ITEM 4A

CAPITAL OUTLAY SUPPORT UPDATE
January 2015 COS Workplan

**Approved COS Budget:**

- COS Revised Budget (A&E, Staff)  $40.4 M
- Contingency  $1.0 M
- Current COS Budget  $41.4 M

**Workplan (FY 14-15 Total):**

- A&E  $20.4 M
- Staff  $20.0 M
- Contingency  $1.0 M
- Total  $41.4 M
February 2015 COS Actual Expenditures Data

TBSRP Expenditures as of Feb. 15:

FY 14-15 Through January 2015
(includes unanticipated METS rod work) $ 26.8 M expended

January Workplan for Feb–June 2015:

A&E $ 5.4 M
Staff $ 8.2 M
Contingency $ 1.0 M

Subtotal: Feb – June 2015 COS Workplan $ 14.6 M Budget
March 2015 – Unanticipated Work Being Evaluated for COS Budget Impacts FY 14-15

SAS Tower Anchor Rod Grouting Issue:

- METS - A&E Through February 23, 2015 $5.6 M expended
- METS - A&E COS Approved FY COS Budget $6.0 M**

Risks Ahead:

**METS A&E Rod Investigation - Ongoing

- Tower Anchor Rod Additional Testing Proposal - Pending TBPOC Testing Proposal Approval
- Rod Investigation additional A&E Testing, Peer Review, Results Analysis - Pending TBPOC Testing Proposal Approval
- Additional Staff Support of Rod Investigation - Evaluating
ITEM 4B

RISK MANAGEMENT UPDATE
TBPOC Briefing
Risk Management Update
Mid-First Quarter 2015
Comprehensive Update Next Quarter

- Assess and Update of all Moving Parts
  1. Engineer’s Estimate – Contracts in Design or Bids Opened
  2. Items and Change Orders (Executed & Pending) – On-going Contract
  3. Schedule Risk Analysis
  4. Capitol Outlay Support
  5. Risk Assessment on Above

- Focus Back on Risk Ranges – Optimistic and Pessimistic
  1. Moving toward the end of the Program
  2. Less Focus on 50% Probable
  3. Assess Against Program/Project Reserves
Challenge Going Forward

- **Project close-out - YBITS1 & OTD2**
- **SAS**
  - Tower Anchor Rods
    - Grout Investigation
    - Testing Program
    - Path Forward
  - Database
- **504/288**
  - Assess Bid compared to Engineer’s Estimate
  - Adjust Risks as Appropriate
- **YBITS2**
  - Bike Path Considerations
    - COS for Foreign Fabrication
    - Schedule for Opening
    - Changes to Landing if any are not considered risks – Change to Scope
- **Marine Foundations**
  - Separate Pier E3 Demonstration – Create New Risk Register
  - Base Assessment on Conventional Removal – Recognize Implosion Opportunity
  - Environmental Considerations
    - Permits – Impact to Schedule
    - Outcome of Demonstration Project
Project Risk Management
ITEM 5A
YBITS 2 UPDATE
ITEM 5B

PIER E3 DEMOLITION PERMITS UPDATE
Memorandum

TO: Toll Bridge Program Oversight Committee (TBPOC)  
DATE: February 26, 2015  
(Revised 3/5/15)

FR: Stefan Galvez, Chief, Office of Environmental Analysis

RE: Agenda No. - 5b  
Item- Pier E3 Demolition Permits Update

Recommendation:
Information

Cost:
TBD

Schedule:
TBD

Discussion:

As previously presented, the old bay bridge concrete pier demolition proposal to safely implode the underwater portion of pier E3 by construction controlled charges is being reviewed with regulatory agencies for permit approvals. Preliminary meetings have been completed and detailed packages are under development to request various agency approvals of the Pier E3 Demonstration Project. The California Department of Transportation (Department) is also preparing a revalidation of the 2001 San Francisco-Oakland Bay Bridge Seismic Safety Project (SFOBB Project) environmental document.

As the Department continues to work closely with these regulatory agencies, we have also begun to reach out to stakeholder organizations and the public, with the timeline to achieve overall support and agency approvals to conduct the E3 Demonstration Project in November 2015. The initial responses are indicating the request is feasible but there may be additional mitigation costs, possibly above the current approved budget, yet to be determined. This timeline is also important to help maintain the current existing bridge dismantling schedule and to stay within the current existing bridge dismantling budget. Status of specific stakeholder outreach, agency approvals, and the revalidation are provided below.
Memorandum

Stakeholder Outreach:

- March 17th, 2015 is the current tentative date proposed for an outreach meeting with the following stakeholder organizations:
  - Save the Bay; Golden Gate Audubon Society; Sierra Club; The Bay Institute; and San Francisco Bay Keeper.

