COWI North America

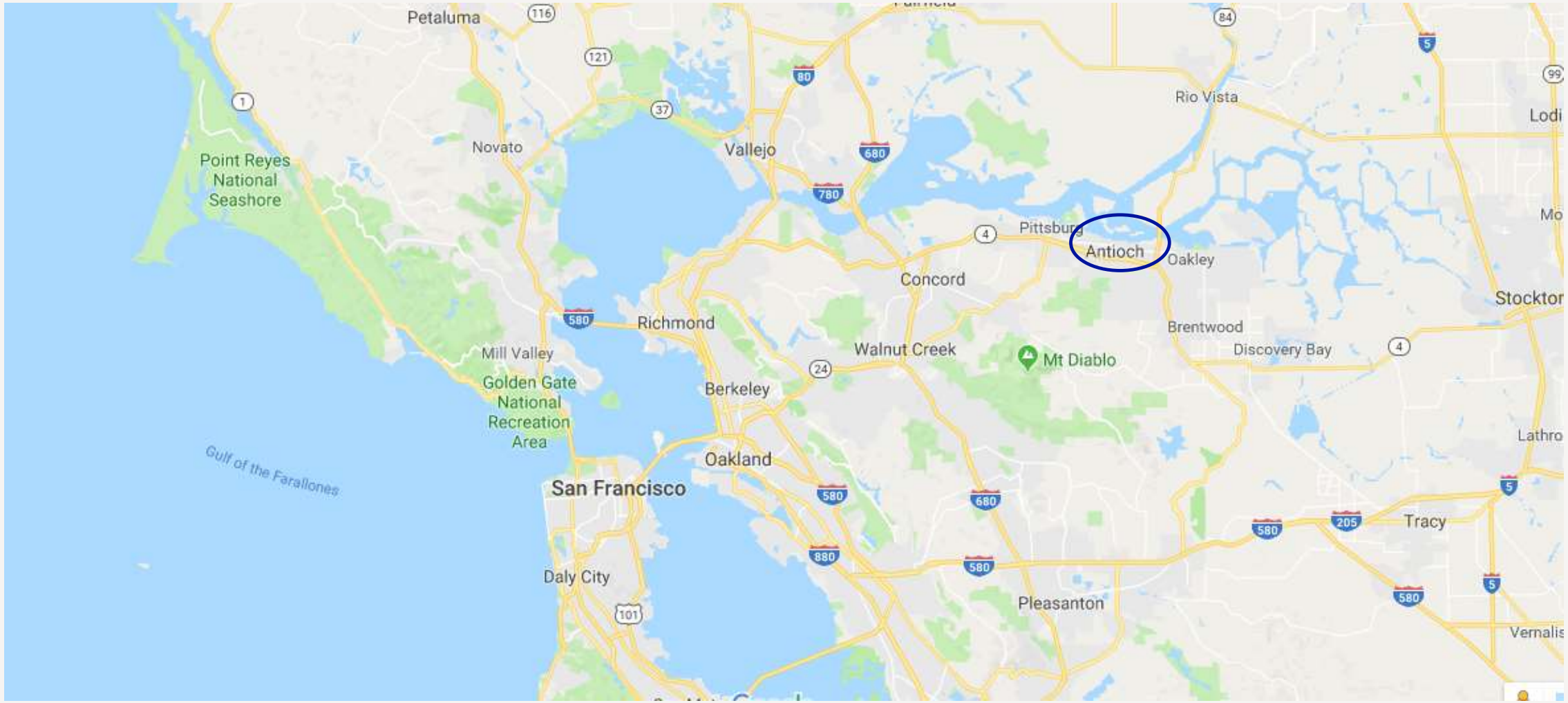
Upgrading an Existing Bulk Terminal for New Service

Jim Kearney, PE

Original Scope of Work

- Assess Condition of Existing Structures to Accept RoRo Car Carrier Vessels
- Determine Needs for New Service
- Develop Repair and New Structure Requirements
- Provide Design of Mechanical Electrical Appurtenances
- Assist with Permitting
- Final Design

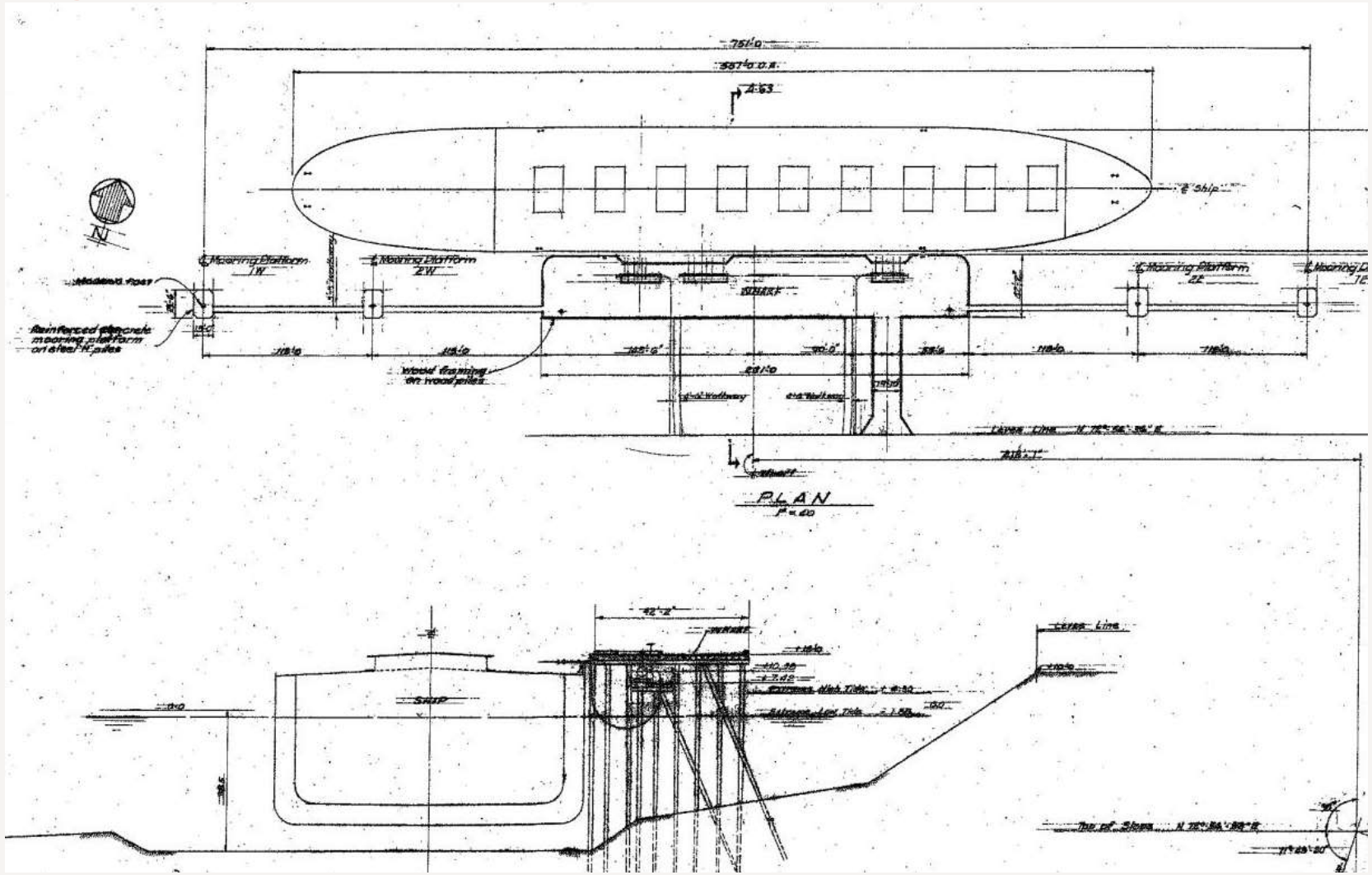
Location


Petaluma
Point Reyes National Seashore
Novato
Vallejo
Rio Vista
Lodi
Pittsburg
Antioch
Oakley
Concord
Stockton
Brentwood
Discovery Bay
Mt Diablo
Walnut Creek
Richmond
Mill Valley
Golden Gate National Recreation Area
Berkeley
Oakland
San Francisco
Gulf of the Farallones
Daly City
Pleasanton
Tracy
Lathrop
Vernalis

Original Dock Structure – 1955

Original Berth Design Criteria - 1955

- 557' LOA
- 84'-0" Beam
- 38.5 Ft Dredge Depth



New Vessel Type to Accommodate – Roll-on/Roll-off Car carriers

- 750'-0" LOA, Design Vessel
  (Max expected to actually call ~600'-650')
- 106'-0" Beam
- 32 Ft. Required Depth at Berth
  (Including 2 ft UKC)

San Francisco Bar Pilots Guidelines

- The vessels would have to go beyond the current extent of travel for RoRo Car Carriers in San Francisco Bay. Current vessels call in Richmond and Benicia.
- The Bar Pilots' Guidelines for transiting beneath the Union Pacific Bridge from Martinez to Benicia and on to Antioch are as follows:

19. **Union Pacific Railroad Bridge**

a. During average tidal conditions vessels can normally pass without time restrictions if the air draft is no higher than 132 feet.

b. Vessels 800’ or longer, or beam greater than or equal to 130’, must transit the bridge at or near slack water and daylight only.

c. Any vessel of PANAMAX Class or larger or with air draft of more than 132' must coordinate with the Operations Pilot.

d. Maximum beam permitted will be 140’ or less.

- Our largest (design) vessel – 750 ft LOA, 106 ft Beam, Max Air Draft < 132 OK (Per operator, taller vessels will call at Benicia.)

San Francisco Bar Pilots Guidelines

› Antioch requirements:

21. **Pittsburg/Antioch Terminals (PBG3, PBG4, PBG6, ANZ2, ANZ3)**

a. Vessels loading to deep draft should be docked port side to.

b. We recommend that all vessels more than 600` LOA turn at "Riverview"

c. Vessels more than 700' (213.4 M) LOA and turning must have daylight above New York Point, if vessel cannot meet the DLO, Operations Pilot should be consulted.

d. Vessels over 700' LOA, turning at "Riverview", will require one At and one A tug.

e. Loaded vessels docked port side to and sailing during ebb current should use minimum one At and one A tug. Loaded vessels docking at PBG4 should use a minimum one A and one B tug. If docking down tide, they will require one A and one B tug. Vessels sailing on ebb current from ANZ2/3 should use minimum: one A and one B tug (in ballast) or one At and A (loaded).

f. In general, the narrow channel limits the size of vessels calling at terminals above New York Point to the PANAMAX class (750' LOA x 106' Beam).

› Again, our largest (design) vessel – 750 ft LOA, 106 ft Beam.

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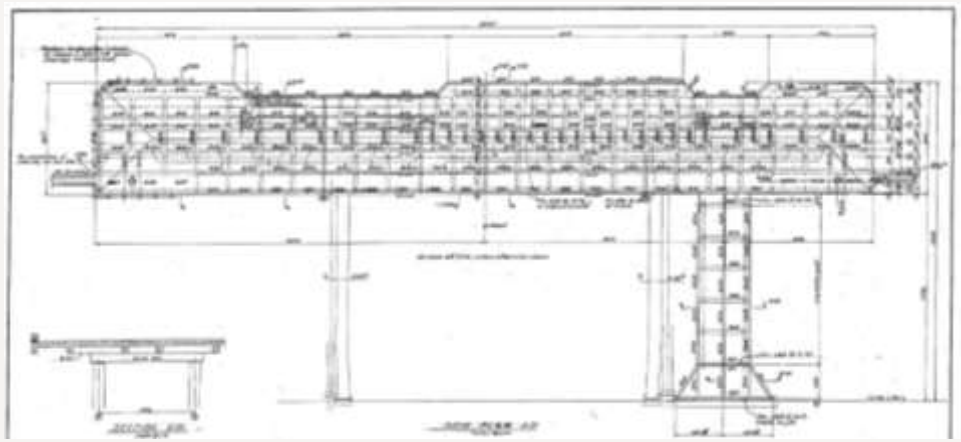
Condition Inspection

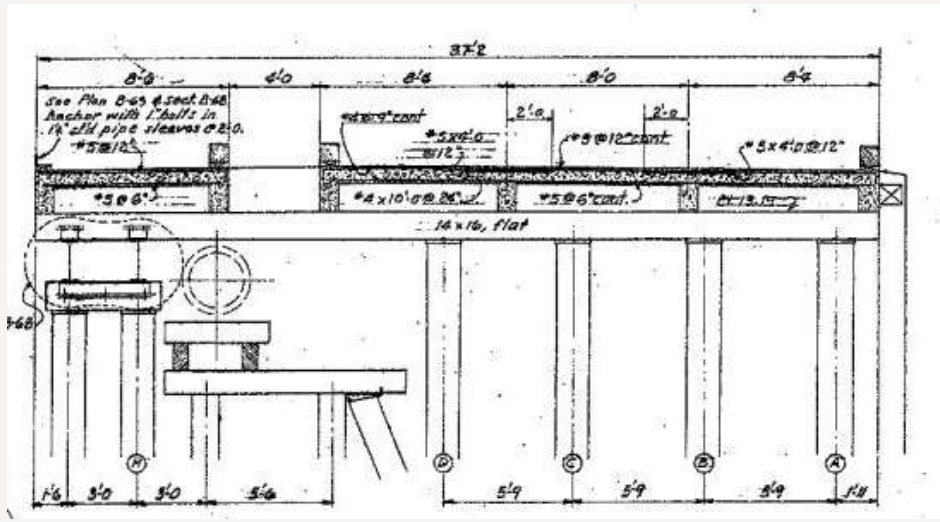
- Performed Above and Below Water Inspections of the Structures
- The existing main wharf structure was in Satisfactory condition. Isolated defects from Minor to Severe but easily addressed.

