

# Engineering & Operations

## Item #6b

**Subject:** Update on Metropolitan's Seismic Assessment Program

**Purpose:** To provide an update on the Seismic Assessment Program and Union Station Headquarters Building Assessment.

## Engineering & Operations

Item #6b

Summary:

The seismic program is an on going program that evaluates all of MWD's facilities to insure they will provide life safety and continue to operate and deliver water after a major earthquake. The program includes MWD's reservoirs, structures and buildings.



# Update on Seismic Assessment & Upgrade Program

Engineering & Operations Committee  
March 11, 2013

# Seismic Program

## Goals:

- Provide continuous water deliveries following a major earthquake
- Minimize Damage to Facilities
- Protect Occupants

## Drivers:

- Improved knowledge of earthquake probability and seismic forces
- More stringent building codes
- Updated site-specific geotechnical information

# Origin of the Seismic Program

Jensen Plant Construction -1971



Over \$3 million Damage  
from Sylmar Earthquake

# Examples of Changes to Peak Ground Accelerations Over Time at Weymouth

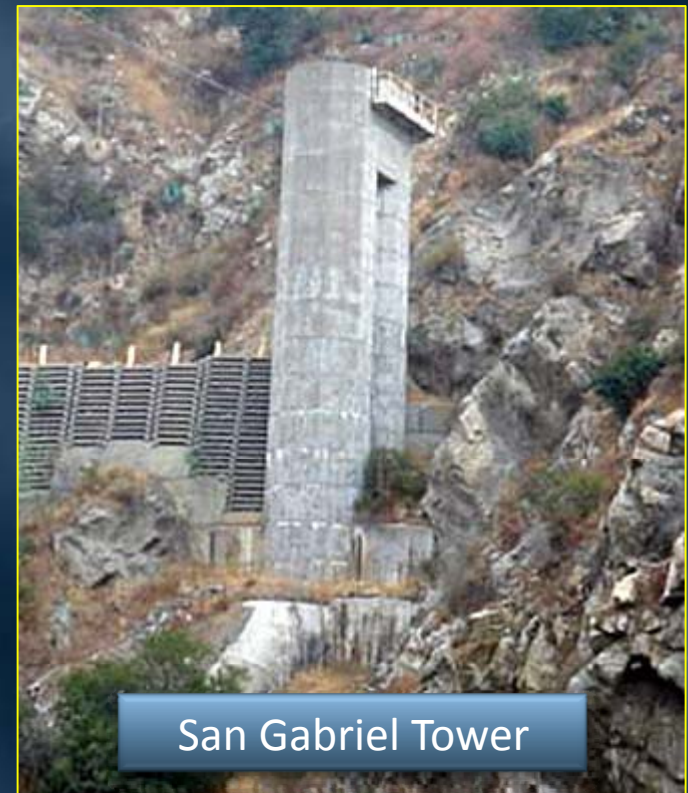
Year	Design Peak Ground Acceleration (PGA)
1933	0.1g
UBC 1988	0.4g
UBC 1994	0.4g
UBC 1997	0.52g
IBC 2009	0.71g