Agency Approvals:

**National Marine Fisheries Service (NMFS) Fisheries:**
- Submitted a Biological Assessment to NMFS on February 17, 2015.

**California Department of Fish and Wildlife (CDFW):**
- Submitted a request for a major amendment to Incidental Take Permit No. 2081-2001-021-03 (ITP) on February 18, 2015.
- CDFW ITP Major Amendment - June 2015.

**San Francisco Regional Water Quality Control Board (RWQCB):**
- The Department is preparing a Water Quality Study to be submitted to RWQCB 03/04/15.
- Contractor is preparing SWPPP for mechanical dismantling phase of Pier E3 and will submit to Department for approval week of March 9th, 2015.
- Department to submit SWPPP proposal to RWQCB after review.

**National Oceanic and Atmospheric Administration (NOAA) Marine Mammals:**
- The Department is preparing a package for NOAA for an Incidental Harassment Authorization (IHA) for behavioral impacts to marine mammals to be submitted to NOAA week of March 3rd, 2015

**United States Army Corps of Engineers (USACE):**
- The Department is preparing a package for USACE requesting a letter of modification (LOM) to Permit No. 023013S. Package is expected to go out week of March 9.
- USACE is requiring a public comment process prior to issuing the modification.
San Francisco Bay Conservation and Development Commission (BCDC):

- The Department is preparing a package for BCDC requesting a material amendment to Permit No. 2001.008 (formerly 8-001). Expected to go out week of March 9.
- BCDC is requesting that the Department brief the BCDC Commission on the Demonstration Project on April 2\textsuperscript{nd}, 2015. Public notification and approval by the Commission at a later meeting are also required.
- BCDC Material Amendment – Commission Hearing+ vote- Summer 2015.

United States Fish and Wildlife Services (USFWS):

- Memorandum of no effects for the federally protected California least tern in internal review.
- Memorandum accepted and finalized by Department – June 2015.

Final Environmental Impact Statement (FEIS) Revalidation:

- Department currently preparing a revalidation of the SFOBB FEIS.
ITEM 5C

504/288 DEMOLITION BID OPEN UPDATE
SFOBB East Spans

504-288 Project Limits

THE SAN FRANCISCO-OAKLAND BAY BRIDGE
EAST SPAN SEISMIC SAFETY PROJECT
ITEM 5D
SAS UPDATE
San Francisco-Oakland Bay Bridge
Self Anchored Suspension Span
Tower Anchor Rod Status Update: Mar. 5, 2015
Tower Footing

- 424 Anchor rods
  - Approximately 26 feet long
  - 388 - 76 mm Diameter
  - 36 - 100 mm Diameter

- 152 Steel Dowels
  - 150 mm Diameter
4/12/2007 T1 Tower Footing (8091D026)
1/3/08 Tower Footing Concrete Pour (8331D003)
Tower Footing

- Within tower footing
- Anchor rods extend 18 feet below tower base plate
Caulking Removal
## Water Testing Results