Condition Inspection

- A fire within the first year of the berth's original construction in 1955 required a concrete deck to be constructed in place of the original timber deck.
- Pile were protected with gunite to MLLW



- Localized defects in the gunite at MLLW show that the gunite in combination with creosote was very effective at protecting the piles form marine borers in the tidal zone.
- (Water El. -1.0 ft, MLLW in photo)



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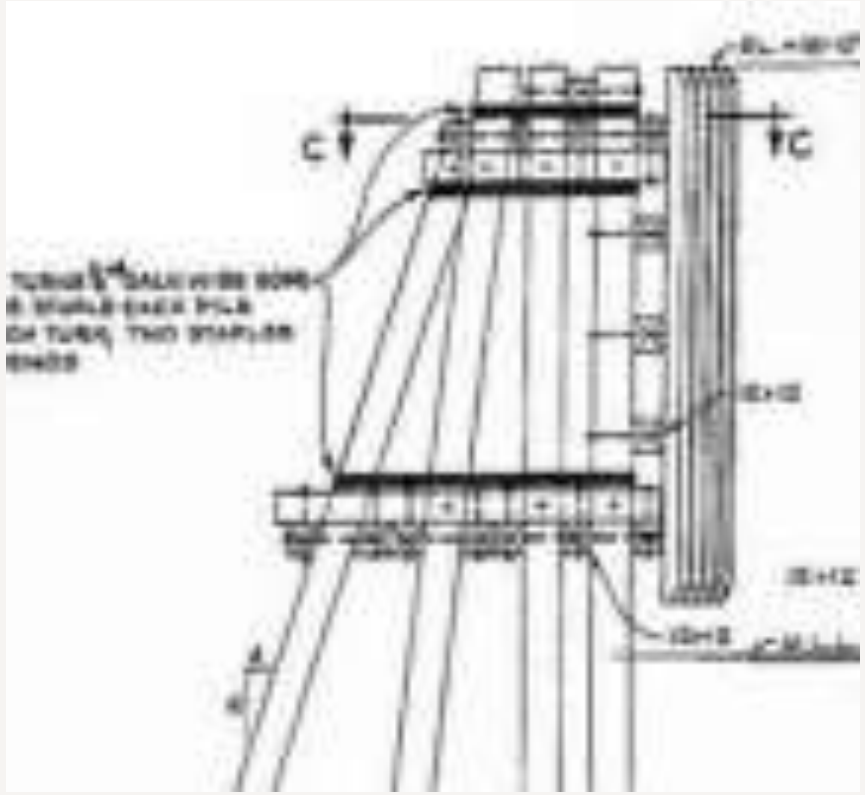
Condition Inspection

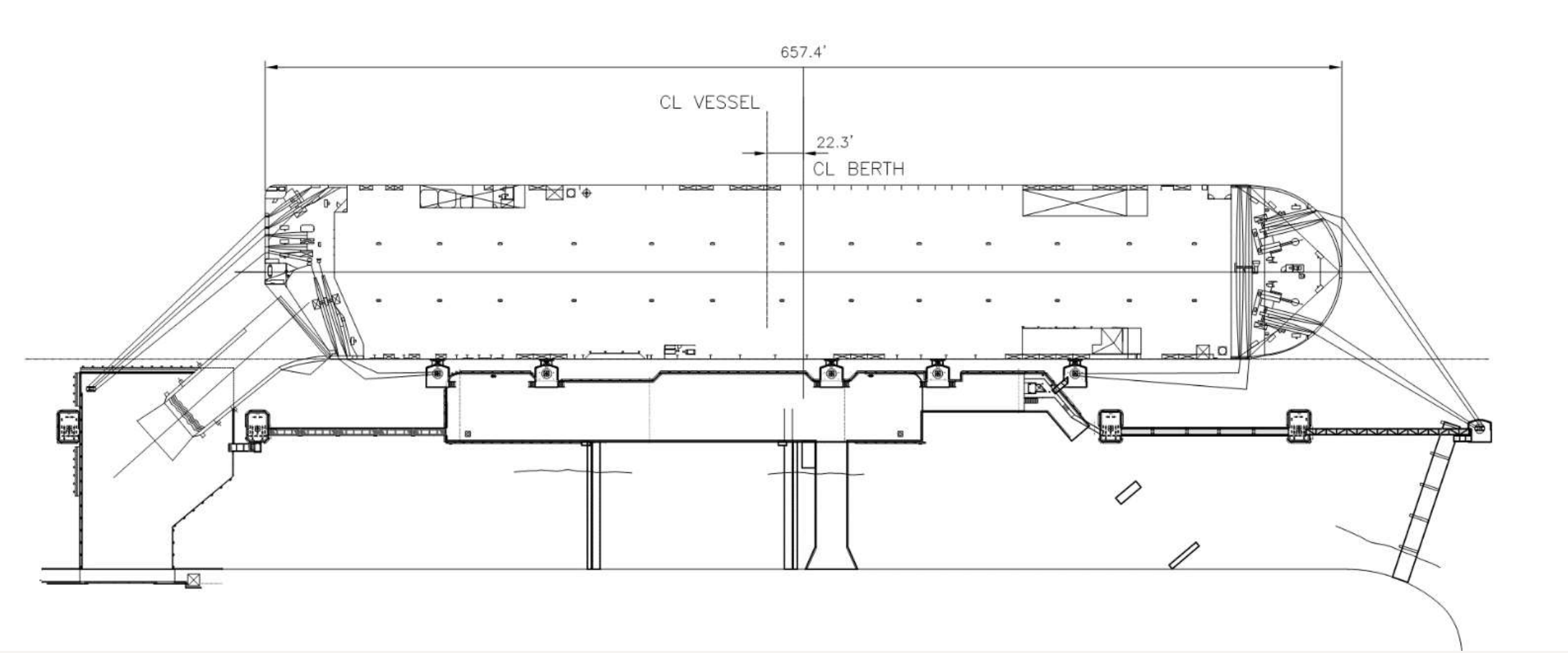
- Existing 16-pile timber fender dolphins were a non-starter.
- Prior to even performing a condition inspection we knew from previous analysis of identical designs, in more shallow depths, that the fenders would be deficient from an engineering standpoint.
- Inspection verified our initial assessment.



Plan to Accommodate New Vessels

- New breasting dolphins were definitely required.
- Mooring analysis proved that a new mooring point off the starboard bow was required for the longest design vessel.
- A new deck structure off the starboard stern was required to serve as a landing for the vessel ramp and provide access to shore.
- Existing mooring dolphins could be reutilized where located conveniently.
- New breasting dolphins would have mooring hardware to accommodate spring lines.