# Seismic Program Components

- Buildings & Structures
- Dams & Reservoirs
- Geotechnical Hazards

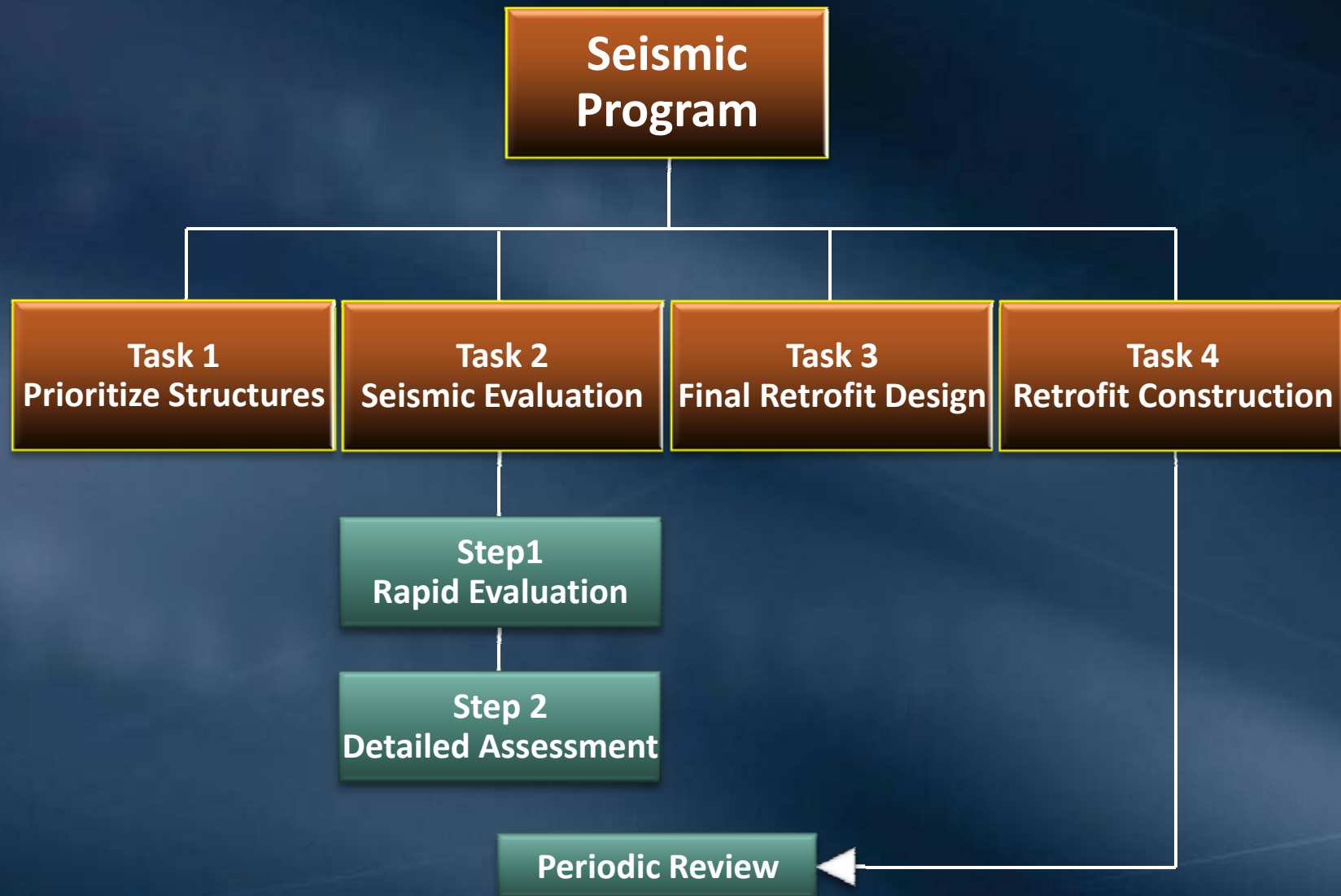


Palos Verdes Reservoir



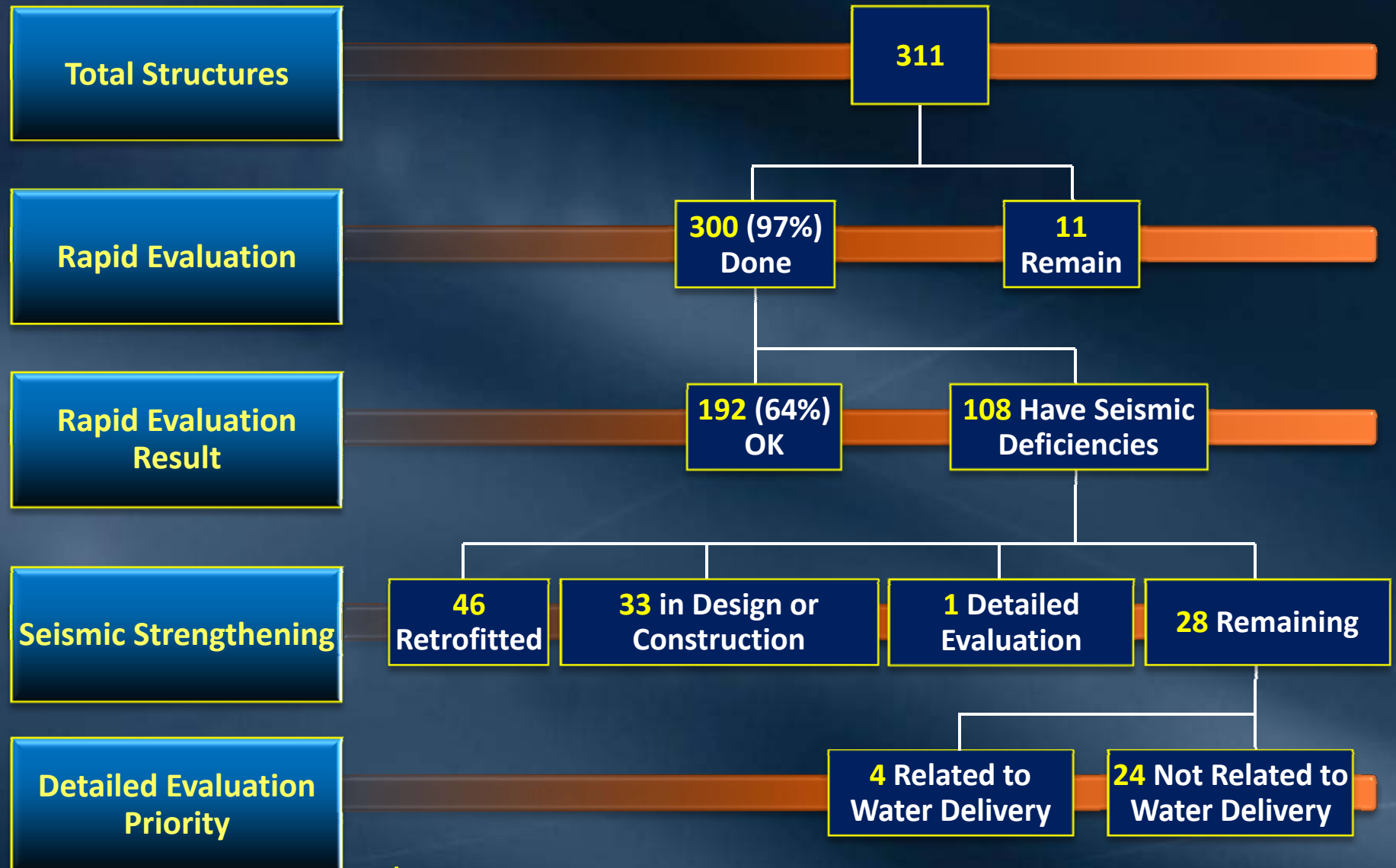
San Gabriel Tower

# Program Methodology for Structures





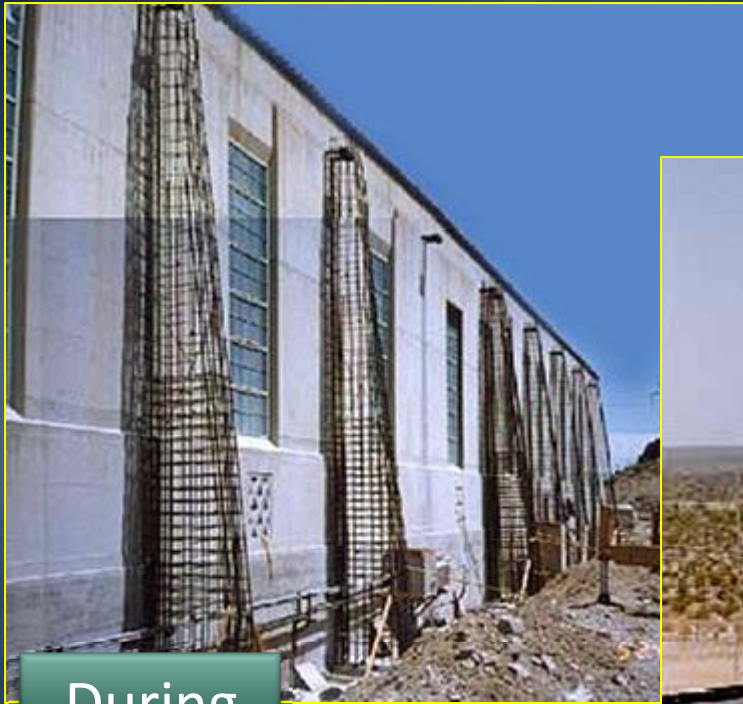
