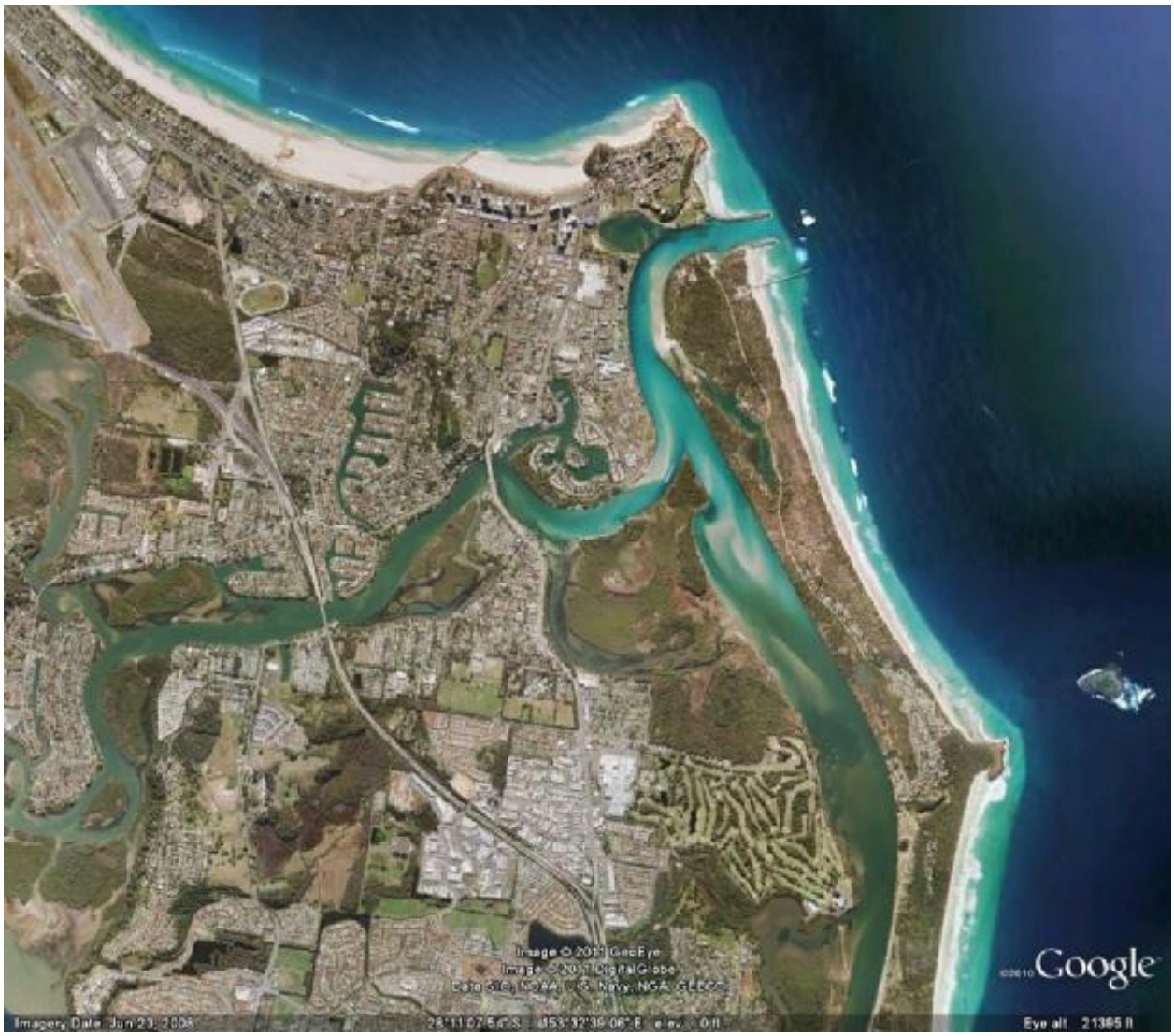
_____

Tweed River Harbor

Queensland, Australia
Owner: Queensland Government, NSW Land and Property Management Authority
Website: http://www.tweedsandbypass.nsw.gov.au/

Summary:

- Year-round sand bypassing operation;
- Dredge material discharged on downcoast beaches;
- Dredge equipment used: permanent bypass system comprised of sediment intake jetty upcoast of harbor entrance and hydraulic discharge pipes to downcoast beaches;
- Prior to sand bypassing system, material removed in entrance via hopper dredge and deposited in nearshore.



Survey contact (done via website information):
http://www.tweedsandbypass.nsw.gov.au/

Tweed River Harbor, Australia

4-15-11
KG via website info

Introduction
This questionnaire is intended to describe the coastal processes, dredging demand, and dredging and disposal operation of your facility. Please fill out the questions below to the best of your ability and provide any additional details and information you feel is appropriate. Thank you for your time and information.

(1) What is the marina's average volume of dredge material per episode?

- ☐ <80,000 CY
- ☐ 80,000 – 140,000 CY
- ☐ 140,000 – 200,000 CY
- ☒ >200,000 CY

(2) What is the average frequency of dredge episodes?

- ☒ Annually
- ☐ 1-3 years
- ☐ 3-5 years
- ☐ >5 years

(3) Is the entire marina dredged in one episode?

- ☐ No N/A
- ☐ Yes

If no, please explain: _____

(4) Marina dredging is completed:

- ☐ Mechanically
- ☒ Hydraulically

Second phase: permanent bypassing; Initial phase via trailing suction dredge – pumped via pipeline onto upper beaches & nearshore.

Type (e.g. Suction, Cutterhead, Clamshell, etc.) "Sand collection jetty" – Sand trap in conjunction w/ ten submerged jet pumps; into slurry pit & then pumped via pipeline ~~to~~ under River to downcoast beaches.

(5) Additional Equipment used in the dredge and disposal operation: (check all that apply)

- ☐ Scow
- ☐ Crane
- ☐ Crane
- ☐ Booster Pump
- ☐ Bulldozer
- ☐ Toyo Pump
- ☒ Other Unique system – see above discharge pipe series w/ four potential outlet locations

(6) Dredging duration is:

☐ <1 month
☐ <3 months
☐ < 6 months
☐ < 9 months
☒ > 9 months – year-round

(7) Maintenance Dredging Depth is:

☐ < 10 ft
☐ < 12ft
☐ < 15 ft
☐ > 15 ft

(8) Where is dredge material disposed of?

☐ Nearshore waters
☐ Offshore waters (outside of littoral zone)
☒ Downstream beach – four outlets.
☐ Other _____

(9) Are there organics present in the dredge material?

☒ No – not noted although mentions Sand is initially a grey colo & then bleaches out.
☐ Yes

If Yes please provide percentage and/or sediment testing reports.

(10) Have there ever been issues with odor during dredge operations?

☒ No
☐ Yes

If Yes please describe _____

(11) Do you have a permanent sand by-passing system?

☐ No
☒ Yes

If Yes please describe See above.

(12) Wave conditions outside the marina annually range from: (Check min and max values)

☐ 2 – 8 ft
☐ 14 – 20 ft
☐ 8 – 14 ft
☐ >20 ft

(13) Has long-term erosion occurred in the vicinity of the marina? (e.g. downstream beach, downstream bluff, etc.)

☐ No ☒ Yes
Location: downcoast beaches

(14) Is there significant sediment accumulation outside of the marina? (e.g. upstream beach, upstream jetty, etc.)

☐ No ☒ Yes
Location: upcoast beach

(15) Is the littoral transport rate along the shoreline known?

☐ No ☒ Yes
Rate: 500K m^3/yr ≈ 650K cy/yr

(16) What is the dominant direction of littoral transport in the vicinity of the marina?

☒ Longshore Direction: north to south
☐ Cross-shore ☐ Mixed ☐ Unknown

(17) Has there been or are there ongoing improvements to address erosion in the vicinity of the marina (such as beach nourishment, groin fields, sea walls, etc.)?

☐ No ? ☐ Yes

If Yes please describe _____

If you feel that there are any additional details which have not been provided above please feel free to comments below:

System cost $23.3 M, (in 2001)

Sand Bypassing the Tweed River Entrance:

An Overview

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Abstract

The entrance bar of the Tweed River has historically been a concern for navigators. Extensions to the river entrance walls were built in the early 1960s to improve the situation. This was relatively successful for a period, but over time sand accreted on the beach to the south of the entrance and, as sand began to pass the entrance again, a new bar developed seaward of the old bar. During this transition period, extensive erosion occurred on beaches to the north. As the Tweed River is in NSW and the affected beaches are in Queensland, the problems were jointly addressed. A solution was agreed that involved artificially bypassing sand from south of the entrance area to the Queensland beaches.

From the start of work in 1995 until the permanent sand bypassing system began operations in May 2001, 3.6 million cubic metres of sand were dredged from the entrance and used to nourish the beaches to the north. This restored the condition of the southern Gold Coast beaches to their former condition and gave some relief to boat operators.

A permanent system, which has the capacity to move the full littoral transport through pipelines placed under the river and below ground, was built in 14 months and commissioned in May 2001, after the channel was again cleared.

The sand bypassing system is an environmental sustainable method of maintaining the improved beach and navigation conditions.

1. Introduction

The breakwaters at the entrance to the Tweed River were extended in the early 1960s to improve navigation conditions. Navigation conditions improved as a result of the works, but this improvement did not last. Sand accreted to the south of the entrance and, as sand began to pass the entrance again, a new bar formed and navigation conditions worsened.

Beaches to the north eroded to an extent that sea walls were constructed to protect property and infrastructure. They had not fully recovered by the early 1990s, despite the construction of groynes and associated beach nourishment works.

Studies showed that there is a net littoral drift of about 500,000 m^3 a year to the north at this site, and that the interruption of this sand movement by the walls could account for much of this erosion.

2. Interstate Agreement

As the Tweed River entrance is near the border between NSW and Queensland, the problems became a matter for extensive negotiations between the two States. These led to an agreement to undertake a joint project with the following aims:

- establish and maintain an improved navigable entrance to the Tweed River; and

- place an initial quantity of sand on the southern Gold Coast beaches to restore their amenity, and then provide a continuous supply of sand to those beaches,

The agreed solution, which satisfied these objectives, was to artificially move sand from the entrance area to the Queensland beaches.

The work was to be carried out in two stages:

- dredge sand from the entrance and use it to restore the beach profile by placing a net 2.55 million m^3 of sand, and

- develop a permanent sand bypassing system, to collect sand from the southern side of the Tweed River entrance and transport it to the Queensland beaches in perpetuity.

The agreement was ratified by acts of parliament in each state.

3. Initial Dredging and Nourishment

The beaches of the Southern Gold Coast were substantially depleted and navigation conditions were poor when the agreement was reached between the States. Consequently, it was considered desirable to dredge the bar and restore the southern beaches of the Gold Coast as a matter of priority before the construction of the sand bypassing system.

An environmental impact assessment study established the benefit of undertaking this work, and led to the granting of planning approvals.

A contract was awarded to Dredeco Pty Ltd and work commenced in April 1995. A large trailing suction dredge moved about 1.5 million m^3 in a period of 5 weeks. Placement of 600,000 m^3 of sand on the upper beaches from Rainbow Bay in the east to North Kirra in the West was achieved by pumping from a bow pipe through a specially constructed pipeline. This provided an immediate benefit to beach users.

An additional 900,000 m^3 was placed in the nearshore area to provide a foundation to maintain the improvements. While the use of a large dredge was economical, the large volume in each load deposited resulted in an uneven bed surface that adversely affected surfing conditions for several months.

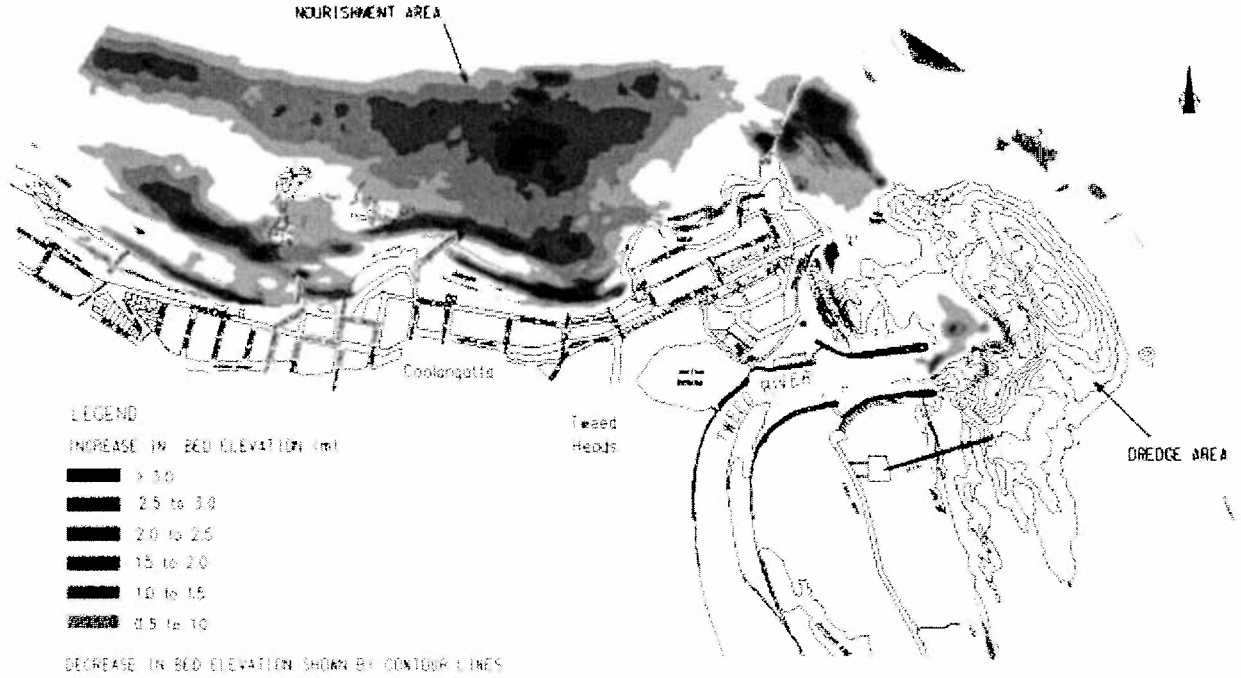


Figure 1 – Bed level changes (April 1995 – January 2001)

Dredging of the river entrance to improve navigation was carried out by shallower drafted vessels. During this work, the placement area was extended to include an area to the east of Snapper Rocks (See Figure 1). This area was under consideration for the primary outlet for the fixed sand bypassing system and is a location from which sand moves naturally to feed the upper beaches of the southern Gold Coast. This placement area also provided shorter travel distances for the dredges and was supported by the surfing community. The placement in this area proved successful and led to further use of this area in later dredging campaigns.

In August 1997, McQuade Marine was contracted for a second dredging and nourishment campaign. No sand was placed on the upper beach as the upper beach conditions were still in a good condition. However, about 40,000 m^3 of sand were placed in very shallow water. The Snapper Rocks (East) location was targeted for a larger proportion of the placement volume. The navigation channel was cleared and 800,000 m^3 of sand were placed over a 9 month period.

Further dredging was carried out in conjunction with the construction of the sand bypassing system (refer Section 4). Less sand could be placed at Snapper Rocks East during this campaign, as the permanent system was being constructed to discharge sand to this area. The nearshore nourishment area was designed to have contours similar to those that existed prior to the extension of the Tweed River breakwaters. A total of 600,000 m^3 was placed to this design between April 2000 and June 2001.

Over a six year period, a total of 3.6 million m^3 of sand was taken from the entrance and placed on the beaches at a cost of $17M. The net result was an increase of over 2.5M m^3 of sand in the beach profile, as shown in Figure 1. Details of this dredging and beach nourishment work are in Boswood et al, 2001, and information on dredge supervision is in Cummings et al, 2001.

4. Fixed Sand Bypassing System

The second stage of the project is to maintain good navigation conditions at the entrance to the Tweed River and to provide a continuous supply of sand to the beaches of the southern Gold Coast at a rate consistent with the natural processes in order to maintain their recreational amenity.

4.1. Procurement

As the project was innovative, and the technology uncertain, it was thought that it would be desirable for the sand bypassing system to be run by the private sector to limit the need for day to day involvement of the two Governments. The involvement of the private sector was a difficult task for the size of the project because of the large variability in the coastal processes, and hence the risks associated with the undertaking.

It was decided that the risk could best be shared by involving a private sector partner in a long-term agreement in which payment would be related to the performance of the system.

A call was made for expressions of interest in 1997 to obtain information about technologies that might be used by proponents in order to ensure that all probable options were considered in the environmental studies.

A Call for Proposals, made in October 1997, attracted 10 submissions. Two firms were then chosen to forward detailed proposals. These were received in November 1998.

A selection panel reviewed and evaluated the detailed proposals against a number of pre-determined criteria and recommended that negotiations be held with a consortium led by McConnell Dowell Constructors (Aust) Pty Limited to design, build and operate a system until September 2024.

These negotiations were successful, and performance based contracts were signed in December 1999. More information on this process is in Dyson *et al* (1999).

4.2. Planning Approval

Environmental Impact Assessment Studies (Hyder *et al, 1997)* were carried out prior to a decision on design, as it had been decided to obtain development approval before selecting a company to design, construct and operate the system.

Apart from predicting a deeper entrance and improved stability and amenity of the southern Gold Coast beaches (with resultant positive economic and community benefits), the environmental studies predicted the following:-

- A change in the shape, alignment and surf quality of Duranbah Beach (immediately to the North of the entrance),
- Increased wave activity on the entrance walls,
- Insignificant changes to tides, floods and storm surge propagation in the Tweed River,
- Improved water quality within the river.

Planning approval was finally obtained in July 1998.

4.3. Design

The permanent system collects sand with 11 jet pumps supported from a pier located about 250 m south of the southern breakwater. Up to five jet pumps are operated at a time, powered by high pressure water collected from the river. The sand and water mixture is then pumped under the Tweed River to the required outlet at Snapper Rocks East, Snapper Rocks West, Kirra Point, or Duranbah Beach (See Figure 2). Two pumps in series are used to move sand the larger distance to Kirra Point. The quantity of sand pumped is measured using a magnetic flow meter in conjunction with a nuclear densometer.

The system also provides for moving sand from the bar from time to time using trailer suction dredges. The frequency of such dredging will depend on the overall efficiency of the permanent system and the occurrence of storm events, which may overwhelm the jetty sand collection unit and allow some sand to "escape".

