Marine Oil Terminals at POLA

IMPLEMENTING MOTEMS ON EXISTING & NEW OIL TERMINALS AT THE PORT OF LOS ANGELES

Prevention First 2008

September 10, 2008

Long Beach, CA

THE PORT OF LOS ANGELES

Angel Lim, S.E. & John Posadas, P.E.

IMPLEMENTING MOTEMS ON EXISTING & NEW OIL TERMINALS AT THE PORT OF LOS ANGELES

Part 1: Existing Marine Oil Terminals

Part II: New Marine Oil Terminal

THE PORT OF LOS ANGELES

PART I: EXISTING MARINE OIL TERMINALS

MOTEMS-Marine Oil Terminal Engineering and Maintenance Standards

a) MOTEMS attempts to "…prevent oil spills and to protect public health, safety, and the environment…"

b) 2001 California Building Code Chapter 31F (MOTEMS)

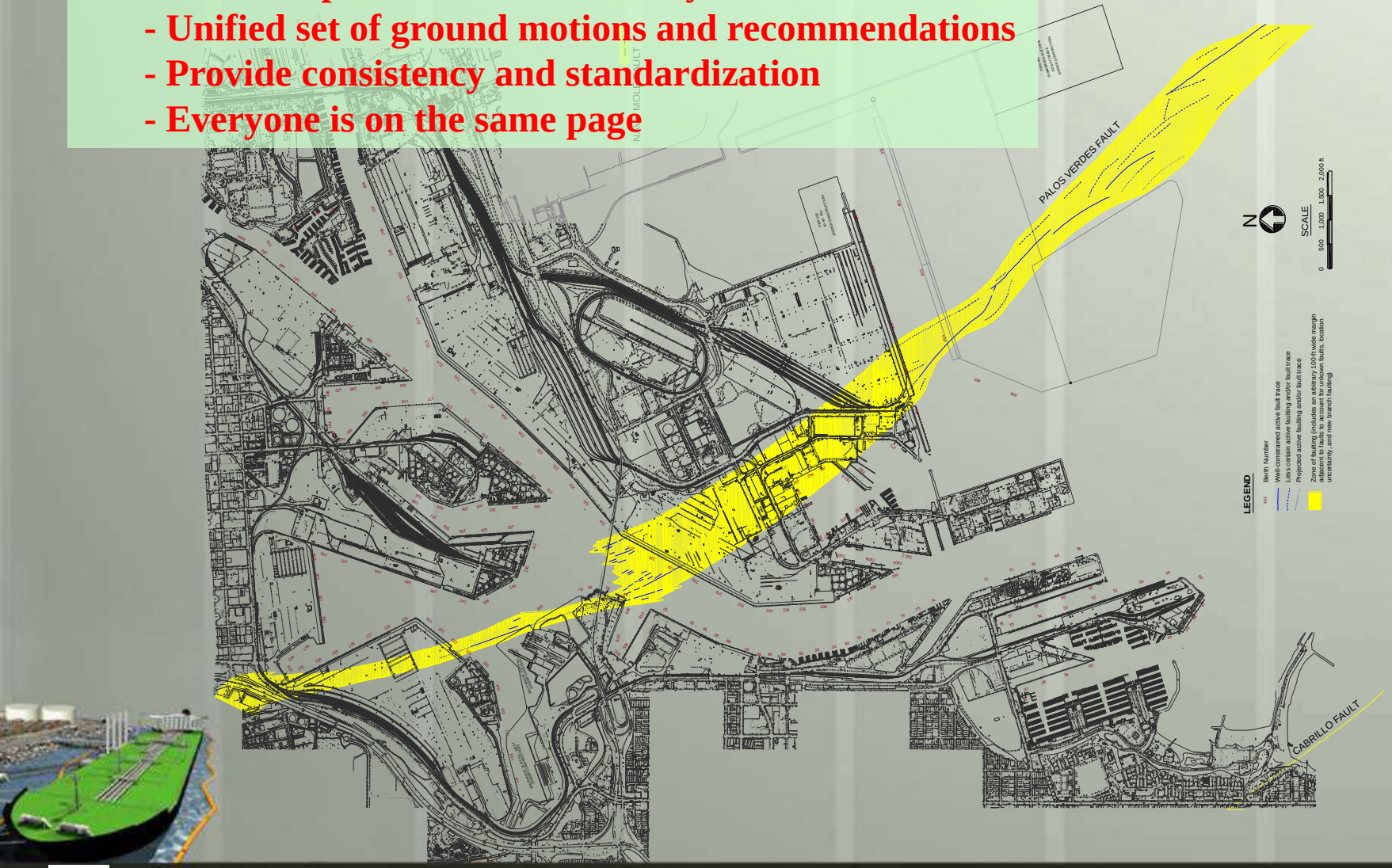
c) Effective February 6, 2006

MOTEMS CHAPTER 31 F

• Structural Loading Criteria	POLA 70%; Tenant 30%
• Seismic Analysis & Structural Performance	POLA 80%; Tenant 20%
• Mooring and Berthing Analysis and Design	POLA 80%; Tenant 20%
• Geotechnical Hazards	POLA 80%; Tenant 20%
• Structural Analysis & Design of Components	POLA 80%; Tenant 20%
• Audit & Inspection	POLA 50%; Tenant 50%
• Fire Protection Detection and Suppression	Tenant 85%; POLA 15%
• Piping and Pipelines	Tenant 85%; POLA 15%
• Mechanical and Electrical Equipment	Tenant 85%; POLA 15%
• Electrical Systems	Tenant 85%; POLA 15%

PORT OF LOS ANGELES
GROUND MOTION STUDY

- **What is important about the study?**
  - **Unified set of ground motions and recommendations**
  - **Provide consistency and standardization**
  - **Everyone is on the same page**



PART I: EXISTING MARINE OIL TERMINALS

POLA
MARINE OIL TERMINALS

1	Berths 70-71, Moderate Risk	- Earnie	→	URS
2	Berths 118-120, Moderate Risk	- Edwin	→	DMJM + Harris
3	Berths 148-151, High Risk	- John	→	PBS&J / Moffatt & Nichol
4	Berth 163, Moderate Risk	- Hugo	→	Halcrow Inc. / BCG
5	Berth 164, Moderate Risk	- Lily	→	Halcrow Inc. / BCG
6	Berths 167-169, Moderate Risk	- Ron	→	DMJM + Harris
7	Berths 187-191, Moderate Risk	- Chuong	→	PBS&J / Moffatt & Nichol
8	Berths 238-240C, High Risk	- Angel	→	Halcrow Inc. / BCG
9	Berth 74, Low Risk	- Chinh	→	TBD
10	Berths 408-409, High Risk	- John	→	PBS&J / Moffatt & Nichol