| Parameter                  | Bay Water | Rod 135-2-2 | Rod 136-2-3 | Rod 144-2-6 | Rod 145-1-1 | Rod 145-1-2 | Rod 149-1-2 | Rod 149-1-5 | Rod 150-2-2 | Rod 154-1-7 | Rod 155-1-4 | Rod 155-2-1 | Rod 160-2-1 | Rod 160-2-2 |
|----------------------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Conductivity, µS           | 43,000    | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       | 1,791       |
| Chloride, mg Cl/L          | 18,600    | 124         | 2           | 67          | 124         | 2           | 67          | 124         | 2           | 67          | 124         | 2           | 67          | 124         |
| Nitrate, mg NO₃/L          | ND        | ND          | <5          | <5          | ND          | ND          | <5          | ND          | ND          | <5          | ND          | ND          | <5          | ND          |
| Flouride, mg F/L           | INC       | NT          | NT          | INC         | NT          | NT          | INC         | NT          | INC         | NT          | INC         | NT          | NT          | NT          |
| Sodium, mg Na⁺/L           | 9,770     | 228         | 550         | 807         | 298         | 332         | 830         | 332         | 567         | 599         | 1,870       | 797         | 550         | 309         |
| Potassium, mg K⁺/L         | ND        | 124         | 402         | 1,540       | 301         | 381         | 435         | 381         | 741         | 993         | 2,390       | 1,110       | 402         | 301         |
| Magnesium, mg Mg²⁺/L       | 310       | ND          | ND          | ND          | ND          | ND          | 6.4         | ND          | <2          | ND          | ND          | 11.0        | ND          | ND          |
| Calcium, mg Ca²⁺/L         | ND        | 13          | ND          | ND          | <10         | <10         | 25.7        | <10         | <10         | <10         | ND          | 18.6        | ND          | <10         |
| Carbonate, mg/L as CaCO₃   | ND        | 300         | 480         | 2,860       | 450         | 770         | ND          | 700         | 540         | 420         | 1,300       | 100         | 480         | 250         |
| Bicarbonate, mg/L as CaCO₃ | 115       | 0           | 0           | ND          | 0           | 0           | 2,570       | 175         | 1,475       | 1,690       | ND          | 2,540       | 0           | 0           |
| Organic Compounds          | ND        | E           | E           | ND          | ND          | ND          | E           | ND          | ND          | ND          | ND          | E           | ND          | ND          |
| Zinc, mg Zn/L              | <0.2      | 0.60        | 9.22        | 3.60        | 2.73        | 1.49        | 3.01        | 0.29        | 3.84        | 1.31        | 30.0        | 4.84        | 9.22        | 2.09        |
| Chromium, mg Cr/L          | <0.1      | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        |
| Iron, mg Fe/L              | <0.5      | <0.5        | <0.5        | <0.5        | <0.5        | <0.5        | 3.44        | <0.5        | 1.74        | <0.5        | 1.28        | 0.62        | 0.61        | <0.5        |
| Aluminum, mg Al/L          | <1        | <1.5        | 2.07        | 9.33        | <2.5        | 3.92        | <1          | 2.79        | <2.5        | <2.5        | 1.22        | <1          | 2.07        | <2.5        |
| Total dissolved solids, mg/L | 32,600   | 826         | 2,250       | 5,340       | 1,529       | 1,662       | 3,880       | 1,448       | 3,220       | 1,377       | 8,930       | 4,840       | 2,250       | 1,437       |

**Conclusion:** Samples are not bay water.
Grout Conditions: Post Water Jetting

<table>
<thead>
<tr>
<th>Number of Occurrences</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>273</td>
<td></td>
</tr>
<tr>
<td>136</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>424</td>
</tr>
</tbody>
</table>

**Full Grouted**
No Scale

**Partially Grouted**
No Scale

**GROUT CAP**
No Scale

**Fully Ungrouted**
No Scale

**Intermittent Voids**
No Scale
VIDEO
Grout Status Verification

Methods Considered

• Non-destructive
  • Impact Echo
  • Dynamic Load Testing
  • Impact Hammer Modal Testing

• Destructive
  • Drilling inspection hole
  • High pressure water jetting

Selected by Contractor

• High pressure water jetting
  • Borescope used to visually verify the grouted condition
Grout Verification and Repair

• Used borescope to visually inspect the post water jetting condition of the grout

• Two trials (11 scenarios) of mockups to determine proper repair method
# Field Cleaning Operation

## Bottom Condition Status: Mar. 3, 2015

<table>
<thead>
<tr>
<th>Condition:</th>
<th>Debris Removed</th>
<th>Coarse Debris – Unknown Depth</th>
<th>Requires Additional Cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (422):</td>
<td><strong>288 (68%)</strong></td>
<td><strong>91 (22%)</strong></td>
<td><strong>43 (10%)</strong></td>
</tr>
</tbody>
</table>

| Images: (Typical) | ![Image 1](#) | ![Image 2](#) | ![Image 3](#) | ![Image 4](#) | ![Image 5](#) | ![Image 6](#) | ![Image 7](#) | ![Image 8](#) |
T1 Anchor Bolts - Water Jetted Inspection Holes - Cleaning Status

Status as of end of shift Wednesday 3/4/2015

- 288 (69%) For Construction Review - No Fine Debris (from METS borescope)
- 90 (21%) Coarse Debris with unknown condition underneath (from METS borescope)
- 40 (10%) Partially cleaned (need more cleaning or are under review)
- 2 (0%) No cleaning effort to date