# Status of Seismic Upgrades



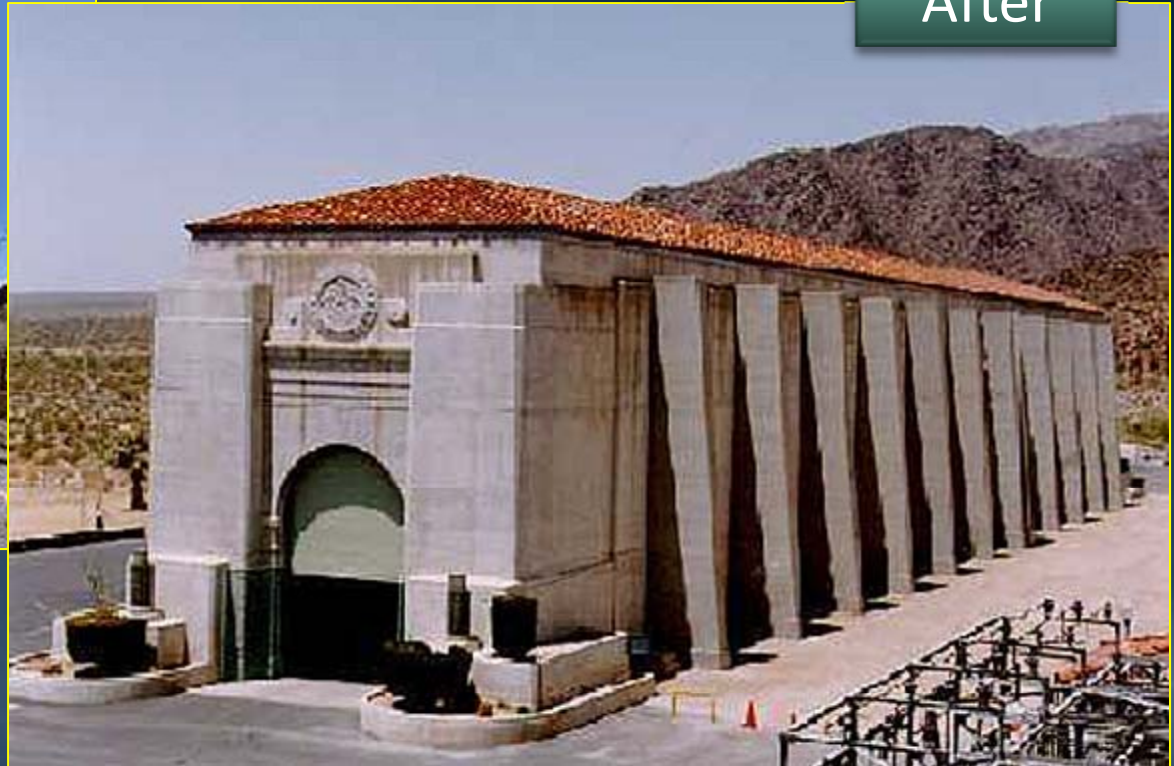
**\$210 Million Expended to Date**

# Hinds Pumping Plant - 1996

## Hinds Pumping Plant



During



After

# Slope Stabilized by Roller Compacted Concrete

Roller Compacted Concrete Buttress



RCC Buttress



Diemer South Slope Stabilization

# Analytical Tools

- Structural Analysis
- Soil Analysis
- Hydraulic Analysis
- Surveying
- CAD



# Santa Ana Bridge

- Seismic Issues

- Base isolators to be replaced
- Existing piers need to be reinforced
- Existing truss to be evaluated