Peer review BCG

THE PORT OF LOS ANGELES

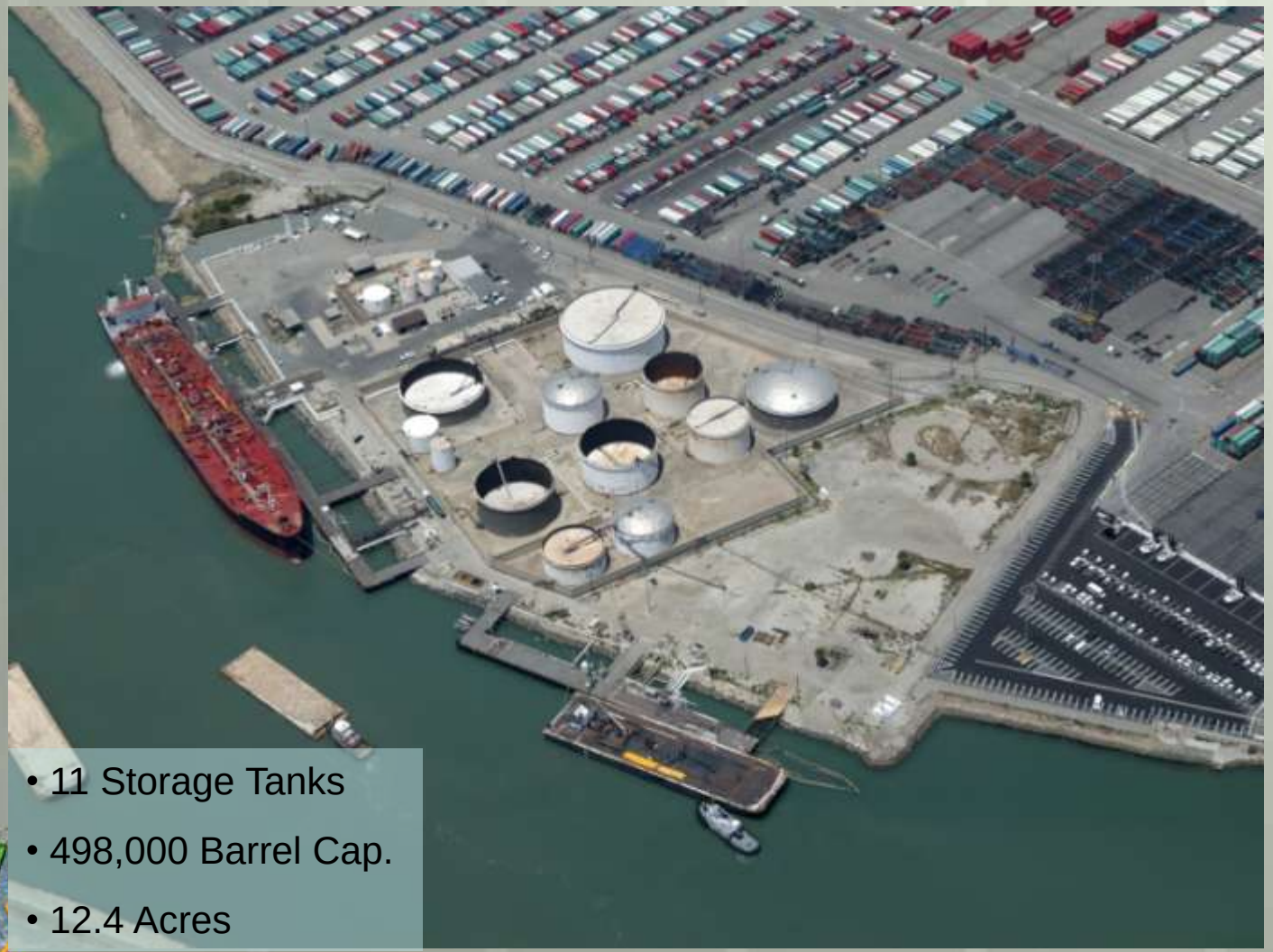
BERTHS 118-120

- Built 1959
- 825 ft 2 Berths
- Timber Deck
- Timber Piles
- 13.0 ft Height
- 35.0 ft Water Depth

Moderate Risk

Initial Audit Due 2/6/2009

BERTHS 118-120



- 11 Storage Tanks
- 498,000 Barrel Cap.
- 12.4 Acres

BERTHS 148-151

- Built 1955
- 2-1328 ft Berths
- Concrete Deck
- 18” Concrete Piles
- 15.2 ft Height
- 35.0 ft Water Depth

- 26 Storage Tanks
- 825,000 Barrel Cap.
- 13.5 Acres

High Risk

Initial Audit Due
8/6/2008

BERTHS 148-151

- 26 Storage Tanks
- 825,000 Barrel Cap.
- 13.5 Acres

BERTHS 163 & 164

Berth 163

- Built 1959
- 888 ft Berth
- Timber Deck
- Timber Piles
- 13.0 ft Height
- 40.0 ft Water Depth

Berth 164

- Built 1923
- 888 ft Berth
- Timber Deck
- Timber Piles
- 13.0 ft Height
- 35.0 ft Water Depth

Moderate Risk

Initial Audit Due 2/6/2009

BERTHS 163 & 164

Berth 163	Berth 164
• 19 Storage Tanks	• 17 Storage Tanks
• 599,000 Barrel Cap.	• 947,000 Barrel Cap.
• 5.8 Acres	•10.5 Acres