Upgraded Berth Plan

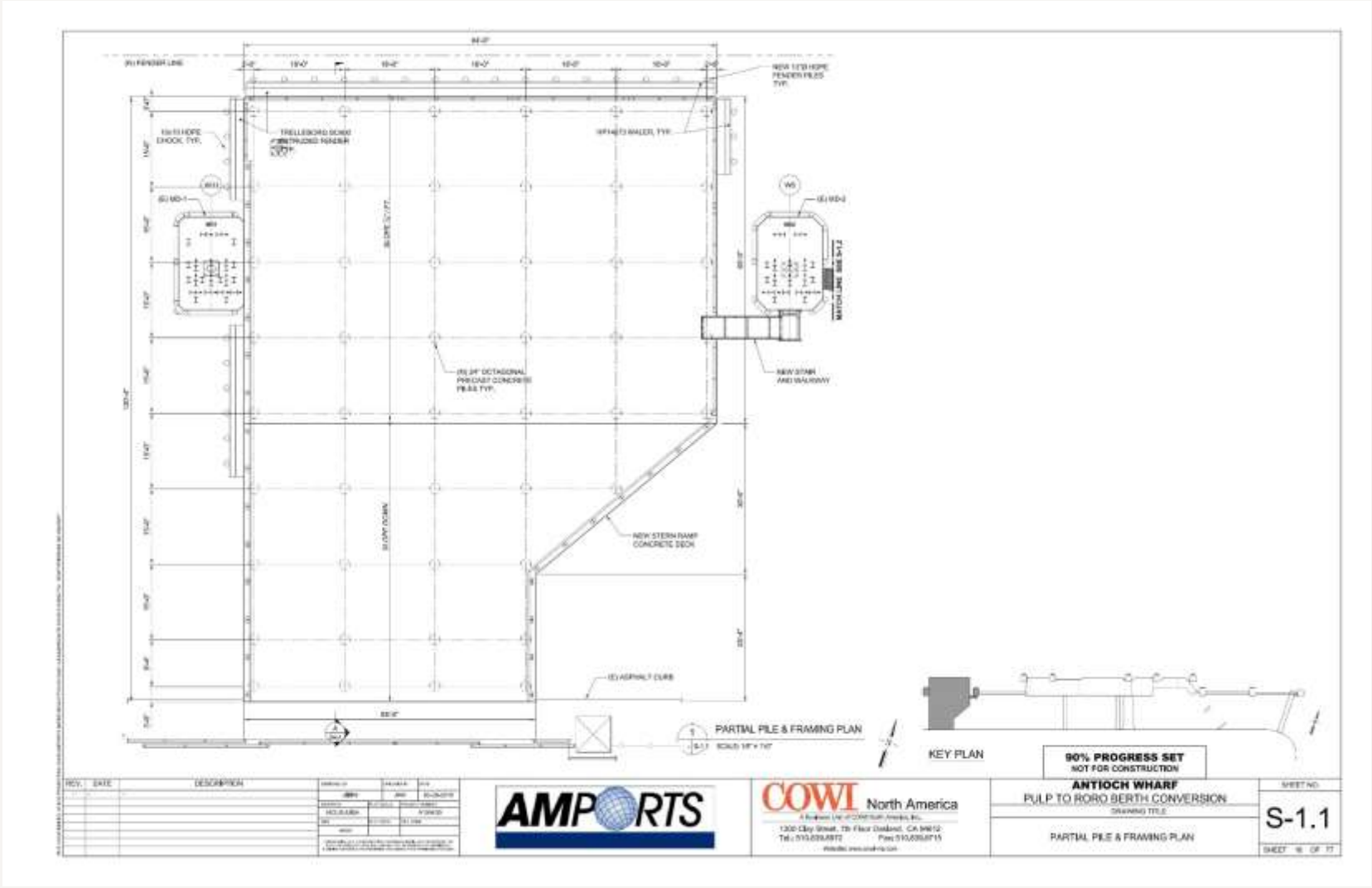


Add New Deck at Stern

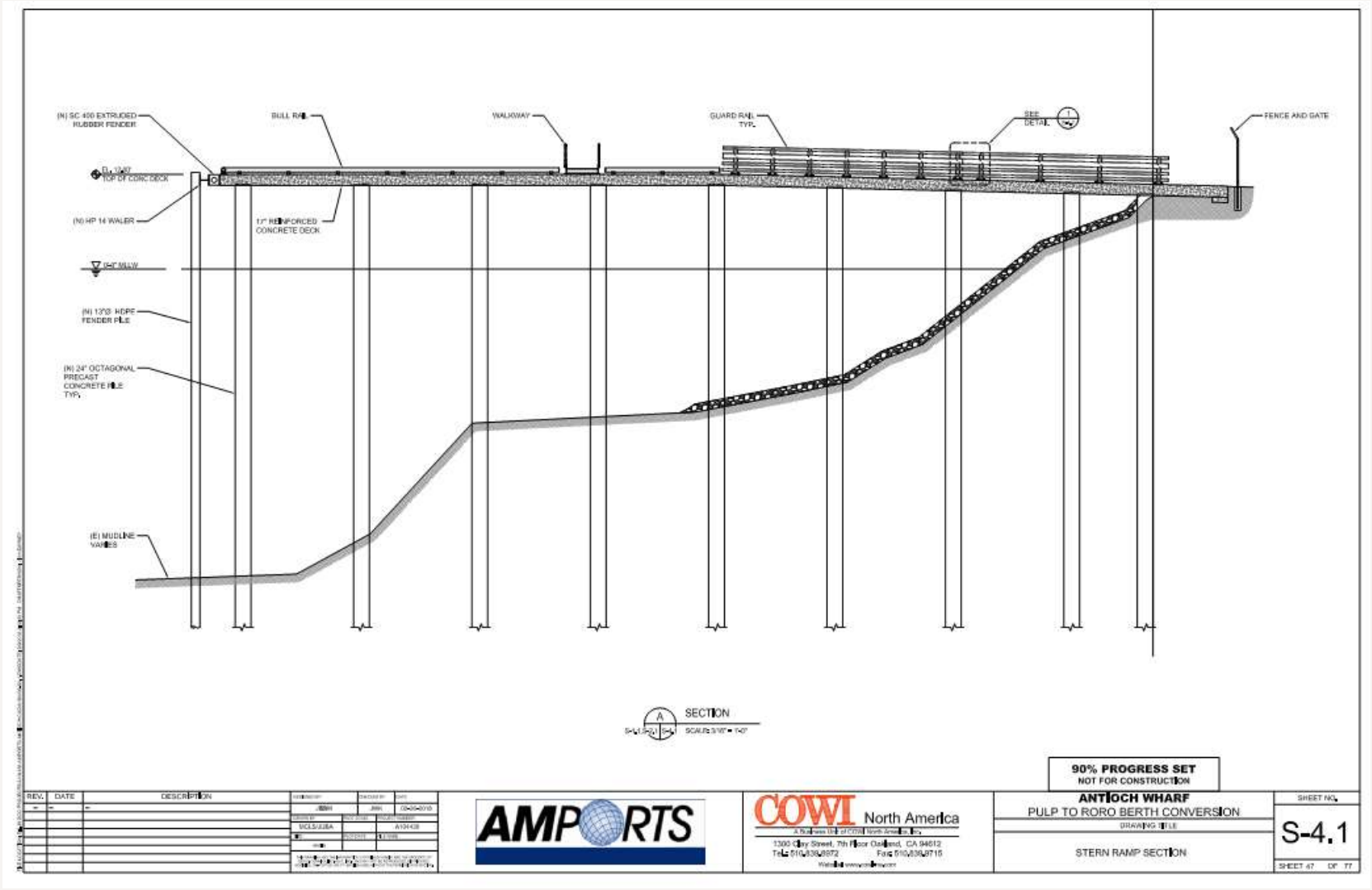
Demolish Existing and Add 5 New Breasting Dolphins

Add New Mooring Dolphin

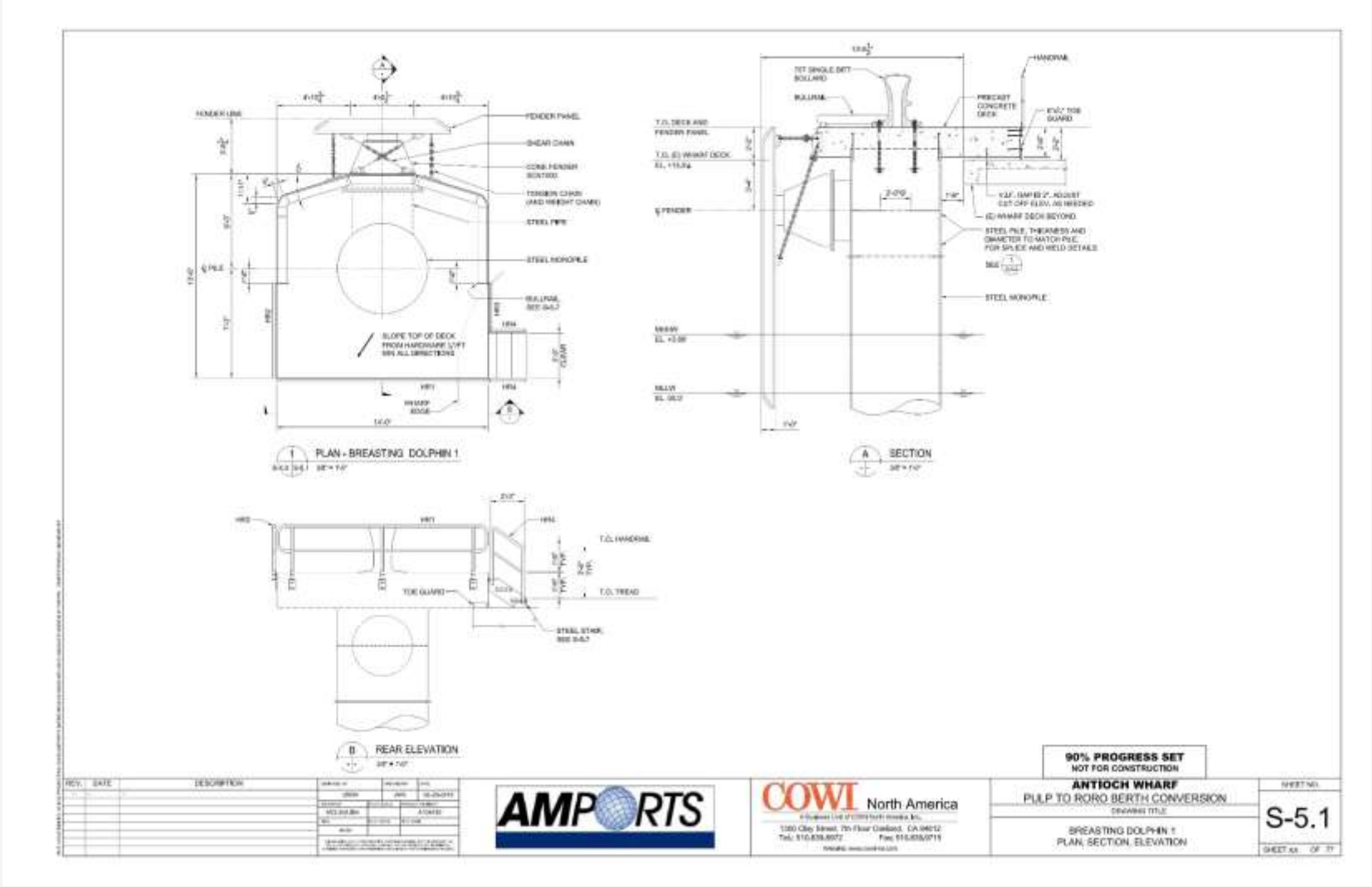
New Stern Ramp Deck



New Stern Ramp Deck



New Breasting Dolphin



Permitting/Regulatory Environment

- California State Lands Commission
  - Since State Lands is the waterside, and partially landside landowner, MOTEMS is used as the guiding design code for the structural design. As this is not a Marine Oil Terminal not all requirements apply.
- Contra Costa County
- California Department of Fish and Wildlife
- U.S. Corps of Engineers
  - National Marine Fisheries
- Regional Water Quality Control Board
- Bay Conservation and Development Commission (BCDC) – Outside of Jurisdiction
- California Coastal Commission – Outside of Jurisdiction

Regulatory Surprise

- Despite completing 9 MOTEMS Initial Audits, including the mandatory on and offshore geotechnical borings as required, and never needing to obtain either State Lands Commission permits or anything beyond a notification to the Corps of Engineers that borings would be conducted under Nationwide Permit No. 6, permits were required by both agencies, triggering permits/reviews from more agencies.

- Contra Costa County Permit applied for February 1, 2018, permit received February 5, 2018

- RWQCB Water Quality Certification (WQC) applied for February 2, 2018, WQC received April 17, 2018

- SLC Permit applied for January 26, 2018, received (onshore borings could begin) April 27, 2018

- USACE Permits applied for February 2, 2018 received June 26, 2018.

- California DFW applied for February 7, 2018, received July 13, 2018. Final request for information for approval by DFW, July 9: **"What size are the spuds on the drill ship?"** We had already told them there were 2 of them, 70 ft long. We repeated that information. July 11, **"No, diameter or plan size."**

- Offshore borings had been rescheduled numerous times and were able to be completed July 16 and 17, 2018. So, there was a five-month permit process for 2-8" diameter borings necessary to complete pile design for the structure.

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Regulatory Environment

› Oh, they're 18" square.

Increased Scope of Work – We received a phone call.

› Had the pilots been contacted?

Yes. We called regarding their experience with current directions on the south shore of the San Joaquin River in this location. We explained the proposed plan and that these were essentially the same ships as currently called at Benicia, and wanted to make sure there wouldn't be issues with strange currents. They said currents run parallel to the shoreline/dock faces.

› Are these vessels allowed to transit to this site?

As far as we knew. The only issue mentioned in our conversation with the pilots was that multiple tugs would be required to back the vessels to River View for turnaround. We knew this from our work at the gypsum dock next door.

› What about Air Draft at the UPRR Bridge?

Per the port operator they could schedule taller vessels, if needed, to call at Benicia.

› What about the PG&E powerlines between the Gypsum dock (COWI was in construction of an upgrade there at the time) and this dock?

Oh oh.

› By the way, the Pilots are saying they aren't inclined to take car carriers that far. For a bunch of reasons. They sent a letter.

Here we go.

Pilots Concerns

- The San Francisco Bar Pilots readily acknowledged that their guidelines did not explicitly exclude vessels of this size or class.
- Their concerns included:
  - Fog limiting movements of vessels through a federally regulated area, a concern for all vessels east of the UPRR bridge.
  - Air draft at the UPRR bridge.
  - Air draft at the powerlines to West Island.
  - Control of large vessels with greatly increased windage area in high wind through the UPRR bridge and by berths in New York Slough while travelling at reduced speeds to limit passing vessel effects.

Simulations

- COWI suggested performing simulations of the transit at the Simulation Center located at the California Maritime Academy.
- Multiple meetings were conducted to set up simulation parameters and vessel models.
- The simulations were performed from April 17-18, 2018

California Maritime Academy Vessel Simulation Center

- Full Bridge Simulator with 360 degree projection
- Custom Vessel Creation
- Complete path to the site from south of the UPRR bridge modelled.

