Olmsted Locks & Dam

Innovation and Improvements

Matthew D. Lowe, PE, PMP
Project Manager, Olmsted Division
Louisville District

13 March 2015 - For Official Use Only

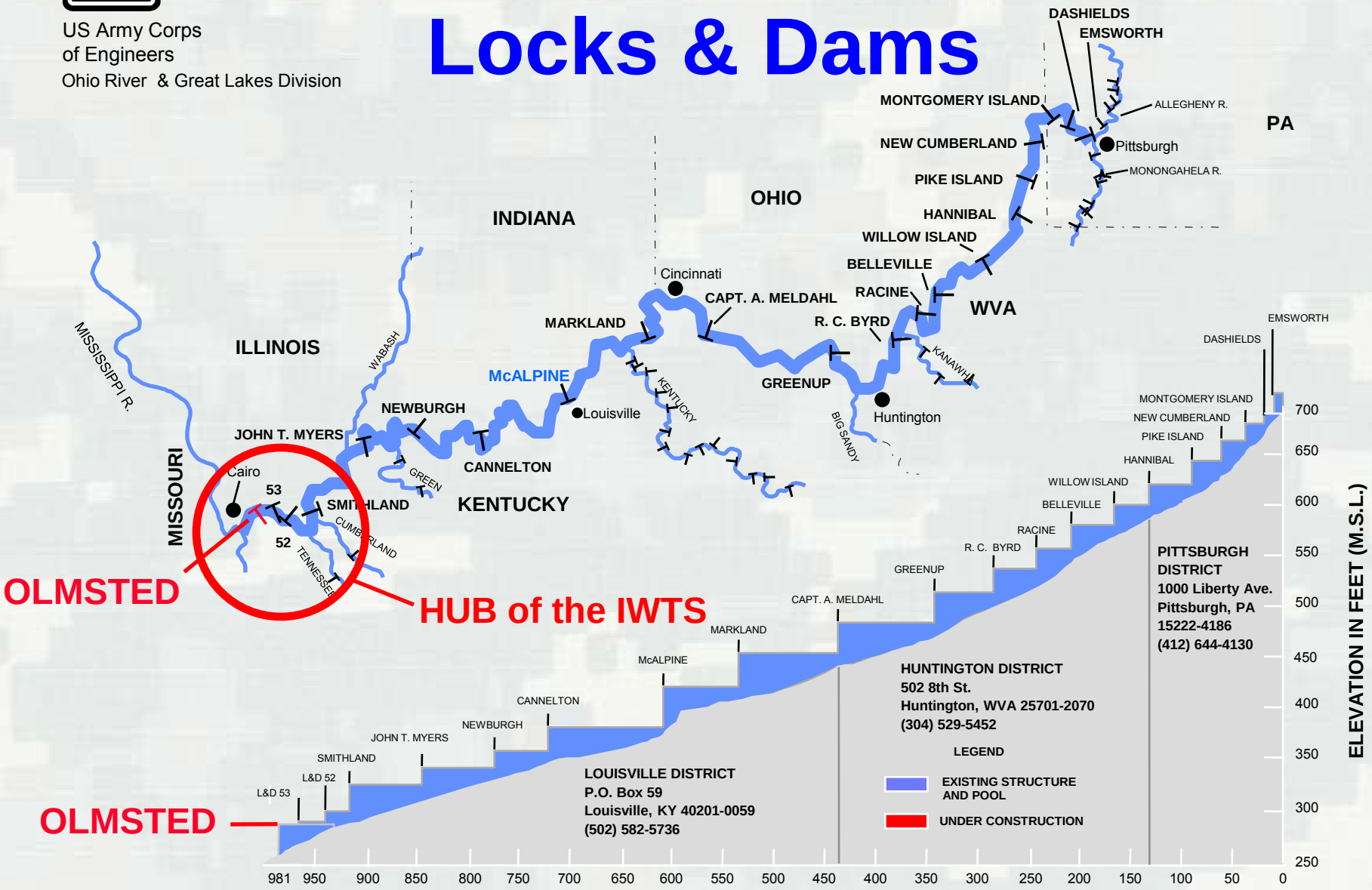
US Army Corps of Engineers
BUILDING STRONG®

Overview of Topics

- Importance of Olmsted
- Project History/Timeline of Events
- Overview of Construction
- Innovations and Improvements
- Management and Controls
- Realities
- Discussion

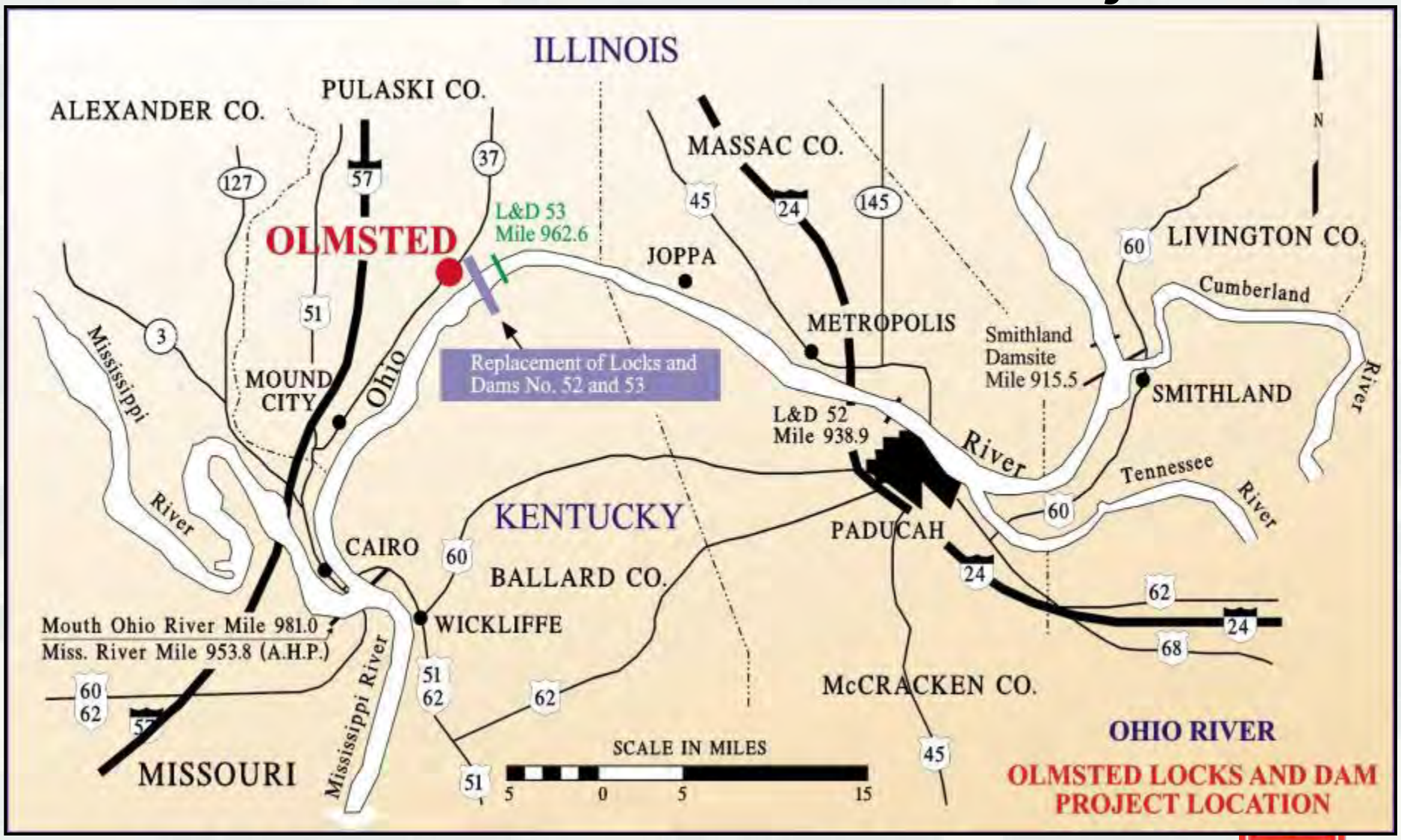
US Army Corps
of Engineers
Ohio River & Great Lakes Division