BERTHS 187 - 191

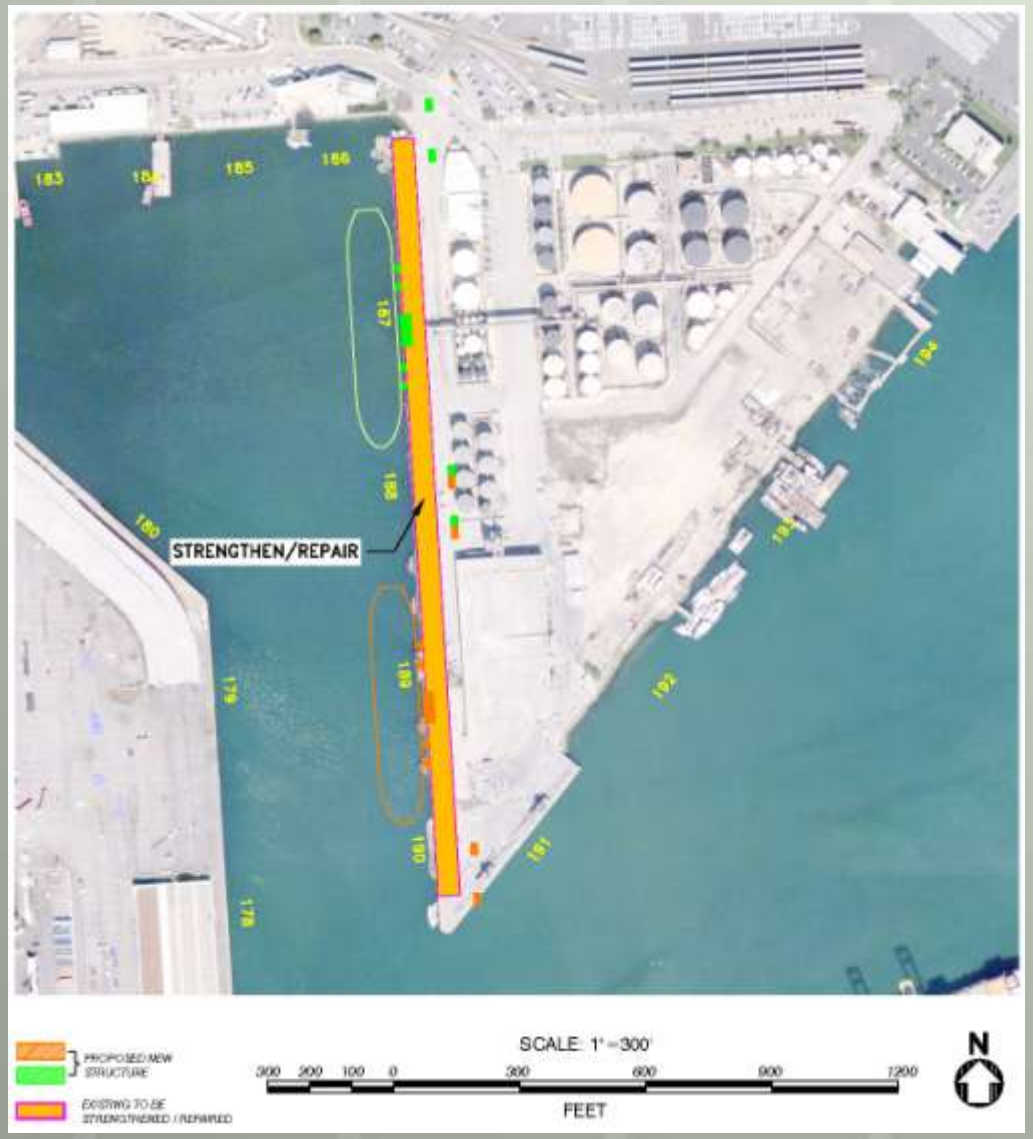
Berths 187-191

- 2,336 ft Total Length
- 15.0 ft Height
- 38.0 ft Water Depth

- B187 Built 1920
- Concrete Deck & Piles

- B188 Built 1921
- Concrete Deck & Piles

- B189-191 Built 1922
- Timber Deck & Piles



Moderate Risk

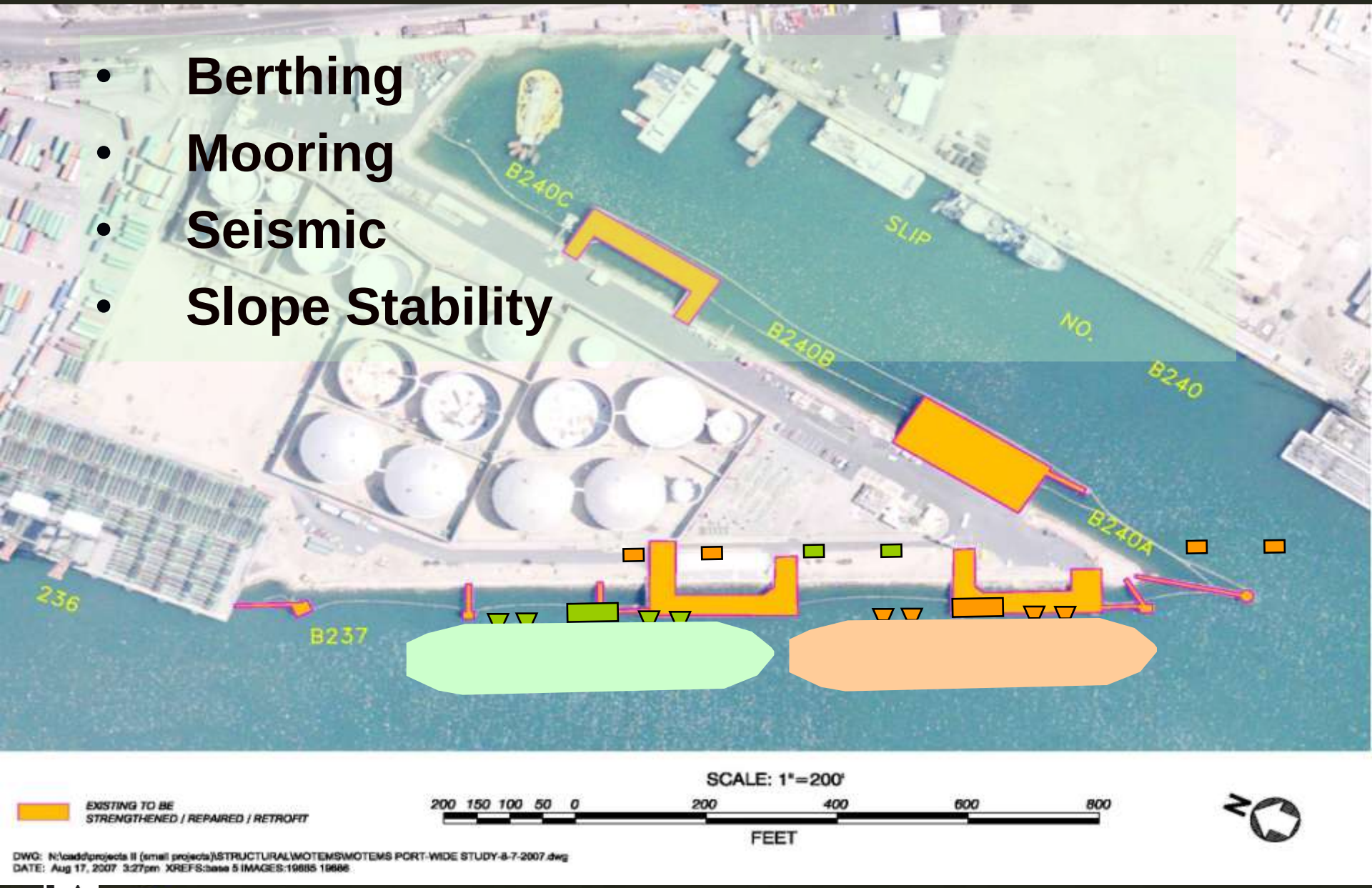