California Maritime Academy Vessel Simulation Center

Simulation Center

Our Capabilities

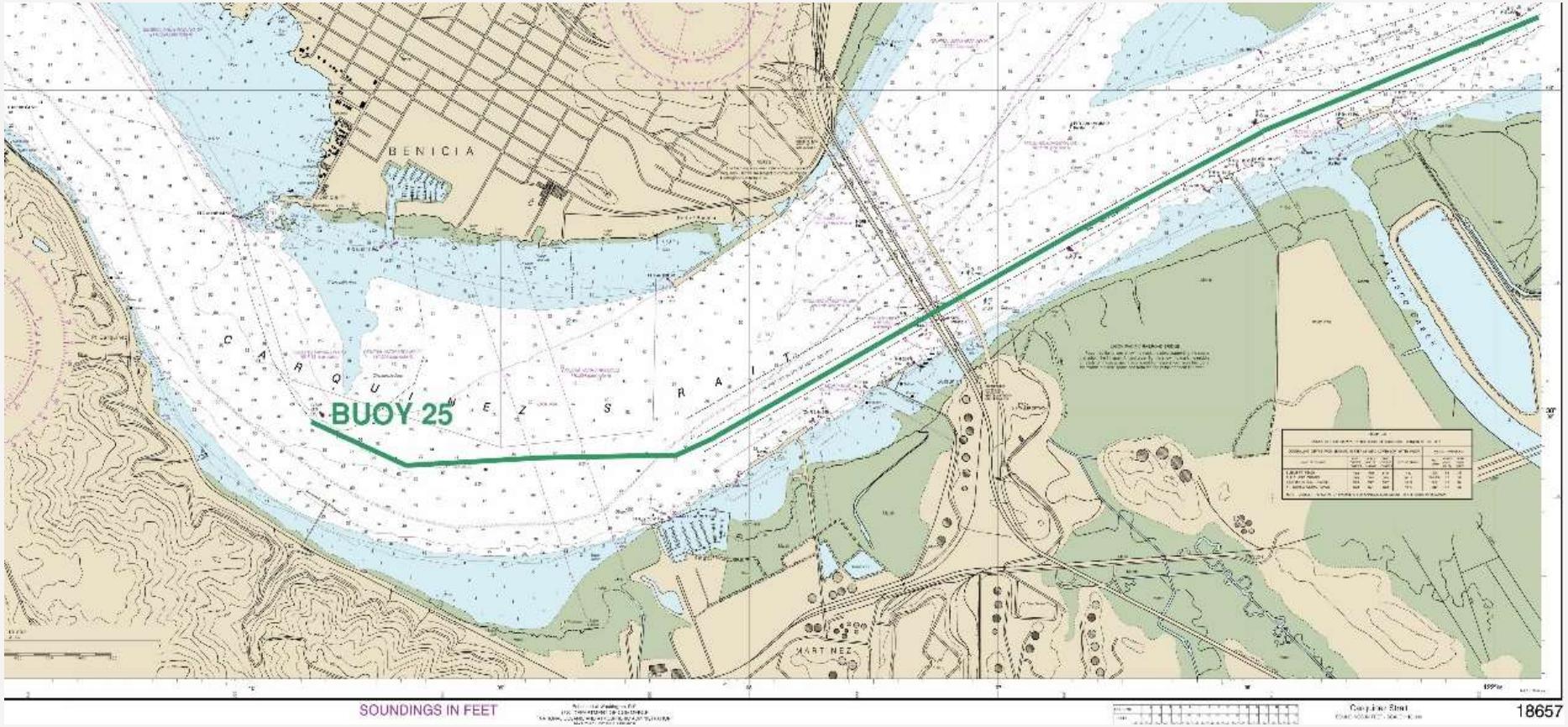
- Bridge Simulation
- Multi-Team Simulation
- Crisis Management
- Diesel Simulation
- GMDSS
- Liquid & Gas Cargo
- Oil Spill Simulation
- Radar/ARPA/ECDIS
- Steam Simulation
- Research & Validation
- Design Projects
- Environmental Safety

California Maritime Academy Vessel Simulation Center

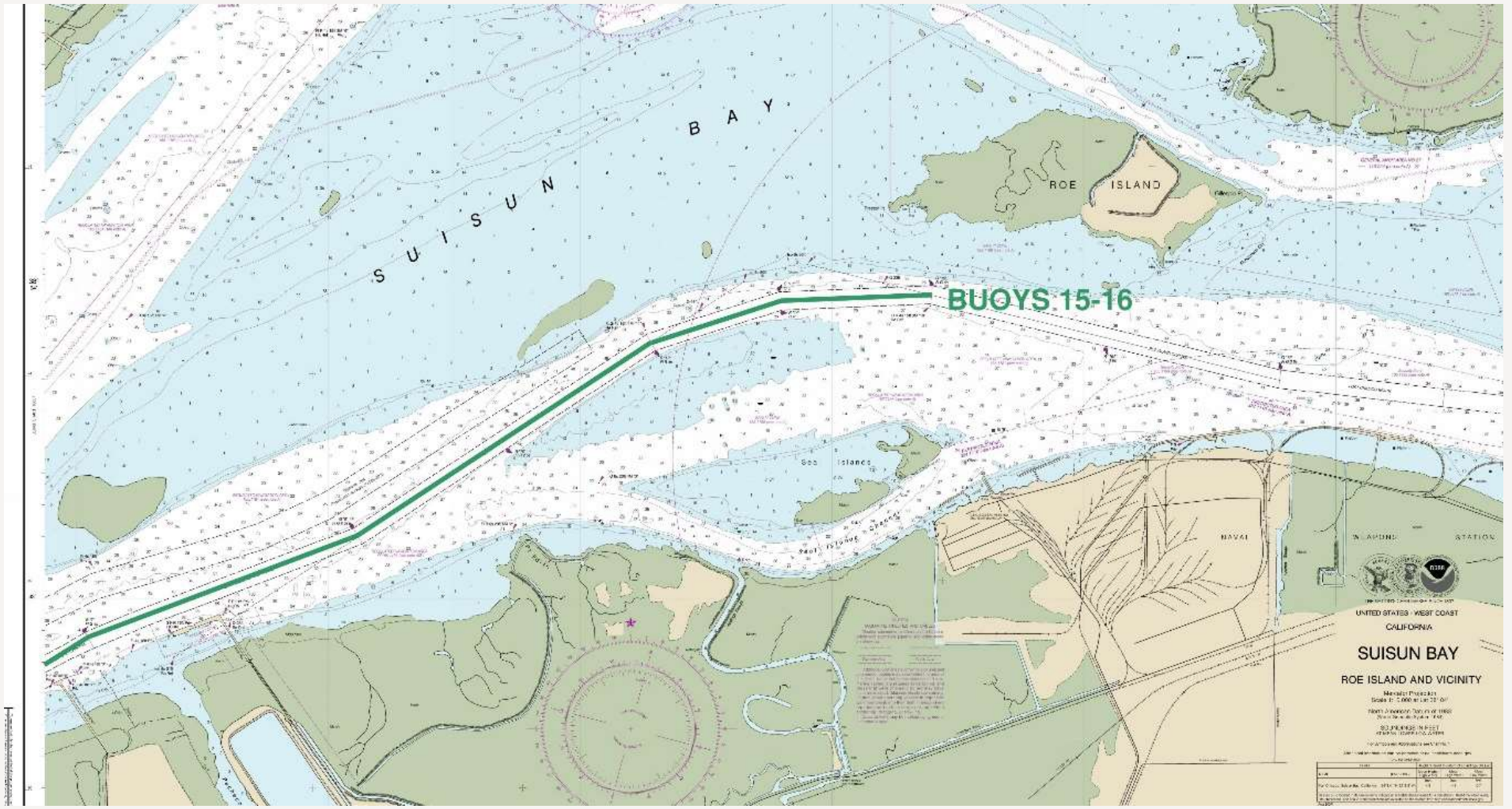
California Maritime Academy Vessel Simulation Center

California Maritime Academy Simulations Route

Simulations with winds varying from 10 to 25 knots and with both flood and ebb currents, whichever was more difficult depending on direction of travel. Both up bound and down bound transits were modelled and run.
Speed through the water limited to 7 knots passing Shell, Amorco, TransMontaigne, and AVON.

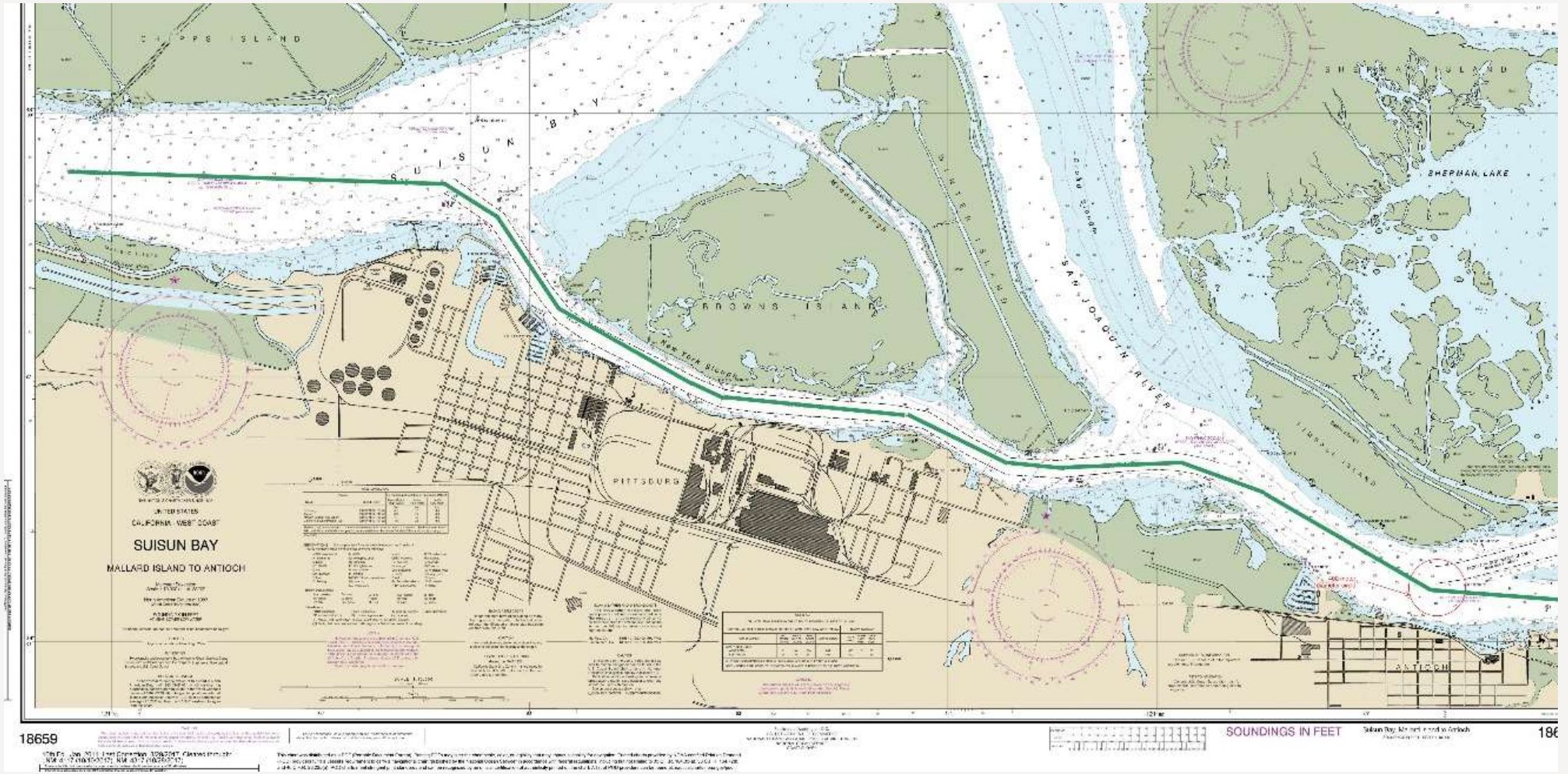


California Maritime Academy Simulations Route

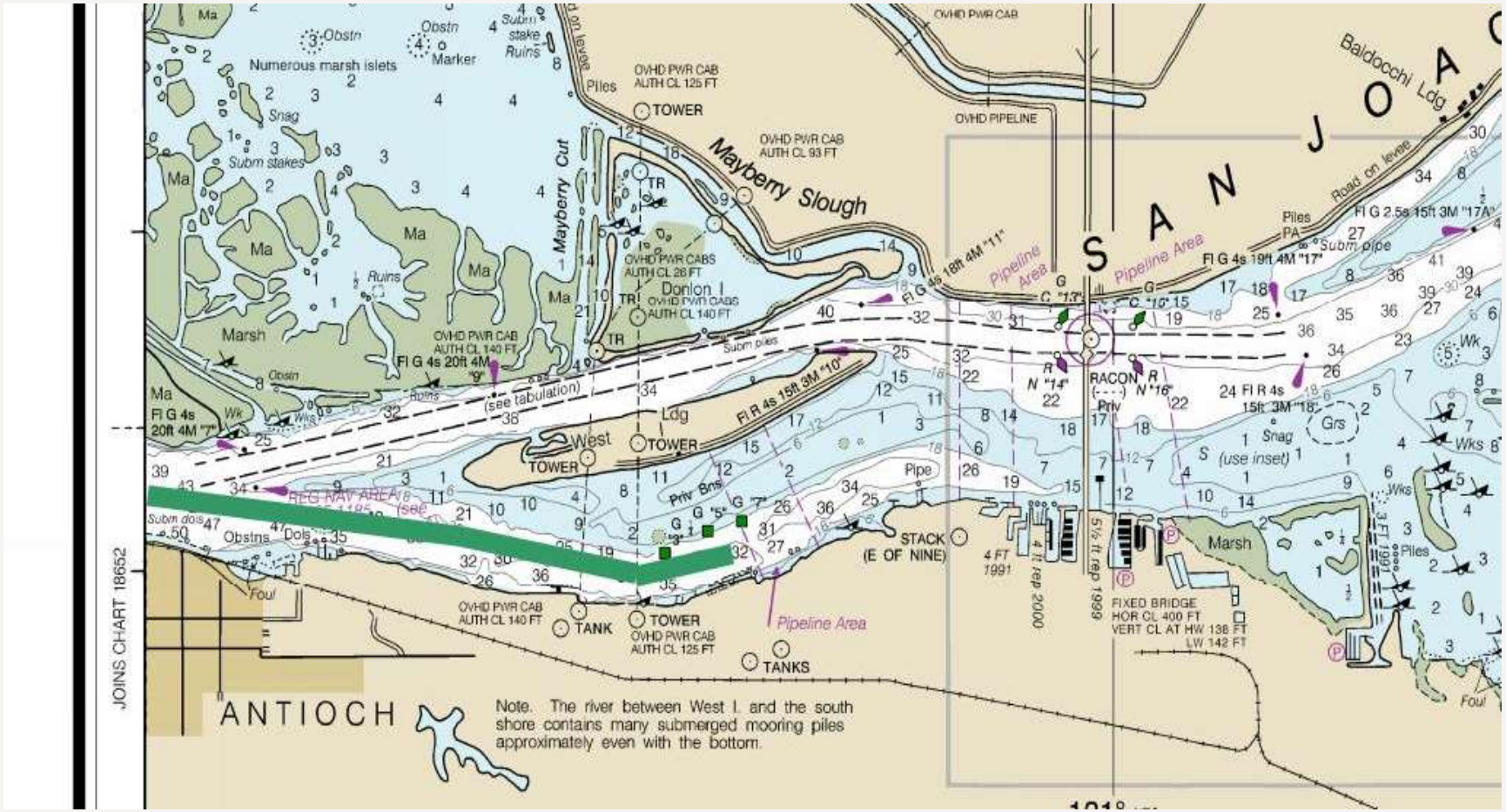


California Maritime Academy Simulations Route

Speed through the water limited to as little as 5 knots for some pilots passing berths in New York Slough. Two tractor tugs were on hand to assist in this leg.