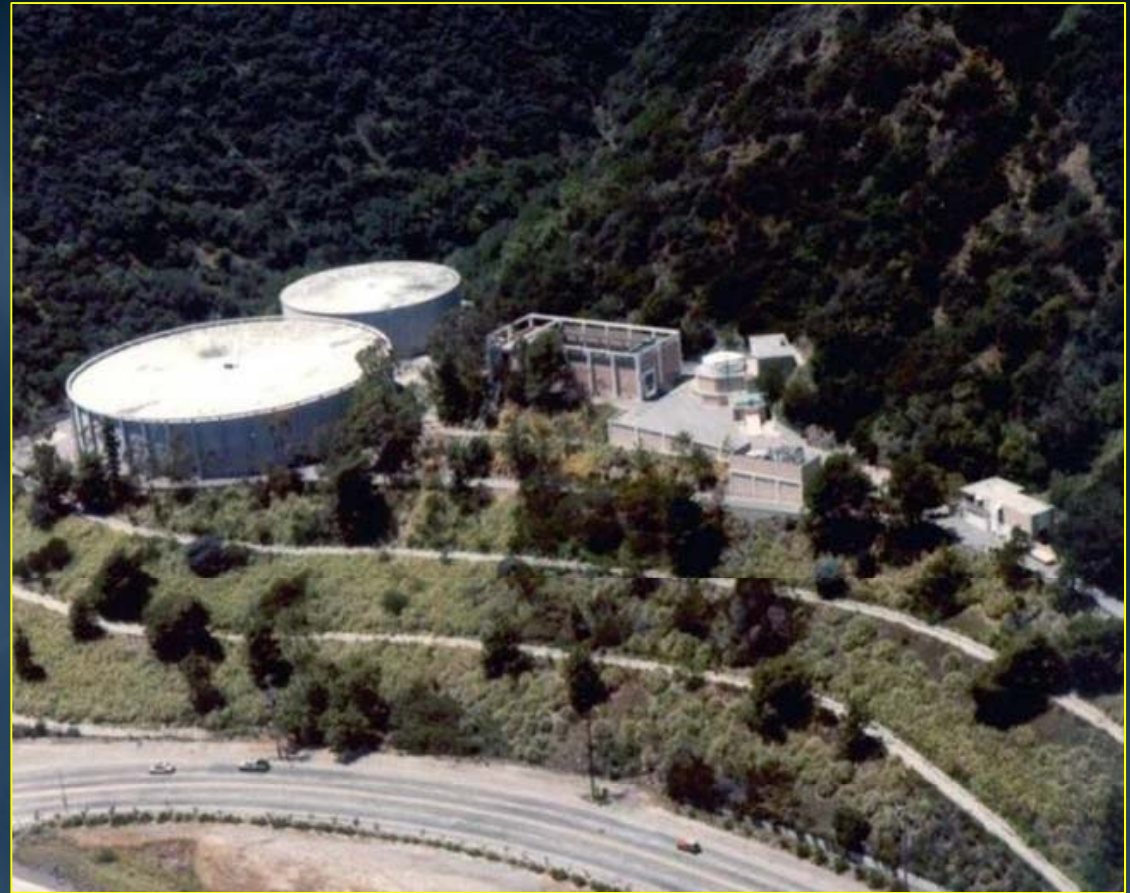


- Board Action Item 7-5

- Procurement of base isolators

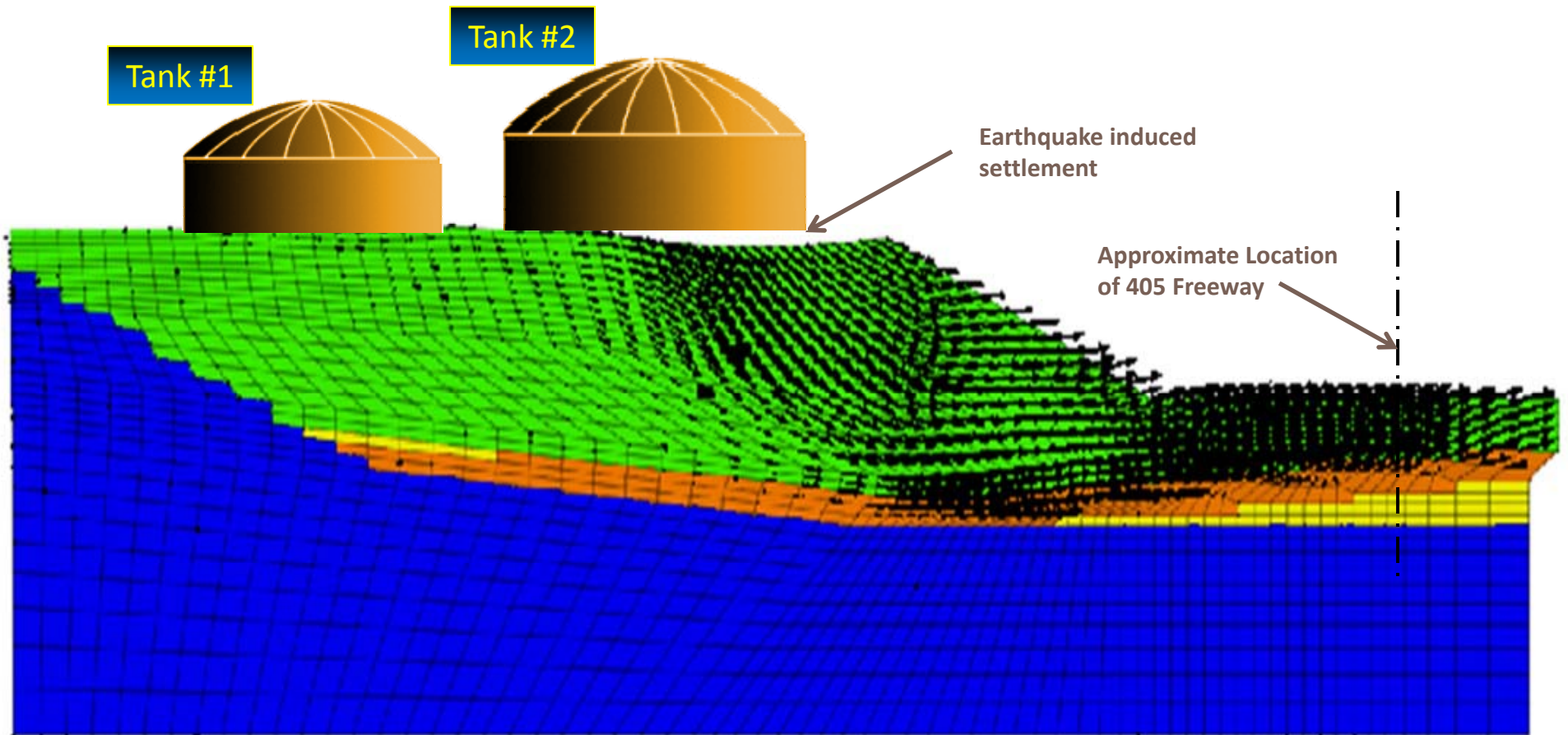
# Sepulveda Canyon Control Facility

- Seismic Issues
  - Potential settlement under east tank
  - Potential settlement under hydroelectric plant
  - Strengthening of structures required
- Current Action Item 7-1
  - Geotechnical assessment and modeling of slope