Ohio River Main Stem Locks & Dams



BUILDING STRONG®

Olmsted Locks & Dam Project



Locks and Dams 52 & 53

Hub of the Inland Navigation System

L&D 52-53 = 91M tons annually

1928/1929: L&D 52 & 53 in service
1949-1957: Miscellaneous studies
1969: L&D 52 1,200-ft Chamber operational (temporary chamber)
1977: Recon Report for Major Rehab L&D 52 & 53
1980: L&D 53 1,200-ft Chamber operational (temporary chamber)
1985: Feasibility Report
1988: Authorization

Olmsted Importance

L&D 52/53 = 91M tons/yr

Original (600') Chamber - 1928
Temporary (1,200-ft) Chamber - 1969

Original (600') Chamber - 1929
Temporary (1,200-ft) Chamber - 1980

AVERAGE ANNUAL BENEFITS AND COSTS

Olmsted Locks and Dam Replacement

(1 Oct 2011 price level, 7%)

Benefit or Cost Category		Average Annual Equivilent	Percent Of Total
Annualized Benefits			
Transportation Benefits - efficiency	$	706,296,867	81%
Transportation Benefits - reliability	$	116,975,474	13%
Fuel Tax Revenues	$	19,976,006	2%
Less WOPC Normal O&M	$	7,664,547	1%
Less LD 52 Repairs	$	12,291,092	1%
Less LD 53 Repairs	$	11,860,808	1%
TOTAL Annual Benefits	$	875,064,795	100%
Annualized Costs			
Construction *	$	211,450,732	90%
Interest During Construction **	$	19,093,734	8%
Normal O&M	$	3,832,274	2%
Main Chamber Maintenance	$	277,669	0%
Aux Chamber Maintenance	$	314,605	0%
Dam Maintenance	$	60,200	0%
TOTAL Annual Costs	$	235,029,214	100%
Net Annual Project Benefits	$	640,035,580	

SOURCE: Post Authorization Change Report (PACR) dated April 2012. Years 1986 through 2069 using year 2020 (locks operational year) as base year for discounting and amortization.

* Total base cost of $2918177900

** Sunk IDC removed per OWPR guidance.

Benefit and cost cash flows for years 1986-2069 are discounted to year 2020 and amortized into an average annual equivalent.

"Net Benefits" represent "Benefits" minus "Costs"

81% of the Av. Ann. Transportation benefits arise from avoiding closures at L/Ds 52 & 53 *($706M)*

OLMSTED TIMELINE OF EVENTS

Wildlife Improvements Complete
Final cost: $2.3M

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Final Feas Study	Chief's Report	EIS ROD	Auth WRDA	General Design Memo	GDM Supp	Biological Opinion	2nd Const Awarded	Supp EIS ROD		Award Lock Cont; Wicket Decision		In the Wet Decision

Resident Office Complete
Final cost: $3.7M

Cofferdam complete

Final cost: $72M

BUILDING STRONG®

OLMSTED TIMELINE OF EVENTS

Begin Install Approach Walls

Lock Complete; Dam Bid RTA

Award Dam Contract

Complete Lock Bulkheads

Scour Protection Installed

Dam Piling Installation

Fab & Set 5 Precast Shells

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011

Lock contract complete

Final cost: $453.6M

Approach Walls contract complete

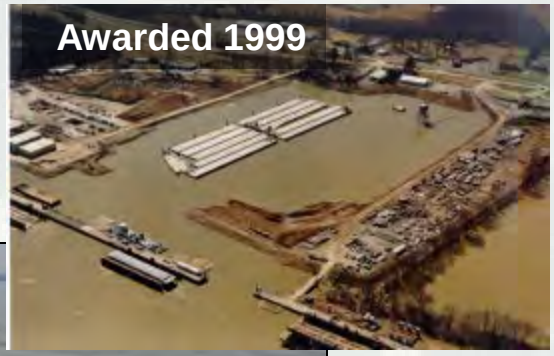
Final cost: $106.4M

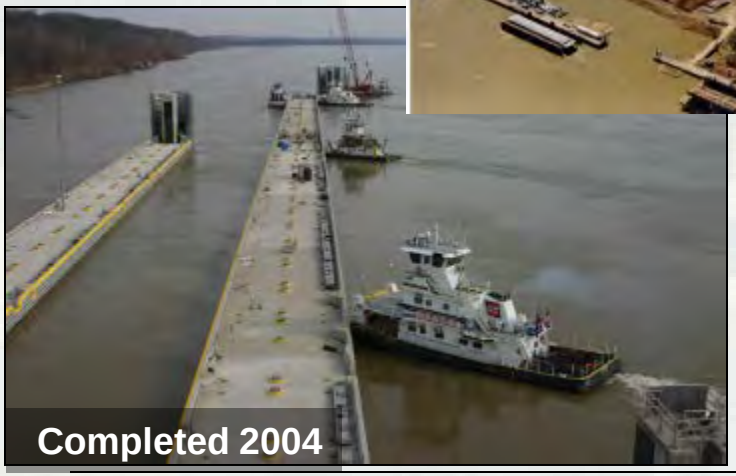
Re-baseline Cost Estimate

Congressional Interaction & Authorization Milestones

- Post Authorization Change Request (13 Apr 2012)
  - **$2.918B, Dam Operational 2020, Project Complete 2024**
- Construction Method Validation (31 May 2012)
  - Validated that In-The-Wet (ITW) is the most efficient method to complete the project
- Qualitative Risk Assessment (28 Aug 2012)
  - Validated that **Locks & Dam Nos. 52/53 are failing** and identified failure mode mitigation measures
- Continuing Resolution (17 Oct 2013) increased Olmsted authorization avoiding significant slow/shutdown impacts
  - Cost ($80M - $208M)
  - Schedule (1 - 3 Years)
- 2014 Consolidated Appropriations Act (17 Jan 2014)
  - Division D—Energy and Water Development and Related Agencies
  - **25% IWTF "during [this] fiscal year period"**
- 2014 WRRDA Legislation (10 Jun 2014)
  - **15% IWTF cost share for FY15 and beyond**
  - **Sense of Congress to expend not less than $150M annually until complete**