- 420 Total locations with water jetted holes to be cleaned
- 2 Removed rods (150-1-2 in May-13 & 136-2-3 in Dec-14)
- 2 Rods grouted Oct-14 & not water jetted (149-1-4 & 149-1-5)
- 424 Total rods at T1

Note: due to rounding, the percentages may not sum to 100%

Contract 04-0120F4 SFOBB SAS
Verification Testing of Tower Rods

- **Test I – Field Hardness Testing**
  - 3” (226 rods, 1582 tests)
  - 4” (24 rods, 216 tests)

- **Test II – Laboratory Tests**
  - 3” (6 rods), 4” (3 rods)
  - HRC Hardness
    - 3” (142 tests), 4” (95 tests)
  - Charpy V-Notch (40 °F & 70 °F)
    - 3” (36 tests), 4” (18 tests)
  - Spectrochemical Analysis
    - 14 elements per rod
    - Al, C, Cr, Co, Cb, Cu, Mn, Mo, Ni, P, Si, S, Ti, V
Verification Testing of Tower Rods

- **Test III – Full Size Tension Test**
  - 3” (1 rod) - Full-size, reduced section, Charpy (6 tests), HRC (23 tests), chemical (13 elements), coating analysis (2 elements)

- **Test IV – Townsend Test (one 3” rod)**
  - HRC, Charpy, carb/decarb, chemical, electrochemical potential analysis, fracture analysis, galvanizing analysis

- **Test V – Raymond Test**
  - 3” (2 rods, 31 specimens)
    - FFS (8 tests), IHE (5 tests), EHE (18 tests)
  - 4” (1 rod, 15 specimens)
    - FFS (5 tests), EHE (10)
Rod Removal

Rod Removed 2013
Rod 150-1-2
(in orange)

Rod Removed 2014
Rod 136-2-3
(in yellow)

Top of Rod Removed
Rod 136-2-3 Testing Program

![Diagram of rod pieces](image)

**Tests Performed by METS (Jan./Feb. 2015)**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>ASTM Standard</th>
<th>Piece 4b</th>
<th>Piece 3a</th>
<th>Piece 1a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wet Fluorescent Magnetic Particle Examination</td>
<td>ASTM E 1444</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>2. Microscopical Examination of Galvanizing</td>
<td>ASTM B 487</td>
<td>20</td>
<td>2</td>
<td>6</td>
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<tr>
<td>3. Chemical Analysis of Galvanizing</td>
<td>ASTM E 1479</td>
<td>6</td>
<td>1</td>
<td>3</td>
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<tr>
<td>4. Reduced Section Tensile Testing</td>
<td>ASTM E 8</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>5. Cross-Sectional Hardness Testing (HRC)</td>
<td>ASTM E 18</td>
<td>3</td>
<td>3</td>
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<tr>
<td>6. Cross-Sectional Hardness Testing (Knoop)</td>
<td>ASTM E 384</td>
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<td>7. Microstructural Examination</td>
<td>ASTM E 45</td>
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<td>2</td>
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<td>8. Charpy Impact Testing (40 °F, 70 °F)</td>
<td>ASTM E 23</td>
<td>6</td>
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### Rod 136-2-3 Mechanical Testing Results

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<th>Property</th>
<th>Min</th>
<th>Max</th>
<th>Avg</th>
<th>Contract Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate Tensile Strength (ksi)</td>
<td>156</td>
<td>169</td>
<td>164</td>
<td>✓</td>
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<tr>
<td>Yield Stress @ 0.2% offset (ksi)</td>
<td>137</td>
<td>155</td>
<td>148</td>
<td>✓</td>
</tr>
<tr>
<td>Elongation (%) in 2”</td>
<td>17</td>
<td>20</td>
<td>19</td>
<td>✓</td>
</tr>
<tr>
<td>Reduction of Area (%)</td>
<td>56</td>
<td>60</td>
<td>58</td>
<td>✓</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>property</th>
<th>Min</th>
<th>Max</th>
<th>Avg</th>
<th>Contract Compliance</th>
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<tbody>
<tr>
<td>CVN 40° F</td>
<td>46</td>
<td>51</td>
<td>48</td>
<td>Not specified</td>
</tr>
<tr>
<td>CVN 70° F</td>
<td>47</td>
<td>55</td>
<td>51</td>
<td>Not specified</td>
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Comparison of Rod 136-2-3 With Previous Data