4.4. Construction

The jetty was built using land based plant and a cantilevered pile driving rig that moved seaward at the completion of each headstock. The final deck and handrails were completed as the work progressed.

The flume and other pipework were built after the jetty was completed. The jet pumps and control gear were installed last of all.

The pump and control building was built concurrently with the jetty. The site required de-watering, as the pumps are located in a basement. A 400mm polyurethane lined steel pipeline was placed under the Tweed River using horizontal directional drilling technology.

A 150mm borehole was drilled through fine sands and fractured greywacke, and this was reamed out to a final diameter of 750mm. The slurry pipeline and an electrical conduit were then drawn through the tunnel.

The other pipelines were placed in trenches in a conventional manner. Care was taken to bund and treat some material with potential acid sulfate soil properties. Particular care was taken in the construction of the outlet at Snapper Rocks West to ensure that it did not impact on the natural scenic beauty of the area.

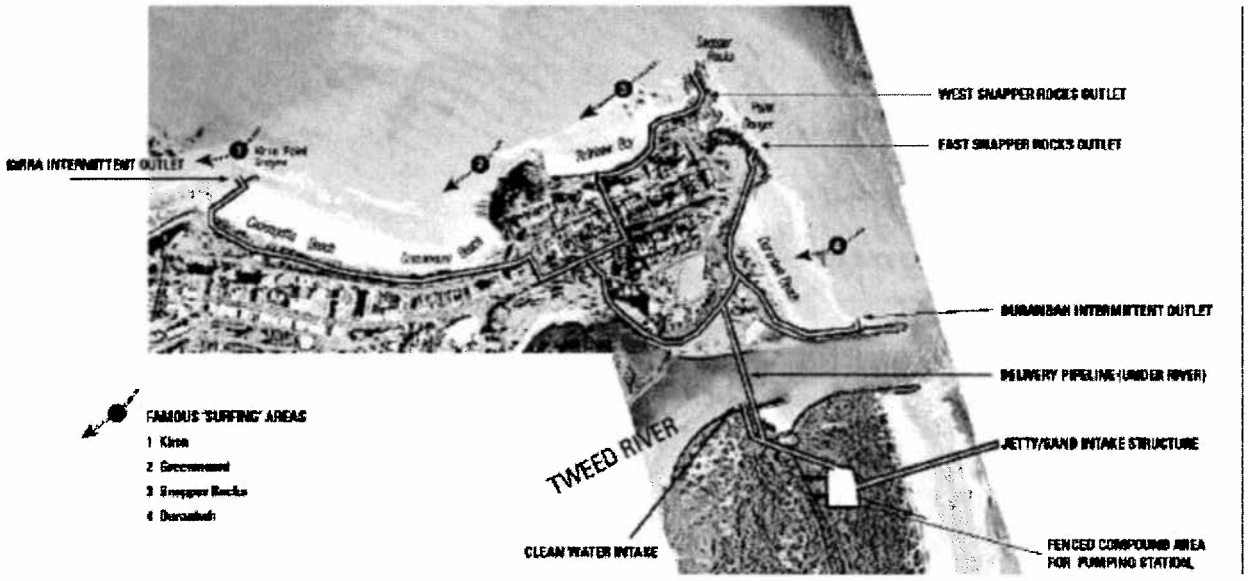


Figure 2 – Layout of Sand Bypassing System

The sand bypassing system pumped its first sand on 27 February 2001. All contract conditions were satisfied in a little over 14 months, which was within the required time period.

The system cost $23.3M. This was paid for with promissory notes, which are redeemable over a 12 year period so long as the system is complying with performance specifications.

Jetty under construction

4.5. Commissioning

Sand was placed at the primary outlet at Snapper Rocks East during the commissioning tests. The contractor was required to pump 120,000 cubic metres in 30 days and 11,500 cubic metres in a 24 hour period. The 30 day quantity was delivered within the time period and the 24 hour test was complied with a few days later. In the first instance, beach sand around the jet pumps appeared to be compacted and did not form cones of the size predicted. This reduced the efficiency of the sand trap, particularly at low tide.

Commissioning was completed on 4 May 2001, after the navigation channel was cleared and operation plans were finalised.

4.6. Operations

If sand passes the collection system and settles in the entrance channel, the operator may be required to dredge the material, but still receive payment at the same unit rate. Hence, the operator is expected to pump as much sand as possible within environmental constraints (mainly the limit on beach retreat at the jetty). Once the beach at the jetty has receded, the operator will pump or dredge an amount of sand equal to the net longshore transport supply. Hence, the system is expected to provide sand at a rate consistent with the natural processes.

The bypass is normally operated at night using a computerised control system, which arranges cycling between jet pumps (and backwashes) using slurry density data measured at each pump.

Most of the sand will be pumped to the primary outlet at Snapper Rocks East, from where it will move under natural processes around Snapper Rocks to the target beaches. However, it is proposed to place sand at Kirra Point and Duranbah Beach during February and March (the peak season for longshore transport) in order to smooth the supply of sand. Following the successful completion of the commissioning tests, 67,000 m^3 of sand was pumped to the temporary outlet at Duranbah Beach, which had been badly eroded by storms.

4.7. Environmental Monitoring

Extensive monitoring is being carried out in a number of areas, as follows:

- Surveys are taken of nearshore areas, beaches and the Tweed River.
- Surf quality at Duranbah and other beaches.
- Offshore wave height and direction is measured, wave activity on training walls is monitored, and breakwaters are monitored to detect any movement in armour stones.
- The tidal range in the Tweed River is measured and analysed to detect any changes.
- Mangroves and wetlands are monitored.
- Little Terns and other avifauna are monitored.

The purpose of this monitoring is to detect any adverse environmental impacts, should they occur, and allow remedial action to be undertaken.

4.8. Public Consultation

The project is extremely important for the communities of the area with interest in boating, surfing, beach recreation and tourism. While the usual consultation process was undertaken during the environmental impact assessment process, of greater importance was the consultation and media involvements once the project became a reality with the construction phase. The pro-active and reactive efforts during this phase were considerable but it can also be said that the outcomes of that process benefited the project in terms of modifications suggested by the public and their greater knowledge, and 'ownership' of the final outcome. Further information on this aspect of the work are in Foster et al, 2001.

4.9. Public Access to Jetty

During the course of construction, some fishermen asked Tweed Shire Council if they could access the jetty when completed. Council approached the NSW State Government, which agreed to assist in financing this development if a number of outstanding issues can be satisfactorily resolved. At the time of writing, public comment had been invited.

5. Conclusions

The project has been complex, because of the multiple objectives, the risk issues and the number of active stakeholders.

Beach nourishment has restored the beaches of the southern Gold Coast to their former glory, and the associated entrance dredging improved navigation conditions.

The uncertainty associated with coastal processes made it difficult to reach a long term agreement with the private sector that was compatible with the multiple objectives of the project, the formal agreements already reached between the two states and the conditions imposed with planning approvals. However, the performance based contract signed by the two state governments and the private sector may be expected to achieve these aims and ensure the efficient management of the sand bypassing system.

The permanent system was constructed and commissioned on time, and is operating well.

The entrance has again been cleared, and navigation conditions are expected to be more reliable now that the sand bypassing system is operating.

The constant supply of sand is expected to keep the southern Gold Coast beaches in good condition.

6. References

Boswood P., Victory S. and Lawson S. (2001), *Placement Strategy and Monitoring of the Tweed River Entrance Sand Bypassing Project Nourishment Works.* Paper to be presented to Conference on COASTS & PORTS 2001, Gold Coast.

Colleter, G., Cummings P., Aguilar, P., Walters, R. and Boswood P. (2001), *Monitoring of Tweed River Entrance Dredging and Beach Nourishment.* Paper to be presented to Conference on COASTS & PORTS 2001, Gold Coast.

Dyson, A., Murray, R., and Connor, T. (1999), *Sand Bypassing the Tweed River: Insights into Coastal, Approval and Procurement Processes*, Proceedings of the 14th Australian Conference on Coastal and Ocean Engineering, I.E. Aust, Perth.

Foster M., Cummings P., Connor T., Dyson A., Victory S. and McMahon J. (2001), *Community Consultation for the Tweed River Entrance Sand Bypassing Project.* Paper to be presented to Conference on COASTS & PORTS 2001, Gold Coast.

Hyder Consulting Pty Ltd, Patterson Britton & Partners Pty Ltd and WBM Oceanics Australia Joint Venture (1997), *Tweed River Entrance Sand Bypassing Project, Permanent Bypassing System, Environmental Impact Statement - Impact Assessment Study*, Sydney.

Lawson S., McMahon J. and Boswood P., (2001), *Environmental Management of the Construction and Operation of a Sand Bypassing System at the Tweed River Entrance.* Paper to be presented to Conference on COASTS & PORTS 2001, Gold Coast.

APPENDIX D

OBSERVATIONS OF RECREATIONAL USE OF BEACH

DURING NOURISHMENT OPERATIONS

1. Beach Replenishment Underway

2. Beach Replenishment Including Tractor Operations Underway

3. Peninsula Formation Due to Surfzone Disposal

4. Beach Replenishment Underway

5. Pipeline on Beach

6. Pipeline on Beach

APPENDIX E

POTENTIAL MODIFICATIONS

SPECIAL EQUIPMENT

Mud Gas Separator

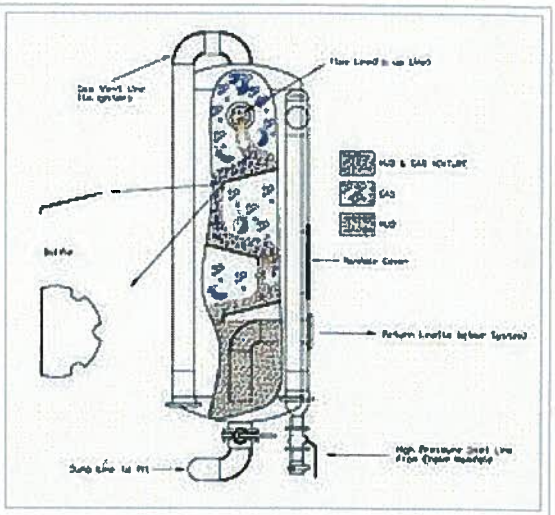
From Wikipedia, the free encyclopedia

Mud Gas Separator is commonly called a **gas-buster** or **poor boy degasser**. It captures and separates large volume of free gas within the drilling fluid. If there is a "KICK" situation, this vessel separates the mud and the gas by allowing it to flow over baffle plates. The gas then is forced to flow through a line and vent it to a flare. A "KICK" situation happens when the annular hydrostatic pressure in a drilling well temporarily (and usually relatively suddenly) falls below that of the formation, or pore, pressure in a permeable section downhole, and before control of the situation is lost.

It is always safe to design the mud/gas separator that will handle the maximum possible gas flow that can occur.[1][2]

Mud Gas Separator capable of handling 1000-1500gpm

Contents



Process Flow Diagram For Mud Gas Separator

Types of Mud/Gas Separators

The principle of mud/gas separation for different types of vessels is the same.[3]

- Closed bottom type
- Open bottom type
- Float type

According to pedestal or base type there are

- Fixed type
- Elevating type

Poor boy degasser in China is usually named according to vessel diameter.So the type also including

- FLQ800 or ZYQ800
- FLQ1000
- FLQ1200
- FLQ1400

Usually, the degasser type or configuration is customizable

Principle of operation

The principle behind the **mud gas separator** is relatively simple. On the figure, the mud and gas mixture is fed at the inlet allowing it to impinge on a series of baffles designed to separate gas and mud. The free gas then is moved into the flare line to reduce the threat of toxic and hazardous gases and the mud then discharges to the shale shaker and to the tank.

See also

- Mud systems

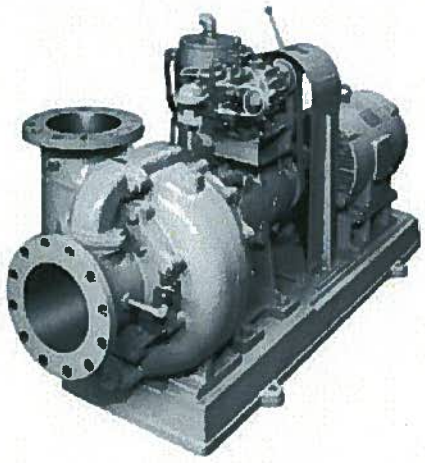
Notes

1. ^ Dilling Fluids Processing Handbook ISBN 0-7506-7775-9
2. ^ Mud Equipment Manual ISBN 0-87201-614-5
3. ^ SPE Drilling Engineering, December 1991

Enhanced Self-Priming Pump
UPM, UPS types (PAT.)

YOKOTA

Suction and transfer of liquid containing foam or high viscosity liquid



Patented in Japan, U.S.A., other

Bore 50-250mm
Total head 10-60m
Capacity 0.1-8m^3/min

The YOKOTA Enhanced Self-Priming Pump is a volute pump with an interlocked water-air separating impeller and a vacuum pump.
The mixture of water and air gathered in the center of the volute pump is centrifugally separated by rotation of the water-air separating impeller and only the air is drawn out by the vacuum pump. Therefore the volute pump always operates under the highest vacuum condition, and shows stable and supreme pumping performance without being blocked by the incoming air or cavitation.
It is probably the only horizontal shaft type volute pump in the world which is capable of continuous suction and transfer of liquids containing high viscosity sediment materials and air (i.e., gas-solid-liquid multiphase flow).

UPM type: Vacuum pump built-in type
UPS type: Vacuum pump mounted type
UPS type: Vacuum pump separate type

Unique features

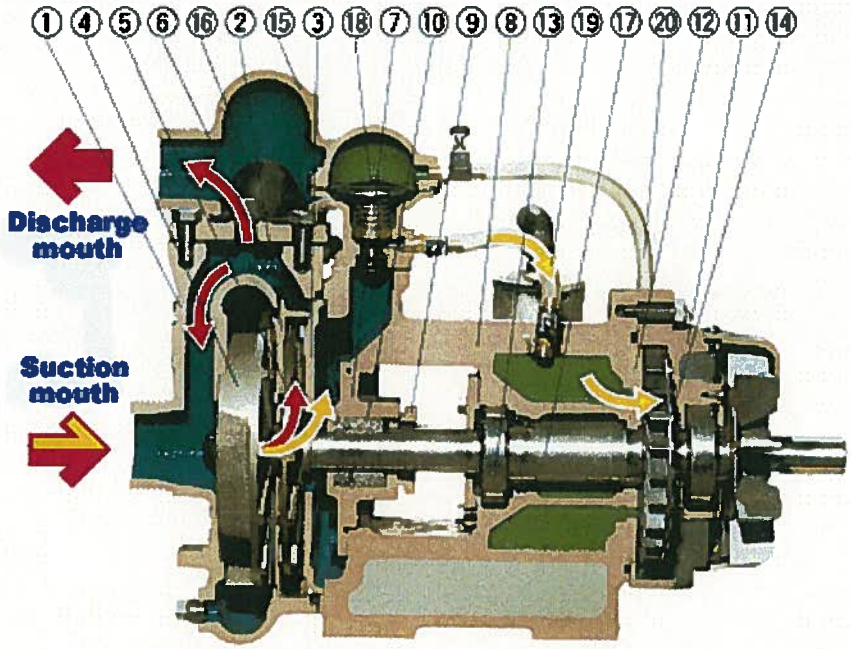
- Capable of continuous suction and transfer of liquids containing high viscosity sediment materials and air (gas-solid-liquid multiphase flow).
- Universal pump which is also capable of continuous suction and transfer of liquids containing solid, such as food materials, muddy water containing gravel, and sewage containing empty cans.
- Enhanced self-priming type which needs no priming even at initial operation after installation.
- The intake piping can be constructed in many ways such as with waved pipes or across embankments, and so on.
- Due to rational construction, the pump is highly reliable, maintenance is easy, and economical automatic operation is possible.

A wide variety of materials are available, including FC, CAC, SCS and YOKOTA's corrosion and

wear resistant special stainless steel casting (YST), to meet the needs of various kinds of liquid.

Principle (PAT.) ..... Try and see its excellent performance.

UPM type



4 : Main impeller
5 : Water-air separating impeller
6 : Return passage
14 : Vacuum pump impeller

The water-air separating impeller 5 is installed between the volute pump and the vacuum pump.

When operation is started, the main impeller 4 races and the vacuum pump 14 operates, eliminating the air in the suction pipe.
When the air is eliminated and a vacuum level close to the suction head is reached, the pumping liquid flows into the pump casing, and is discharged by the main impeller 4.

The mixture of water and air in the center is drawn by the vacuum pump 14, goes behind the main impeller and reaches the water-air separating impeller 5.
The water-air separating impeller separates the water from the air by centrifugal force.
The water returns to the suction mouth through the return passage 6, and only the air gathered in the center is drawn out by the vacuum pump 14.

Therefore the volute pump always operates under the highest vacuum condition, and is not blocked by the incoming air at the pump suction mouth or the main impeller.

Applications

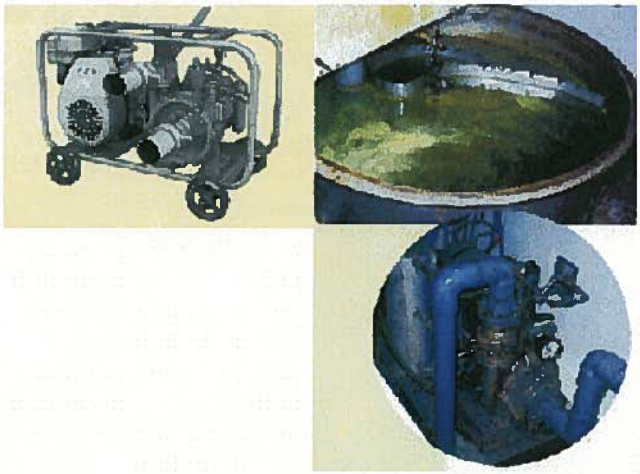
Transferring food materials:	Sauce, Soy sauce, Stock, Ketchup, Unrefined sauce, Liquor, Seaweed, Fluid of other raw materials, other
Transferring chemical liquids:	Phosphate slurry, Formalin, Ammonia, Caustic soda, Light oil, Heavy oil, Concentrated sulfuric acid, Ketone, Acrylic ester, Volatile liquids such as ethylene glycol, Gas-containing liquid, Polypropylene powder,

	Pellets, other
Loading and unloading for tankers:	Aniline, Nitrobenzene, Acetic acid, Nitric acid, other (cargo oil pumps for cargo transfer and stripping for tankers, ballast pumps, bilge pumps)
Sludge drainage:	Sludge, Pulp waste water, Muddy water, Human waste, Pulverized coal sludge, Sewage, other
Earth excavation:	Muddy sand, Seawater, Muddy water containing gravel, other (pumps for reverse circulation, non-clogging dredging pumps, sand pumps)
Sealed (Vacuum) tank extraction:	Pure water, Chemical liquid, other
Defoaming air-containing liquid:	Foam latex liquid, Foam starch liquid, Normal paraffin fermenter liquid, Lubricants, hydraulic oil, cutting oil, other
Other:	Hydropower snow transport (For details, please refer to "Current Topics: Snow Removal and Snow Melting".)