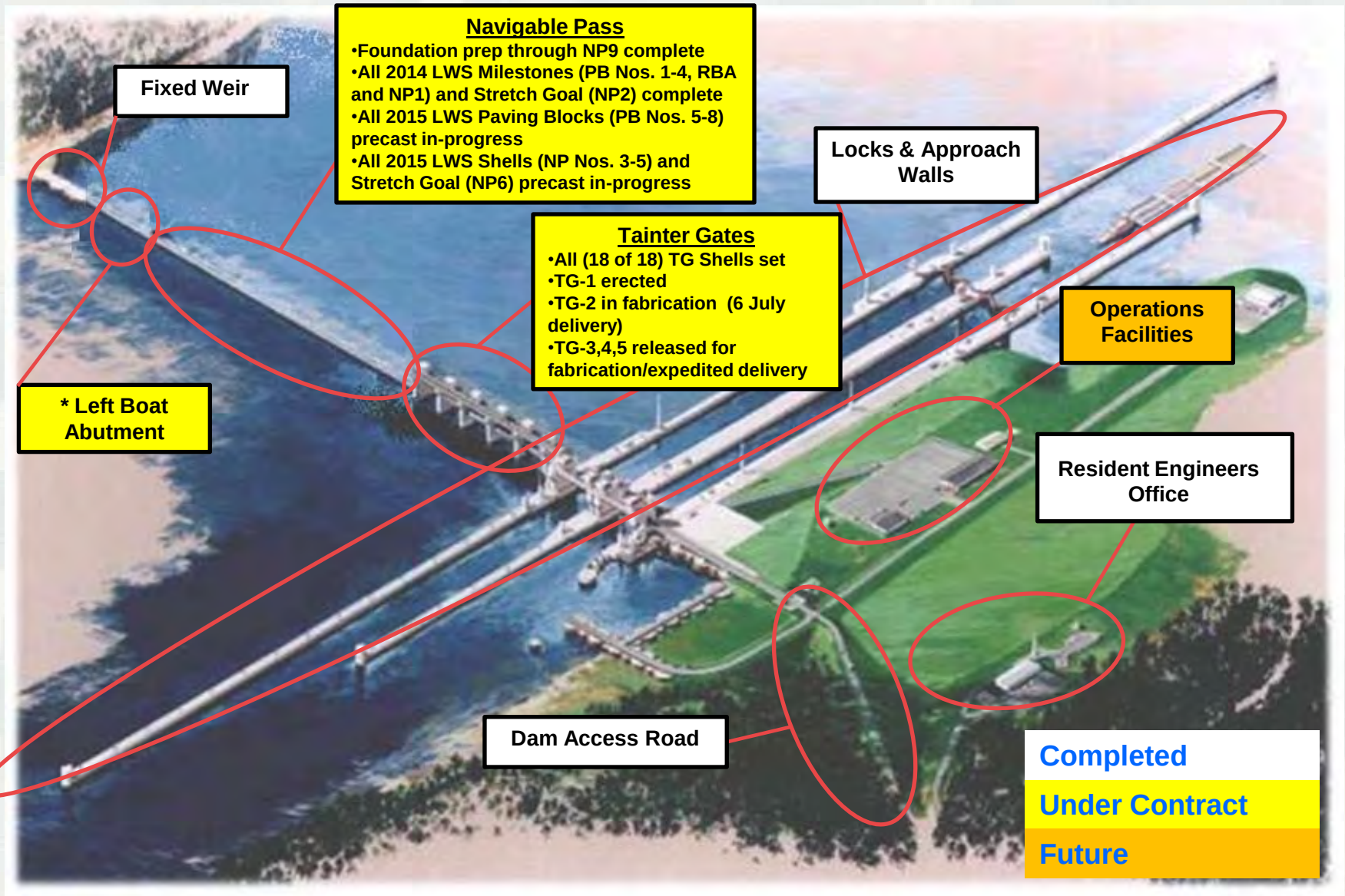
Olmsted Cofferdam/Locks/Approach Walls





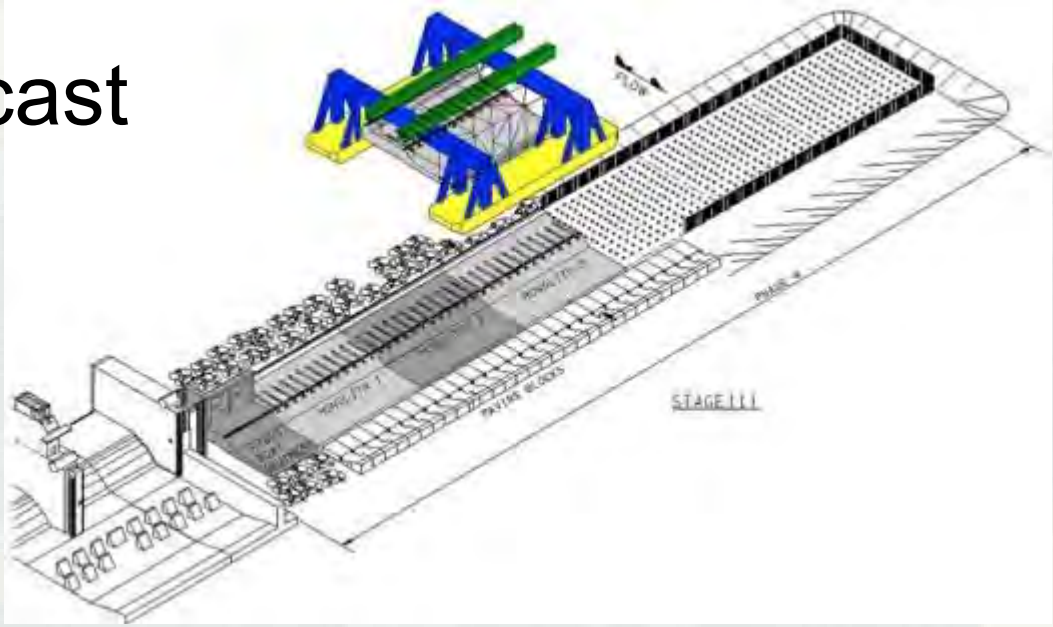
Lock Construction

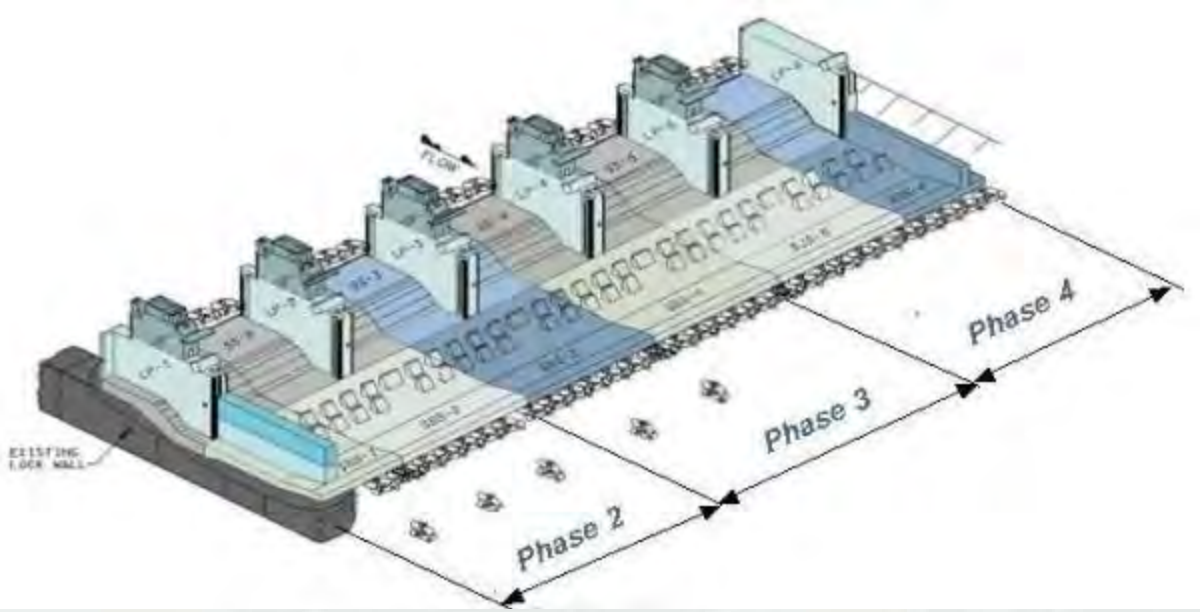
Olmsted Project Overview



BUILDING STRONG®

Navigable Pass Precast Elements





Tainter Gate Precast Elements

Dam Contract