Initial Audit Due 2/6/2009

BERTHS 187 - 191

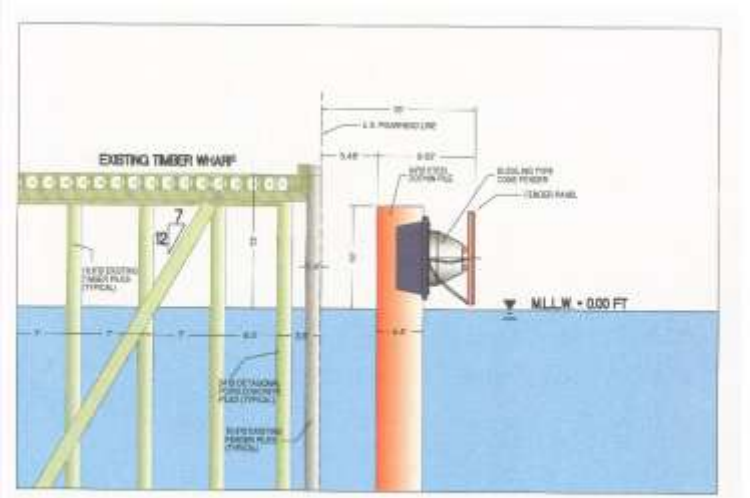
- 60 Storage Tanks at 700,000 Barrels Cap.
- 22 Storage Tanks 1,700,000 Barrels Cap. (inland)

MOTEMS Plan

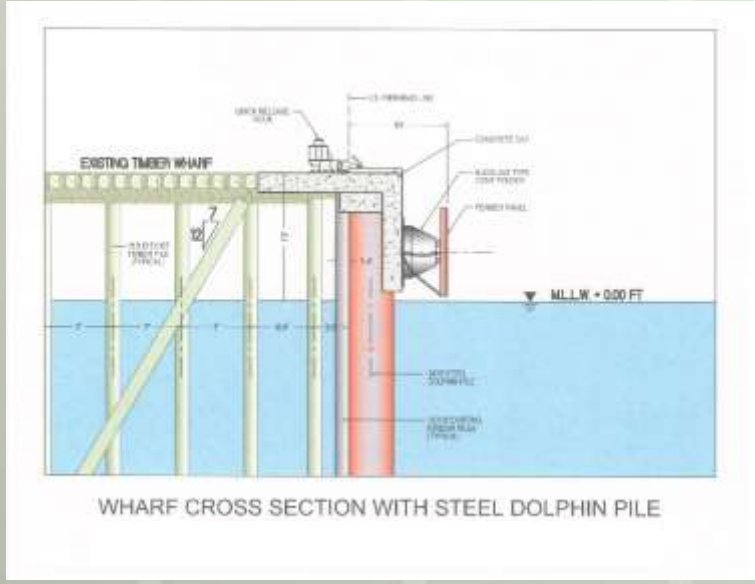
- Berthing
- Mooring
- Seismic
- Slope Stability