Example applications and installations

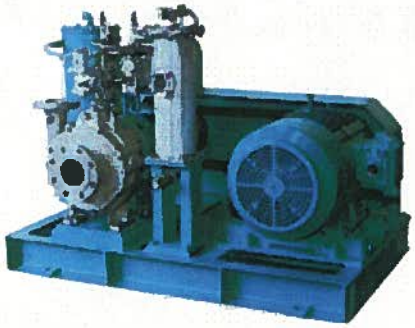
For transferring food

More details >



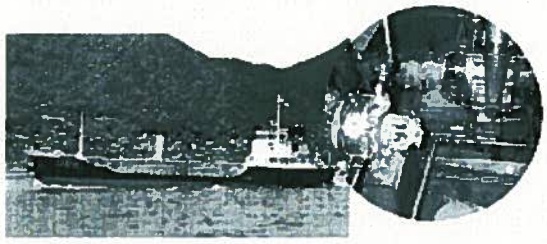
For defoaming

More details >



For chemical tankers

More details >



For reverse circulation

More details >

For sewage

More details >

Defoaming and degassing pumps with intensified water-air separation capability are also available. For details, please refer to
Defoaming Pump, Defoaming Equipment UPSA type
Degassing Pump, Degassing Equipment ASP type

Features Structure Technical data Selection & Dimensions Inquiry form

moffatt & nichol

2185 North California Blvd., Ste 500
Walnut Creek, CA 94596
(925) 944-5411

Hydrogen Sulfide Nuisance Prevention Protocol

Adopted 10/31/03; Revised 10/18/05, 12/9/10

This protocol is adopted to minimize exposure to the public from the release of hydrogen sulfide (H_2S) at levels that constitute a public nuisance. The protocol and its provisions are incorporated into the District Permits to Operate for dredges "Seabright" and "Squirt", and are enforceable through the provisions of Air District Rule 200.

A. Avoidance of beach discharge.
To the maximum extent feasible, the Port District shall discharge dredge sediments with H_2S odor potential under water, outside of the beach zone[1] whenever the wind is onshore.

B. Discretionary beach discharge[2]
Whenever the Port District elects to direct the sediments from its dredging operation into the beach zone, and when the wind direction is onshore (from between 090 degrees south through 270 degrees magnetic), it shall implement the following practices.

1. Give public notice of the intention to conduct beach discharge as much in advance as is possible by posting a conspicuous notice on the Harbor's web site.

2. Operate an Air District-approved hydrogen sulfide monitor, which automatically samples and records data on the basis of one minute sampling intervals.

(a) The H_2S monitor shall be operated at a location that is directly downwind[3] from the center of the discharge area[4].

---

[1] "The Beach Zone" is the area from East Cliff Drive seaward to the point where the water depth allows the pipe, while discharging sediment, to create a visible surface disturbance. The seaward extent of this zone will vary with the tide and sediment accretion.

[2] "Discretionary beach discharge" occurs when the Port District elects to deposit dredge sediments into the beach zone at a time when dredging is not immediately necessary to clear, or keep clear, the Harbor channel, or to protect any onshore asset, such as roads, utilities or other structures.

[3] During periods when wind direction is not steady, "downwind" from the discharge area shall be the average direction the wind is blowing as it fluctuates back and forth or which is in the direction of the nearest residences if the wind is entirely erratic.

[4] "The Discharge area" is a line passing through the terminus of the discharge pipe, perpendicular to the wind direction, whose length is marked by the visible surface flow of the sediment being discharged. If the discharge is under water, the width of the discharge area perpendicular to the wind direction is marked by the visible upwelling of water from the submerged discharge pipe.

(b) The H_2S monitor shall be operated within a warning zone[5] with the following characteristics:

(1) A semicircle whose center is at the discharge outlet,

(2) Whose arc runs from the surf line to the west clockwise to the surf line to the east, and

(3) Whose radius is at least the distance of the monitor from the discharge outlet.

(c) The H_2S monitor shall be operated and maintained according to manufacturer specifications, and shall be sited so that it is protected from conditions that could adversely affect its performance.

(d) The H_2S monitor shall be checked for accuracy by performing the zero check every day of operation before beginning monitoring, according to the manufacturer's specifications.

(e) Anemometers approved by the Air District shall be located and operated as follows:

(1) A directional wind indicator approved by the Air District shall be collocated with the H_2S monitor to continuously provide a conspicuous indication of wind direction, and

(2) An anemometer approved by the Air District, which records wind speed and direction, shall be located at a position at the Harbor Beach approved by the Air District.

(f) The Port District shall maintain the following records for each day of dredging for three years:

(1) The H_2S monitor's data output,

(2) The anemometer's data output.

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[5] "A warning zone" is an area of beach inside which members of the public are advised by the Harbor District of the dredge operation and warned of the possibility of H_2S odors inside the warning zone which could reach levels that might cause discomfort. The warning zone shall be defined by a conspicuous boundary with signage that plainly signals this admonition to public access that would be seen and recognized as such by any member of the public, both adult and child, who would enter the warning zone. This area represents the region of highest concentrations of any hydrogen sulfide that may be released from the discharge area, and is the area inside of which the Harbor will monitor H_2S concentrations.

(3) A log recording dredge events, including for each date of beach discharge at least:

(i) Time of commencement of beach discharge,
(ii) Time of termination of beach discharge,
(iii) Reason for termination of beach discharge, and
(iv) If termination was required by H_2S monitor readings, the readings which triggered termination and all subsequent readings recorded by the monitor until they returned to below 15 ppb.

(4) A detailed log of all odor complaints received by the Port District, describing at least:

(i) Complainant's name and location,
(ii) Time and date of complaint,
(iii) Period of operation complained of,
(iv) Summary of complaint,
(v) Physical symptoms complained of, and
(vi) Any operational response to remedy complaint.

3. Terminate discharge into the beach zone whenever:

   (a) The H_2S monitor rolling one hour average of 10 ppb is exceeded, or

   (b) The H_2S monitor is removed from service.

4. After such termination:

   (a) Beach zone discharge may be resumed when the H_2S monitor is placed back in service.

   (b) Beach zone discharge that is terminated pursuant to 3(a) above may resume the next operating day after the dredge operation is modified to reduce H2S emissions to allowable levels.

   (c) If beach zone discharge is terminated pursuant to 3(a) above, the H_2S monitor shall continue to operate and record H_2S concentrations until they return to below 15 ppb and remain there for at least 10 minutes.

5. Do not exceed an H2S monitor rolling one hour average of 30 ppb.

C. Emergency Beach Discharge[6]

Whenever the Port District is required by circumstances beyond its control to direct its dredge sediments into the beach zone, and when the wind direction is onshore (from between 090 degrees south through 270 degrees magnetic), it shall implement the following practices:

1. Comply with the requirements of sections B.1 through B. 2(f) above.

2. Give advance notice as follows:

(a) Notify the Air District by fax, as soon after the decision is made as possible, of the intention and rationale to conduct emergency beach discharge and the anticipated period of such discharge, and

(b) Notify the public of the intention to conduct emergency beach discharge as soon as possible after the decision is made by posting a conspicuous notice on the Harbor's web site and by giving individual notice to any member of the public who has requested such notice.

3. Terminate discharge into the beach zone any time the H_2S monitor is removed from service.

4. After such termination, beach zone discharge may be resumed when the H_2S monitor is placed back in service.

5. Dredge operations shall be curtailed to maintain an H_2S monitor rolling one hour average of less than 30 ppb.

D. Public Information Sign

1. During the dredge season, if there will be any beach zone discharge during the season, the Port District shall place at the beach front a semi-permanent sign at each beach location where other explanatory beach signs are installed, with a size and conspicuity equal to the existing beach signs, that recites the following information:

---

[6] "Emergency beach discharge" occurs when the Harbor has to deposit dredge sediments into the beach zone because either:
- dredging is immediately necessary to clear, or to keep clear, the Harbor channel, and
- the offshore outfall is incapacitated, or
- a public official having responsibility for a public asset declares in writing that immediate beach replenishment is necessary to prevent damage to an asset, such as roads, utilities, or structures.

Notice

"The Santa Cruz Port District dredges the Harbor channel between November 1st and May 1st each year. Dredge sediments are sometimes discharged to this area of the beach and may contain decomposing seaweed which can release hydrogen sulfide, a gas recognized by its rotten egg smell.

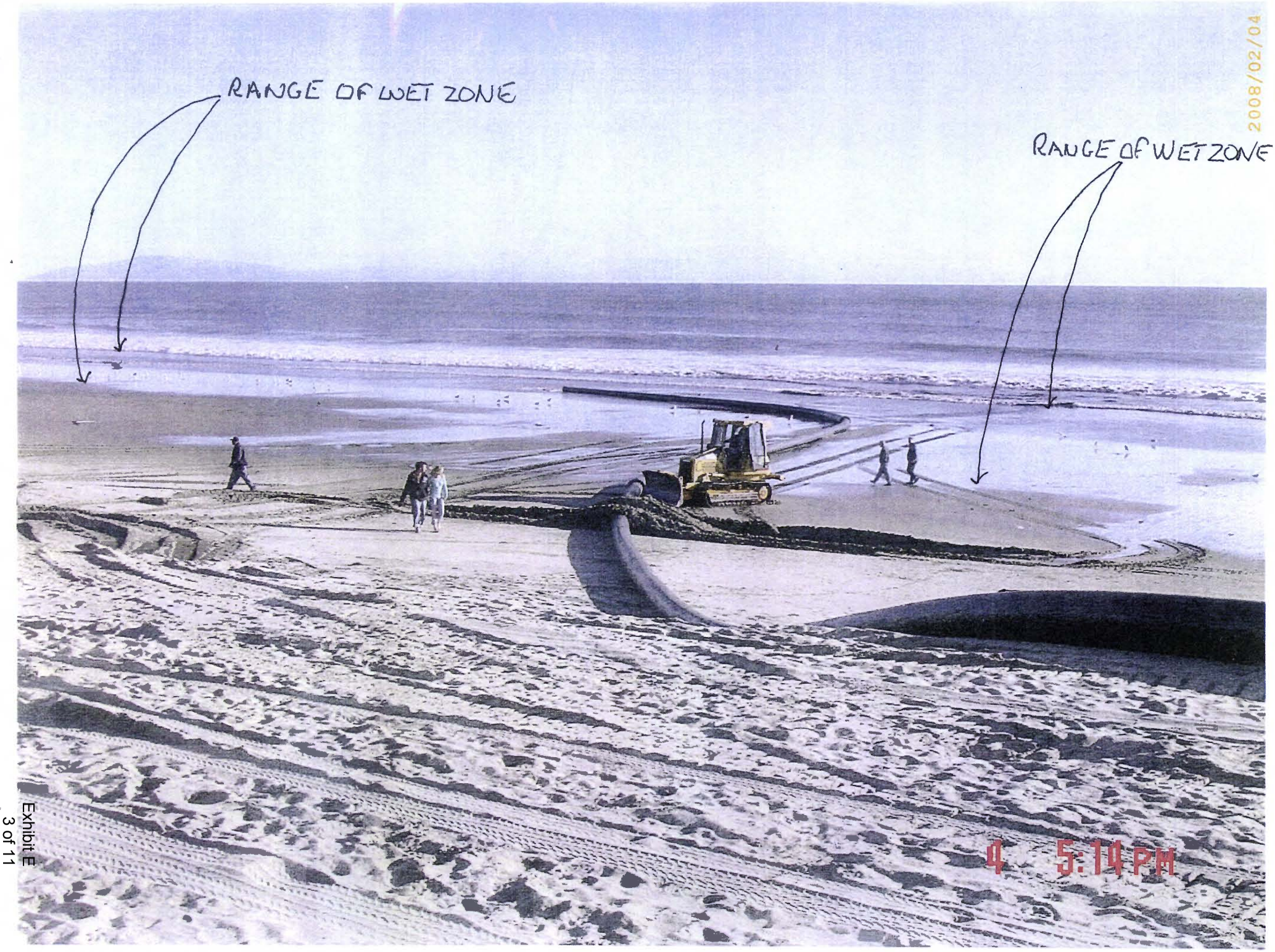
Because hydrogen sulfide can cause a public nuisance and possible adverse health effects, the Port District operates its dredge under a special permit from the Air District, which requires cessation if measured hydrogen sulfide levels reach specified limits.

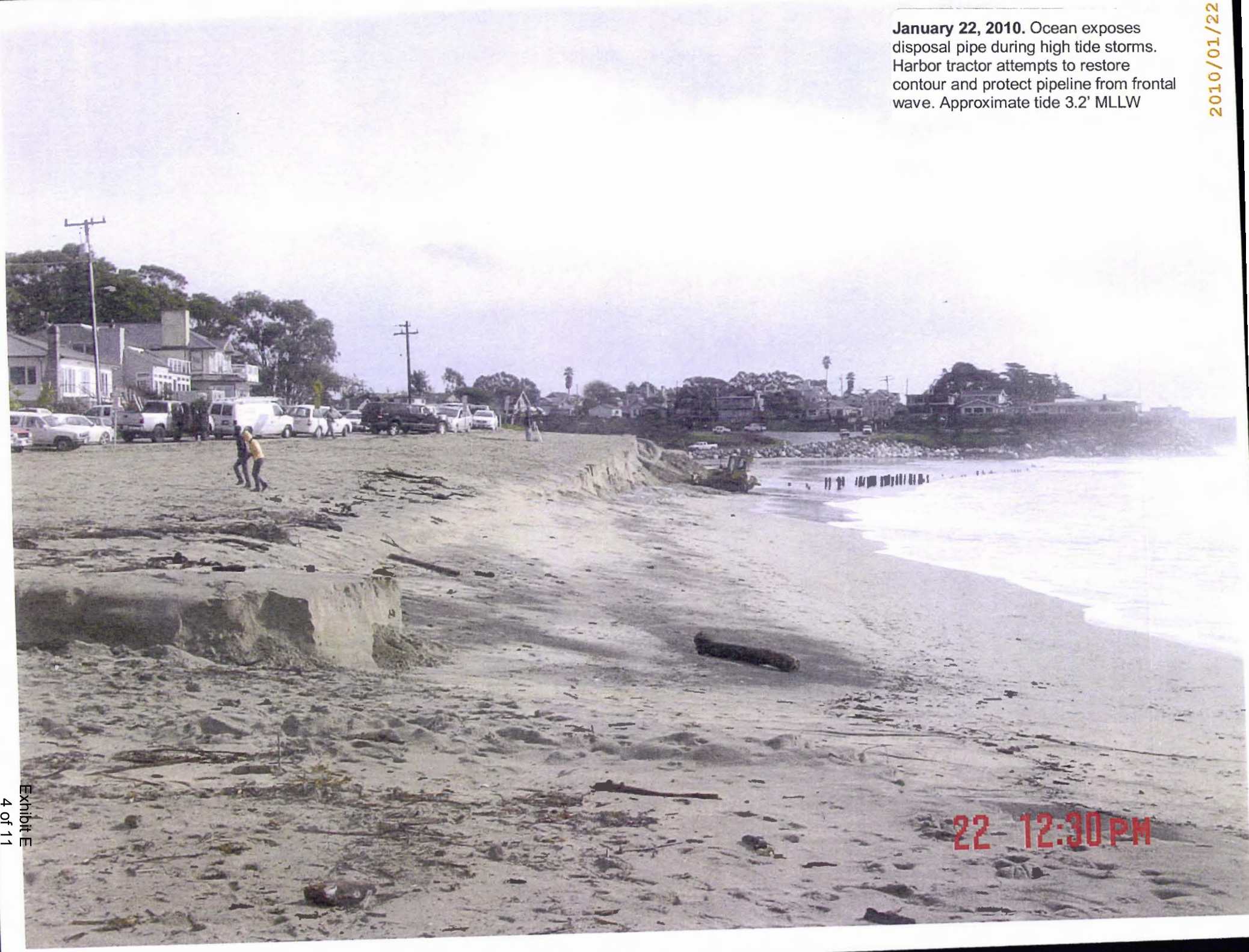
For information or complaints, you may call either:

The Air District Office at: 647-9411, or
The Port District Office at: 475-6161"

Santa Cruz Harbor in Shoaled Condition
Breaking surf is a hazard to all boats, large and small.


Santa Cruz Harbor Dredge Sediment Discharge Program
Range of "Wet Zone" at low tide condition.
Note how a shallow beach gradient can create a wide "wet zone"
Off shore pipe location.
Note sand bar forming over discharge nozzle of off shore pipe.