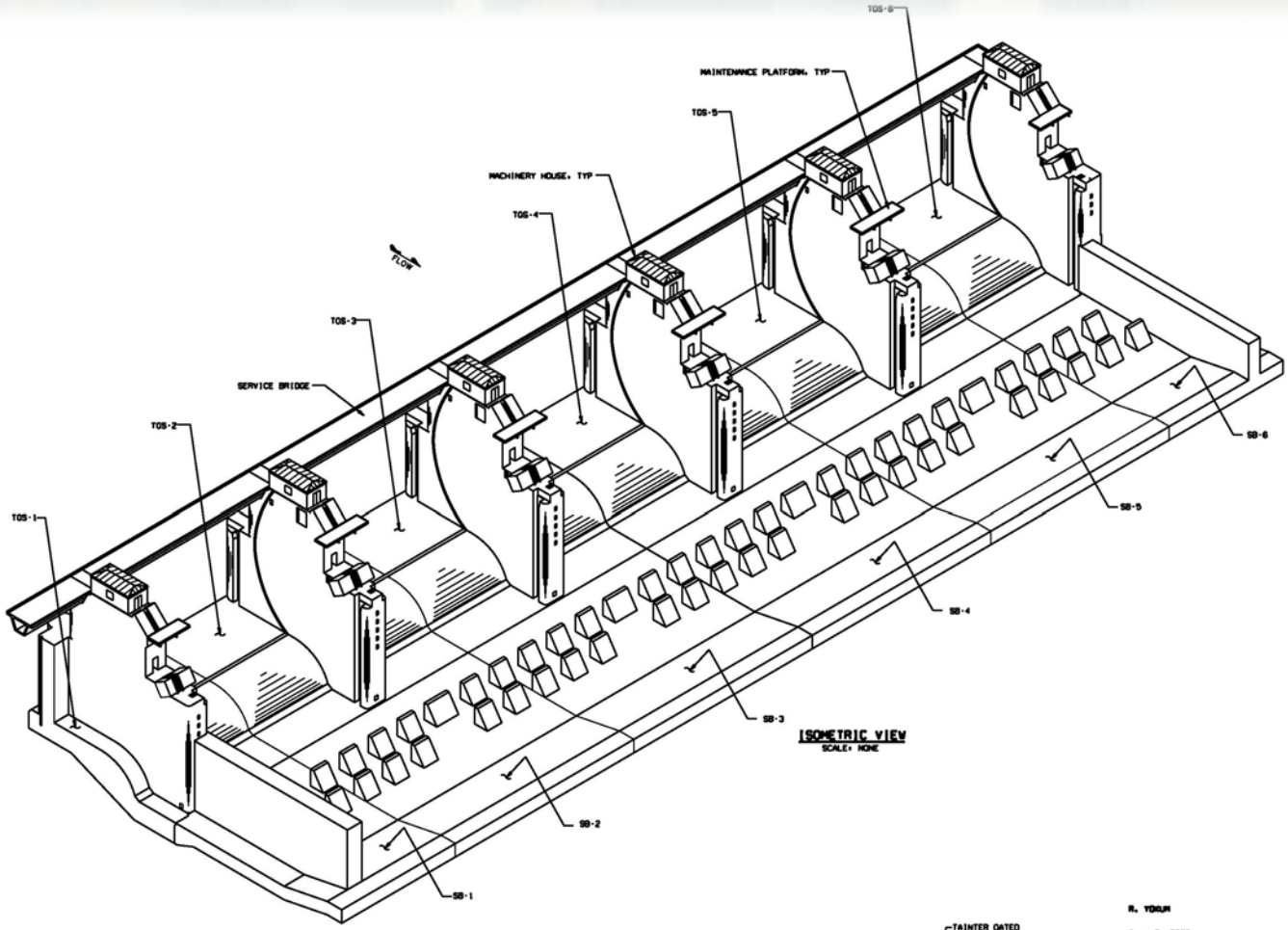
- Awarded 28 January 2004 to a WGA
- Cost Reimbursable: Cost plus Award Fee
- Current completion: March 2019
- EAC: $1.729 Billion
- Spent to date (31 Dec 2014): $1.118 Billion
- Current Force Count:
  - Staff: 160
  - Craft Labor: 447
- 156 control accounts; 6,593 cost codes; & 17,120 schedule activities