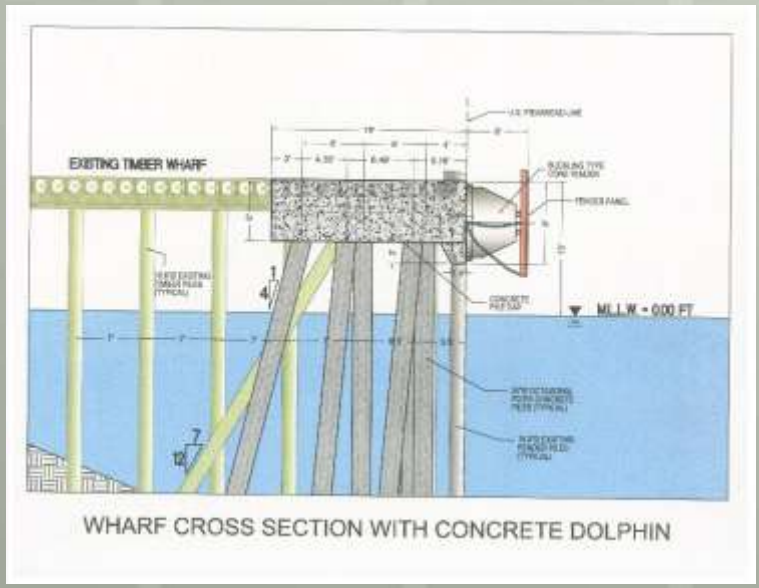
BERTHING STRUCTURE



WHARF CROSS SECTION WITH 54" STEEL PILE DOLPHIN



WHARF CROSS SECTION WITH STEEL DOLPHIN PILE

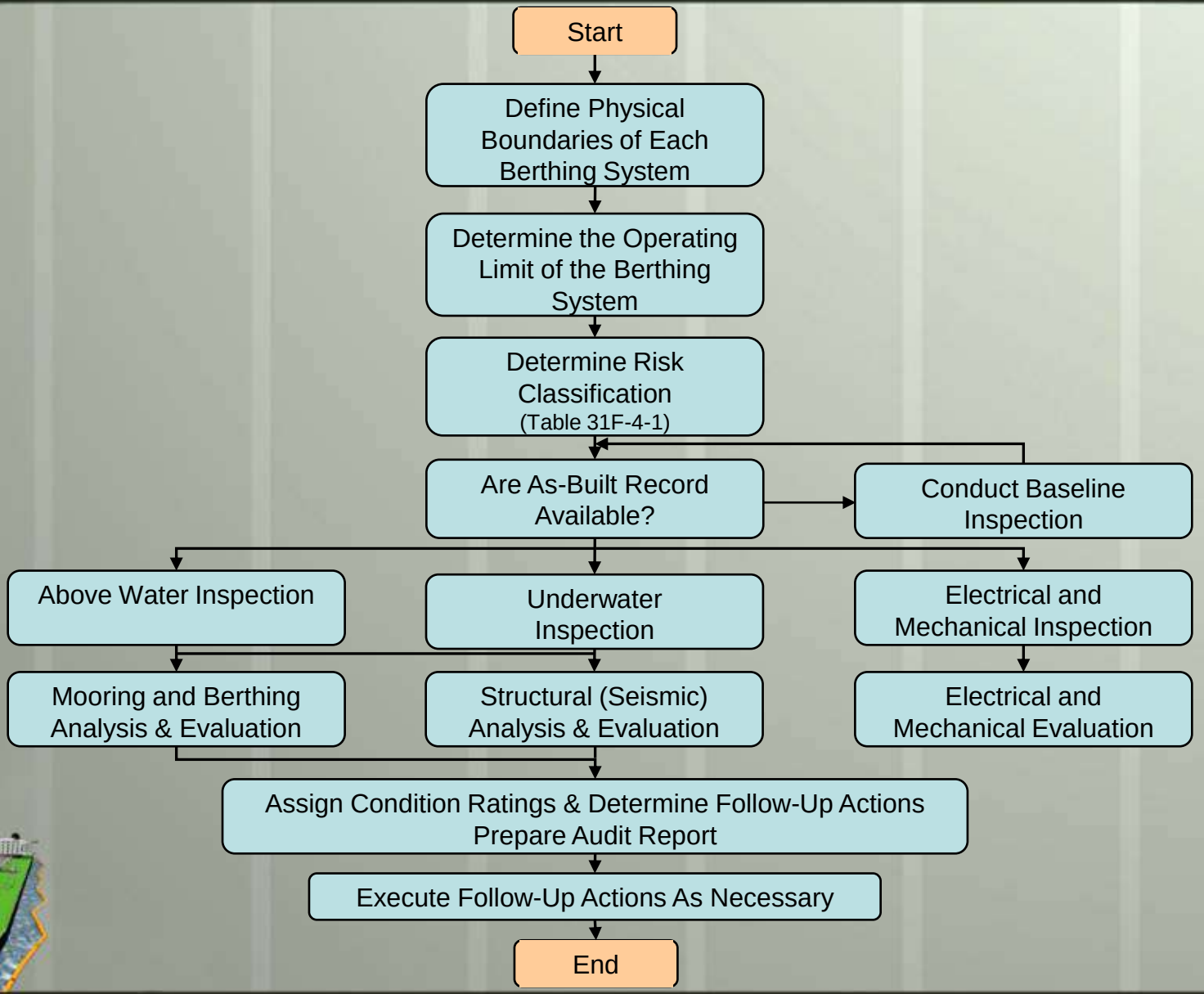


WHARF CROSS SECTION WITH CONCRETE DOLPHIN

MOTEMS Outline

	Months
• Initial Audit & Inspection	6 to 10
• Conceptual Plans	2 to 4
• Plans, Specifications & Estimates (PS&E)	6 to 18
• Bid & Award	5
• Construction NTP	12 to 24
• Future Maintenance Program	On Going

INITIAL AUDIT PROCEDURE



Stage 1 – Initial Assessment

Stage 2 – Audit

Stage 3 – Action

INITIAL AUDIT REPORT

- Executive Summary
- Introduction
- Existing Conditions
- Evaluation & Assessment
- Follow Up Actions
- Path Forward
- Appendices: Site Plan, Global Structural CAR, Component Deficiency RAP, Team Organizational Chart Deficiency Tables, CSLC Check Lists, and supporting attachments
- Along with: Mooring, Berthing, Seismic, Geotechnical Reports

- Chapter 3102 F.3.8
- Table 31F-2-5 (ES-1)
- Table 31F-2-6 (ES-2)
- Table 31F-2-7

CONCEPTUAL PLAN

- Interim Phase:
  Keep Tenant in Operations
  Accommodate vessel traffic with operating restrictions

- Final Phase:
  Improvements to existing terminal to bring it to MOTEMS compliance

- Items to think about:
  EIR / EIS Impacts
  Permiting Process
  Lease Negotiations
  Multiple Tenants at Site
  Future Improvements of Facility

PS&E

- Comply with MOTEMS
- Prepare Plans, Specifications, and Estimates:
  - New Mooring and Berthing Structures
  - Independent Structural Systems
  - Slope Stability
  - MEP components compatible with Structural System Displacements

FUTURE MAINTENANCE PROGRAM

- On-Going Process
- Data Management System
- GIS
- Coordinate with POLA Concrete Maintenance Program
- Coordinate with POLA Construction Maintenance Division

Part II
New Marine Oil Terminal
Structural Design of the Pier 400 Crude Oil Marine Terminal

STRUCTURAL DESIGN
PIER 400 MARINE OIL TERMINAL

STRUCTURAL DESIGN
PIER 400 MARINE OIL TERMINAL

- Unique Features
- Facility Description
- Engineering Design per MOTEMS
- Mooring & Berthing per MOTEMS
- Engineering Details
- Design Innovation