RANGE OF WET ZONE
RANGE OF WET ZONE
2008/02/04
4 5:14 PM



January 22, 2010. Ocean exposes disposal pipe during high tide storms. Harbor tractor attempts to restore contour and protect pipeline from frontal wave. Approximate tide 3.2' MLLW

2010/01/22

Exhibit E
4 of 11

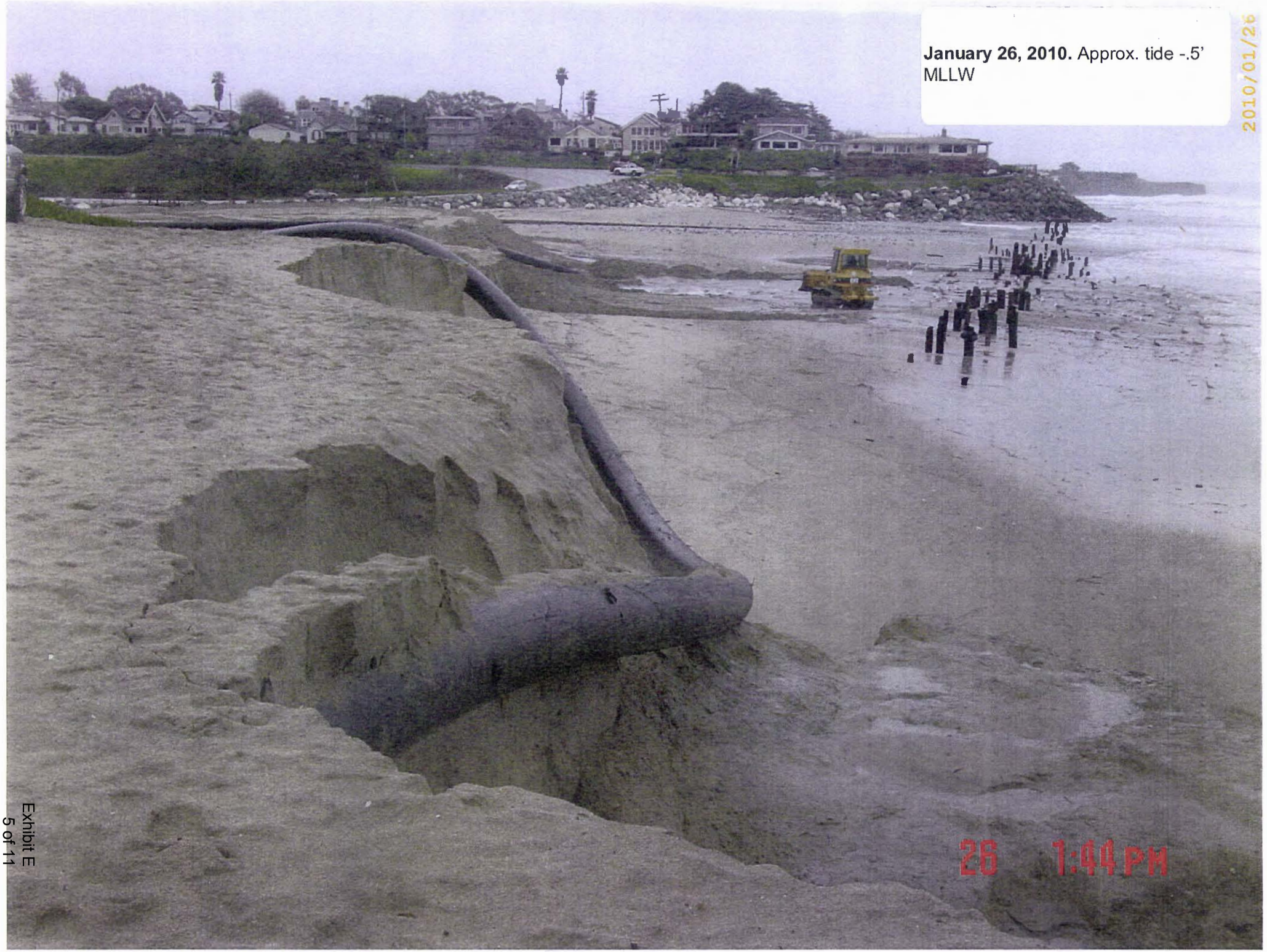
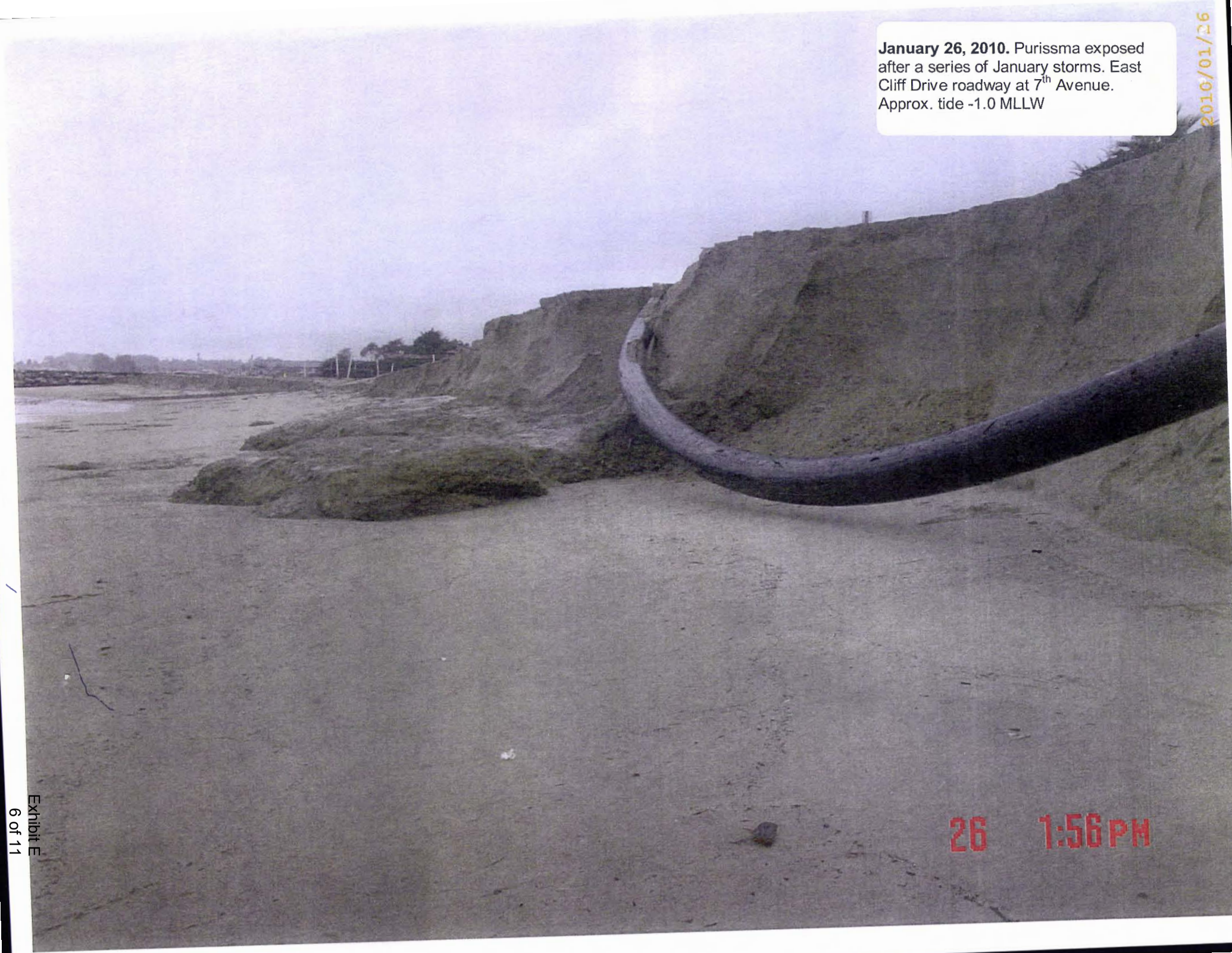
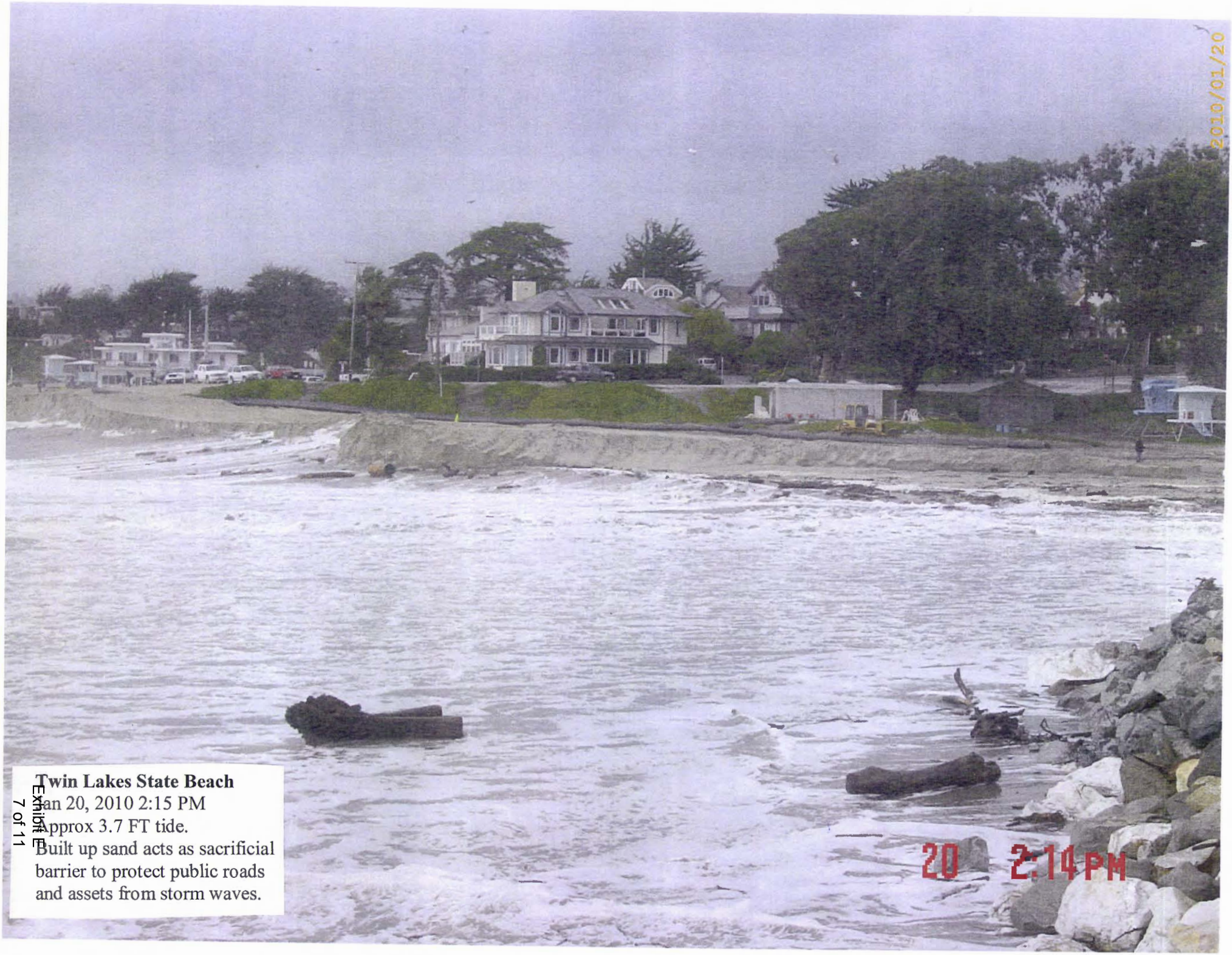


Exhibit E
5 of 11

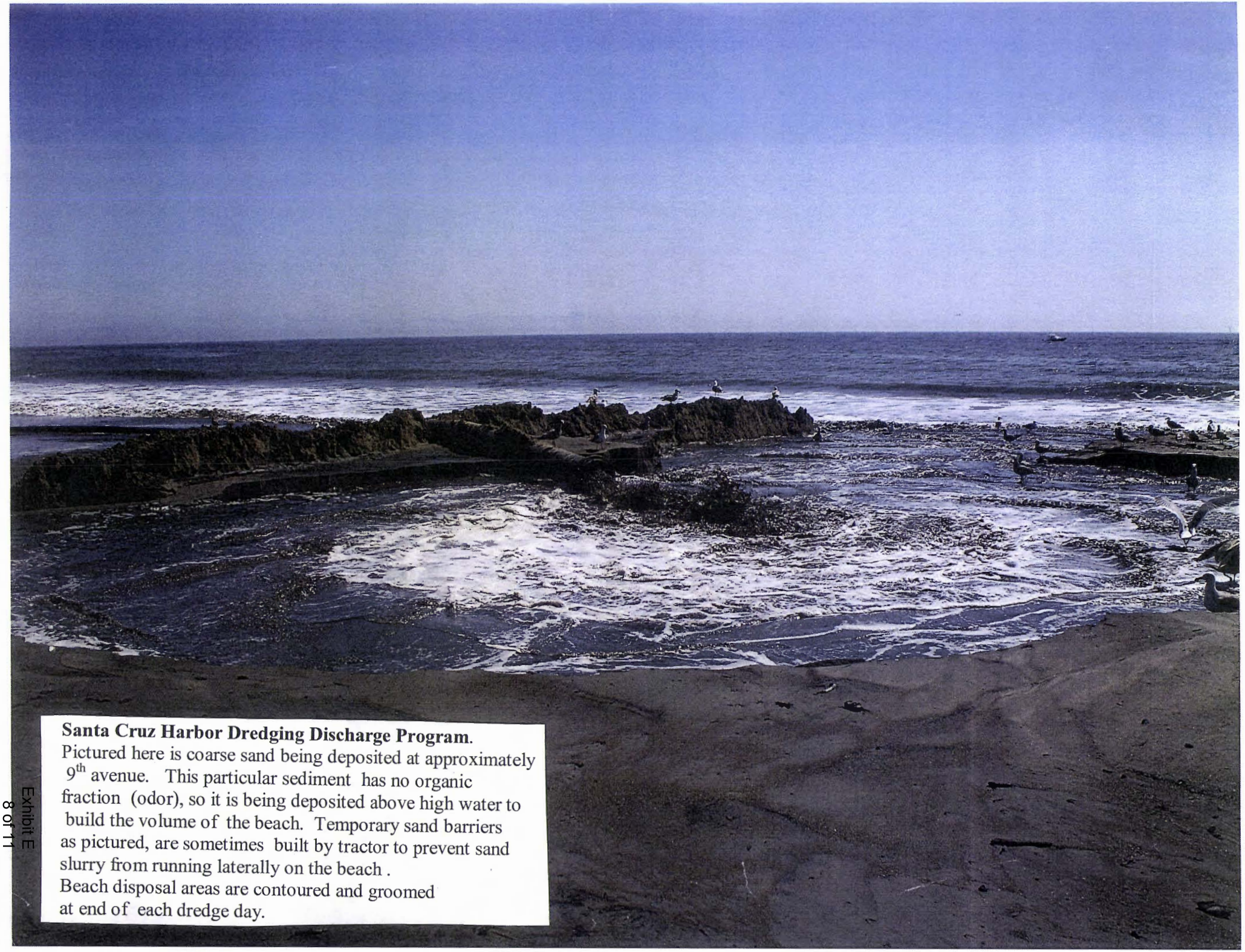


January 26, 2010. Purissma exposed after a series of January storms. East Cliff Drive roadway at 7th Avenue. Approx. tide -1.0 MLLW

Exhibit E
6 of 11



Twin Lakes State Beach
Jan 20, 2010 2:15 PM
Approx 3.7 FT tide.
Built up sand acts as sacrificial barrier to protect public roads and assets from storm waves.



Santa Cruz Harbor Dredging Discharge Program.
Pictured here is coarse sand being deposited at approximately 9th avenue. This particular sediment has no organic fraction (odor), so it is being deposited above high water to build the volume of the beach. Temporary sand barriers as pictured, are sometimes built by tractor to prevent sand slurry from running laterally on the beach .
Beach disposal areas are contoured and groomed at end of each dredge day.

Exhibit E
9 of 11

"Wet Zone" Operation
D-5 tractor pushes dredge disposal pipe into surf line in order to attain enough depth to reduce hydrogen sulfide odor.
Safety spotter monitors area for environmental and public safety issues at all times.
All beach personnel are in radio communications.

Sand island created by four days of dredging through offshore pipeline.
Low tide condition, +0.5 at 1600 hours on January 24, 2002.
Pipeline nozzle by two people at far left.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

December 20, 2011

In response, refer to:
2011/05925

Lieutenant Colonel Torrey A. DiCiro
Corps of Engineers – San Francisco District
333 Market Street, 8th Floor
San Francisco, California 94103-1398

Dear Colonel DiCiro:

Thank you for your request of October 5, 2011, for the initiation of informal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended, and the Essential Fish Habitat (EFH) provisions of the Magnuson Stevens Fishery Conservation and Management Act (MSA). This letter also serves as consultation under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (FWCA) of 1934, as amended. These consultations pertain to the proposed ten-year maintenance dredging of Santa Cruz Harbor by Santa Cruz Port District (Port) (PN #2010-00015S). The U.S. Army Corps of Engineers (Corps) proposes to authorize maintenance dredging of Santa Cruz Harbor pursuant to Section 404 of the Clean water Act (33 U.S.C §1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 USC §403).

The Corps has requested NMFS' concurrence with its determination that the proposed project is not likely to adversely affect green sturgeon *(Acipenser medirostris)*, Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*), CCC steelhead (*O. mykiss*), and winter-run Chinook salmon (*O. tshawytscha*), and their designated critical habitats.

NMFS has reviewed the Corps' Public Notice for the proposed project (PN # 2010-00015S), the initiation letter received October 7, 2011, and additional information provided via email from the Corps received October 24, 2011.

The request for consultation involves the removal and disposal of sediment from the Santa Cruz Harbor, located at the mouth of Arana Gulch, in the City of Santa Cruz, Santa Cruz County, California. Santa Cruz Harbor is defined by two separate geographic areas known as the Entrance Channel and Inner Harbor. The Inner Harbor is further subdivided into the North Harbor and South Harbor. The proposed project involves dredging a maximum of 3,110,000 cubic yards (cys) of sediment (with no annual limit) during the next ten years from Santa Cruz.

Harbor to maintain sufficient depths for operation of the harbor. The proposed project would permit using a hydraulic dredge to remove approximately 2,560,000 cys of sandy sediments (80% sand or greater) from the Entrance Harbor and 550,000 cys from the Inner Harbor.

The Port District is currently authorized to dispose of dredged material at the aquatic disposal site SF-14 (Off-shore Moss Landing Monterey Bay Disposal Site) and, via pipeline, at the Twin Lakes State Beach "nearshore disposal site" located 300 yards east of the East Jetty. The permit conditions on disposal at the nearshore site prohibits disposal of any material less than 50% sand, and limits disposal of material 50% to 79% sand content to 3,000 cys per year. All other inner-harbor sediment must be 80% sand or greater to qualify for nearshore disposal. The Corps proposes to increase the annual limit for disposal of fine-grained material (anything less than 80% sand with no lower limit) to 10,000 cys.

To avoid or minimize potential impacts to listed species and their designated critical habitats, and EFH occurring in the proposed project area, the Corps has provided NMFS with avoidance measures including:

1. Dredging and disposal will be conducted during daylight hours between November 1 and February 28 and one hour before sunrise and one hour after sunset between March 1 to April 30. These operational windows will minimize the possibility of adverse impacts to CCC steelhead smolts out-migrating from Arana Gulch.