Olmsted Dam - Aerial

Olmsted Dam – Precast

* Lower Pier Shell No. 5 suspended under Super Gantry Crane

Precast Yard/Shell Work



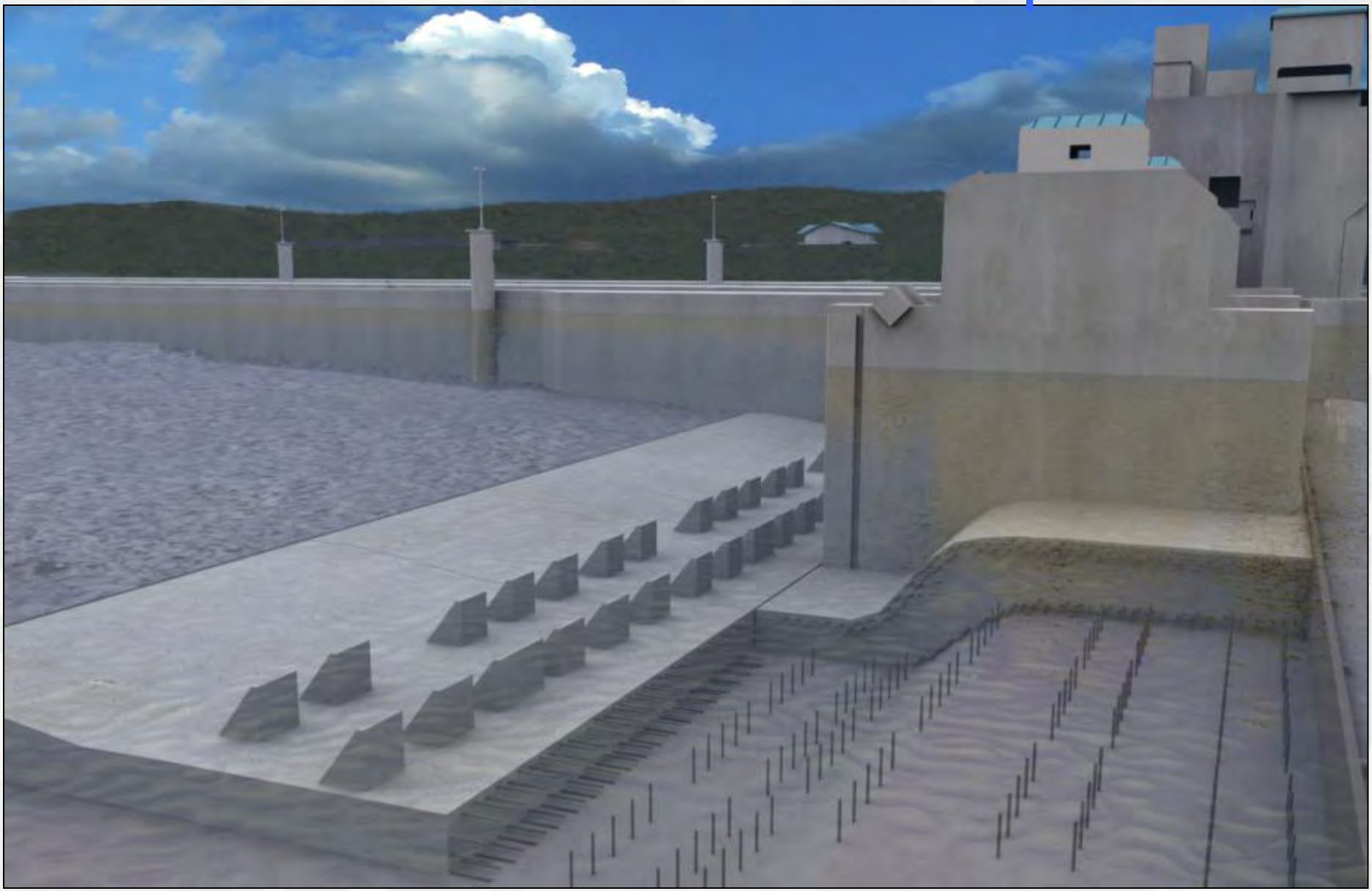
TAINTER GATED DAM SECTION

R. YOKUM
S. KAEMMERER
T. TREE

TAINTER GATED
ISOMETRIC

NONE

Tainter Gate Sections in-place



Construction of Shells

SBS Pintels and Receivers

BUILDING STRONG®

CRAIN

Shell Preparation Activities

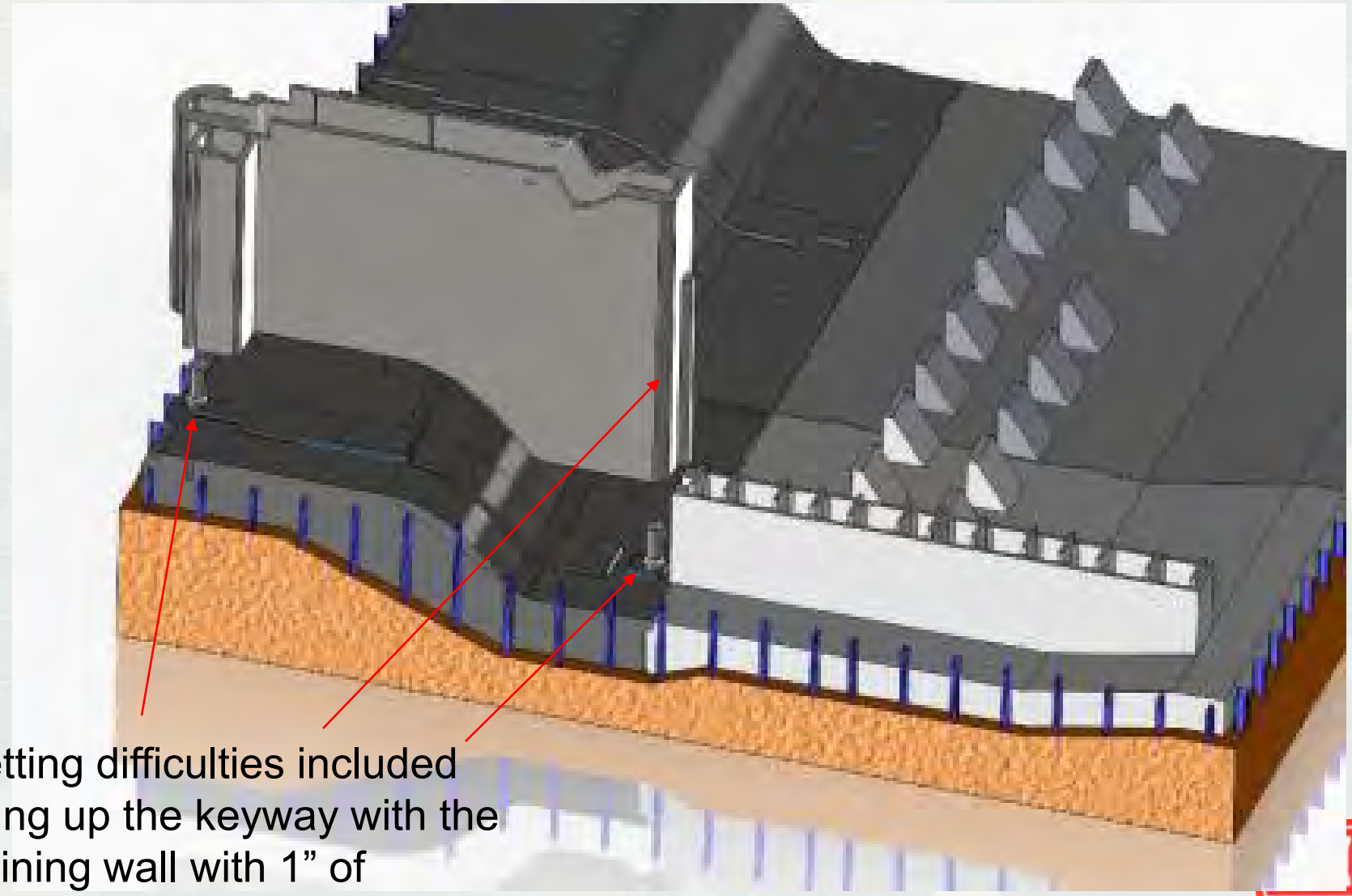
Containment structures & wire brushes

SS2 Tremie Mat Rebar

Precast Yard – 3 Months

Precast Yard – Lower Pier Shell

Cat Barge with Lower Pier Shell



Setting difficulties included lining up the keyway with the training wall with 1” of clearance and the 2 pintles that had ½” clearance

NavPass Shell w/ Wickets

Olmsted Dam – Heavy Lift

* Lower Pier Shell No. 5 (17/18) being lowered from the Catamaran Barge

Specialized Tools to Build Olmsted Dam

Cat Barge w/ Lifting Frame

Lifting Frame

Tremie Rebar Template on Cradle

Gantry w/ Lifting Frame

Super Gantry Crane

Facts & Figures:

Cost: $9.5 million

Lifting System: 12 Strand Jacks

Lifting Capacity: 5,100 tons

Travel Speed:
20’ per minute (unloaded)
10’ per minute (loaded)

Interior Dimensions:
100’ tall by 130’ wide

Catamaran Barge Construction

Facts & Figures:

Cost: $19 million.

The barge will be moved by two 4,500 HP push boats.

Dimensions:
310’ Wide, 200’ Long, 115’ High.

Strand Jack Heavy Lift Equipment

Facts & Figures:

Cost: ~$240,000 per jack

Lifting Speed: 20' per hour

http://www.dormanlongtechnology.com/

Cradle Transport System
(Push-Pull Skid System)