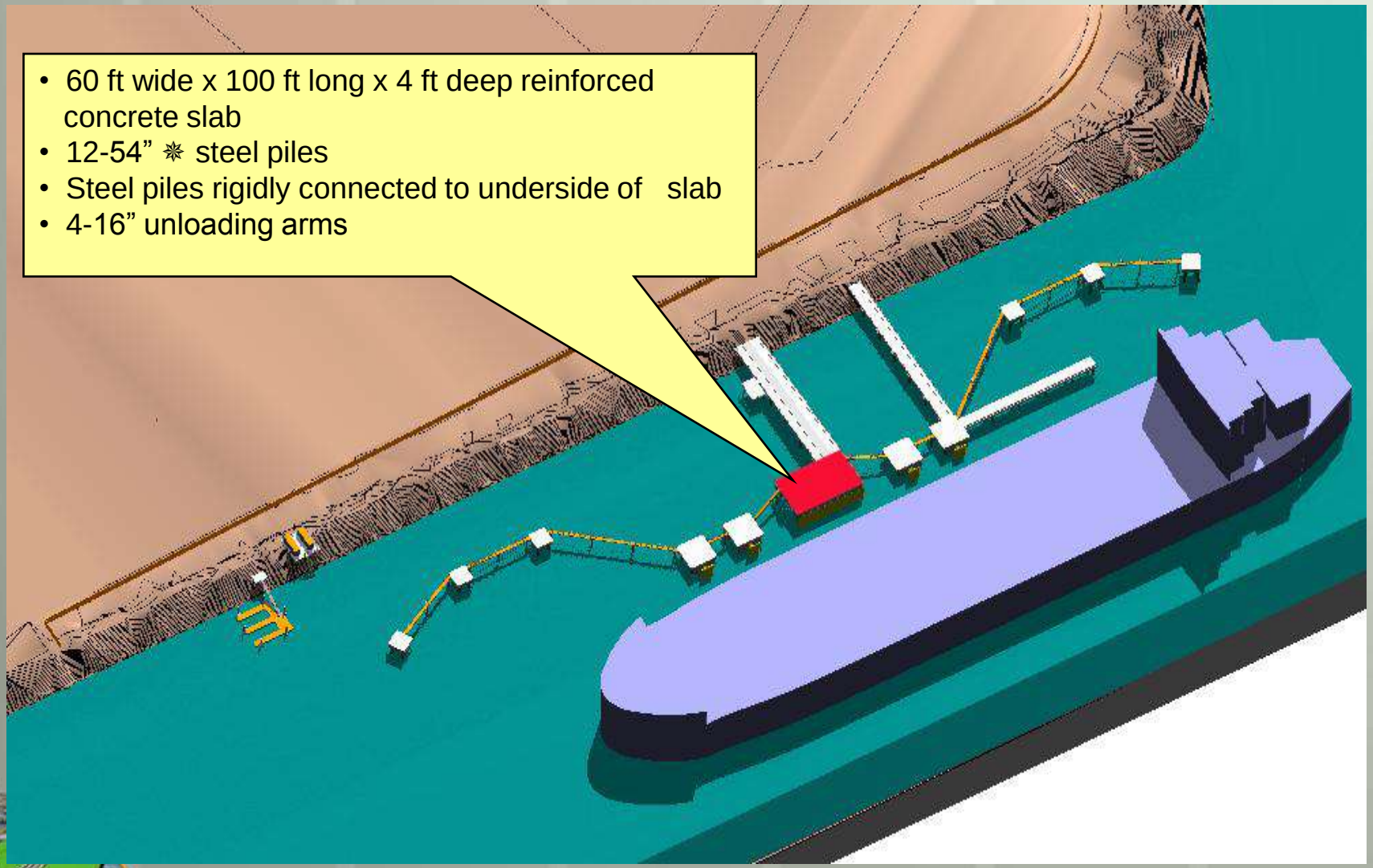
UNIQUE FEATURES

- 1st New Oil Terminal Designed to MOTEMS
- Designed to meet new MOTEMS & POLA Seismic Code
- 81 ft of water depth to accommodate VLCC's
- Material selection & modular construction
- New technology to mitigate spills
- Designed to ensure Green/Blue Initiatives

FIRST NEW OIL TERMINAL DESIGNED TO MOTEMS

- MOTEMS mandated by Lempert-Keene-Seastrand Oil Spill Prevention & Response Act of 1990
- California to comply with MOTEMS per 2001 CBC Chapter 31F
- MOTEMS attempts to "…prevent oil spills and to protect public health, safety, and the environment…"
- Uses Performance Based Design

STRUCTURAL COMPONENT
UNLOADING PLATFORM

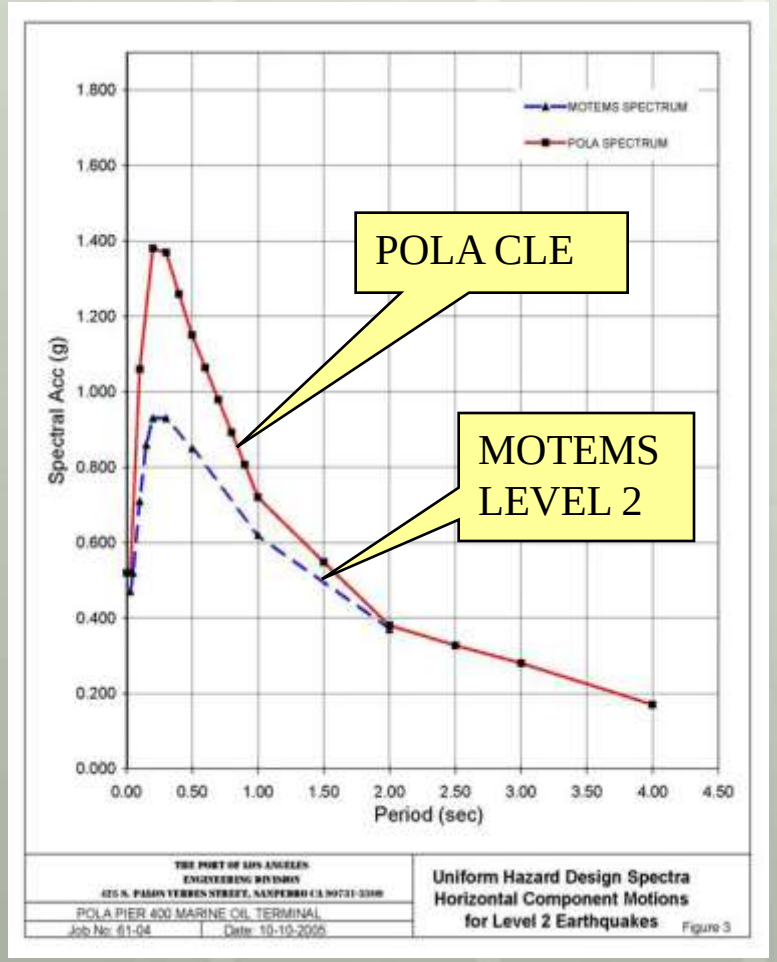


DESIGN TO MOTEMS

- MOTEMS Risk Classification
- Seismic Performance Criteria
- Minimum Required Analytical Procedure
- Structural Loading
- Design Optimization

DESIGN TO MOTEMS

- Design consistency at POLA
- Palos Verdes fault
- Site-specific design spectra and seven sets of orthogonal time history records
- POLA Port-wide Ground Motion Study produced site-specific OLE and CLE spectra



MOT RISK CLASSIFICATION

TABLE 31F-4-1 MOT RISK CLASSIFICATION			
Risk Classification	**Exposed Oil (bbls)**	**Transfers per Year per Berthing System**	**Maximum Vessel Size (DWTx1000)**
High	≥1200	N.A.	N.A.
Moderate	<1200	≥90	≥30
Low	<1200	<90	<30

Purpose is to establish minimum seismic analysis and structural performance.

Performance is evaluated at a two level criteria:

Level 1 and Level 2

MOTEMS risk classification (Table 31-F-4-1)

All new MOTS are classified as high risk.