2. The hydraulic-suction dredge will not be operating when raised or lowered through the water column.

3. The dredge will be turned on (in operation) only when it is at the bottom of the water column and in the sediment.

4. Nearshore disposal of fine-grain material will be discharged at a maximum rate of 550 cys per day.

Endangered Species Act

Available information indicates the following listed species Distinct Population Segments (DPS) or Evolutionarily Significant Units (ESU), and critical habitat may occur in the project area:

Central California Coast Coho salmon (*Oncorhynchus kisutch*) **ESU**
endangered (70 FR 37160: June 28, 2005);
Central California Coast steelhead (*O. mykiss*) **DPS**
threatened (71 FR 52488, January 5, 2006); and
Southern DPS of North American green sturgeon (*Acipenser medirostris*) **DPS**
threatened (71 FR 17757, April 7, 2006)
critical habitat (74 FR52300, October 9, 2009).

The life history of CCC coho salmon is summarized by Shapovalov and Taft (1954) and Hassler (1988). The southern extent of CCC coho salmon historically included the San Lorenzo River

and Aptos Creek watersheds. A proposed rule extends the range to include Soquel Creek. Designated critical habitat for CCC coho does not include Santa Cruz Harbor or the adjoining Arana Gulch watershed. NMFS believes it is unlikely coho salmon will be present in the action area and, therefore, any effects resulting from this project are not expected to impact this species.

The life history of CCC steelhead is summarized by Busby *et al.* (1996). Steelhead are anadromous fish, spending some time in both fresh- and saltwater. The older juvenile and adult life stage occur in the ocean, until the adults ascend freshwater streams to spawn. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean and finish rearing and maturing to adults. Fukushima and Lesh (1998) describe typical migration timing for steelhead in many California streams. Santa Cruz Harbor, and the tributary stream Arana Gulch, are not designated as critical habitat for steelhead. D.W. Alley reports the population of steelhead in Arana Gulch is very small and habitat conditions are poor (Alley 2000).

The life history of green sturgeon in California is summarized in Adams *et al.* (2002) and NMFS (2005). The southern DPS of North American green sturgeon spawns in deep turbulent sections of the upper Sacramento River. As juvenile green sturgeon age, they migrate downstream and live in the lower delta and bays, spending from three to four years there before entering the ocean. Adult green sturgeon return from the ocean every few years to spawn and generally show fidelity to their upper Sacramento River spawning sites. Designated critical habitat for North American green sturgeon southern DPS exists in bays and estuaries of the Monterey Bay, extending to mean higher high water line (MHHW). Therefore, the Santa Cruz Harbor and action area are within the green sturgeon critical habitat designation. There is insufficient information to determine the population abundance of green sturgeon in Santa Cruz Harbor.

Winter-run Chinook salmon spawn and rear in the Sacramento River. NMFS believes it is unlikely winter-run Chinook salmon will be present in the action area and, therefore, any effects resulting from this project are not expected to impact this species.

The Corps has requested NMFS' concurrence with their finding that the proposed project is not likely to adversely affect the above ESA-listed species, and designated critical habitats.

NMFS considers the possibility of adverse effects to listed CCC steelhead and green sturgeon and their designated critical habitat during project implementation to be insignificant because: (1) BMPs including dredging methods and timing will minimize impacts to listed species; and (2) of the low abundance of CCC steelhead and green sturgeon in the action area.

Based on the best available information, NMFS has determined CCC steelhead and southern North American green sturgeon are not likely to be adversely affected by the Santa Cruz Harbor Maintenance Dredging Project. Regarding designated critical habitat, NMFS has determined the proposed project is not likely to adversely modify designated green sturgeon critical habitat.

This concludes informal consultation in accordance with 50 CFR 402.12(a) for the proposed Santa Cruz Harbor Maintenance Dredging Project in Santa Cruz County, California. However,

further consultation may be required if: (1) new information becomes available indicating that listed species or critical habitat may be affected by the project in a manner or to an extent not previously considered; (2) current project plans change in a manner that causes an effect to listed species or critical habitat in a manner not previously considered; or (3) a new species is listed or critical habitat designated that may be affected by the action.

Magnuson-Stevens Fishery Conservation and Management Act

The project is located within an area identified as Essential Fish Habitat (EFH) for various life stages of fish species managed with the following Fishery Management Plans (FMP) under the MSA:

Pacific Groundfish FMP – various rockfish, sole, and shark;

Pacific Salmonid FMP – Chinook salmon, coho salmon; and

Coastal Pelagic FMP – northern anchovy, Pacific sardine, mackerel, market squid.

In addition, the project occurs within an area designated as Habitat Areas of Particular Concern (HAPC) for various federally managed fish species within the Pacific Groundfish FMP. HAPC are described in the regulations as subsets of EFH that are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC are more carefully scrutinized during the consultation process.

Kelp canopies are designated HAPC for groundfish and provide an important structural habitat for fish as well as a surface for the attachment of fish eggs. Giant kelp (*Macrocystis pyrifera)* canopies form during the summer and fall in Monterey Bay and the Harbor. Based on the information provided by the Port District, no established areas of kelp exist in the dredge footprint or nearshore disposal site. However, kelp beds occur east of the nearshore disposal site at Twin Lakes Beach within the path of transported sediment. Based on Google Earth, the nearshore disposal site is less than 1 km from the Blacks Point kelp bed.

Effects of the Action

NMFS has evaluated the proposed activities for adverse effects to EFH pursuant to Section 305 (b)(2) of the MSA. Potential adverse effects to EFH from the proposed dredging and dredged material disposal activities include: (1) increased turbidity and suspended sediments in the water column from dredging and disposal activities, (2) increased sedimentation in bedrock down-current of nearshore disposal site, (3) degradation of canopy kelp HAPC, (4) removal of benthic prey organisms with dredged sediments, and (5) burial of benthic organisms from disposal of dredged material.

Turbidity

Dredging and disposal activities are expected to increase the concentration of suspended sediments and result in increased turbidity within the water column. Fish may suffer reduced

feeding ability (Benfield and Minello 1996) and be prone to fish gill injury (Nightingale and Simenstad 2001) if exposed to excessively high levels of turbidity. Fish are expected to move out of areas of high suspended sediment. Turbidity generated by the disposal of fine-grain material at the nearshore site is of particular concern due to potential impacts on early life stages of nearby kelp, including free-swimming microscopic stages (gametophytes) and the early stages of the new macroscopic plants (sporophytes).

During the prescribed dredging and disposal windows, multiple processes and sources in the area contribute to high turbidity in the Santa Cruz Bight, including resuspension of sediments due to winter storms and discharge of suspended sediment from the San Lorenzo River and Arana Gulch. Quantifying the amount of turbidity attributable solely to dredging and disposal may not be feasible. However, dredge demonstration studies conducted in winter and fall of 2005 documented the movement of sediment deposited in the nearshore disposal site. Following dredging and disposal, increased turbidity was measured near the seabed near areas that support kelp (Blacks Point and Soquel Point) (Sea Engineering 2006). In the fall and early winter of 2009, another demonstration project was done by USGS to evaluate potential changes to sediment grain size on the beach and inner shelf from disposal of fine-grain material (71 percent) at a discharge rate of 450 m^3/day. This study also reported turbidity near the seabed was higher during and after dredging compared to levels measured before the dredging (USGS 2011). Levels of turbidity associated with dredge material disposal at the nearshore disposal site are not considered significantly higher than normal high-turbidity winter conditions (Curt Storlazzi, personal communication, 12/5/11).

Both studies predict that suspended sediment at the disposal site is expected to dissipate quickly out of the area, due to the highly dynamic nature of the areas, and as demonstrated by models of average velocity vectors and dye concentrations near the disposal sites (Sea Engineering 2006; USGS 2011). Proposed control measures to reduce the rate of dredge material discharge to 550 cubic yards per day may be effective for reducing turbidity, plume length, and concentration at the nearshore disposal site but may also extend the duration of increased localized turbidity (Green 2011, USGS 2011). Suspended sediment concentration for the dredging sites would likely be reduced, due to the proposed use of a hydraulic dredge.

Sedimentation

Disposal of dredged material at the nearshore disposal site could result in accumulation of sediment over the rocky outcrop kelp habitat near Blacks Point. Increased sedimentation over bedrock may prevent spore attachment, or cause smothering or scouring of sporophytes. This could lead to a decrease in the growth, productivity, and/or survival of kelp beds along the path of transported sediment. Benthic habitat maps included in the Sea Engineering report illustrated an increase in sediment-covered rock after dredging in November, 2005 (Sea Engineering 2006). It is unknown whether this change was due to dredge disposal activities, natural scour and deposition, or sampling error of the mapping technology.

Findings from studies in 2005 and 2009 indicate that fine-grain material (silt and clay) does not deposit in the nearshore and that local wave energy and currents are sufficient to move both fine-grain material and sand offshore (Sea Engineering 2006; USGS 2011). The 2009 USGS demonstration project included sediment accumulation models that indicate sheer stress in the

area of Blacks Point is too strong to allow fine-grain material to settle out (USGS 2011). Sand is still expected to migrate from the nearshore disposal site eastward towards the Blacks Point kelp reef through normal longshore transport processes but the path or volume of sand could be altered due to the presence of the jetty and/or dredge material placement.

Cumulative Degradation of Canopy Kelp

The studies provided by the Port characterize the sediment dynamics in the area, including turbidity and sedimentation associated with dredging and nearshore disposal, but do not consider the potential of long-term, cumulative impacts of nearshore disposal of millions of cubic yards of sediment. Turbidity associated with dredge material disposal measured in these studies is not considered significantly higher than normal high-turbidity winter conditions but, in NMFS' opinion, could pose a cumulative impact by increasing turbidity above normal background levels and for extended periods of time. Long-term increases in turbidity generated by the nearshore disposal of fine-grain material poses potential impacts on early life stages of nearby kelp that depend upon sunlight reaching the bottom for energy to live and grow (Deysher and Dean 1986). The landward portion of the rocky kelp habitat near Blacks Point is an area of high wave energy, but is also characterized by low relief bedrock in shallow areas with a mosaic of sediment and bedrock. These types of low relief features could be more prone to sedimentation (Storlazzi 2011). Even minimal sedimentation (as little as 1 mm) over bedrock can prevent spore attachment (Green 2011). At NMFS request, the Port District conducted a 3-year baseline SCUBA study of abundance and density of nearby kelp beds at monitoring sites (Blacks Point and Pleasure/Soquel Point) and at control sites. The study also included spatial analysis of CDFG aerial photos over six years to measure canopy cover as a proxy for available habitat. Dredge material disposal has been ongoing at the nearshore disposal site since 2001, and kelp has been consistently present in the Blacks Point and Pleasure/Soquel Point monitoring sites since at least 1999 when high-quality CDFG aerial photos of the area started to become available (Sandoval 2011). However, spatial and temporal analysis of aerial photos over six years indicate canopy cover (*i.e.*, available habitat) at Blacks Point and Pleasure Point is not as persistent as control sites. Control site canopies increased in surface area and suitable habitat at Blacks Point was considered small (highly variable, less persistent) or perhaps decreasing (Sandoval 2011). SCUBA surveys conducted annually 2008-2010 showed no significant decrease in abundance or density among control and monitoring sites. However, Blacks Point did show a decrease in plant abundance (though not significant) (Sandoval 2011).

Removal of Benthic Prey

Dredging is expected to remove prey items from the benthos, reducing the value of the dredged area as a foraging area for FMP species (Newell *et al.* 1998). Prey items are primarily found within the surface layers of the sediment. Based on rates of community recovery listed in the scientific literature, NMFS expects the benthic community in the project area to recover within several months (Oliver *et al.* 1977).

Burial of Benthic Prey

Disposal of dredged material will bury immobile, benthic organisms, removing them as prey items for marine and estuarine fishes. Similar to the benthic communities within the Santa Cruz

Harbor, the benthic community at SF-14 is expected to recover within several months of disturbance. The nearshore disposal site at Twin Lakes State Beach is a high-energy, turbulent environment, as indicated by the presence of sandy sediments. NMFS expects the benthic community in this area to be adapted to a highly disturbed environment and, therefore, to recover relatively quickly from the disturbance.

EFH Conservation Recommendations

As described in the above effects analysis, NMFS has determined that the proposed project modifications would adversely affect EFH and HAPC for various Federally-managed fish species within the Pacific Groundfish, Pacific Salmonid and Coastal Salmonid FMPs. Pursuant to section 305 (b)(4)(A) of the MSA, NMFS offers the following EFH Conservation Recommendation to avoid, minimize, mitigate, or otherwise offset the adverse effects to giant kelp HAPC.

1. Fine-grain material (silt and clay) has been restricted from surf-zone disposal in the past by EPA Region IX standards for grain-size (Sandoval 2011). In addition, "USEPA and USACE (2004) specify guidelines for acceptability of dredge material for beneficial use as beach nourishment, as follows: it should closely match the sediment composition of the eroding beach and be low in fine sediments..." (Green 2011). NMFS agrees with these guidelines and recommends that the Corps only permit material >80% sand for nearshore disposal. Studies provided by the Port indicate material does not deposit in nearshore or change grain size characteristics of the beach, but demonstration studies are limited in duration and volume and do not address long-term cumulative impacts, especially regarding turbidity.

2. If, however, the Corps approves of the disposal of <80% sand at the nearshore disposal site, NMFS recommends the following avoidance and minimization measures to prevent potential impacts from increased turbidity and sedimentation to nearby kelp beds:

   a. NMFS recommends that the Corps not increase the volume of fines permitted in the nearshore disposal site. The previous 10 year permit included a 3000 cubic yard annual limit on nearshore disposal of material composed of 50-79% fines. An increase to an annual limit of 10,000 cubic yards in volume is proposed for material composed of <80% sand (with no minimum limit for % sand). Any additional material in excess of the currently permitted volumes should go to an upland beneficial reuse site or to a deeper disposal site (SF-14).

   b. NMFS recommends that, to verify that dredging and disposal activities are not significantly impacting the distribution and abundance of giant kelp, the Corps and/or Port District continue to annually monitor control sites and impact sites (the Pleasure Point fault offshore of Soquel Point and the rock outcrop shelf extending southwestward offshore of Blacks Point) for kelp density and abundance. As recommended in the kelp monitoring report, monitoring should occur for a minimum of five more years and increased sampling density should occur at Blacks Point to improve statistical confidence (Sandoval 2011). The Corps and/or Port District should provide a detailed monitoring plan to NMFS for approval within 60 days of

issuing the permit. The results of monitoring should be provided to NMFS annually within 60 days of completion of monitoring. After five years of monitoring, the Port District should meet with NMFS to determine if disposal activities are resulting in a decrease in kelp distribution and abundance, or if additional monitoring is needed to make a determination.

c. If at any time the monitoring recommended above demonstrates a significant decrease in kelp distribution or abundance at impact sites compared to control sites, the Corps and/or Port District should develop a plan to avoid, minimize, and mitigate for the loss of giant kelp HAPC. The plan should be provided to NMFS for approval within 60 days of the determination that kelp has been negatively impacted by the project.

Statutory Response Requirement

Please be advised that regulations (50 CFR 600.092) to implement the EFH provisions of the MSFCMA require your office to provide a written response to this letter within 30 days of its receipt and prior to the final action. A preliminary response is acceptable if final response cannot be completed within 30 days. Your final response must include a description of how the EFH Conservation Recommendations will be implemented and any other measures that will be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH Conservation Recommendation, you must provide an explanation for not implementing this recommendation at least 10 days prior to final approval of the action.

Fish and Wildlife Coordination Act

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development [16 U.S.C 661]. The FWCA establishes a consultation requirement for federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage [16 U.S.C 662(a)]. Consistent with this consultation requirement, NMFS provides recommendations and comments to federal action agencies for the purpose of conserving fish and wildlife resources. NMFS has determined that kelp could be negatively impacted by proposed project activities. As such, the EFH Conservation Recommendations provided above also serves as a FWCA recommendation to compensate for these negative impacts.

Supplemental Consultation

This concludes EFH consultation for the 10-year permit for maintenance dredging of Santa Cruz Harbor. Pursuant to 50 CFR 600.920(l) of the EFH regulations, the Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH or other fish and wildlife resources, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations.

For ESA questions please contact Mr. Devin Best at (707) 578-8553, or via e-mail at devin.best@noaa.gov. For EFH questions, please contact Ms. Maureen Goff at 707-575-6067, or at maureen.goff@noaa.gov.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Bob Hoffman, NMFS, Long Beach
Bryant Chesney, NMFS, Long Beach
Jane Hicks, USACE Regulatory Branch, San Francisco
Copy to file: 151422SWR2011SR00581

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DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94105—2197

REPLY TO
ATTENTION OF

Regulatory Division (1145b)

SUBJECT: File Number 2010-00015S, Santa Cruz Harbor District Maintenance Dredging Essential Fish Habitat Consultation

Mr. Rodney R. McInnis
National Marine Fisheries Service
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

Dear Mr. McInnis:

In accordance with Section 305(b) (4) (B) [50 CFR §600.920] of the Magnuson-Stevens Fishery Conservation and Management Act, we are responding to your letter of December 20, 2011 (Reference Number: 2011/05925) regarding Essential Fish Habitat (EFH) for the proposed maintenance dredging at Santa Cruz Harbor. Santa Cruz Harbor is located within an area managed with the following Fishery Management Plans (FMP):

Pacific Groundfish FMP (English sole, Pacific sanddab, starry flounder, etc.)
Coastal Pelagics FMP (northern anchovy and Pacific sardine)
Pacific Coast Salmon FMP (chinook salmon).

The applicant is proposing to dredge a maximum of 3,110,000 cubic yards during the next ten years. The purpose of the proposed dredging is to maintain sufficient depths to continue safe operation of the harbor. The 46.5-acre Santa Cruz Harbor is located in Monterey Bay in Santa Cruz, Santa Cruz County, California.

The applicant is proposing to place the dredged material at one of the following sites: the nearshore placement site (nearshore immediately east of the east jetty); the Off-Shore Moss Landing, Monterey Bay Disposal Site (SF-14); separately permitted wetlands restoration projects (such as the conceptual Elkhorn Slough Restoration project should it ever be permitted); or on an upland site located outside of U.S. Army Corps of Engineers (Corps) regulatory jurisdiction. All of the 2,560,000 cubic yards of material dredged from the entrance channel, and approximately 70% of the 83,848 cubic yards of sediment dredged from the inner harbor between 2000 and 2010 has been placed in the nearshore placement site. It is anticipated that most of the dredged material will continue to be placed at the nearshore placement site.