Cost: $4 million

Travel Speed: 64’ per hour

Olmsted Dam – Marine

* Low Water Season = 15 Jun through 30 Nov

Dam Foundation

Master Pile / Sheet Pile walls

Foundation Pipe Piles

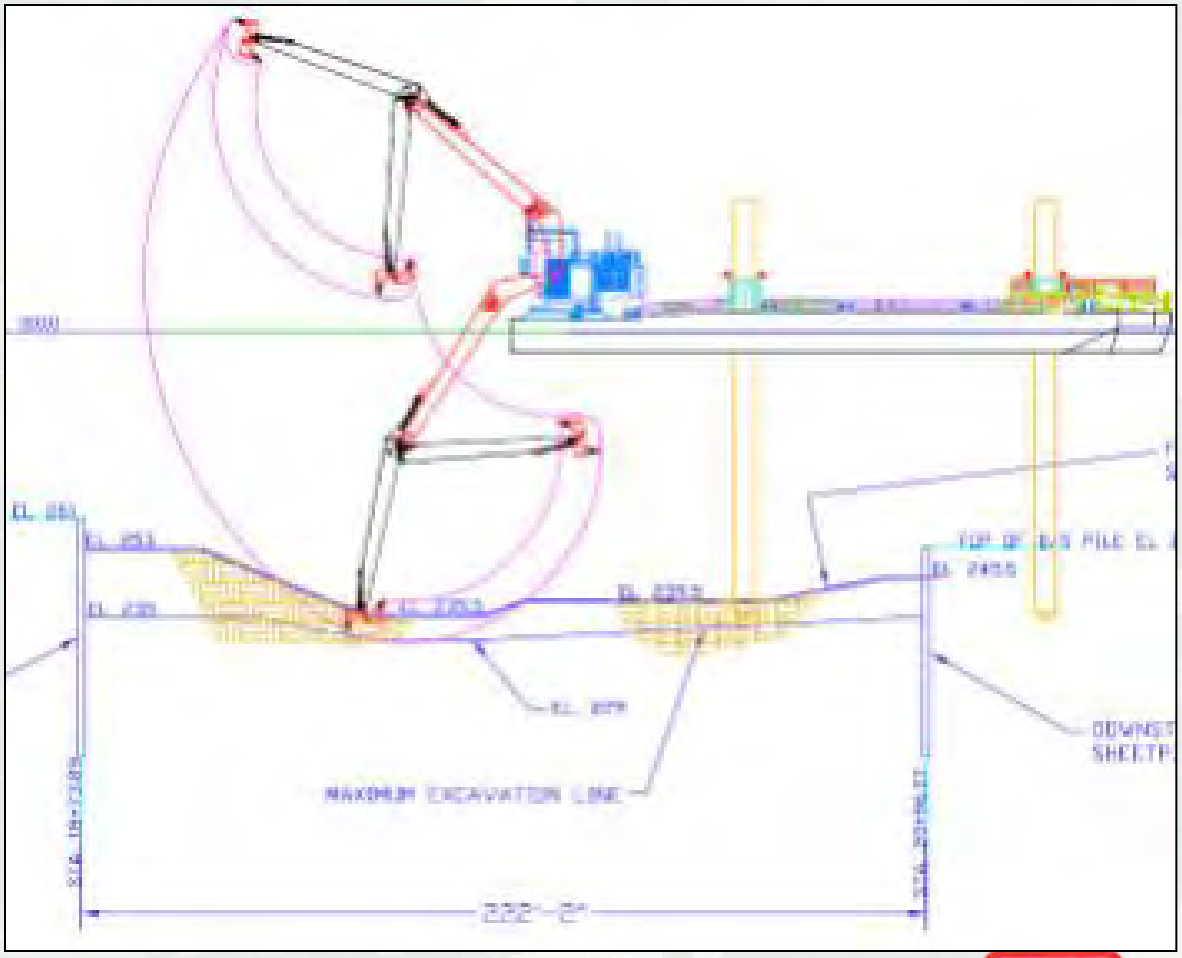
Downstream Rock Scour Protection

Aquadigger

Aquadigger

Barge: $14 million
180’ x 50’ x 11’ deep

Excavator:
$3,500,000
Bucket Size: 5 CY

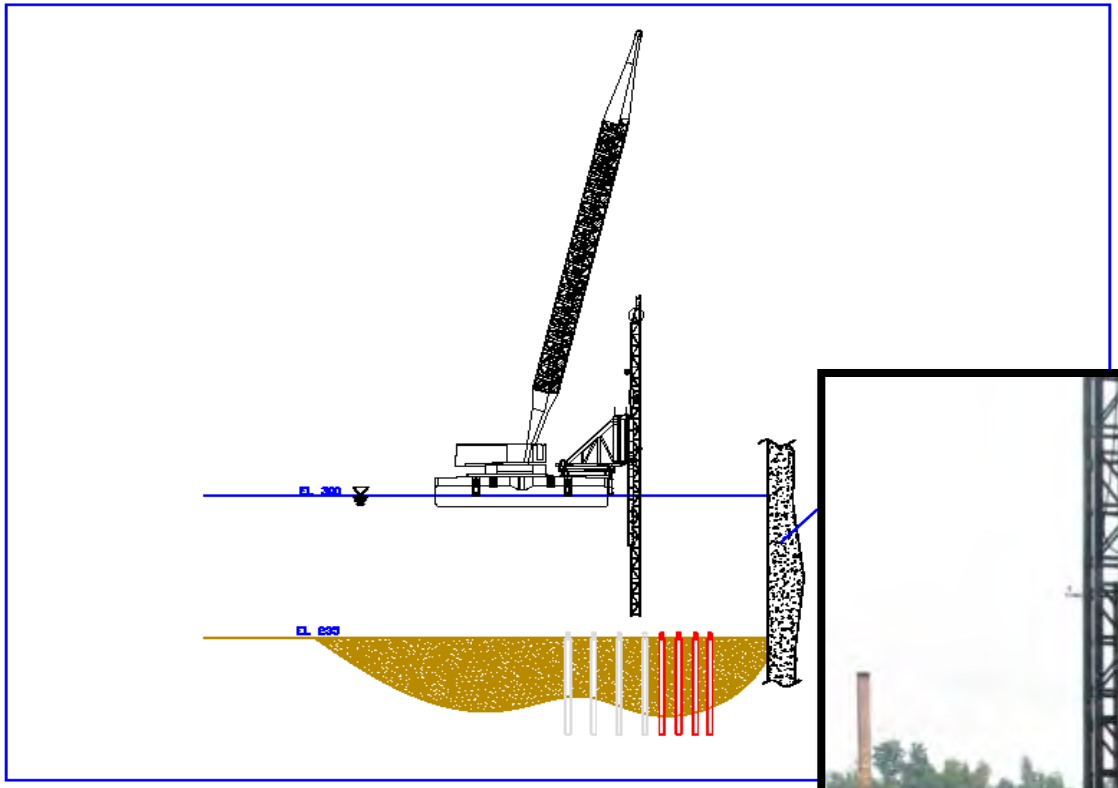


Grout Mat