1. Exposed oil ≥ 1200 bbls

MOTEMS SEISMIC PERFORMANCE CRITERIA

TABLE 31F-4-2
SEISMIC PERFORMANCE CRITERIA

Risk Classification	Seismic Performance Level	Probability of Exceedance	Return Period
High	Level 1	50% in 50 years	72 years
	Level 2	10% in 50 years	475 years
Moderate	Level 1	65% in 50 years	48 years
	Level 2	15% in 50 years	308 years
Low	Level 1	75% in 50 years	36 years
	Level 2	20% in 50 years	224 years

Design Earthquake Motions:

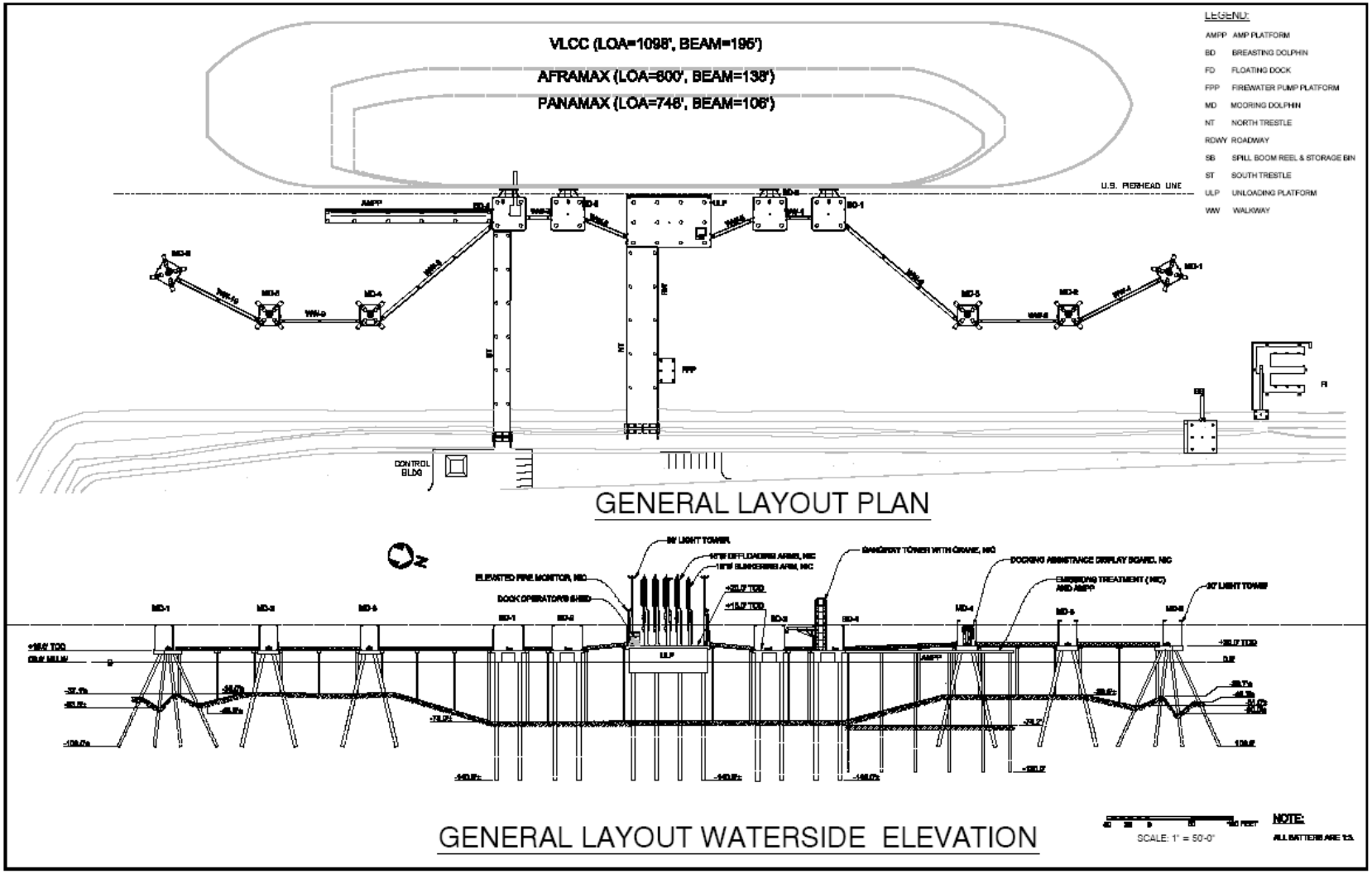
Level 1

- Minor or no structural damage
- Temporary or no interruption in operations