California Maritime Academy Simulations Route



California Maritime Academy Simulations

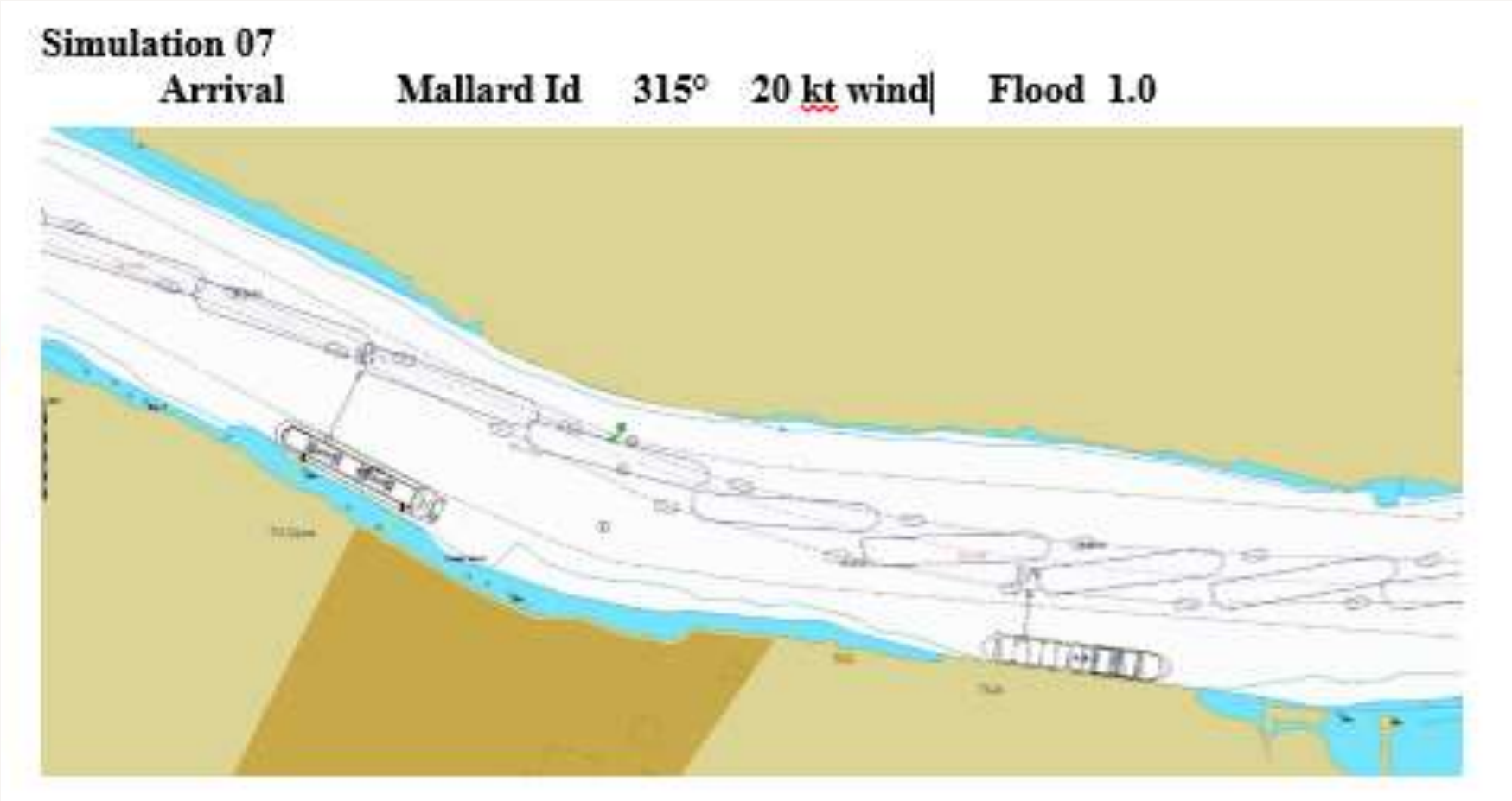
› Passing through UPRR Bridge down bound

California Maritime Academy Simulations

› Passing TransMontaigne toward UPRR Bridge down bound

California Maritime Academy Simulations

- Transiting new York Slough with tug assistance



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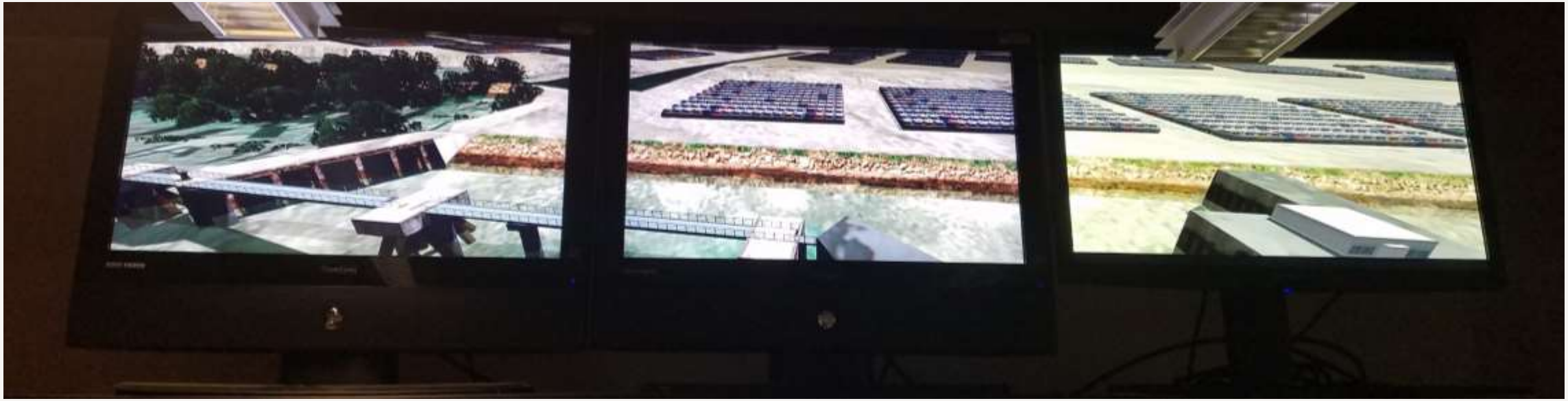

California Maritime Academy Simulations

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California Maritime Academy Simulations

- Under all current and wind conditions the pilots were able to navigate the bridge and passing moored vessels alongside docks without allision.
- This screen shot of a 25 knot wind simulation may have been the closest pass to the bridge tower fenders.

Wind

- High winds being the greatest concern from the pilots we looked in great detail into the wind data from three NOAA wind stations along the route from the UPRR bridge to the site. Amorco, Port Chicago, and Pittsburg.
- NOAA stores readings of 2 min average wind speeds and 5 second gusts 10 times an hour.
- We used a year's worth of data from each site to determine the percent of time that wind speeds exceeded certain levels.
- We looked at hourly averages and gusts, converted to 30-second gusts.
- We then further broke the data down to between sunrise and sunset, and sunset to sunrise.

Wind Data

A partial shot of one month's data at one station. There are about 7200-7400 readings per month.

DATE TIME	WINDSP	DIR	GUSTS	AT	BARO	RELHUM	VIS	DATE	Hour	Hourly Ave 2 Min Wind	30 Sec Gust from Ave 5 Sec
1/1/2018 0:00	6.61	289	7.39	51.4	1022.7	99.9	5.4	1/1/18	0:00	5.19	5.37
1/1/2018 0:06	5.05	245	6.61	51.3	1022.7	99.9	5.4	1/1/18			
1/1/2018 0:12	5.05	284	6.03	51.1	1022.7	99.9	5.4	1/1/18			
1/1/2018 0:18	4.28	265	5.44	51.1	1022.7	99.9	5.4	1/1/18			
1/1/2018 0:24	5.25	280	5.83	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 0:30	5.25	268	6.22	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 0:36	4.67	284	5.44	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 0:42	5.05	288	5.64	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 0:48	5.83	276	6.61	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 0:54	4.86	277	5.83	50.9	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:00	2.92	281	4.67	50.9	1022.7	99.9	5.4	1/1/18	1:00	3.79	4.21
1/1/2018 1:06	4.08	282	4.86	50.9	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:12	4.47	283	5.25	51.1	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:18	5.25	293	6.03	51.3	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:24	5.05	286	6.03	51.1	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:30	4.86	284	5.64	51.1	1022.8	99.9	5.4	1/1/18			
1/1/2018 1:36	3.11	258	4.86	50.9	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:42	2.92	274	3.5	50.9	1022.7	99.9	5.4	1/1/18			
1/1/2018 1:48	2.14	244	3.5	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 1:54	3.11	221	3.5	50.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:00	2.92	225	3.11	50.4	1022.5	99.9	5.4	1/1/18	2:00	2.90	3.08
1/1/2018 2:06	2.33	247	3.3	50.7	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:12	3.5	255	3.69	50.7	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:18	3.3	259	4.08	50.5	1022.5	99.9	5.4	1/1/18			
1/1/2018 2:24	2.92	264	3.5	50.5	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:30	2.53	261	3.3	50.4	1022.5	99.9	5.4	1/1/18			
1/1/2018 2:36	3.5	256	4.08	50.4	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:42	3.11	244	3.5	50.4	1022.5	99.9	5.4	1/1/18			
1/1/2018 2:48	2.53	248	3.5	50	1022.6	99.9	5.4	1/1/18			
1/1/2018 2:54	2.33	262	2.92	50	1022.6	99.9	5.4	1/1/18			
1/1/2018 3:00	3.11	241	3.5	50	1022.7	99.9	5.4	1/1/18	3:00	3.38	3.51
1/1/2018 3:06	3.5	243	3.89	50	1022.7	99.9	5.4	1/1/18			
1/1/2018 3:12	3.5	248	3.69	49.6	1022.7	99.9	5.4	1/1/18			
1/1/2018 3:18	3.5	243	4.08	49.5	1022.7	99.9	5.4	1/1/18			
1/1/2018 3:24	2.92	240	4.08	49.1	1022.6	99.9	5.4	1/1/18			
1/1/2018 3:30	3.11	242	3.69	48.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 3:36	2.92	251	3.5	48.9	1022.6	99.9	5.29	1/1/18			
1/1/2018 3:42	3.69	265	4.28	48.9	1022.6	99.9	5.4	1/1/18			
1/1/2018 3:48	3.69	266	4.47	49.1	1022.6	99.9	5.4	1/1/18			
1/1/2018 3:54	3.89	268	4.67	49.1	1022.6	99.9	5.4	1/1/18			
1/1/2018 4:00	4.28	267	4.67	49.1	1022.7	99.9	5.4	1/1/18	4:00	5.15	5.49
1/1/2018 4:06	4.28	272	4.86	49.3	1022.7	99.9	5.4	1/1/18			
1/1/2018 4:12	4.28	262	5.05	49.3	1022.9	99.9	5.4	1/1/18			
1/1/2018 4:18	5.25	270	5.83	49.3	1022.9	99.9	5.4	1/1/18			
1/1/2018 4:24	4.86	279	5.83	49.3	1022.8	99.9	5.4	1/1/18			
1/1/2018 4:30	4.08	276	6.03	49.1	1022.8	99.9	5.4	1/1/18			
1/1/2018 4:36	6.22	284	7.39	48.9	1022.9	99.9	5.4	1/1/18			
1/1/2018 4:42	5.83	285	7.58	48.9	1022.8	99.9	5.4	1/1/18			
1/1/2018 4:48	5.83	284	7.19	49.3	1022.9	99.9	5.4	1/1/18			
1/1/2018 4:54	6.61	287	7.97	49.1	1022.9	99.9	5.4	1/1/18			