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</thead>
<tbody>
<tr>
<td>Hardness — Lab (R/2) (HRC)</td>
<td>35</td>
<td>36</td>
<td>34</td>
<td>35</td>
<td>36</td>
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<tr>
<td>Hardness — Lab (Edge) (HRC)</td>
<td>34</td>
<td>38</td>
<td>35</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Toughness — CVN (ft-lb)</td>
<td>35</td>
<td>14</td>
<td>37</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Full Size Tensile (ksi)</td>
<td>159</td>
<td>161</td>
<td>153</td>
<td>162</td>
<td>164</td>
</tr>
</tbody>
</table>

* Tower anchor rods

Hardness Testing Pieces  Charpy V-Notch (CVN) Impact Testing  Rockwell Hardness Testing  Reduced Section Tensile Testing
Micro-cracks Discovered

- Found while measuring galvanizing thickness with a microscope
- Observed at high magnification
- Located in thread roots of Piece 4b (bottom) and **Piece 1a** (top)
- Root cause not yet determined

Rod 136-2-3, Piece 4b, Zone IIb, 100X

Thread root micro-cracks, 1000X
Anchor Rod Corrosion Modeling

- Objective of modeling: Can we rule out concern for corrosion?
  - Pessimistic
  - Simplistic (complexity consistent with available information)

- Components for projection of service life:
  - Corrosion Rate
  - Limit State

- Two approaches:
  - Back of the Envelope (BOE)
  - Extrapolation Based on Rod 136-2-3
Back of the Envelope (BOE) Models

- **Assumptions**
  - Corrosion initiated by contaminants (e.g. chloride) in water
  - Corrosion is a uniform and constant macrocell process: pure anode and pure cathode
  - Corrosion rate is governed by resistance of system

- **Conservative assumptions were made relative to:**
  - Mechanism of corrosion
  - Limit states
  - Input parameters

- **Does not consider**
  - Specific water chemistry, galvanizing
  - Many other potential influences on corrosion or limit state
<table>
<thead>
<tr>
<th>No.</th>
<th>Date Range</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Oct-Nov 2007</td>
<td>Anchor Rods Installation</td>
</tr>
<tr>
<td>2</td>
<td>22-Sep to 24-Sep-2010</td>
<td>Initial Pre-Tension Anchor Bolts</td>
</tr>
<tr>
<td>3</td>
<td>28-Dec to 5-Jan-2011</td>
<td>Grout Tower Anchor Rods</td>
</tr>
<tr>
<td>4</td>
<td>8-Sep to 13-Sep-11</td>
<td>Pull Bak Tower</td>
</tr>
<tr>
<td>5</td>
<td>27-Sep-12</td>
<td>Phase 1 Load Transfer</td>
</tr>
<tr>
<td>6</td>
<td>8-Oct to 22-Oct-12</td>
<td>Remove Cables fr Pull Back</td>
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<tr>
<td>7</td>
<td>1-Apr to 3-May-2013</td>
<td>Final Tensioning of Anchor Rods</td>
</tr>
<tr>
<td>8</td>
<td>Sep-Oct-2013</td>
<td>Tower Skirt Erection</td>
</tr>
<tr>
<td>9</td>
<td>7-Nov to 15-Nov-2013</td>
<td>Tower Skirt- Tension Anchor Bolts</td>
</tr>
<tr>
<td>10</td>
<td>29-Jul-14</td>
<td>Start Up Dehumidification Unit - Mechanical</td>
</tr>
<tr>
<td>11</td>
<td>4-Aug to 21-Aug-14</td>
<td>Air Balancing - Skirt / Anchorage - Mechanical</td>
</tr>
</tbody>
</table>

**KFM - E2T1 Contract- Tower footing**

- Concrete Pour: 13-Mar 08

**ABF- SAS Project**

- Initial Pre-Tension Anchor Bolts: 6/1 to 7/16/10
- Tower Skirt Erection: 9/22 to 9/24/10
- Dehumidification Unit: 7/29/14
- Air Balancing: 8/5-8/21/14

**T1 Tower Anchor Rods- As-Built Schedule**

- OEB / Tower Installation: 8/15 to 9/22
- Cable Installation to Load Transfer: 8/27/12
- Compl Hinge A / Electrical / Painting / Pave / Misc: 8/2 to 8/21
- Seismic Safety Opening: 9/22
- Final Tensioning of Anchor Rods: 4/1 to 5/3/13
- Grout & Tension E2: 5/9 to 5/13
- Tower Skirt-Skirt Bolt / Paint: 7/29-8/21
- Air Balancing: 8/5-8/21
- Air Balancing: 8/5-8/21
- Tower Skirt- Tension Anchor Bolts: 11/2 to 11/13