The Corps is obligated to accept or respond to the EFH conservation recommendations made by the National Marine Fisheries Service (NMFS). The Corps responses to the NMFS conservation recommendations made in the December 20, 2011 letter are below.

EFH Conservation Recommendation 1: Fine-grain material (silt and clay) has been restricted from surf-zone disposal in the past by EPA Region IX standards for grain-size (Sandoval 2011). In addition, "USEPA and USACE (2004) specify guidelines for acceptability of dredge material for beneficial use as beach nourishment, as follows: it should closely match the sediment composition of the eroding beach and be low in fine sediments... (Green 2011). NMFS agrees with these guidelines and recommends that the Corps only permit material >80% sand for nearshore disposal. Studies provided by the Port indicate material does not deposit in nearshore or change grain size characteristics of the beach, but demonstration studies are limited in duration and volume and do not address long-term cumulative impacts, especially regarding turbidity.

The Corps does not concur that additional study of the sediment dynamics is necessary to address long-term cumulative impacts of the proposed placement of dredged material in the nearshore site. Based on the results of the 2010 demonstration project using 10,000 cubic yards of fine grained material placed at a rate of no more than 550 cubic yards per day, the Corps has determined that the finer grained material does not deposit in the nearshore or change the grain size characteristics of the beach. Since there was negligible deposition during the year that was studied with the currently proposed levels of fine grained material, the Corps has determined that there will not be major long-term cumulative impacts and additional sediment studies are not warranted. The 2001 and the 2005 demonstration projects showed similar results. Additionally, even if the applicant places the maximum amount of authorized fine material from the inner harbor (100,000 cubic yards over 10 years) it is minimal compared to the amount of sand placed by the applicant in the nearshore (approximately 2,030,000 cubic yards based on the last 10 years of dredging).

The Corps will continue to limit the amount of fines placed in the nearshore area to the amount of fines the applicant has demonstrated will not result in an appreciable deposition on the beach or nearshore environment.

EFH Conservation Recommendation 2: If, however, the Corps approves of the disposal of <80% sand at the nearshore disposal site, NMFS recommends the following avoidance and minimization measures to prevent potential impacts from increased turbidity and sedimentation to nearby kelp beds:

a. **NMFS recommends that the Corps not increase the volume of fines permitted in the nearshore disposal site. The previous 10 year permit included a 3000 cubic yard annual limit on nearshore disposal of material composed of 50-79% fines. An increase to an annual limit of 10,000 cubic yards in volume is proposed for material composed of <80% sand (with no minimum limit for % sand). Any additional material in excess of the currently permitted volumes should go to an upland beneficial reuse site or to a deeper disposal site (SF-14).**

The Corps does not concur that any additional fine grain material should be removed from the beach or nearshore environment. As explained in response to EFH Conservation Recommendation 1 above the Corps will limit the amount of fines placed in the nearshore area to the amount of fines the applicant has demonstrated will not result in an appreciable deposition on the beach or nearshore.

John Oliver, Ken Israel and Laura Fantozzi state in their paper *The Role of Mud in Regional Productivity and Species Diversity* (attached) fine grain material containing iron is necessary productivity in Monterey Bay. According to the USGS average concentration of elements, the weight percentage of iron in Santa Cruz County soil ranges from 1 to 6%. Therefore, removing fine grain material from the sediment transport system of Monterey Bay might have unintended deleterious effects on productivity.

b. **NMFS recommends that, to verify that dredging and disposal activities are not significantly impacting the distribution and abundance of giant kelp, the Corps and/or Port District continue to annually monitor control sites and impact sites (the Pleasure Point fault offshore of Soquel Point and the rock outcrop shelf extending southwestward offshore of Blacks Point) for kelp density and abundance. As recommended in the kelp monitoring report, monitoring should occur at Blacks Point to improve statistical confidence (Sandoval 2011). The Corps and/or Port District should provide a detailed monitoring plan to NMFS for approval within 60 days of issuing the permit. The results of the monitoring should be provided to NMFS annually within 60 days of completion of monitoring. After five years of monitoring, the Port District should meet with NMFS to determine if disposal activities are resulting in a decrease in kelp distribution and abundance, or if additional monitoring is needed to make a determination.**

The Corps does not concur that additional monitoring is required to verify that dredging and placement is not having a significant impact on giant kelp. While the Corps agrees that additional monitoring would improve the statistical confidence, the *Santa Cruz Port District Kelp Monitoring, Habitat Assessment and Aerial Photography Analysis, Final Report 2008-10* (Sandoval, 2011) concluded that there were no statistically significant differences in the

treatment and control groups. Therefore the Corps does not believe that requiring additional monitoring of the giant kelp is warranted.

c. **If at any time the monitoring recommended above demonstrates a significant decrease in kelp distribution or abundance at impact sites compared to control sites, the Corps and/or Port District should develop a plan to avoid, minimize, and mitigate for the loss of giant kelp HAPC (Habitat Area of Particular Concern). The plan should be provided to NMFS for approval within 60 days of the determination that kelp has been negatively impacted by the project.**

As stated above the Corps does not concur that additional monitoring is necessary.

In accordance with the EFH Consultation Procedure, we plan to issue the subject permit no sooner than 10 days from the date of this letter unless NOAA Fisheries requests, in writing, that this matter receive a higher level of review.

If you have any questions please call Debra O'Leary at (415) 503-6807 or e-mail to debra.a.o'leary@usace.army.mil. If you wish to write, please address all correspondence to Regulatory Division.

Sincerely,

ORIGINAL SIGNED
BY
CAMERON L. JOHNSON
CHIEF, REG. DIV., SOUTH BRANCH

Jane M. Hicks
Chief, Regulatory Division

Copies Furnished:

SCPD, Santa Cruz, CA Attn: Marin Olin
US NMFS, Santa Rosa, CA, Attn: Maureen Goff
US MBNMS, Attn: Deirdre Whalen

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

In response, refer to:
2011/05925

FEB 14 2012

Lieutenant Colonel Torrey A. DiCiro
Corps of Engineers – San Francisco District
333 Market Street, 8th Floor
San Francisco, California 94103-1398

Dear Colonel DiCiro:

Thank you for your response to NOAA's National Marine Fisheries Service's (NMFS) essential fish habitat (EFH) Conservation Recommendations (CRs) received by NMFS January 23, 2012. NMFS' recommendations were provided pursuant to the EFH provisions of the Magnuson Stevens Fishery Conservation and Management Act in response to your October 5, 2011, request for EFH consultation pertaining to the proposed ten-year maintenance dredging of Santa Cruz Harbor by Santa Cruz Port District (PN #2010-00015S). We appreciate your timely response regarding our recommendations.

The primary objective of CRs provided by NMFS in our consultation letter was for the protection of kelp, which is designated EFH Habitat Area of Particular Concern (HAPC). While we disagree with the rationale given by the Corps for the rejection of CRs 1 and 2a, at this time we are only disputing the Corps' rejection of CRs 2b and 2c – the continued monitoring of kelp and subsequent mitigation (if needed):

> 2b. NMFS recommends that, to verify that dredging and disposal activities are not significantly impacting the distribution and abundance of giant kelp, the Corps and/or Port District continue to annually monitor control sites and impact sites (the Pleasure Point fault offshore of Soquel Point and the rock outcrop shelf extending southwestward offshore of Blacks Point) for kelp density and abundance. As recommended in the kelp monitoring report, monitoring should occur for a minimum of five more years and increased sampling density should occur at Blacks Point to improve statistical confidence (Sandoval 2011). The Corps and/or Port District should provide a detailed monitoring plan to NMFS for approval within 60 days of issuing the permit. The results of monitoring should be provided to NMFS annually within 60 days of completion of monitoring. After five years of monitoring, the Port District should meet with NMFS to determine if disposal activities are resulting in a decrease in kelp distribution and abundance, or if additional monitoring is needed to make a determination.
>
> 2c. If at any time the monitoring recommended above demonstrates a significant decrease in kelp distribution or abundance at impact sites compared to control sites, the Corps

and/or Port District should develop a plan to avoid, minimize, and mitigate for the loss of giant kelp HAPC. The plan should be provided to NMFS for approval within 60 days of the determination that kelp has been negatively impacted by the project.

Our CRs are consistent with findings of the Kelp Monitoring Report for the proposed project, which recommends long-term monitoring, with a minimum of three additional years, to evaluate surface canopy trends. The monitoring report states that Blacks Point, located down current of the dredge material discharge site where increased volumes of fine-grained material discharge are proposed, showed a decrease in kelp plant abundance over the 2008-2010 monitoring period. Based on SCUBA surveys, following a decline in plant abundance in 2009 at all sites, Blacks Point continued to decline in 2010 while the other sites increased. In addition, aerial photo spatial analysis does suggest differences among sites and that suitable habitat at Blacks Point may be small or decreasing.

The Corps response letter states that the Kelp Monitoring Report concluded there were no statistically significant differences in kelp abundance at the treatment and control groups and therefore additional monitoring is not warranted. While the monitoring report does state that ANOVA tests of plant abundance and stipe density among sites and years did not detect a statistically significant difference, the power for the statistical tests was low. Low statistical power can increase the rate of type II errors (or, a "false negative") and may result in failed detection of an effect or difference among test groups. The report further suggests an increase of 24 samples at each impact site (at the 10 meter depth contour) to improve statistical confidence. The Corps agrees, per your letter, that additional monitoring would improve statistical confidence.

NMFS respectfully requests the Corps reconsider implementation of CRs 2b and 2c to adequately describe and mitigate for adverse effects to kelp EFH-HAPC resulting from the proposed Santa Cruz Harbor dredging. If the Corps maintains denial of further kelp monitoring as part of the proposed project, we request a meeting with the appropriate Corps Branch Chief and NMFS Northern California Habitat Manager at the earliest possible date. Please contact Maureen Goff at 707-575-6067, or at maureen.goff@noaa.gov for scheduling, as appropriate.

Sincerely,

WBChesney

W. Bryant Chesney
Acting Assistant Regional Administrator
for Habitat Conservation Division

cc: Eric Chavez, NMFS, Long Beach
Jane Hicks, USACE Regulatory Branch, San Francisco
Debra OLeary, USACE Regulatory Branch, San Francisco
Robert Lawrence, USACE Regulatory Branch, San Francisco
copy to file: 151422SWR2011SR00581

7/16/2010

Dan Carl
District Manager
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95062

Subject: Santa Cruz Harbor Dredge Disposal Program

Dear Mr. Carl:

I understand that Santa Cruz Port District is renewing its dredging permit with the Coastal Commission, and other regulatory agencies. We support the harbor's dredging program.

Our department has worked closely with Port District staff in managing our adjacent beaches and in countless rescue and safety cases. The dredge disposal is also a function that has been closely coordinated over the past 24 years of Port District operations. Our Lifeguard and Rangers and maintenance personnel are in constant contact with each other on matters of operations and public safety. Port District staff has been responsive to our needs.

While the pipes and equipment on the beach can have an impact on visitors, the dredging operation also significantly benefits the beach, and enhances the park visitor's experience at Twin Lakes State Beach. This beach area would normally disappear in the winter months due to wave energy. The harbor's winter time dredging program provides a useable beach from 5th Avenue to Blacks Point at nearly all tides during the winter months.

Additionally the harbor's directed sand disposal has, on numerous occasions prevented frontal wave damage to our public restroom at 7th Avenue and East Cliff.

The harbor's dredging program also maintains critical access to Monterey Bay for our patrol boat. Maintaining safe access to the bay is integral to the rescue and back-up support our state guards provide to the public at other state beaches.

On balance we feel that the dredging program is well managed, and a significant benefit to the viability of this important state beach.

Sincerely,

Kirk Lingenfelter
Park Superintendent-Pajaro Coast Sector

County of Santa Cruz

DEPARTMENT OF PUBLIC WORKS

701 OCEAN STREET, ROOM 410, SANTA CRUZ, CA 95060-4070
(831) 454-2160 FAX (831) 454-2385 TDD (831) 454-2123

JOHN J. PRESLEIGH
DIRECTOR OF PUBLIC WORKS

July 8, 2010

DAN CARL, DISTRICT MANAGER
California Coastal Commission
Central Coast District Office
725 Front Street, Suite 300
Santa Cruz, CA 95060

SUBJECT: SUPPORT FOR THE SANTA CRUZ PORT DISTRICT DREDGE DISPOSAL PROGRAM

Dear Mr. Carl:

Brian Foss, Santa Cruz Port District, has asked me to comment on the Santa Cruz Harbor dredge disposal program. It is our belief that the sediment placement regime that has been employed since 1986 has served the County very well in terms of recreation and protection of public infrastructure (roadways and utilities).

Prior to 1986 the Army Corps of Engineers (Corps) on a yearly basis would contract for dredging operations in the harbor for the months of March and April. Although this operation was helpful, the erosion of the beach and bluff areas (including the impacts to the public infrastructure) during the winter months was significant on East Cliff Drive between 5th and 7th Avenues. Due to the limitations of the Corps' dredging operations, there continued to be significant erosion problems along East Cliff Drive, and in the 1970s there was major storm damage to the County sewer line that created a two-day sewage spill into the Monterey Bay. Since 1986 when the Santa Cruz Port District began dredging operations, there have been no major occurrences of erosion or loss of public infrastructure.

The Santa Cruz County Department of Public Works strongly encourages the California Coastal Commission to work with the Santa Cruz Port District to allow for the continuation of the dredge disposal program. Thank you for your consideration on this matter.

Yours truly,

JOHN J. PRESLEIGH
Director of Public Works

JJP:mh

Copy to: Brian Foss, Santa Cruz Port District

County of Santa Cruz

REDEVELOPMENT AGENCY
701 OCEAN STREET, ROOM 510, SANTA CRUZ, CA 95060-4073
(831) 454-2280 FAX: (831) 454-3420 TDD: (831) 454-2123
BETSEY LYNBERG, AGENCY ADMINISTRATOR

June 14, 2011

Debra O'Leary
U.S. Army Corps of Engineers
San Francisco District
Operations and Readiness Division
1455 Market Street
San Francisco, California 94103-1398

Project Name: **Santa Cruz Harbor Maintenance Dredging**
Applicant: Santa Cruz Port District
Public Notice Number: **2010-00015S**

Dear Debra,

County Redevelopment staff has received the Public Notice regarding the Santa Cruz Harbor Maintenance Dredging permit. We strongly support this important ongoing project and the benefits it provides for roadway protection and public beach access along East Cliff Drive, a County maintained road.

The Redevelopment Agency's project area borders the east boundary of the Santa Cruz harbor, and we have been preparing plans for the Twin Lakes Beachfront Roadside Improvements Project. The Department of Public Works along with our agency has and is continuing to develop designs that will greatly improve public access and safety along East Cliff Drive starting at the 5th Avenue circle, continuing to 9th Avenue and beyond. Pedestrian and bicycle safety improvements are our primary goals. Our process has involved extensive community participation and support, and a close working relationship has been developed with the Santa Cruz Port District, California State Parks, and California Coastal Commission staff in order to achieve a successful project.

This popular recreational shore area welcomes a substantial number of visitors both to the beach and to the harbor facility throughout the year. Adequate protection of the seaward side of the roadway depends on the replenishment of dredged sand material from the harbor channel. The groomed sand forms a protective element for the road structure and underground utilities. The deposited sand also provides suitable and easy access for beach visitors making their way from the roadside out to the shoreline.

Without this nourished beach area the roadside would be susceptible to impending storm damage including wave runup causing substantial erosion impacts, along with an excessive grade separation that would impair pedestrian access. The proposed pedestrian improvements along the seaward roadside, without the sand replenishment program would provide a less effective means for most visitors to access this segment of the beach.

Please accept these factors of the public interest when considering the Santa Cruz Harbor Maintenance Dredging application and approve the permit as presented. If you would like further information regarding the proposed Twin Lakes Beachfront project, please contact our office and we will be glad to talk with you.

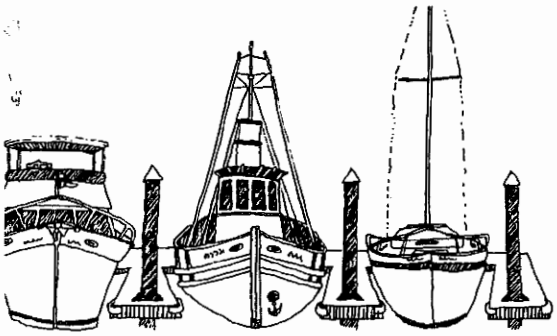
Sincerely,

Betsey Lynberg
Administrator
County of Santa Cruz Redevelopment Agency

BL:jd

John Presleigh
Director
County of Santa Cruz Department of Public Works

Cc: Marian Olin, Santa Cruz Port District
Lisa Ekers, Santa Cruz Port District
✓Dan Carl, California Coastal Commission Central District
Neal Coonerty, County of Santa Cruz Board of Supervisors



SANTA CRUZ HARBOR

Gateway to the Monterey Bay
National Marine Sanctuary

February 22, 2012

Supervisor Mark Stone
County of Santa Cruz Board of Supervisors
701 Ocean Street , Suite 500
Santa Cruz, California 95060

Dear Supervisor Stone:

I am writing on behalf of the Santa Cruz Port District Board of Commissioners in response to your January 31, 2012, letter of support for the Operating Engineers Local Union No. 3 (attached). Your letter alleges that the District's current crew is "lesser-trained and untested," and is endangering public safety and the aquatic environment. These statements could not be further from the truth and, while we understand you are supporter of union labor, we are disappointed that you would send such a letter without first taking the opportunity to hear the facts.

The District's current dredging operations are being conducted by a team of seasoned professional dredgers assisted by several long-term harbor employees. The crew has a combined total of over 80 years of experience working to protect water quality and endangered species at the harbor and surrounding beaches, and over 50 years of experience performing dredging operations. This crew has designed and implemented new equipment and techniques which have reduced impacts on the beach and the neighboring community by drastically reducing tractor operations for hydrogen sulfide mitigation and beach nourishment work. And unlike the seasonal, part-time OE3 crew who commuted here from the central valley, North Bay and Sierras, every member of the current crew is a resident of the Santa Cruz community with an ongoing personal investment in the local environment and economy.