AMORCO 1-18

30 Second Gusts >= (kts)		10	11	12	13	14	15	16	17	18	19	20	21	22
From 1 hour ave 2 Min Wind	Number	63	34	26	12	9	5	5	5	1	1	0	0	0
	Percent	8.5%	4.6%	3.5%	1.6%	1.2%	0.7%	0.7%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%
From 2 min ave	Number	112	80	63	41	28	15	12	7	5	5	5	3	1
	Percent	15.1%	10.8%	8.5%	5.5%	3.8%	2.0%	1.6%	0.9%	0.7%	0.7%	0.7%	0.4%	0.1%
From Ave 5 Sec Gust/hr	Number	64	45	25	13	8	7	6	2	1	0	0	0	0
	Percent	8.6%	6.0%	3.4%	1.7%	1.1%	0.9%	0.8%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
	Number	32	22	12	7	5	5	1	1	0	0	0	0	0
Hourly Average Winds	Percent	4.3%	3.0%	1.6%	0.9%	0.7%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%

Total Hourly Readings	744
Total Daylight Readings	311
Nighttime Readings	433

Daylight (Sunrise-Sunset)

AMORCO 1-18

30 Second Gusts >= (kts)		10	11	12	13	14	15	16	17	18	19	20	21	22
From Ave 5 Sec Gust/hr	Number	23.00	19.00	8.00	4.00	2.00	2.00	2.00	1.00	1.00	0.00	0.00	0.00	0.00
	Percent	3.3%	2.7%	1.1%	0.6%	0.3%	0.3%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
	Number	12.00	4.00	3.00	2.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hourly Average Winds	Percent	3.9%	1.3%	1.0%	0.6%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Nighttime (Sunset-Sunrise)

AMORCO 1-18

30 Second Gusts >= (kts)		10	11	12	13	14	15	16	17	18	19	20	21	22
From Ave 5 Sec Gust/hr	Number	35.00	26.00	17.00	9.00	6.00	5.00	4.00	1.00	0.00	0.00	0.00	0.00	0.00
	Percent	11.3%	8.4%	5.5%	2.9%	1.9%	1.6%	1.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
	Number	20.00	18.00	9.00	5.00	4.00	4.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
Hourly Average Winds	Percent	4.6%	4.2%	2.1%	1.2%	0.9%	0.9%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%

Wind Data

- Having culled through the data we developed some summaries for the client to use in making business decisions regarding potential delays due to wind. Initially these summaries were by month, but then by daylight/nighttime as well.
- The yearly averages for hourly average winds are provided here, but monthly averages vary greatly.
- There is a rapid drop-off in "winds exceeding" over 15 knots.

Table 1 Executive Summary of Wind Exceedance Values by Time

Overall Exceedance by Daylight/Nighttime:	
Percent of daylight hours exceeding 15 knots:	7.5%
Percent of nighttime hours exceeding 15 knots:	7.1%
Percent of daylight hours exceeding 17 knots:	3.4%
Percent of nighttime hours exceeding 17 knots:	3.2%
Percent of daylight hours exceeding 19 knots:	0.4%
Percent of nighttime hours exceeding 19 knots:	1.2%

Wind Data

› Select Monthly Averages

Table 2 Summary of Wind Exceedance Values by Time and Month

(15, 17, and 19 knot winds are shown to illustrated the rapid drop-off in exceedance after 15 knots)

		Percent of Hours with Hourly Average Winds Exceeding :		
April-17		15 knots	17 knots	19 knots
Amorco	Day	6.2%	1.2%	0.2%
	Night	2.2%	0.9%	0.3%
Port Chicago	Day	2.0%	1.0%	0.0%
	Night	14.3%	6.5%	1.6%
Pittsburg	Day	0.3%	0.3%	0.3%
	Night	5.3%	3.0%	0.7%
May-17		15 knots	17 knots	19 knots
Amorco	Day	5.7%	2.3%	1.1%
	Night	7.9%	3.3%	1.3%
Port Chicago	Day	13.5%	6.5%	3.6%
	Night	22.0%	13.0%	4.7%
Pittsburg	Day	6.8%	2.5%	0.9%
	Night	9.0%	2.0%	0.7%
June-17		15 knots	17 knots	19 knots
Amorco	Day	16.9%	7.2%	2.0%
	Night	8.0%	1.8%	0.4%
Port Chicago	Day	20.9%	10.3%	3.8%
	Night	25.5%	11.3%	3.6%
Pittsburg	Day	11.4%	4.7%	0.9%
	Night	12.5%	4.8%	0.7%

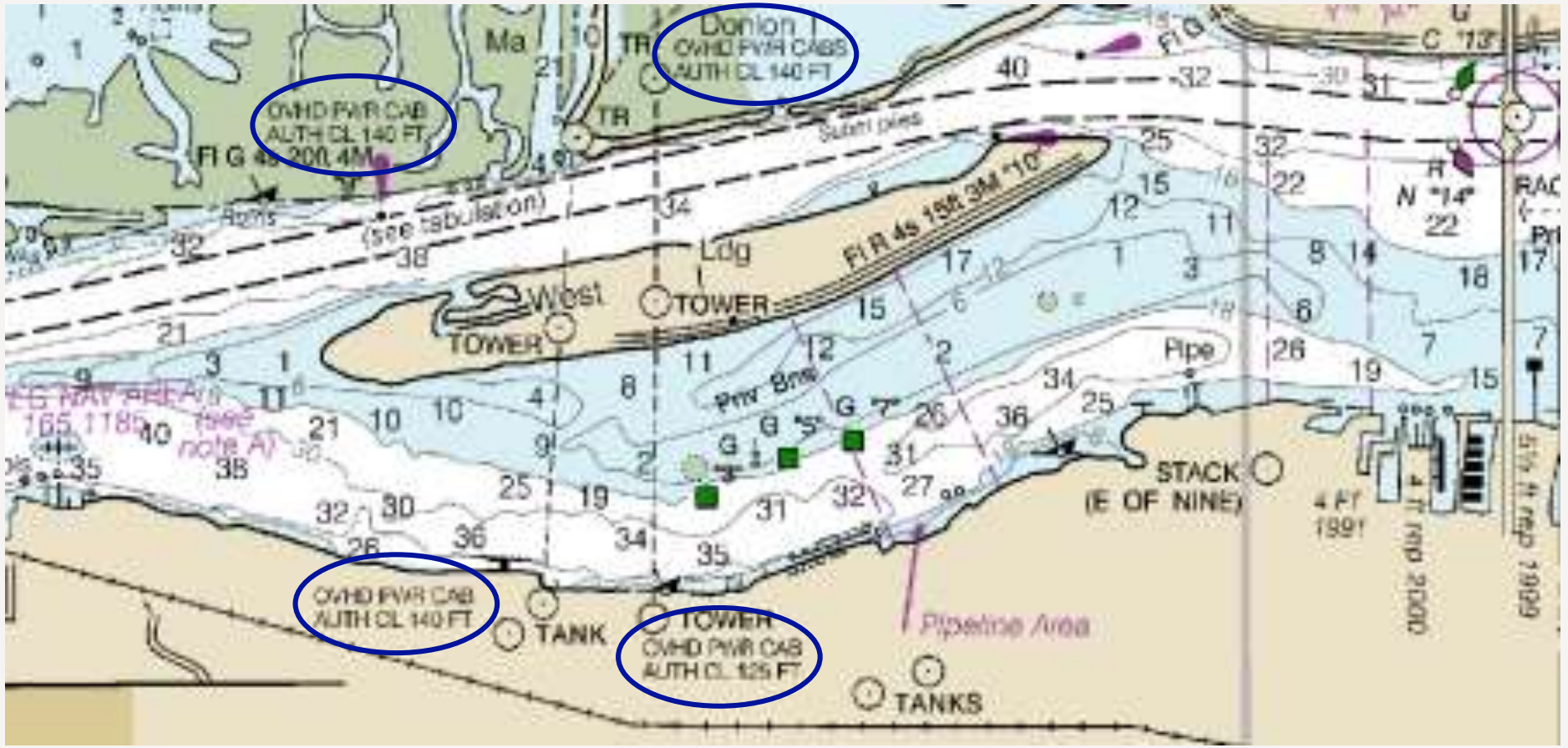
Table 2 continued

		Percent of Hours with Hourly Average Winds Exceeding :		
July-17		15 knots	17 knots	19 knots
Amorco	Day	20.7%	4.5%	0.9%
	Night	9.8%	1.7%	0.0%
Port Chicago	Day	42.9%	26.7%	12.0%
	Night	16.7%	5.1%	2.7%
Pittsburg	Day	17.4%	6.0%	0.7%
	Night	8.6%	1.1%	0.3%
August-17		15 knots	17 knots	19 knots
Amorco	Day	11.7%	1.0%	0.0%
	Night	6.2%	1.5%	0.0%
Port Chicago	Day	27.8%	13.1%	2.6%
	Night	22.6%	4.9%	0.6%
Pittsburg	Day	14.4%	1.4%	0.0%
	Night	11.9%	1.6%	0.0%
September-17		15 knots	17 knots	19 knots
Amorco	Day	8.4%	1.9%	0.3%
	Night	5.1%	1.4%	0.3%
Port Chicago	Day	8.6%	1.9%	0.0%
	Night	9.8%	2.6%	0.3%
Pittsburg	Day	1.6%	0.0%	0.0%
	Night	4.0%	0.6%	0.3%

COWI

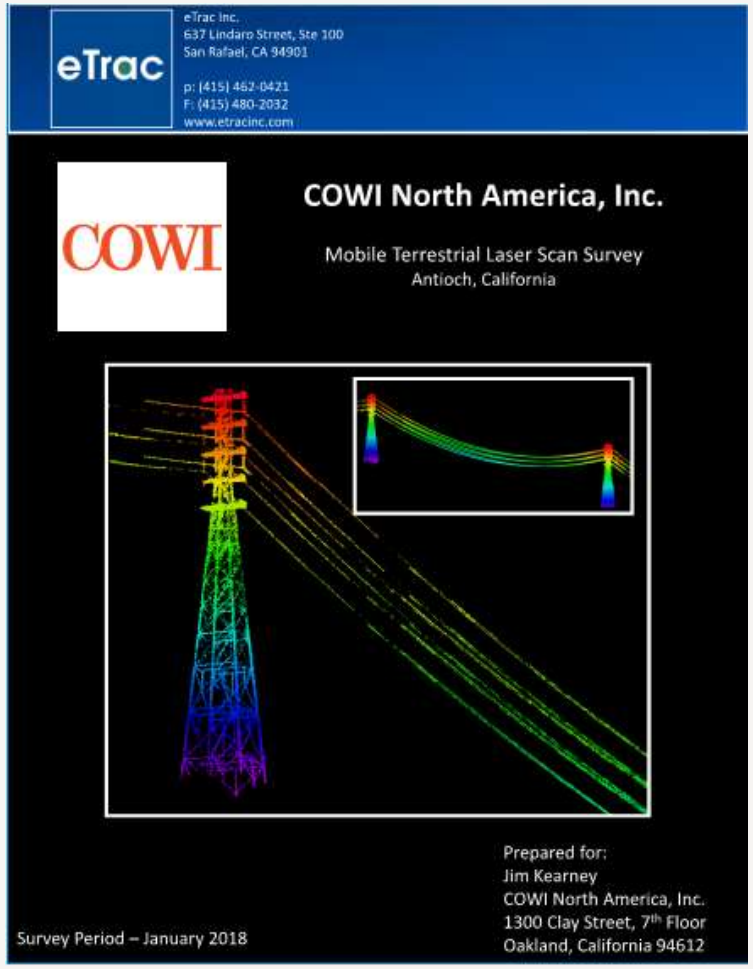
Power Lines

- There are two sets of PG&E power lines shown crossing the San Joaquin River south of West Island. We requested assistance from PG&E in February 2018 to get the actual profile of the lines as the low point would be above a very shallow area of water and the vessels would be well south in deeper water where the lines are higher.