# 3D Geotechnical Analysis

Sepulveda Canyon Control Facility

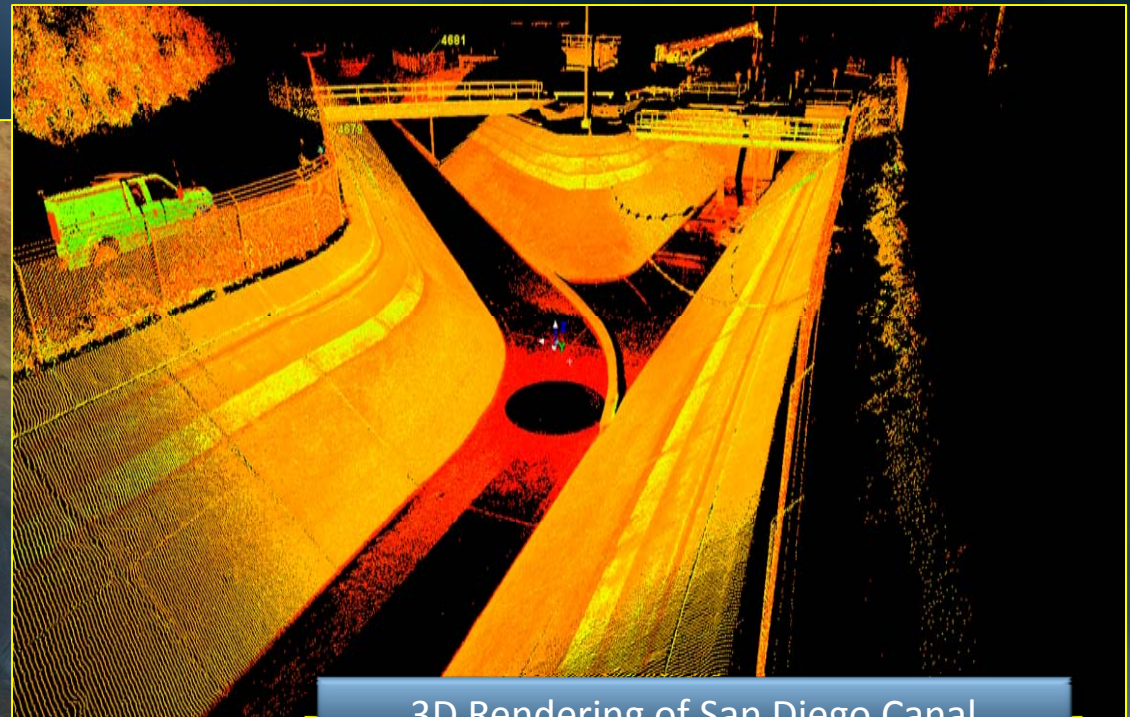


Deformation Mesh with 20x exaggeration

# 3D Survey Capability

- Fast and efficient
- Accuracy within 1/8"
- Can be converted into 3D CAD model

Survey of San Fernando Tunnel

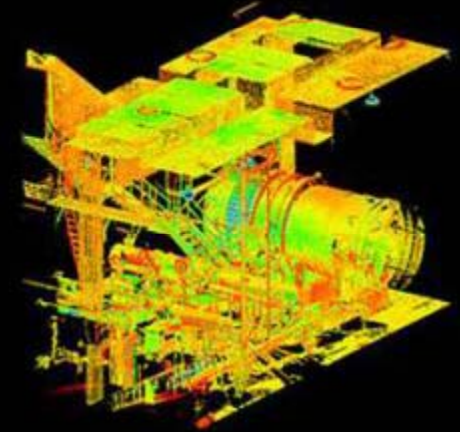
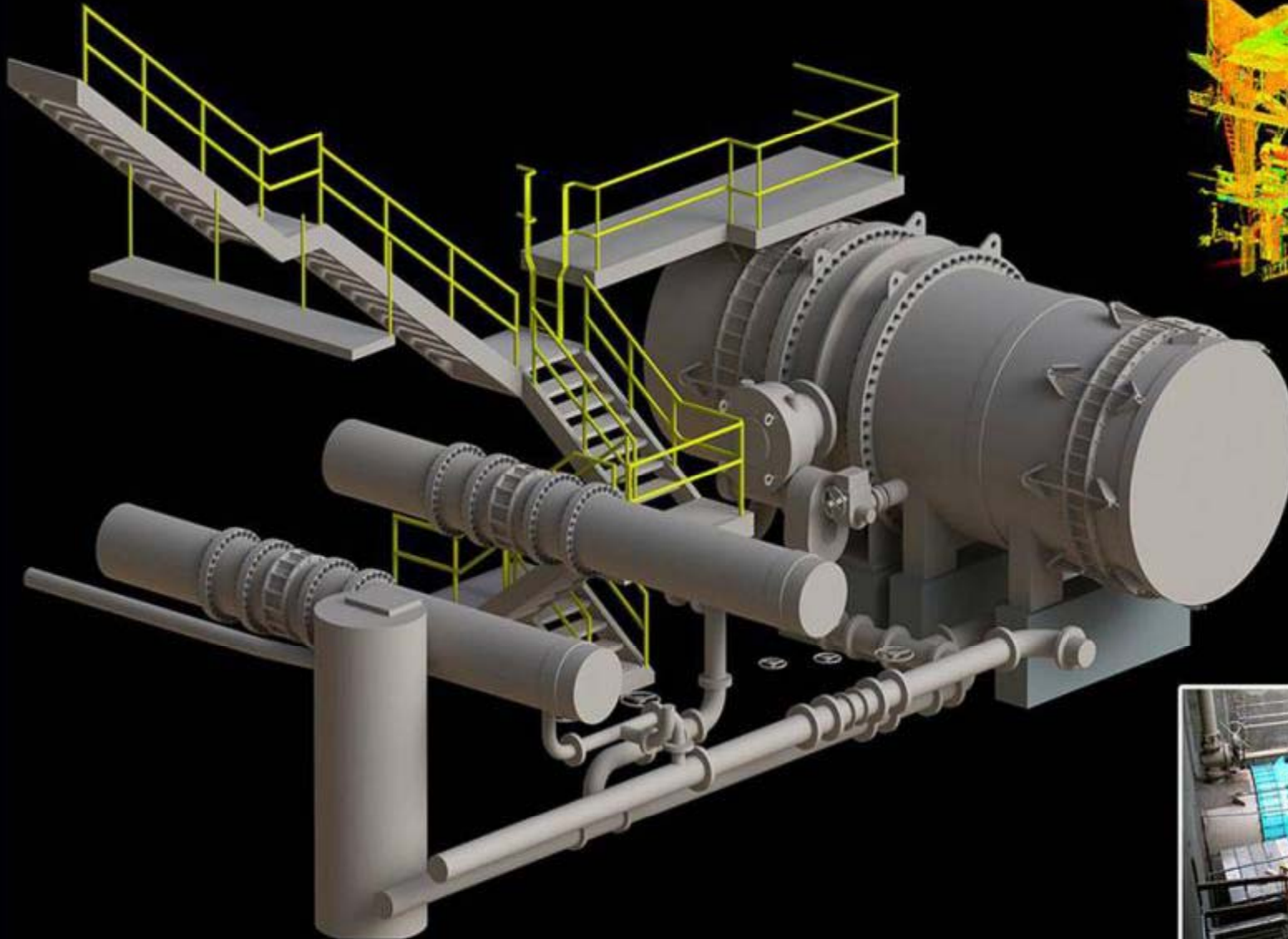