Grout Mat Roll-Up Machine

Grout mat placement

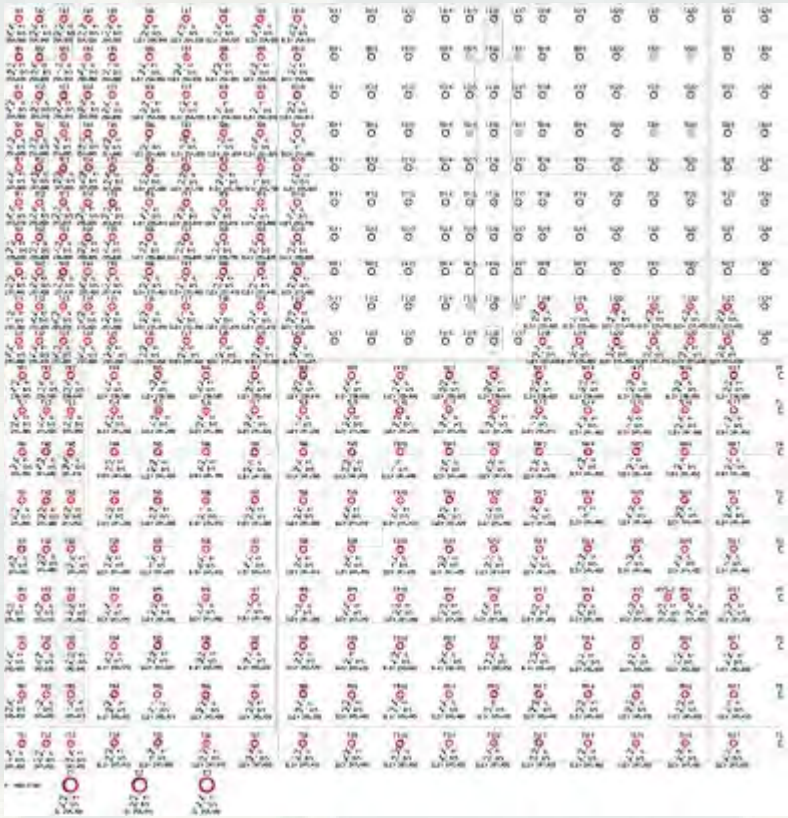
Pile Driving Equipment



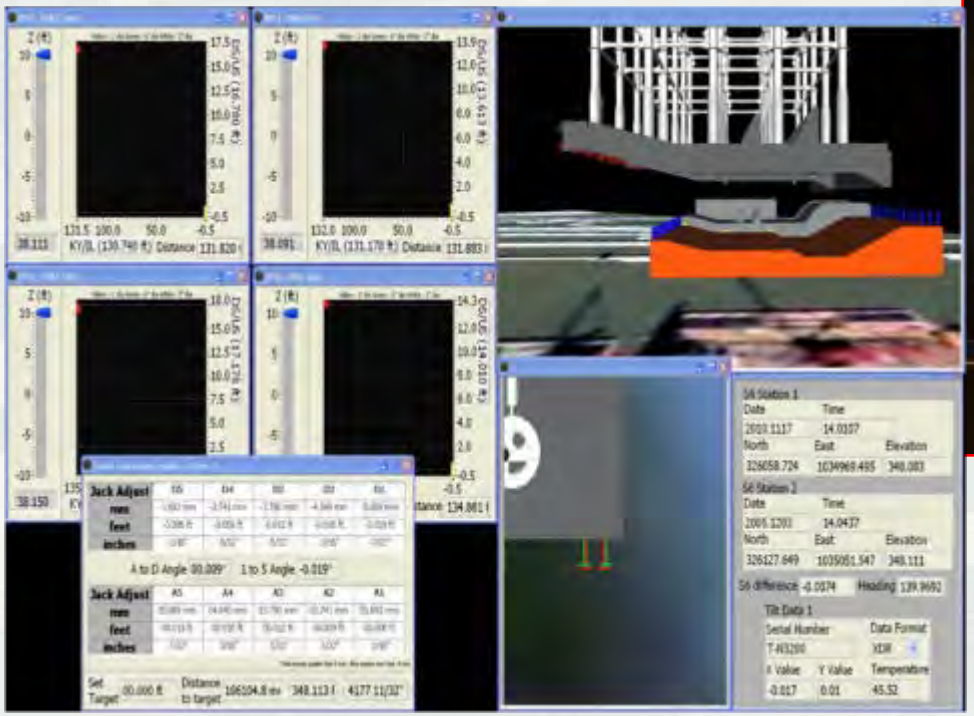
Pipe Pile Installation

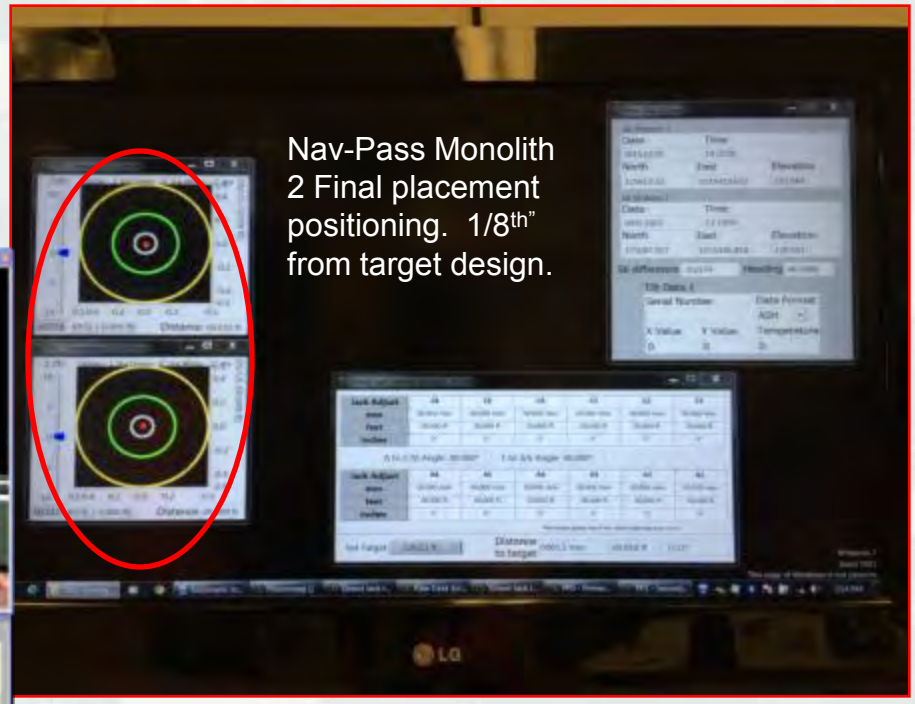
Driving Template

Survey Data Below



Shell Positioning Control Room View





BUILDING STRONG®

Tainter Gate

Tainter Gate

Tainter Gate

Dive Operations

6,000 Dive Operations on the project.