Power Lines

› Requesting but not receiving much response to questions from PG&E, COWI commissioned a LIDAR survey of the crossing immediately west of the berth.



The field survey was conducted January 25, 2018.

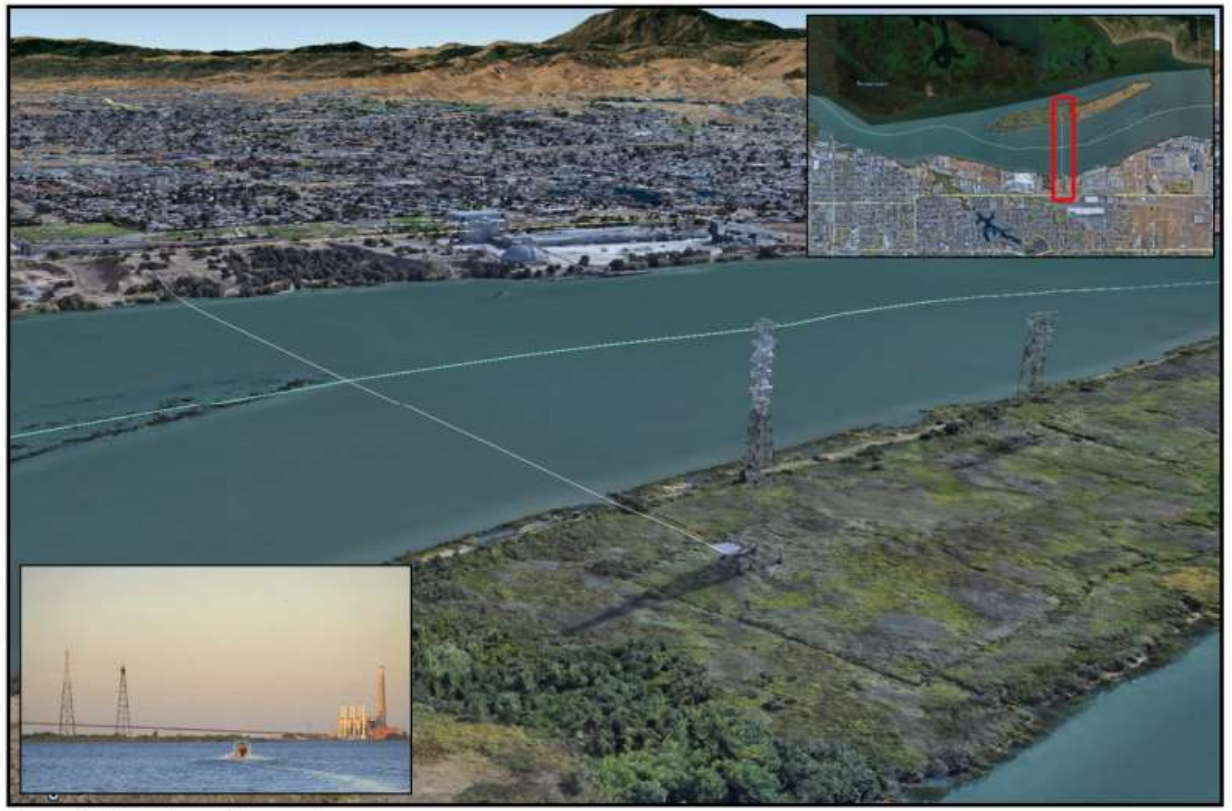
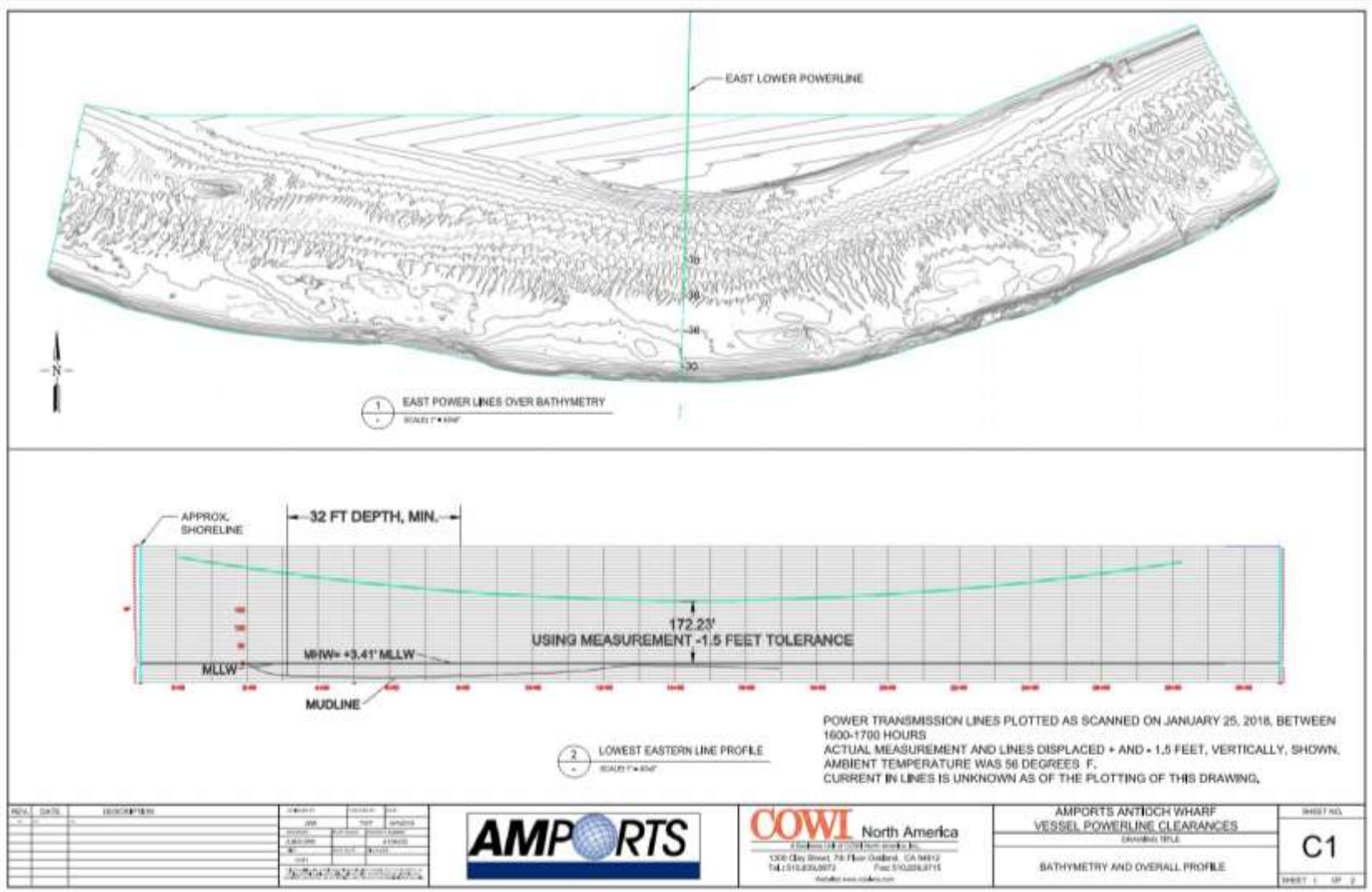


Figure 1 Overview of Survey Area

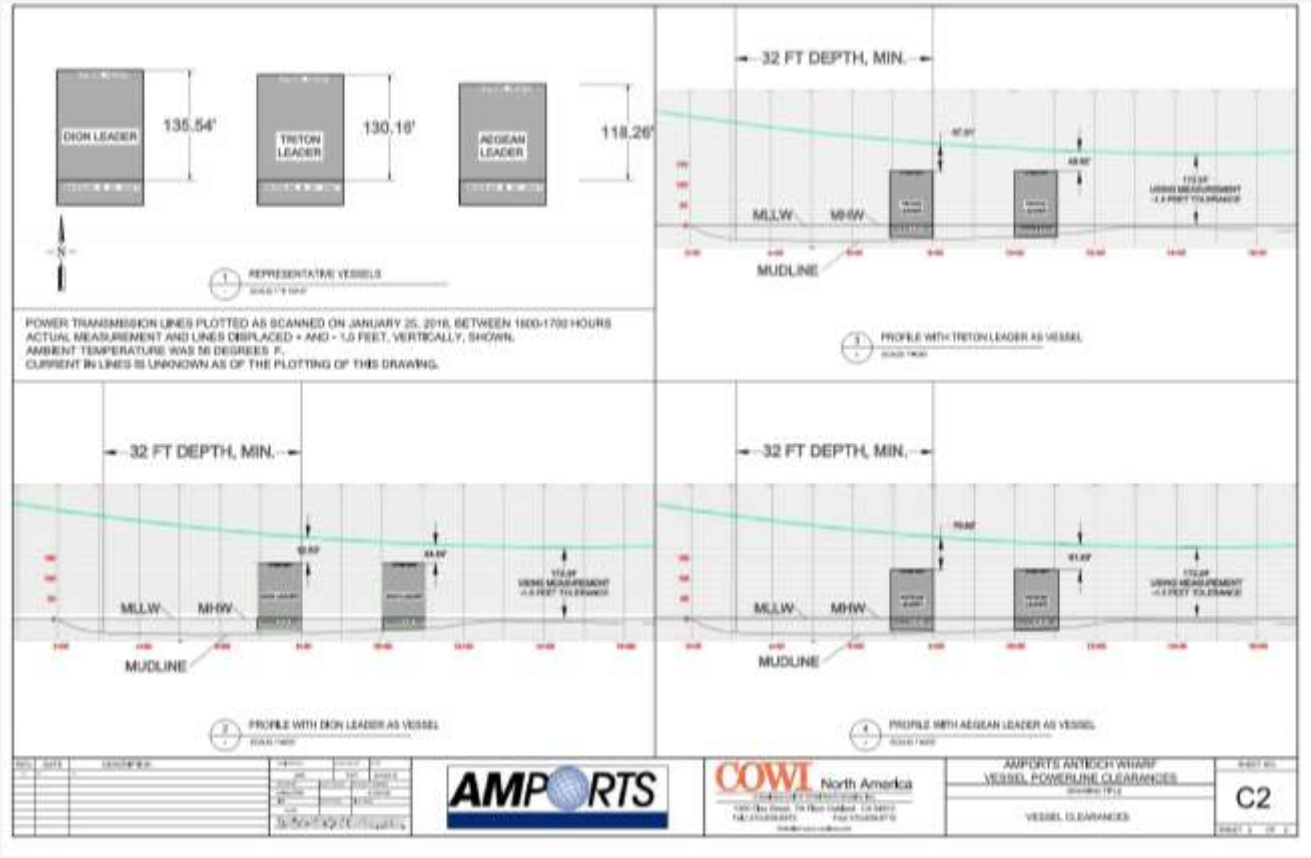
Power Lines

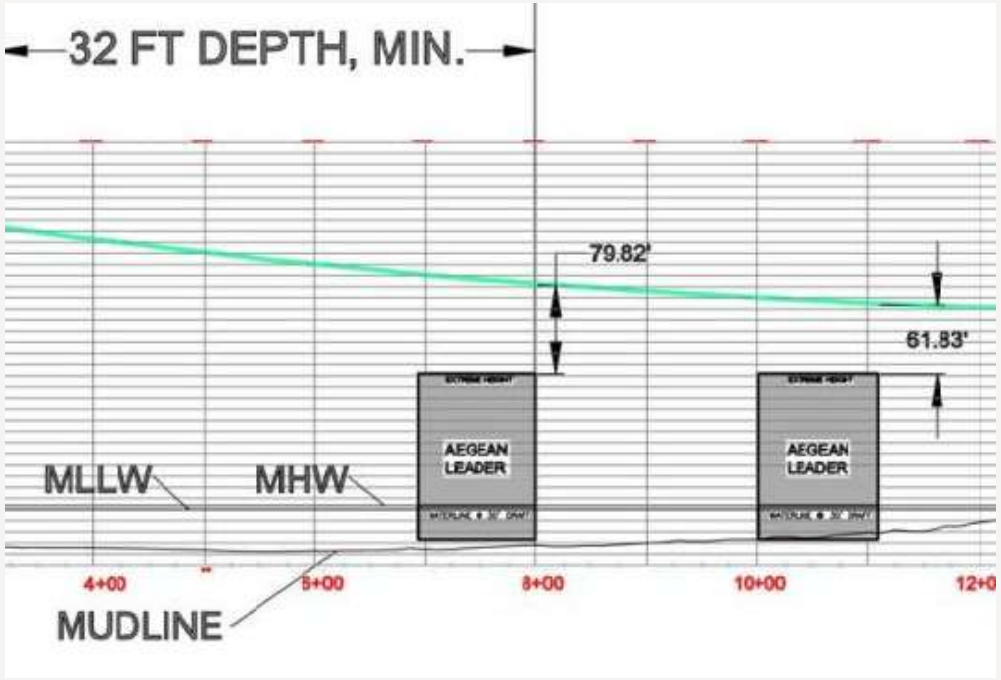
- We then superimposed the results of the LIDAR survey with a bathymetric survey completed 2 months prior.