3D Rendering of San Diego Canal



# 3D Graphic Capability

Survey Rendering → Computer Model → Construction

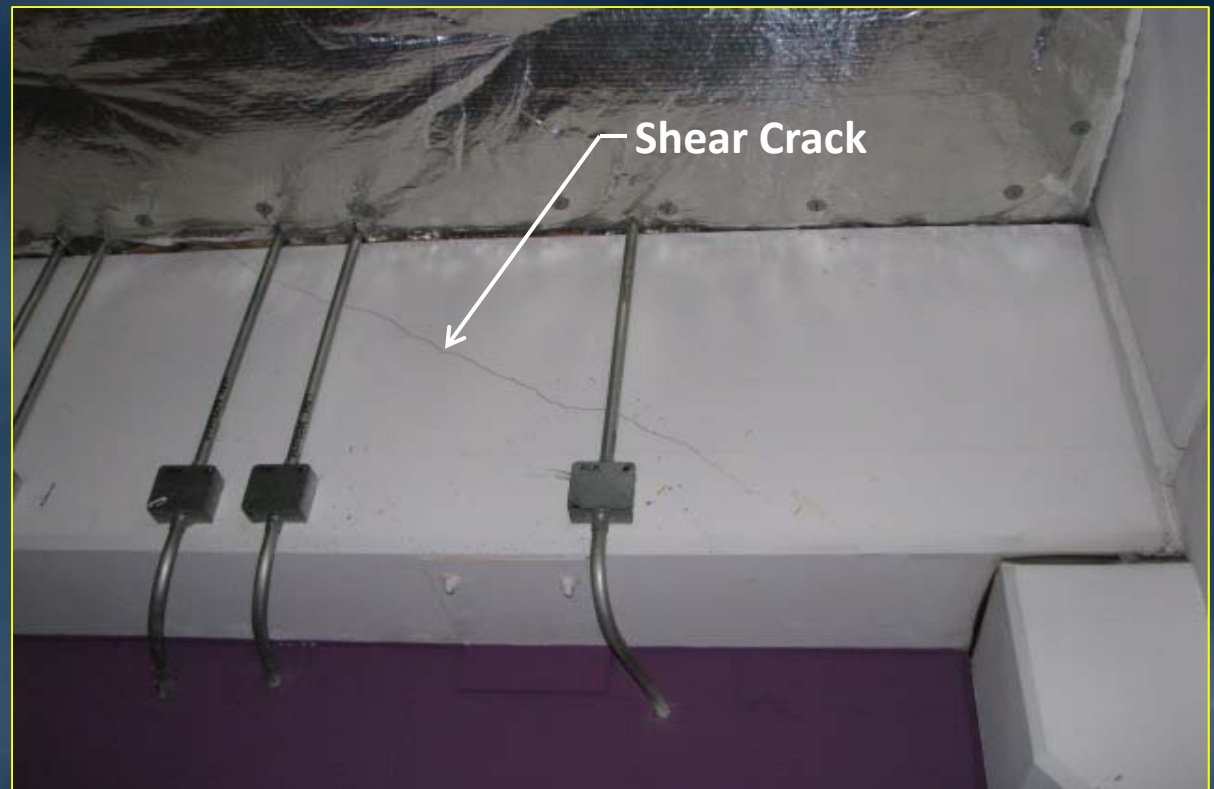


# Update on Headquarters Building



# Background

- Development agreement with Union Station Partners
- Deficiencies identified from 2008 to 2012
- Several repairs performed to date

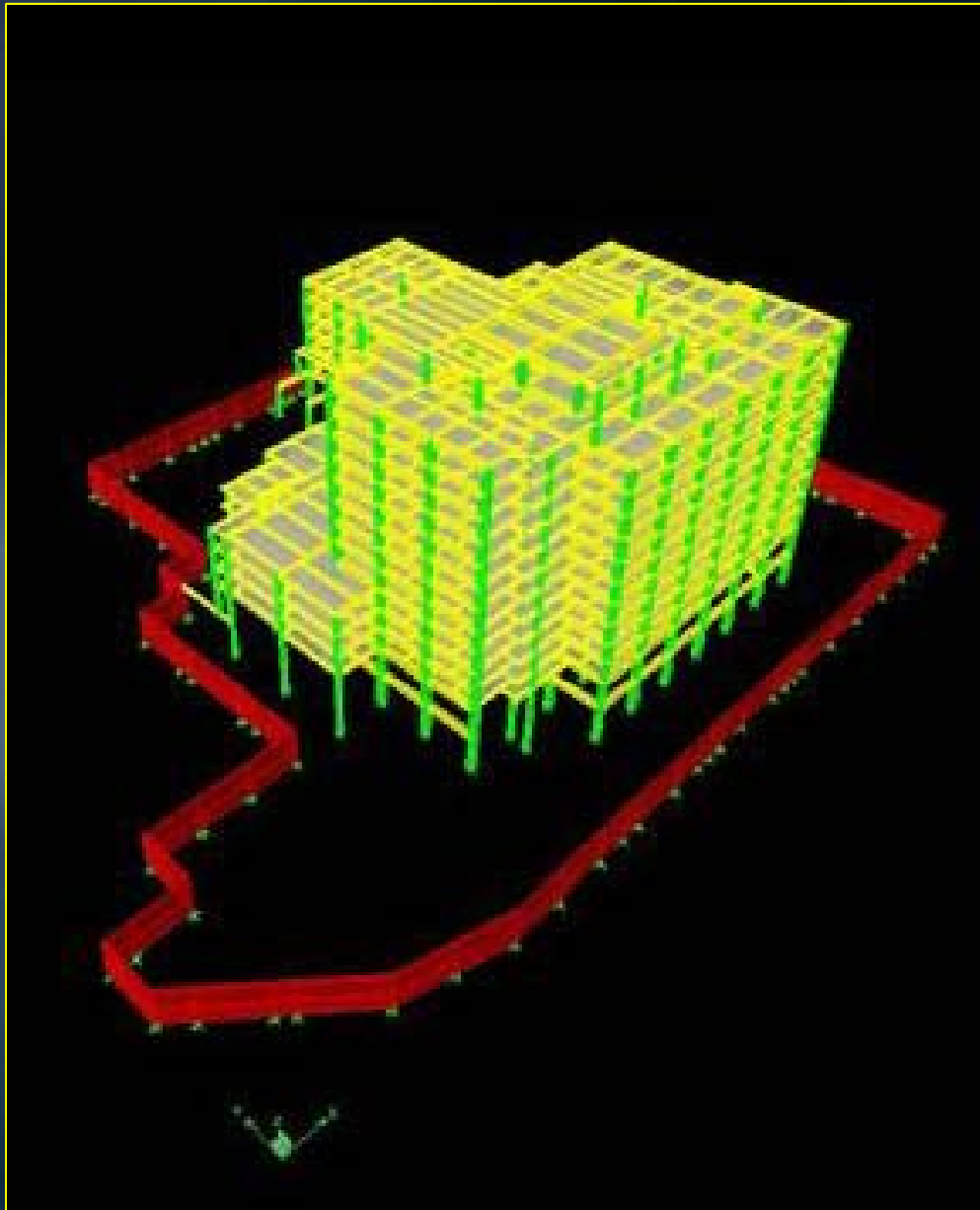


# Background

- Preliminary Assessment
  - Preliminary assessment initiated 2010
  - Findings verified by specialty consultant in 2011
  - Several support beams have large openings