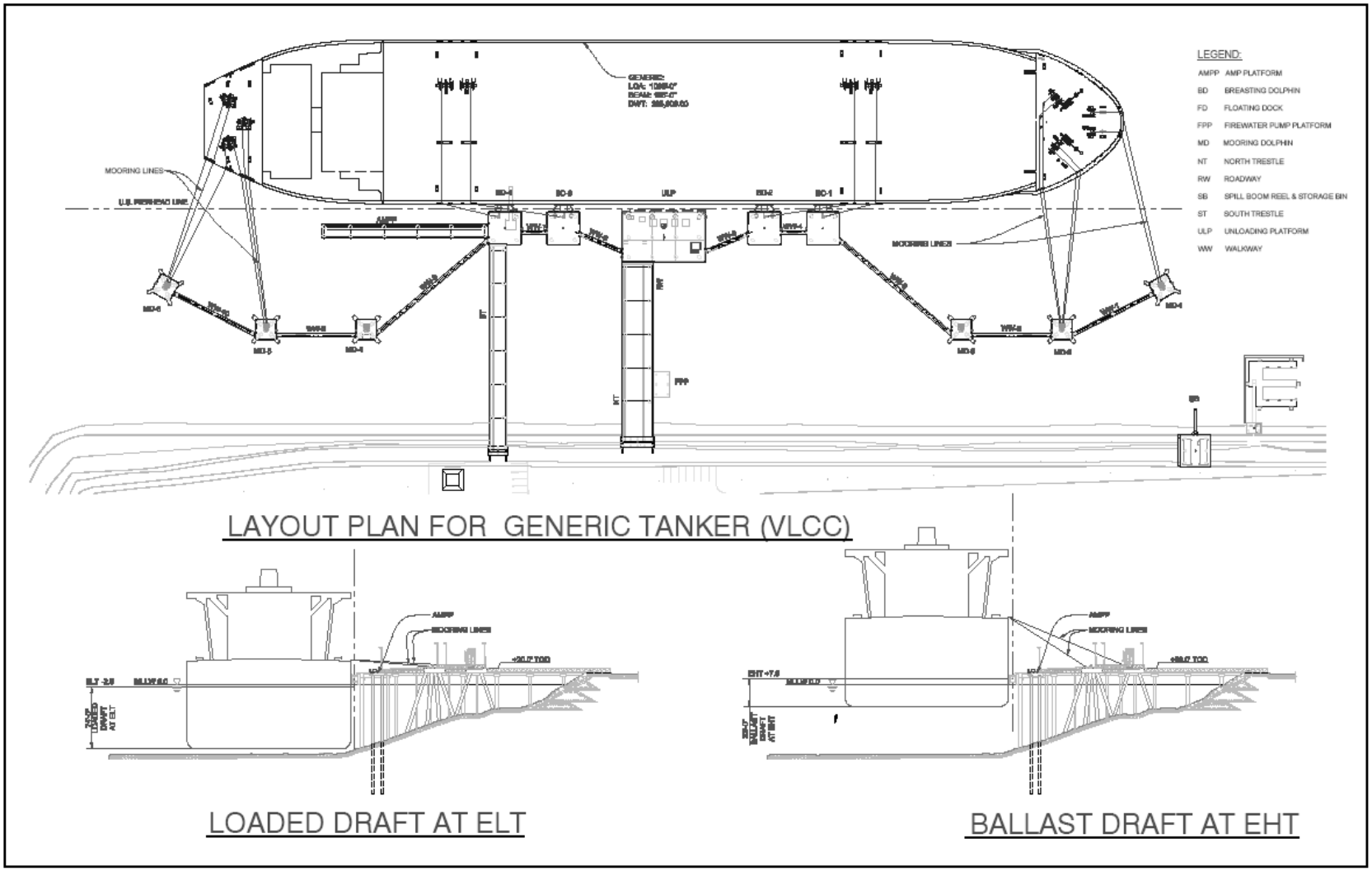
Level 2

- Controlled inelastic structural behavior with repairable damage
- Prevention of structural collapse
- Temporary loss of operations, restorable within months
- Prevention of major spill (≥ 1200 bbls)

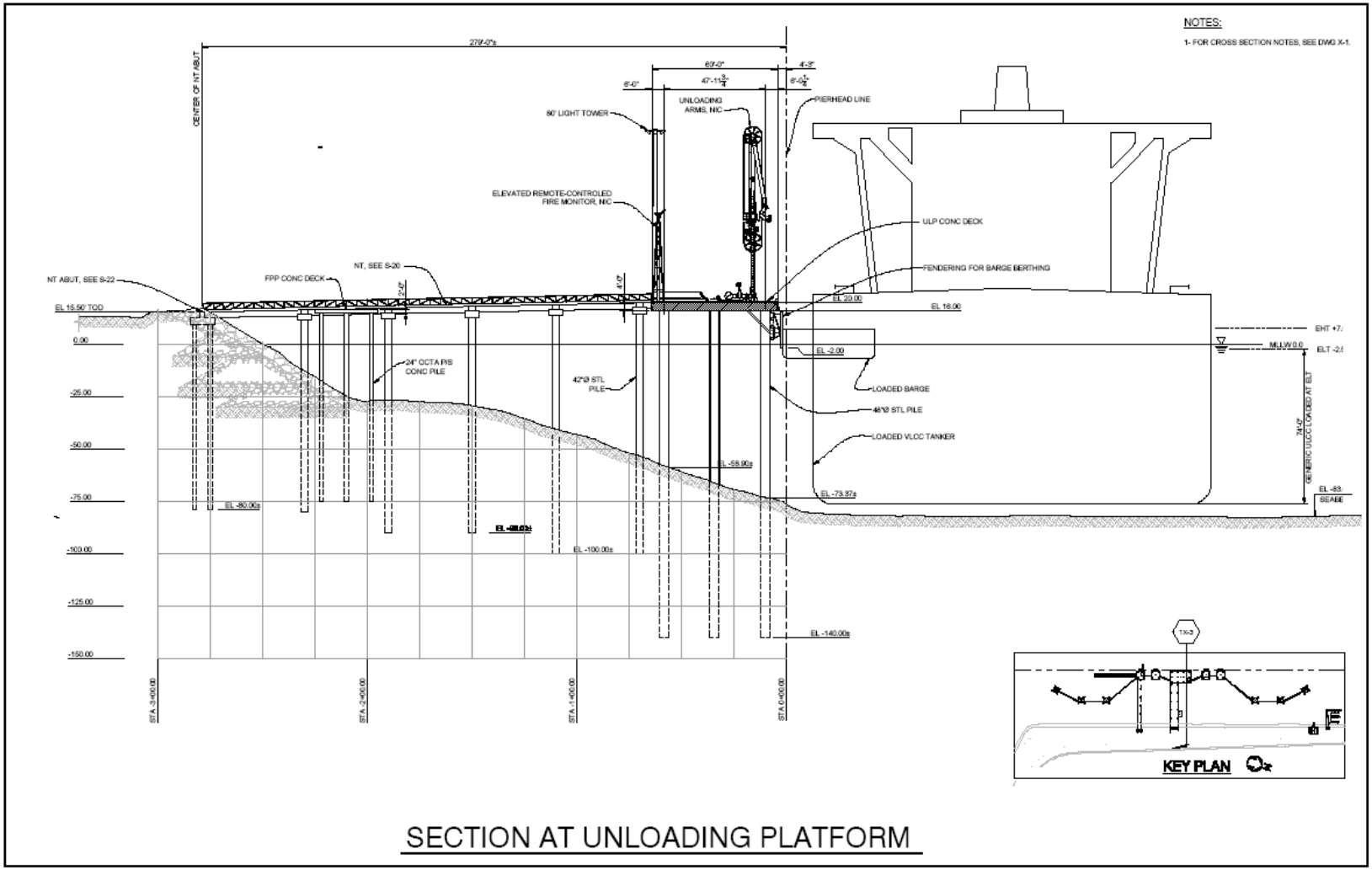
GENERAL PLAN & ELEVATION



MOORING LAYOUT FOR VLCC

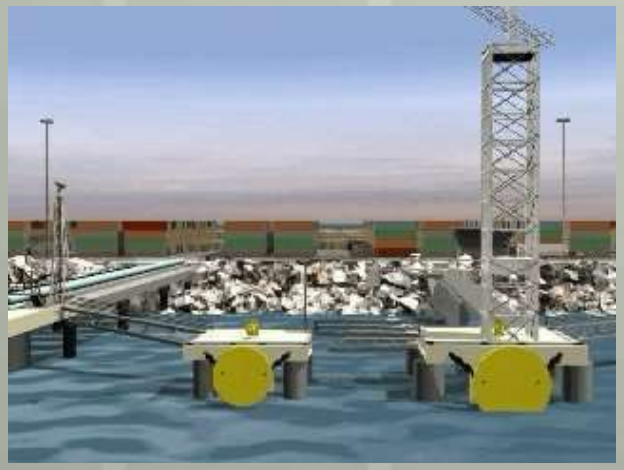


SECTION AT UNLOADING PLATFORM



SECTION AT UNLOADING PLATFORM

PROJECT VIEWS



IMPLEMENTING MOTEMS AT THE PORT OF LOS ANGELES

Questions?

Thank You!

lima@portla.org *jposadas@portla.org*