**Support Foundation by Tower**

- 4/14/08 to 10/6/08

**Phase 1 Load Transfer**

- 9/22 to 9/24/10

**T1 Tower- Align Shafts / Grout Base Pl**

- 8/15 to 9/22

**1 Year**

**2 Years**

**3 Years**
### Per ABF Schedule

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Project</td>
<td>SAS Project - dd 12/20/2014</td>
<td>04-Apr-11 A</td>
<td>27-Mar-13 A</td>
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<tr>
<td>TICON00740</td>
<td>Final Bolt (for Pull Back) Field Splice 4 - T1 Lift 5</td>
<td>20-May-11 A</td>
<td>09-Jun-11 A</td>
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<tr>
<td>CACONEK0040</td>
<td>Install Pull Back Foundation</td>
<td>04-Apr-11 A</td>
<td>22-Jun-11 A</td>
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<td>CACONFB0040</td>
<td>Pull Back Tower</td>
<td>08-Sep-11 A</td>
<td>13-Sep-11 A</td>
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<tr>
<td>CACONEI0540</td>
<td>Phase 1 Load Transfer Complete</td>
<td>08-Oct-12 A</td>
<td>27-Sep-12 A</td>
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<tr>
<td>CACONEJ0040</td>
<td>Remove Cables from Pull Back</td>
<td>08-Oct-12 A</td>
<td>22-Oct-12 A</td>
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<td>CACONEJ0050</td>
<td>Remove Pull Back Foundation</td>
<td>20-Feb-13 A</td>
<td>05-Mar-13 A</td>
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<tr>
<td>TICONF0750</td>
<td>Final Bolt (after Pull Back) Field Splice 4 - T1 Lift 5</td>
<td>25-Mar-13 A</td>
<td>27-Mar-13 A</td>
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</tbody>
</table>

After Tower Pull Back (Picture on 20-Sep-2011)
## Per ABF Schedule

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1CON0000780</td>
<td>Final Bolt (for Pull Back) Field Splice 4 - T1 Lift 5</td>
<td>04-Apr-11 A</td>
<td>09-Jun-11 A</td>
</tr>
<tr>
<td>CACONEK0040</td>
<td>Install Pull Back Foundation</td>
<td>04-Apr-11 A</td>
<td>22-Jun-11 A</td>
</tr>
<tr>
<td>CACONEB0040</td>
<td>Pull Back Tower</td>
<td>08-Sep-11 A</td>
<td>13-Sep-11 A</td>
</tr>
<tr>
<td>CACONEJ0540</td>
<td>Phase 1 Load Transfer Complete</td>
<td>06-Oct-12 A</td>
<td>22-Oct-12 A</td>
</tr>
<tr>
<td>CACONEJ0050</td>
<td>Remove Cables from Pull Back</td>
<td>20-Feb-13 A</td>
<td>06-Mar-13 A</td>
</tr>
<tr>
<td>T1CONFF0750</td>
<td>Final Bolt (after Pull Back) Field Splice 4 - T1 Lift 5</td>
<td>25-Mar-13 A</td>
<td>27-Mar-13 A</td>
</tr>
</tbody>
</table>

Tower Pull Back (Picture taken on 8-Sep-2011)
Figure 6, Base Plate Contact Pressure (No Rods)
Figure 3. Tower Base Plate Stresses (As Designed)

Figure 4. Tower Base Vertical Stresses (Half Rods)

Figure 5. Tower Base Vertical Stresses (No Rods)
Table 1 - Comparison of Seismic Demands with Varying Anchor Rod Configurations

<table>
<thead>
<tr>
<th></th>
<th>As-Designed</th>
<th>1/2 Rods Effective</th>
<th>No Rods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uplift (mm)</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Base Plate Uplift (% Area)</td>
<td>0%</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Peak Stress (MPa)</td>
<td>330</td>
<td>360</td>
<td>380*</td>
</tr>
<tr>
<td>OBG Drift (mm)</td>
<td>950</td>
<td>950</td>
<td>950</td>
</tr>
</tbody>
</table>

* Actual stress will be lower, as anchor rod stiffeners are not included in the model
Future Steps

• Repair of inspection holes
  • Dehumidify?
  • Grout?
• Further develop:
  • Testing protocol of tower anchor rods
  • Corrosion model
• Root cause analysis of micro-cracks
• Plan for monitoring