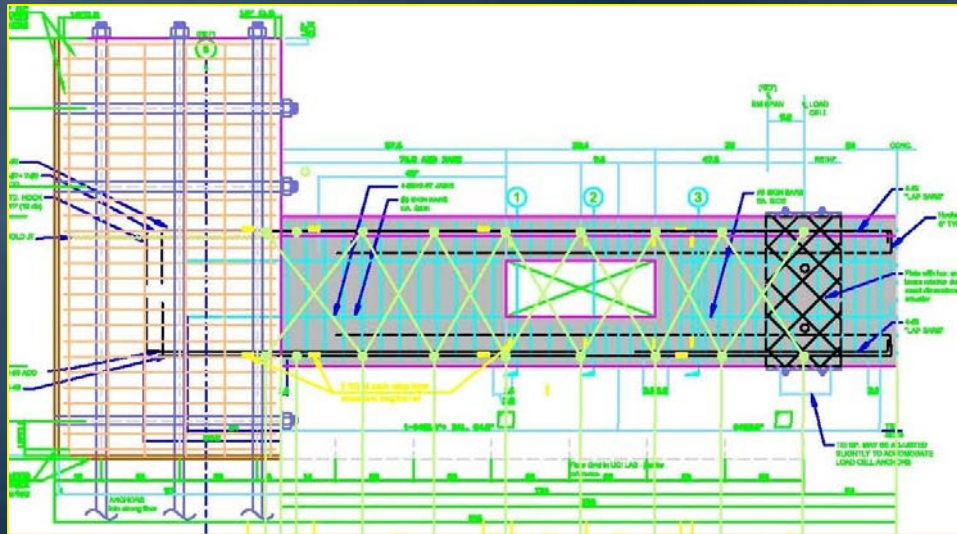


# Union Station Structural Modeling



# Work in Progress

1. Material tests completed
  - Concrete strength 30% greater than design value
2. Geotechnical analysis completed
3. Structural component tests underway
  - Test lab – UC Irvine
  - Phase 1 – Existing beam testing – Presently underway
  - Phase 2 – Retrofitted beam tests - April 2013

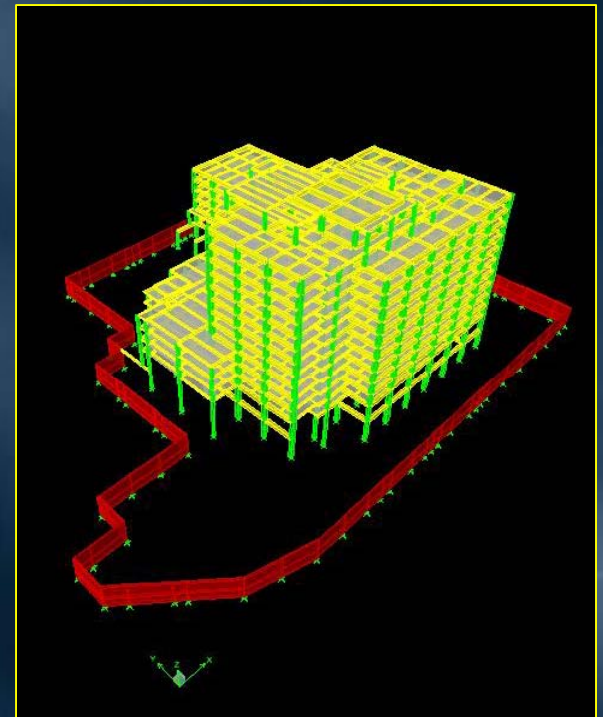


# Assembly of Test Beams



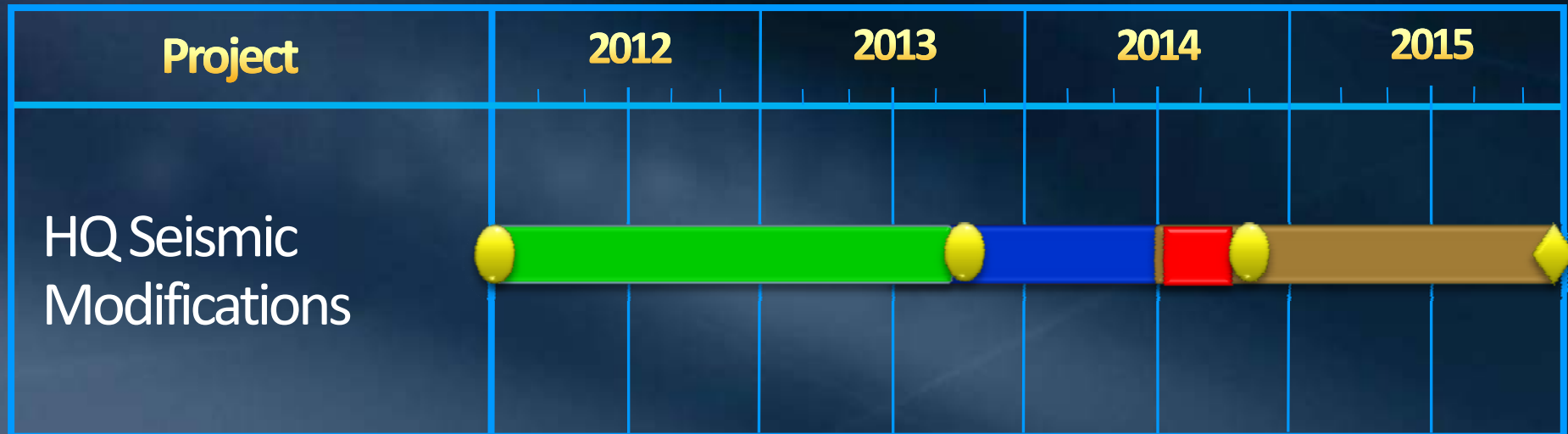
# Remaining Tasks

4. Advanced nonlinear structural analysis
  - Structural model completed by specialty consultant
  - Adjust model beam properties based on component test results
5. Determine seismic performance level of existing structure
6. Future Board Action:
  - Authorize final design of upgrades

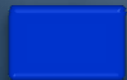




# Project Schedule



**Analyses & Preliminary Design**



**Final Design**



**Advertise & Award**



**Construction**



**Board Action**



**Project Completion**