The District conducts its dredging and disposal operations in strict compliance with many complex and overlapping regulations related to endangered species, water quality, air quality, coastal access and public safety, to name only a few. One of the most unique aspects of our dredging program is the continuous presence of Beach Quality Monitors who ensure that air and water quality standards are being met. In addition, the Santa Cruz Harbor Patrol is available 24-hours per day for public safety operations both on land and on water, and supports the dredging operation by monitoring entrance depths, navigation safety and water quality. Our current dredging operation is an organization-wide effort that is being well served by this cohesive, professional team in which each member understands and is responsive to the complex economic, engineering and environmental challenges we face.

Santa Cruz Port District
135 5th Ave., Santa Cruz, CA 95062 (831) 475-6161 FAX: (831) 475-9558
www.santacruzharbor.org
e-mail: scpd@santacruzharbor.org

I trust this letter dispels the misinformation you were given, and provides reassurance that the District has always and continues to manage its dredging program with the utmost regard for the environment and public safety. Please contact me or Lisa Ekers, Port Director, at (831) 475-6161 if you would like any additional information.

Sincerely,

Dennis Smith, Chair
Santa Cruz Port District Board of Port Commissioners

Attachment – As Noted

Cc: Members, California Coastal Commission
Dan Carl, Deputy District Director, Central Coast District
Susan Craig, Supervising Coastal Planner, Central CoastDistrict

County of Santa Cruz

BOARD OF SUPERVISORS

701 OCEAN STREET, SUITE 500, SANTA CRUZ, CA 95060-4069
(831) 454-2200 • FAX: (831) 454-3262 TDD: (831) 454-2123

JOHN LEOPOLD	ELLEN PIRIE	NEAL COONERTY	GREG CAPUT	MARK W. STONE
FIRST DISTRICT	SECOND DISTRICT	THIRD DISTRICT	FOURTH DISTRICT	FIFTH DISTRICT

January 31, 2012

Reed Geisreiter, Chair
Santa Cruz Port Commission
135 Fifth Avenue
Santa Cruz, CA 95062

Dear Chair Geisreiter:

I am writing to urge you to reconsider renewing your management contract with Operating Engineers Local Union #3 (Local 3) for dredging operations in the Santa Cruz Port.

For over 25 years, the members of Local 3 have helped to ensure that dredging of the Santa Cruz Port is conducted in a timely and cost effective manner while meeting environmental protection/restoration/enhancement goals. They have proven themselves a highly skilled and extremely reliable dredging crew capable of working in the most extreme weather conditions, which as you know are frequent occurrences in Santa Cruz County.

I fully understand the financial reality confronting the Santa Cruz Harbor, but to dismiss a team of professionals who know how to meet the complex economic, engineering, and environmental challenges of dredging makes little sense. I further believe that trusting this critical operation to a lesser-trained and untested crew endangers the safety of the harbor and its users and compromises the health of our beaches, waterways, and aquatic ecosystems.

I join with other prominent community leaders in asking that you reopen negotiations with Operating Engineers Local Union #3 with the goal of arriving at a mutually agreeable contract.

2-10-12

Thank you for your consideration. Please feel free to contact me at 454-2200 if you have any questions.

Sincerely,

MARK W. STONE, Supervisor
Fifth District

MWS:pmp

1832D5

SC
ST

To Whom It May Concern:

We are sending you this video to enlighten you about this unbelievable polluted mess right in our own backyard know as dredging. It's hard to believe that this is allowed to happen, irresponsibly, on our pristine public beach in the Monterey Bay Sanctuary. This smelly mess with pipes and tractors moving about creates nauseating air pollution, noisy sound pollution, awful visual pollution, as well as chemical pollution, that in addition, has to be monitored for a state regulated, dangerous gas, hydrogen sulfide.

This activity adversely affects the public's ability to access, use and enjoy the Twin Lakes State Beach. Unfortunately, the children and unsuspecting general public don't seem to read the warning signs or understand how it may affect them in the future.

Is there anything that you can do to help change this activity and make it less harmful? Or if you know who might be able to make a change please pass this video along.

This is an embarrassment to our county. Pease help make it better. The change has to start somewhere. We all must be stewards of our ocean and beaches.

Thank you for your attention to this matter.

If you have any input about this matter there is a documentary in the making. If you're interested please email jesse.sov@gmail.com

Thanks again.

March 7, 2012

FOR IMMEDIATE ATTENTION

Susan Craig, Coastal Planner
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060

RE: DREDGING OF FINE GRAIN MATERIAL DEPOSITED ON TWIN LAKES BEACH

Dear Ms. Craig:

It would be very important if you would drive over as soon as possible to observe in person the material that has been dumped on the beach near the shore.

Yesterday, about 3:30-4:00 PM, I observed a woman who got stuck in the quicksand-like material that was pumped there most of the day.

Today, they blocked off the area and guarded it from the public near the water line. But at night, it could be potentially dangerous.

The same quicksand – like material was dumped on the beach about six or seven years ago and the tractor sank. At that time, several people observing got stuck and had to be pulled free as well.

At that time, it was determined that this was fine grain material from the upper harbor. I'm sure that this is the case again.

The dredge machine was picking up material near the entrance of the channel very close to the location that the upper pipe disposal pipe was located earlier in the dredging season.

This is another reason why this dredging mess needs to get off the public beach.

This is also a very important reason that the harbor channel must be tested after the upper harbor dredging is completed, but before channel dredging begins.

Last week on the warm days, approximately a thousand people or more were on the beach, many were very upset that they had to move so that the two huge pipes could be pushed around by a tractor.

Please try to turn the beach back into a public place not a commercial dumping ground. Or should they just close the beach entirely during dredging season?

Thank you!

A Concerned California Citizen

30 5th Ave
Santa Cruz, CA 95062

November 16, 2010

To: California Coastal Commission
Executive Director

Dear Sir,

This is in regard to the Santa Cruz Port District waiver and permit renewal.

I want to bring something important to your attention. I have been waiting and watching your web site to post this notice so I could write something for the Coastal Commission. Today it was finally posted but when I called the Santa Cruz office they told me yesterday was the deadline.

I am a boat owner and a slip renter in the upper Santa Cruz Harbor. I have fished and used the harbor for a long time. The past port directors, Joe Townsend and Ron Merril, as well as current port directors Toby Goddard and Bill Lee, are very deceptive to the agencies giving the permits to dredge. The past port director Brian Foss is an expert in this deception from his military background. He is very charismatic and people like him so he uses that. Finally, he is gone from running the harbor but he still is around to represent us until he gets his way with the new permits.

The reason I'm writing you this letter is it looks to me as though members of your staff at the Santa Cruz office are buying into his MO of deceiving people. If staff really wanted input on this they would post it early or put it in the news or something.

What I had to say is that keeping the harbor cleaned out each year should not be on us slip holders only. We pay too much as it is and this should be the responsibility of the whole county or the city. If we go broke trying to dredge then someone else, county or city or state, will then probably pay.

A few years ago when they hauled out the sludge from the upper harbor it was clear to most of us that this should never go out in the ocean. We fish there and the ocean should be treated as a sanctuary.

This dredging mess should be fixed with new ideas that are safe and not the way it is now. None of the dredging should be pumped into the breakwater.

Thank you,
Mr. Jones
Cc: County Supervisor

135 5th Ave
Santa Cruz

RICHARD E. DAMON, PC
A Professional Law Corporation
125 Water Street, Suite D
Santa Cruz, CA 95060
Tel (831) 429-9752
Fax (831) 429-1905
rdamon@cruzio.com

November 15, 2010

Dan Carl, Central Coast District Manager
Susan Craig, Coastal Planner
California Coastal Commission
Central Coast District Office
725 Front Street, Suite 300
Santa Cruz, CA 95060

RE: Santa Cruz Port District Renewal of Five Year Permit and Notice of Proposed Permit Waiver

Dear Mr. Carl and Ms. Craig:

I represent some neighbors of Twin Lakes State Beach. A few days ago, on November 8, 2010 at approximately 2 p.m., one of my clients observed dredging under way at Twin Lakes State Beach that continued for about 30 minutes. Just half an hour earlier, he had discovered a communication from the California Coastal Commission in his mailbox.

The mailing contained a Notice of Waiver, stating that "This waiver is not valid until the waiver is reported to the Coastal Commission on Thursday, November 18, 2010." It appeared that the Port District had jumped the gun and begun dredging and depositing refuse on Twin Lakes State Beach without a permit to do so.

My client contacted the Coastal Commission and spoke with Ms. Craig to advise her that dredging operations had commenced without a permit. I understand that Ms. Craig expressed surprise and said that they were not dredging and could not dredge. She promised to drive to Twin Lakes Beach to see for herself. The dredging stopped about 20 minutes later.

It appears that the Santa Cruz Port District's 5-year dredging permit is up for renewal and that the 10-year permit of the Army Corps of Engineers may also be up for renewal soon as well.

My clients agree as stated in the Notice of Waiver that the Port District should look at viable alternatives to its existing program of dredging, and that it must consider adopting

practices that are most protective of marine resources and promote public use and enjoyment of Twin Lakes State Beach.

The Santa Cruz Port District's present dredging practices result in depositing high levels of toxic chemicals, pesticides, and heavy metals on the state park beach and neighboring recreational waters. The beach is part of the Monterey Bay Marine Sanctuary and is legally entitled to protection.

There are many alternative methods available for safe disposal of the dredged materials and any new or renewed permits should consider the alternatives and mandate changes in the Port District's disposal policy. For instance, the Port District could outsource the dredging to companies with modern equipment capable of dredging the entire harbor area within days or weeks, rather than months (possibly by using a 36-inch pipe) and disposing of the waste products in a safe and efficient manner.

HYDROGEN SULFIDE (H2s)

In 1997 the Monterey Bay Air Quality Control Board declared the Santa Cruz Port District's beach disposal a Public Nuisance.

In 2003 the Monterey Bay Air Quality Control Board discovered that the Port District's test results obtained in 1997 had not been properly reviewed and that the H2s level was of concern. It turned out not to be, as the Port District boasted, "1,000 times less than could hurt a human" but in fact, when the Air Board applied the correct ambient air standards and not the indoor standards, it was found that the levels were near and above state levels of permissible H2s. The Air Board then issued a protocol requiring constant air monitoring during dredge disposal.

For over two decades the Port District and other agencies have received complaints from visitors and residents regarding the smell and the ill effects from this toxic gas.

My clients, as well as others, have been directly affected by this exposure to dangerous levels of H2s. Several times each dredging season they have had to leave their home due to the effects of the dredge disposal. One family member as well as other individuals has been diagnosed with impairments from long-term exposure to H2s from the dredging disposal site on Twin Lakes State Beach. This diagnosis was made by a nationally known, leading expert on H2s exposure, Kaye H. Kilburn, M.D., formerly Ralph Edgington Professor of Medicine, University of Southern California Keck School of Medicine, Director of Environmental Sciences Lab, 1980-2006, now at Neuro-Test, Inc.

HEAVY METALS AND OTHER CHEMICALS

Santa Cruz County Environmental Health Services (see attached)
Water and Sediment Test Result Data – 2004

Testing reveals the presence of heavy metals and other chemicals at significant levels:

Blue – Significantly higher than background levels (>90%) – found on Twin Lakes Beach

Cadmium: 3.8 Chromium: 54 Copper: 52 Zinc: 110

Red – Exceeds human health objective – found on Twin Lakes Beach:

Arsenic: 67 Lead: 19

LEAD AND ARSENIC

May be absorbed by the skin

CENTRAL COAST REGIONAL WATER BOARD INTERNET SITE (see attached)

SWAMP – Surface Water Ambient Monitoring Program
Environmental Condition of Water, Sediment, and Tissue Quality in Central Coast Harbors - Final Technical Report – 2007

" . . . More than half of the samples exceeded sediment quality guidelines for Arsenic, Copper, Nickel, Zinc, total DDTs, and total PCBs." Obviously this is a significant problem.

ENTRANCE CHANNEL TESTING

Army Corps of Engineers, Sediment Budget – Santa Cruz Harbor Entrance (see attached) This diagram shows that dredged materials disposed from the upper Harbor can drift back into the entrance channel, which is then pumped from the channel onto the beach and into recreational waters of the Marine Sanctuary.

(Also see enclosed photograph of current dredging operations.)

NEW PERMIT

The new permit, if granted, should require testing of the entrance channel at least twice during the dredging season.

The new permit, if granted, should mandate that by a date certain the Port District shall be required to find a different method to dispose of the waste other than on a public beach or near the shore environment. The Port District should not be allowed to deploy the dredge each year using the same unacceptable methods of disposal of the dredged materials. The presence of the large dredge pipes and the bulldozer constantly running

up and down the public beach for 8 hours a day clearly limit public access and deter visitors from coming to the state beach.

It is the duty of the permitting agencies to protect the public's interest, especially our precious sanctuary and beautiful state park beach.

The Port District has been under tremendous financial restraints and will need to find sources of revenue to make this significant change in its dredging operation. This change is decades past due. The Port District needs your guidance to find other viable alternatives and to implement them by a date certain.

On behalf of my clients, I request that this letter and enclosed exhibits be included in the application for any new permits and be distributed to the members of the Coastal Commission in advance of the Thursday, November 18, 2010, meeting in Santa Monica.

Thank you for your thoughtful consideration of these proposals.

Very truly yours,

RICHARD E. DAMON
Attorney at Law

RED/rd
Enclosures

CALIFORNIA COASTAL COMMISSION
CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060
PHONE: (831) 427-4863
FAX: (831) 427-4877
WEB: WWW.COASTAL.CA.GOV

NOTICE OF PROPOSED PERMIT WAIVER

Date: November 4, 2010

To: All Interested Parties

From: Dan Carl, Central Coast District Manager
Susan Craig, Coastal Planner S.Craig

Subject: **Coastal Development Permit (CDP) Waiver 3-10-057-W**
Applicant: Santa Cruz Port District

Proposed Development
Allow entrance channel and inner harbor dredging and disposal activities to take place through March 15, 2011 pursuant to the conditions of CDP 3-05-065, as amended by CDP 3-05-065-A2. The March 15, 2011 deadline may be extended for good cause by the Commission's Executive Director.

Executive Director's Waiver Determination
Pursuant to Title 14, Section 13252 of the California Code of Regulations, and based on project plans and information submitted by the applicant(s) regarding the proposed development, the Executive Director of the California Coastal Commission hereby waives the requirement for a CDP for the following reasons:

The Santa Cruz Port District's five-year dredging and disposal permit expired on October 18, 2010. The waiver will allow the Port District to continue its dredging and disposal operations until March 15, 2011, consistent with the conditions of the previous five-year dredging and disposal permit (CDP 3-05-065, as amended by CDP 3-05-065-A2). During this period the Port District will undertake an analysis of alternatives to its existing dredging and disposal operations. The results of this alternatives analysis will be used to amend the Port District's current five-year dredging and disposal CDP application to ensure that these activities are accomplished in a manner that is most protective of marine resources and public access. During this interim period, the Port District will operate under the conditions of its previous five-year permit, consistent with the Coastal Act.

Coastal Commission Review Procedure
This waiver is not valid until the waiver has been reported to the Coastal Commission. This waiver is proposed to be reported to the Commission on Thursday, November 18, 2010, in Santa Monica. If three Commissioners object to this waiver at that time, then the application shall be processed as a regular CDP application.

If you have any questions about the proposal or wish to register an objection, please contact Susan Craig in the Central Coast District office.

Water and Sediment Data for Santa Cruz Harbor and Vicinity
Santa Cruz County Environmental Health Services

Constituent (ppb)	EPA Reg 9 Prelim. Remediation Goals: Residential Soil / Drinking Water	Reference, Sand		Reference, water	Beach sand at Discharge A	Beach sand at Discharge B	Sand, discharge site, one week later	Dredge Discharge First Sample	Dredge Discharge Second Sample	Dilution from highest entrance level to highest discharge level - %	Channel Sediment	Area 2	Area 3	Estimated concentration in discharge based on dilution to 0.65% of Area 2, 2003, levels	Area 1 A&B	Area 1 C-F	Area 2	Area 3	San Lorenzo River Sediment, Felton	Moran Lake Sediment
		Seabright Beach		Seabright Beach	Twin Lakes Beach	Twin Lakes Beach	Twin Lakes Beach	Twin Lakes Beach	Twin Lakes Beach		SS-1 to SS-4	X dock area	Lower Harbor Composite		Note: Areas are in the upper harbor, but are not the same as those sampled in 2003.					
Date	2002	Sep-03	4/27/04	4/27/04	4/27/04	4/27/04	May 3-04	4/27/04	4/27/04	Calculated	Oct-00	Sep-03	Sep-03	Calculated	Dec-02	Dec-02	Dec-02	Dec-02	12/3/90	2003
Sand/Gravel %		96	99.5		99.4	99.4	99.2				86	50	70		85	71	32	33		
Sulfides	–	0.3										1160	39		340	710	730	58		54-887
TOC %		0.15	0.15	0.00012	<0.10	0.15	0.12	–	0.001		0.54	1.9	0.63		0.74	0.9	1	0.83		
arsenic ug/kg dry wt.	22000	3780	2450		<2530	2580	2700			0.64%	3900	3200	3400		2100	2300	4200	4300	–	
arsenic ug/l	50->10			42				35	67					62.8						
cadmium ug/kg dry wt.	37000	359	<364		<379	<381	<384			0.79%	<350	480	540		<300	<300	<300	<300	1,690	
cadmium ug/l	5			<1.0				1.2	3.8					3.1						
chromium ug/kg dry wt.	210,000	24000	13200		8700	8250	11400			0.25%	22000	14000	13000		18,000	19,000	27,000	28,000	12,000	11,700-
chromium ug/l	100			8.9				8.6	54					91.0						18,200
copper ug/kg dry wt.	3,100,000	4370	<6070		<6310	<6290	<6400			0.63%	8300	22000	10000		17,000	22,000	52,000	34,000	4,300	2,730-
copper ug/l	1300			5.1				7.5	52					143.0						14,000
lead ug/kg dry wt.	150,000	4330	<6070		<6310	<6290	<6400			0.38%	5000	6800	7100		7300	8700	16,000	24,000	12,000	1,890-
lead ug/l	15			5.2				2.5	19					44.2						20,600
mercury ug/kg dry wt.	23,000	<20									<20	<50	<50		<20	38	110	88	200	<20-55.2
mercury ug/l	2													0.7						
nickel ug/kg dry wt.	1,600,000	7930									9200	10000	10000		9800	11,000	18,000	14,000	–	
nickel ug/l	730													65.0						
selenium ug/kg dry wt.	390,000	341									<100	297	294		<1000	<1000	<1000	<1000	–	
selenium ug/l	50													1.9						
silver ug/kg dry wt.	390,000	<200									<200	<200	<200		<200	<200	<200	<200	600	
silver ug/l	100													1.3						
zinc ug/kg dry wt.	23,000,000	28400	9430		8580	9000	8770			0.41%	27000	31000	65000		35,000	40,000	64,000	47,000	36,000	
zinc ug/l	5,000			<5.0				6.2	110					201.5						
total butyltins ug/kg dry wt.	18,000	<1.0	5.8		4.4	<1.27	<1.28				4.2	48.1	10.4		<4.0	9.5	56	15		
total butyltins ug/l	11			<0.002				0.00376	<0.002					0.31						
total PAHs ug/kg dry wt.	56,000	<10.0	<12.1		<12.6	<12.6	<12.8				<14	1820	383		75	370	1100	650		940-2,770
total PAHs ug/l	6.2			<5.0				<5.0	<5.0					11.83						
total chlordanes ug/kg dry wt	1,600	<1.4	<0.61		<0.63	<0.63	<0.64				<1.4	3.2	<1.4		6	5.3	9	<4		34-88
total chlordanes ug/l	0.19			<0.02				<0.02	<0.02					0.02						
total DDTs ug/kg dry wt.	1,700	<1.4	<0.61		<0.63	<0.63	<0.64				<1.4	6.3	<1.4		<12	1.5	3.9	2.5		
total DDTs ug/l	0.2			<0.02				<0.02	<0.02					0.04						
total PCBs ug/kg dry wt.		<14	<0.5		<0.5		<0.5	<0.5	<0.5		<14	<14	<14		<20	<20	<20	<20		
total PCBs ug/l	0.5			<0.5		<0.5														
Blue-Significantly higher than background levels (>90%)																				
Red- Exceeds human health objective																				

SWAMP
Surface Water Ambient Monitoring Program

Final Technical Report | 2007

Environmental Condition of Water, Sediment, and Tissue Quality in Central Coast Harbors

Under the Surface Water Ambient Monitoring Program Fiscal Year 2002 – 2003

September 2007

This project was jointly funded by SWAMP and other partners, including the US Environmental Protection Agency.