Power Lines

- Using outlines of the gross dimensions of various RoRo vessels we placed the vessels in the cross section where they would be clear of the bottom and where they would have to be grounded for their entire beam (highly unlikely). Note that the authorized clearance is for the low point of the wires. Water depth there is ~3 feet at MLLW.





Power Lines

- We sent the results of the survey and our drawings showing the superposition of the vessel shapes to PG&E in February and asked them if they could, based on the survey being conducted over a 2-hr period on a specific day (they would know the current in the lines), at 57 degrees Fahrenheit, tell us what the profile would look like on a hot day with maximum current going through the lines.

- We followed up every week with phone calls and 2 weeks or so with emails.
- We received a telephone call from PG&E on July 13th asking if we could help them with a question.
- PG&E wanted to know if we knew why the navigation chart had lowered the clearance to 122 feet where we had been asking about the lines. COE and Bar Pilots were calling PG&E asking what happened.
- We had no idea.
- It turns out the clearance had been altered over the main ship channel, north of West Island, from the previous 140 feet "Authorized Clearance" to 122 feet "Safe Clearance."
- We called everybody we could think of on that Friday afternoon to let them know that if they were using our data from south of the island to make that change they shouldn't be.
- Turns out to all have been a mistake on the chart update but PG&E now finally had the right person involved and looked at the line profile question we had presented.
- They sent us an email on July 31 changing the clearance based on their own in-house LIDAR they had all along to a "Safe Clearance" of 132 feet above MHW.

Power Lines - PG&E Revised Clearance to 132 Feet

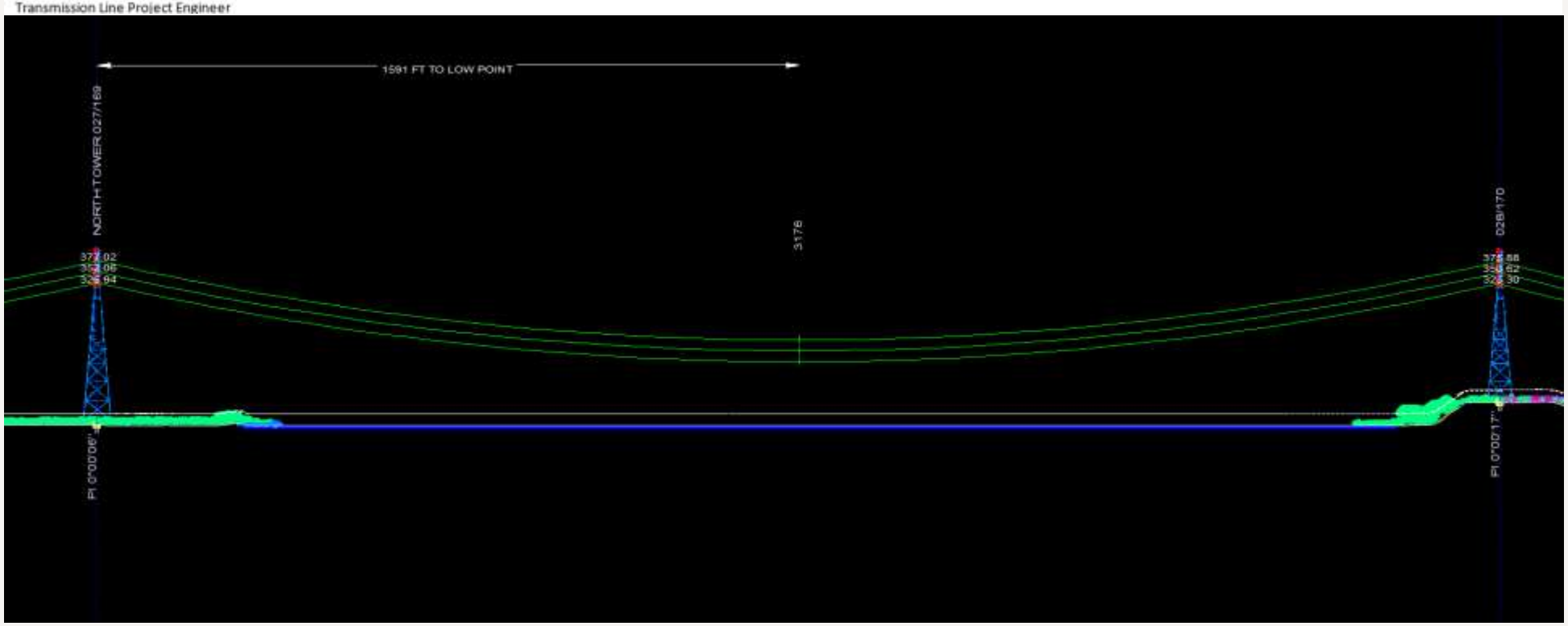
Jim,

For your reference see below a snapshot of the profile of our transmission lines over at Wilbur Avenue. The structure on the left is labeled as North Tower and is located on West Island, the right side is the tower in Antioch next to Wilbur Avenue.

Currently the NOAA navigation charts show an authorized safe clearance of 125 feet, our calculations show that this number is 132 feet. I will reach out to the appropriate party to inform them of the change.

Thanks and let me know if you have further questions.

Jun Yeung P.E.
Transmission Line Project Engineer



Power Lines - Vessel Air Drafts

	A	B	C	D	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Ship_Name	Main Vessel Type	Ship_Type	Called Benicia within Previous 2 Years	Dwt (MT)	Summer Displacement Tonnage (MT)	Summer Draft (m)	Summer Draft (ft)	LOA (m	LBP (m)	Parallel Mid Body Length (realtive to midship if possible) (m)	Beam (m)	Depth (m)	Keel to Masthead Height (m)	Keel to Masthead Height (ft)	air draft at 31 ft water draft	Stern Ramp Length (m)	Stern Ramp Width (m)	Stern Ramp Allowable Load (MT
17	Dionysos Leader	Roro	Vehicles Carrier	x	21438		10.33	**33.89**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
50	Pyxis Leader	Roro	Vehicles Carrier	x	21466		10.33	**33.88**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
52	Artemis Leader	Roro	Vehicles Carrier	x	21424		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
53	Cetus Leader	Roro	Vehicles Carrier	x	21447		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
74	Dorado Leader	Roro	Vehicles Carrier	x	21420		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
80	Lyra Leader	Roro	Vehicles Carrier	x	21453		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
81	Rhea Leader	Roro	Vehicles Carrier	x	21428		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	141.528	35.00	8.00	80.00
82	Don Quijote	Roro	Vehicles Carrier	x	28142	34064	11.00	**36.09**	227.89999	219.3		32.292	32.28	52.03	170.6584	139.6584			
83	Andromeda Leader	Roro	Vehicles Carrier	x	21443		10.32	**33.87**	199.94	190		32.26	34.8	52.6	172.528	139.528	35.00	8.00	80.00
85	Dione Leader	Roro	Vehicles Carrier	x	16400		9.70	**31.82**	199.95			32.26	34.41	50.47	165.5416	134.5416	35.00	8.00	80.00
86	Eridanus Leader	Roro	Vehicles Carrier	x	18056		9.63	**31.58**	199.99001	192		32.26	35.8	50.4	165.312	134.312	35.00	8.00	150.00
87	Harmony Leader	Roro	Vehicles Carrier	x	20434		10.00	**32.81**	199.95	191		32.26	35	50.2	164.656	133.656	37.50	7.00	150.00
91	Horizon Leader	Roro	Vehicles Carrier	x	20434		10.00	**32.81**	199.95	191		32.26	35	50.2	164.656	133.656	37.50	7.00	150.00
93	Demeter Leader	Roro	Vehicles Carrier	x	20019		10.02	**32.86**	199.94	190		32.26	34.8	49.24	161.5072	130.5072	35.00	8.00	80.00
107	Triton Leader	Roro	Vehicles Carrier	x	22657		10.02	**32.86**	199.94	190		32.26	34.8	48.83	160.1624	129.1624	35.00	8.00	100.00
108	Kaijin	Roro	Vehicles Carrier	x	17183	23620	9.02	**29.59**	195.53999	185		28.8	12.04	48.49	159.0472	128.0472	35.40	6.00	50.00
110	Don Quijote (Mast Folded)	Roro	Vehicles Carrier	x	28142	34064	11.00	**36.09**	227.89999	219.3		32.292	32.28	47.92	157.1776	126.1776			
116	Cygnus Leader	Roro	Vehicles Carrier	x	20180		10.00	**32.81**	199.94	190		32.26	34.8	47.21	154.8488	123.8488	35.00	8.00	80.00
117	Pluto Leader	Roro	Vehicles Carrier	x	14342		9.33	**30.60**	190.03	182		28.2	29.43	46.4	152.192	121.192	35.00	8.00	80.00
118	Prometheus Leader	Roro	Vehicles Carrier	x	14382		9.33	**30.60**	190.03	182		28.2	29.43	46.4	152.192	121.192	35.00	8.00	80.00
133	Orion Leader	Roro	Vehicles Carrier	x	21526	38874	10.07	**33.02**	199.94	190		32.3	34.52	45.7	149.896	118.896	40.00	8.00	150.00
141	Antares Leader	Roro	Vehicles Carrier	x	18646		9.73	**31.91**	199.99001	192		32.26	34.52	45.59	149.5352	118.5352	32.00	7.00	100.00
143	Auriga Leader	Roro	Vehicles Carrier	x	18686		9.73	**31.91**	199.99001	192		32.26	34.52	45.59	149.5352	118.5352	32.00	7.00	100.00
153	Altair Leader	Roro	Vehicles Carrier	x	18688		9.70	**31.82**	199.99001	192		32.26	34.52	45.59	149.5352	118.5352	32.00	7.00	50.00
172	Century Leader No. 3	Roro	Vehicles Carrier	x	14155	25986	8.82	**28.94**	178.5	170.01		32.21	20.63	45.528	149.33184	118.33184	29.00	6.00	16.00
174	Jinsei Maru	Roro	Vehicles Carrier	x	17435		9.67	**31.74**	198.60001	188		32.2	14.3	45.41	148.9448	117.9448	31.00	7.04	200.00
175	Leo Leader	Roro	Vehicles Carrier	x	22733		10.02	**32.87**	199.89999	190		32.26	34.55	45.35	148.748	117.748	40.00	8.00	150.00
176	Aegean Leader	Roro	Vehicles Carrier	x	13157	26081	9.00	**29.53**	180	170		32.2	14.29	45.2	148.256	117.256	28.00	6.00	50.00
177	Ryujin	Roro	Vehicles Carrier	x	14080		8.82	**28.93**	180	170		32.2	12.35	45.17	148.1576	117.1576	29.00	5.50	50.00
181	Heijin	Roro	Vehicles Carrier	x	14366	25400	8.82	**28.93**	180	170		32.23	12.35	45	147.6	116.6	29.00	5.50	30.00
183	Centaurus Leader	Roro	Vehicles Carrier	x	21471		10.32	**33.87**	199.94	190		32.26	34.8	44.98	147.5344	116.5344	35.00	8.00	80.00
185	New Nada	Roro	Vehicles Carrier	x	14274	25400	8.80	**28.87**	180	170		32.2	12.35	44.94	147.4032	116.4032	29.00	5.50	30.00
203	Guardian Leader	Roro	Vehicles Carrier	x	21182		10.00	**32.81**	199.89999	187.9		32.26	32.64	44.8	146.944	115.944	38.00	7.00	150.00
204	Jupiter Leader	Roro	Vehicles Carrier	x	12889		8.72	**28.62**	183	170.4		30.2	28.8	44.44	145.7632	114.7632	31.30	9.00	100.00

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Questions?