(PCBs) Aroclors, and total polycyclic aromatic hydrocarbons (PAHs) human health screening exceedances.

Bivalve mussels (*Mytilus californianus*) were deployed at 10 stations within the six harbors. About a third (31.3%) of the samples rated poor due to arsenic, total PAHs, total PCB Aroclors, and total DDTs screening value exceedances.

Sediment samples (0.1 m^2, 1.0 mm sieve) were collected at each station to characterize the benthic infaunal community. Mean species richness per station was 31.9 species per 0.1 m^2 with a median of 23.5 species per 0.1 m^2. Species diversity was highest in Monterey Harbor while Morro Bay had lower diversity on the whole. The majority of taxa were polychaetes, amphipods, and bivalves.

Fish community analysis was conducted at 14 stations throughout the six harbors, but eight of these stations were in Morro Bay. There were 22 distinct fish taxa caught with a total abundance of 508 individuals. Mean abundance was 31.8 fish per trawl with a mean of 4.1 fish species per trawl.

Santa Cruz Harbor

Water quality in Santa Cruz rated good at three of the six stations with no exceedances of available water quality criteria and guidelines. The other three sites, located in the back portion of the harbor, ranked fair due to DO, orthophosphate, and water clarity levels. These same three stations had DO concentrations below the Central Coast Regional Water Quality Control Board (RWQCB) criteria.

The stations falling in the back portion of Santa Cruz Harbor ranked poor according to the Sediment Quality Index while three stations in the front portion of the harbor ranked fair or good. More than half of the samples exceeded sediment quality guidelines for arsenic, copper, nickel, zinc, total chlordane, total DDTs, and total PCBs. Chlordane levels exceeded the more stringent Effects Range Median (ERM) sediment guideline at half of the stations in Santa Cruz Harbor.

Santa Cruz Harbor rated poor for fish and bivalve tissue in 37.5% of samples due to levels of arsenic, total PCB Aroclors, and total PAHs exceeding screening value guidelines. Among the harbors, fish tissue whole body samples from Santa Cruz Harbor had the highest concentrations of manganese, selenium, and total chlordanes. Bivalve mussels bioaccumulated the highest mean concentrations of aluminum, copper, zinc, total PCB Aroclors, total PAHs, and high molecular weight (HMW) PAHs compared to the other harbors.

Analytes of concern in Santa Cruz Harbor are reduced water DO levels and elevated concentrations of arsenic (sediment) and total PCBs (sediment and tissue). Chlordane levels were also elevated in sediment and exceeded human health screening values in resident fish populations.

Ocean at the Harbor. Historically, steelhead trout (*Oncorhynchus mykiss*) have spawned in the watershed. However, sedimentation and unnatural barriers have degraded the habitat, and currently there are multiple restoration efforts underway (Chartrand et al. 2002). Land uses in the upper watershed are primarily rural residential. In the lower elevations, land uses include orchards, areas designated as green space or open space, a golf course, and the urban areas of Santa Cruz.

In response to the Santa Cruz Harbor being dredged annually, sediment and tissue samples have correspondingly been tested. Although dredging reports submitted to the RWQCB by the Harbor District have not shown levels of organic chemicals above published guidelines, the Santa Cruz County Public Health and Environmental Health departments measured some metals, chlordane, and polycyclic aromatic hydrocarbons (PAHs) at concentrations considered to be above background levels with hydrogen sulfide levels detected above levels of concern. The Santa Cruz Harbor District has adopted a protocol that requires monitoring of hydrogen sulfide levels and modification of dredging operations if safe levels are exceeded (Santa Cruz County 2005). Bioaccumulation rates of metals and organic chemicals in sand crabs were not significantly different between pre- and post-dredging event samples (Kinnetic Labs 2005) and were similar to results from sand crab samples collected at other Santa Cruz County beaches outside of the influence of the harbor (Dugan et al. 2005).

Santa Cruz Harbor has also been sampled as part of larger regional and statewide monitoring efforts. In 1996, California mussels (*Mytilus californianus*) were transplanted to two sites in the Harbor and recollected after six weeks to examine bioaccumulated levels of metals and organic chemicals (SWRCB 2000). In 1998, the Bay Protection and Toxic Cleanup Program found elevated levels of sediment PCBs, PAHs, copper, and mercury at three sites (SWRCB 1998). Chlordane, an organochlorine (OC) pesticide banned from use in the 1970s, was the highest result detected in the study and was four times the Effects Range Median (ERM; Long et al. 1995) value at one of these sites. Although sediment was not toxic to the amphipod *Eohaustorius estuarius*, survival of the amphipod *Rhepoxynius abronius* was significantly lower, but the toxicity source was not determined.

Four times in the Harbor's history, anchovy kills resulting in the death of 1,000 or more fish have been documented due to low dissolved oxygen (DO) levels. To alleviate this issue the Harbor District aerates water in the back harbor using thirty aeration devices.

Moss Landing Harbor

Moss Landing is located at the eastern edge of Monterey Bay 25 miles south of Santa Cruz, 15 miles northeast of Monterey, and 95 miles south of San Francisco (Figure 1-3).

Moss Landing was named in 1866 after Captain Charles Moss, who was instrumental in the construction of the wharf establishing shipping facilities and a pier for commercial

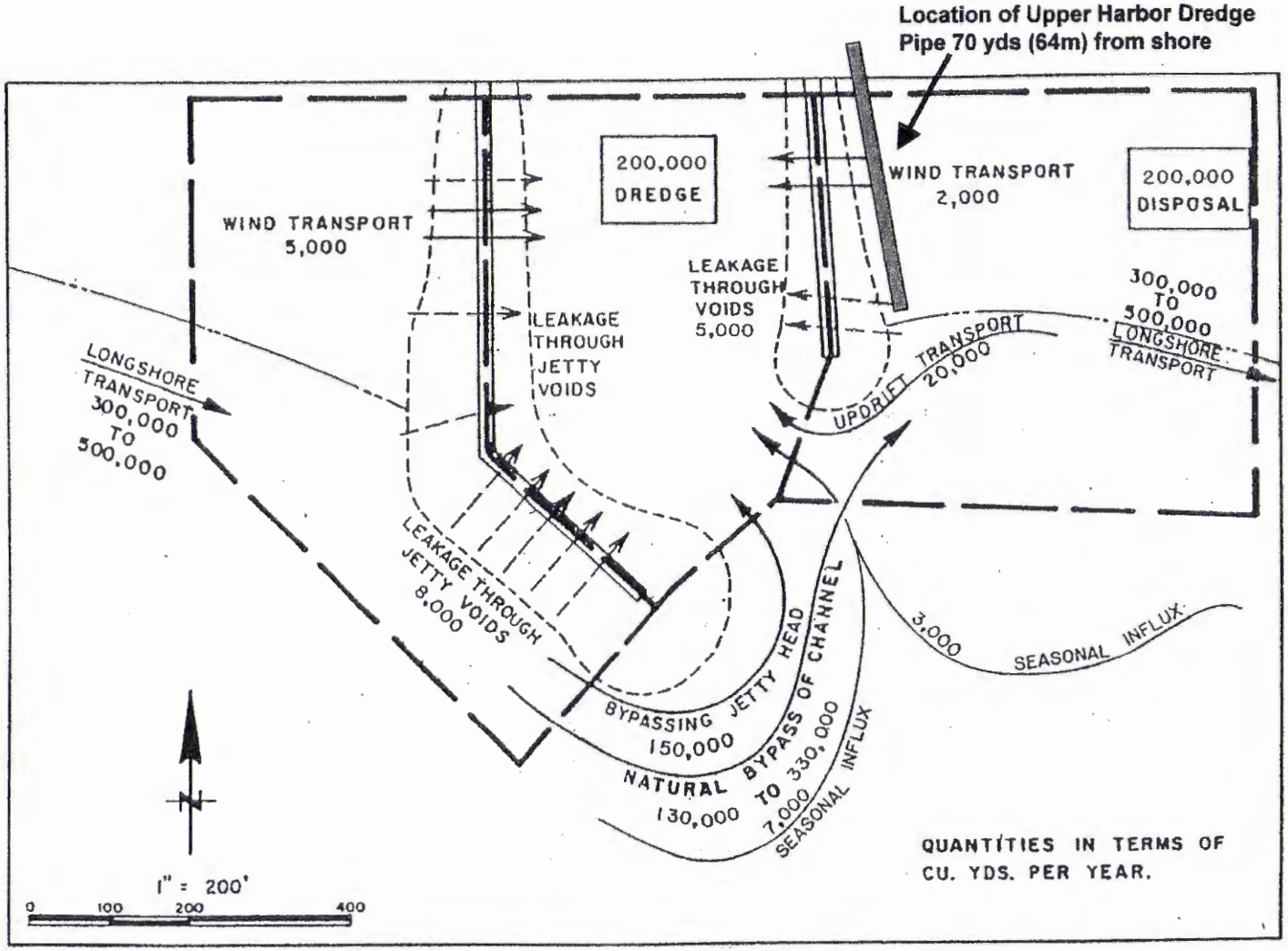


FIGURE 2.3

SEDIMENT BUDGET

SANTA CRUZ HARBOR ENTRANCE

Susan Craig

From: Roxanna Farshchi
Sent: Monday, November 15, 2010 2:00 PM
To: Susan Craig
Subject: FW: 11/18 agenda Santa Cruz Harbor Dredging

From: Starrie2004@aol.com [mailto:Starrie2004@aol.com]
Sent: Monday, November 15, 2010 1:59 PM
To: Roxanna Farshchi
Subject: 11/18 agenda Santa Cruz Harbor Dredging

To: California Coastal Commissiom
Susan Craig

Re: Santa Cruz Permit Renewal

Dear Ms. Craig,

I just spoke with a staff person in your office regarding the Santa Cruz Harbor waiver of permit. She read me what was proposed for the Commission on November 18th. I have the following comments:

1. I have walked and enjoyed the Twin Lakes Beach for nearly twenty years. Each year when the harbor does its dredging it makes it very difficult to walk with friends with the pipes and smelly mess that they make. It seems by the notice that the Coastal Commission has concerns about this obstruction to Coastal access as many of us do. It is surprising that it is still continuing in the same manner of 20 years ago.

2. The people moving the pipe around say that they are replenishing the beach. What a horrible way to do that on our beautiful beach! I notice that four or five years ago the pipes were much further out in the ocean and didn't have the mess on the beach. The sand seemed to be coming back just fine in that scenario.

3. Couldn't they make a permanent pipe out where they have an anchor and yellow buoy? Then they could get that noisy tractor off the beach. Hopefully, the Coastal Commission has had enough of this old fashioned method of dredging that totally impacts the public's right to enjoy our beach.

One last thought, it is impossible to understand how this dredging is allowed to take place on the shores of the Monterey Bay Marine Sanctuary. This tractor is constantly moving sand around and changing the natural contour of our beach and the flow of the natural tides. Isn't it time to leave our beach alone?

Sincerely,
Adrienne S. Black

To the Coastal Commission, Santa Cruz office

About the Dredging Program on the beach at the Santa Cruz Harbor

Today someone put the attached flyer on my windshield while I was parked on Lake Ave. It looks like it was sent by the dredging crew upset about their union contract not getting renewed. It boasts about how safe they are which I would like to comment about that.

We often go to the harbor beach because its quiet, we can watch the boats and there's restaurants for food, drinks and bathrooms. Last year around spring break, we were on the beach with the kids and watched a workman driving a tractor pushing a pipe and backing up without a flagman or anyone watching for kids playing close by. He got awfully close to some kids and my husband went and told him. The guy got off his tractor and puffed up his chest at my husband and said he was the captain of the beach and if we didn't like go somewhere else.

I hope the port district does make a change like the flyer suggests. Sometimes a change is good. His perspective was that he has more of a right to be there than the people on the beach.

It seems simple enough to put up an orange plastic fence to protect people and keep them off the beach while they are driving the tractor around. Isn't this something the Coastal Commission needs to control?

Sincerely,
Amy Saunders
Aptos, CA

Attention residents of the Santa Cruz Port District:

The safety of your port and local workers are at risk!

Your elected commissioners are really making waves ...

Since 1986, the Santa Cruz Port District has harmoniously employed local union members, but this changed when the District hired a new Director in 2010.

Since then, your local dredging crew has taken drastic cuts, and most recently, the crew that saved the port after the recent tsunami has been terminated. Now, SCPD refuses to negotiate with members in good faith and honor the essential benefits that have been in place for 25 years.

Instead of using the skilled local union workforce, SCPD seeks to hire outside, untrained workers at lower wages that will compromise open harbor navigation and channel safety.

YOU CAN'T AFFORD CHANNEL CLOSURES!

THE SCPD IS PUTTING THE SAFETY OF THE PORT, ITS RESIDENTS AND PATRONS AT RISK.

What can you do?

Contact your local elected commissioners at (831) 475-6161 and ask them to negotiate in good faith by approving a fair contract for the skilled dredging crew that has kept the port district safe for years.

For other ways to help and more information, contact Operating Engineers Local #3 Business Agent Dave Harrison at (707) 429-5008.

www.oe3.org

Susan Craig

From: Mike Guth [mguth@guthpatents.com]
Sent: Tuesday, November 16, 2010 6:41 PM
To: Susan Craig
Cc: Dan Carl
Subject: Port District

Hi Susan,

How might I add a concern to be considered to the Port District dredging issue? As I have mentioned before in many venues, I feel that the buildup of a large reservoir of sand, by depositing dredge spoils there, on the beach in front of Twin Lakes temporarily interrupts the littoral drift, which results in less sand down coast in real time during storm season. Just a few inches more of sand on the reefs during wave season may greatly reduce shore erosion. (The flip side of this is the studies showing heavily increased coastal erosion with just a few inches of sea level rise). I have the original Army Corps studies, prior to harbor construction, detailing the volumes of sand flowing per year, and when the Port District dredges onto the beach, and build up a 300 feet by 100 feet rise 9 feet deep, as they do some years, they are taking 15-25% of the sand out of the flow, depending on the year, etc. This sand would have been down coast, on the reefs, dissipating wave energy offshore – which protects coastlines.

I see today that the Port District is operating un-permitted, and is reviewing how to make changes for the next permit cycle. Do you have a suggestion on which agency (perhaps yours) is able to have this concern reviewed, to see if it has merit?

I look forward to hearing back from you on this.

Yours Sincerely,
Michael A. Guth
Attorney at Law
(831) 462-8270 office
(831) 462-8273 fax

Susan Craig

From: Martha Glenn [marthaglenn1@gmail.com]
Sent: Monday, November 15, 2010 9:36 AM
To: Susan Craig
Subject: COASTAL DEVELOPMENT PERMIT (CDP)WAIVER 3-10-057-W

Dear Ms Craig,

I received the notice of permit waiver last week and wish to register an objection. As a long time resident living directly across the street from the dredge operation, I am amazed every year the the coastal commission and other permitting agencies allow this to continue. People do not have access to the beach, the odors of the pollutants and toxins do not lend themselves to a nice day at the beach. The port district obstructs access to the beach with a constant flow of effuse dumped all over the beach. A tractor runs up and down the beach most days moving the sewer pipe.

The port district continually exhibits bad faith in their stated desire to make this situation better. The port district operates in an unsafe manner with regard to their employees as well as the public. They are well aware of the fact that they don't have their permit and they were dredging last week.

I think the time has come for the coastal commission and the other permitting and regulatory agencies actually spend some time around the harbor and experience the reality of dredging.

Sincerely,

Martha Glenn

December 21, 2011

California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060
Attn: Susan Craig

Dear Susan,

I took pictures today of the Harbor's new approach of the dredge spewing straight up into the air on Twin Lakes Beach. Take note how there are no beachgoers on the beach during that time but when the pipe is in the water or put away, tons of people come out to enjoy the beach!

Instead of taking a step forward, the Harbor is taking ten steps back. The Harbor is really going to lose beachgoers at the rate they are dredging insufficiently!

They need to put the pipe in the water to keep more beachgoers coming to Santa Cruz to enjoy Twin Lakes Beach.

Sincerely,

Rachelle Denton


Twin Lake


NO
PARKING
ANY
TIME