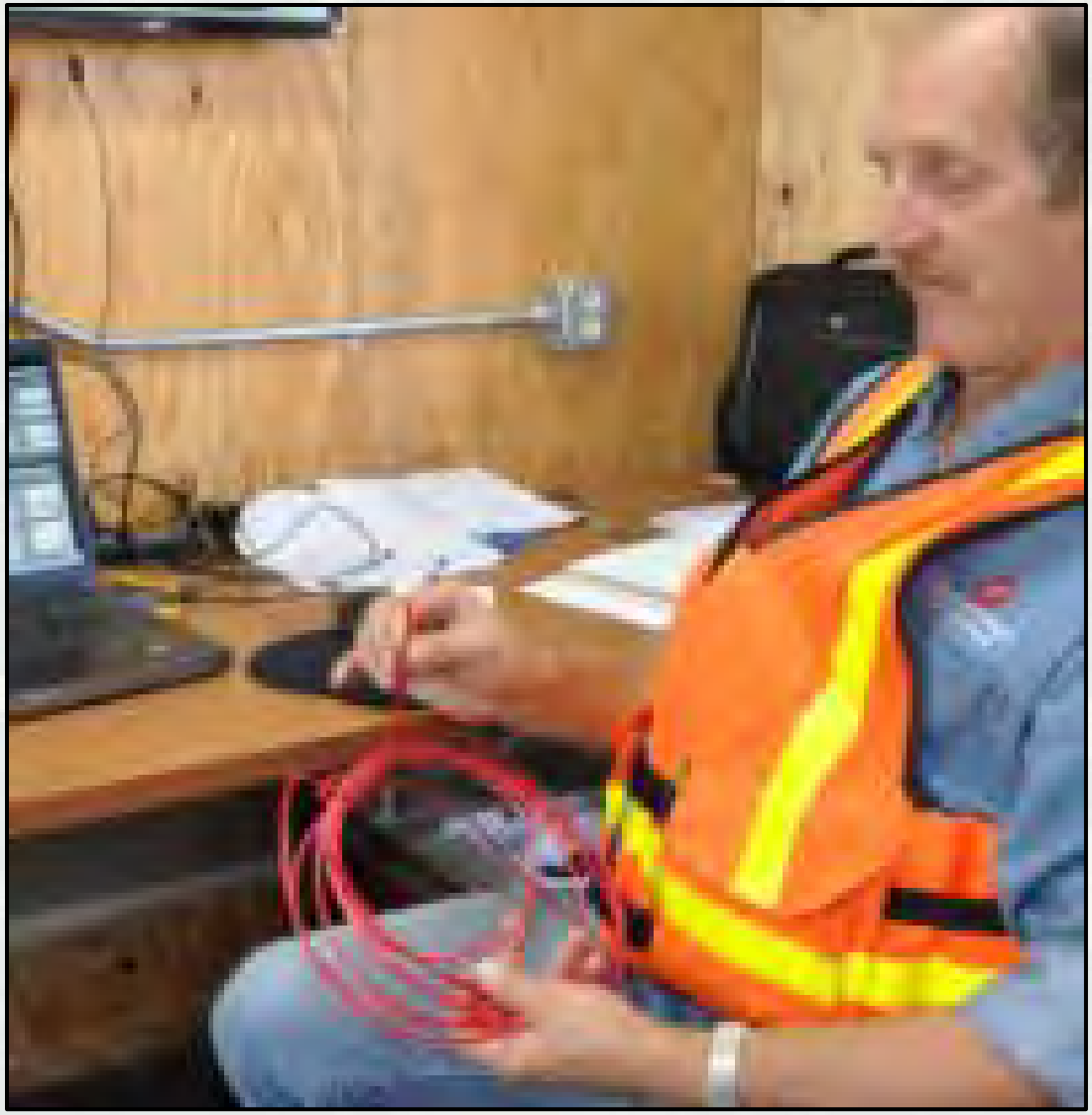
BUILDING STRONG®

Innovations and Improvement

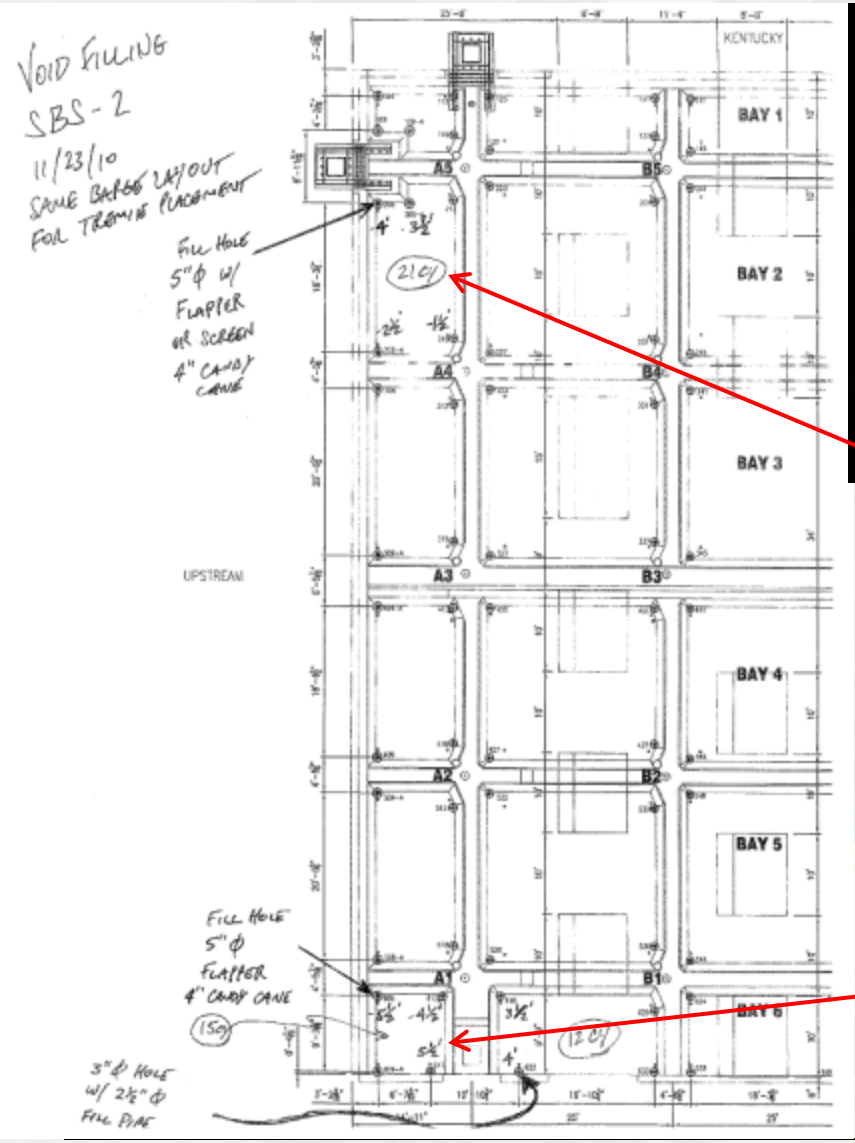
- Dive Curtain
- Tremie Bubblers
- Rapid Impact Compaction
- Dredge Hurley
- Screed
- Self Consolidating Concrete
- Lean Marine Operations
- Partnering (w/ customer rep)

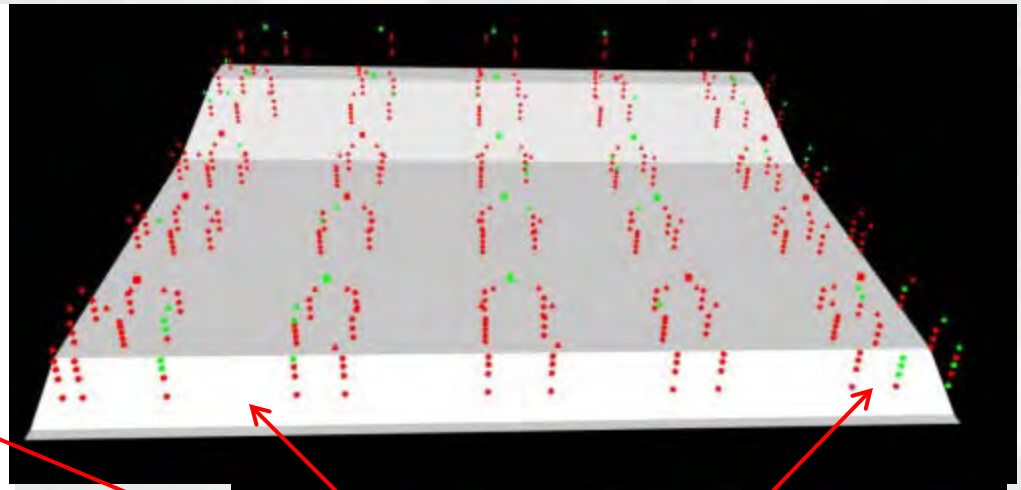
Dive Curtain

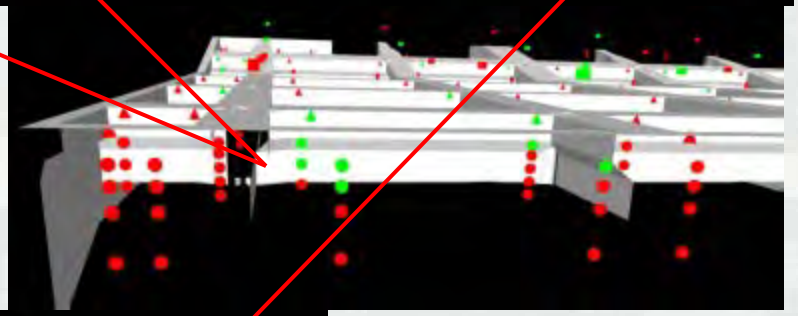
Tremie Bubblers

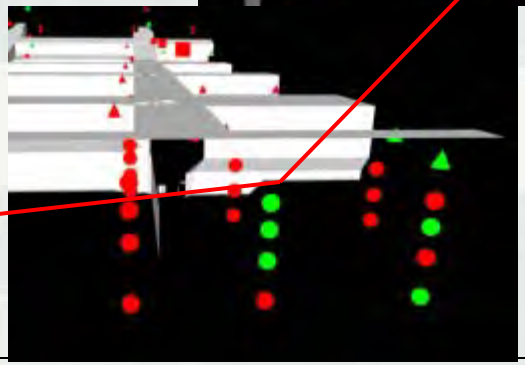


Shell SBS2 Results





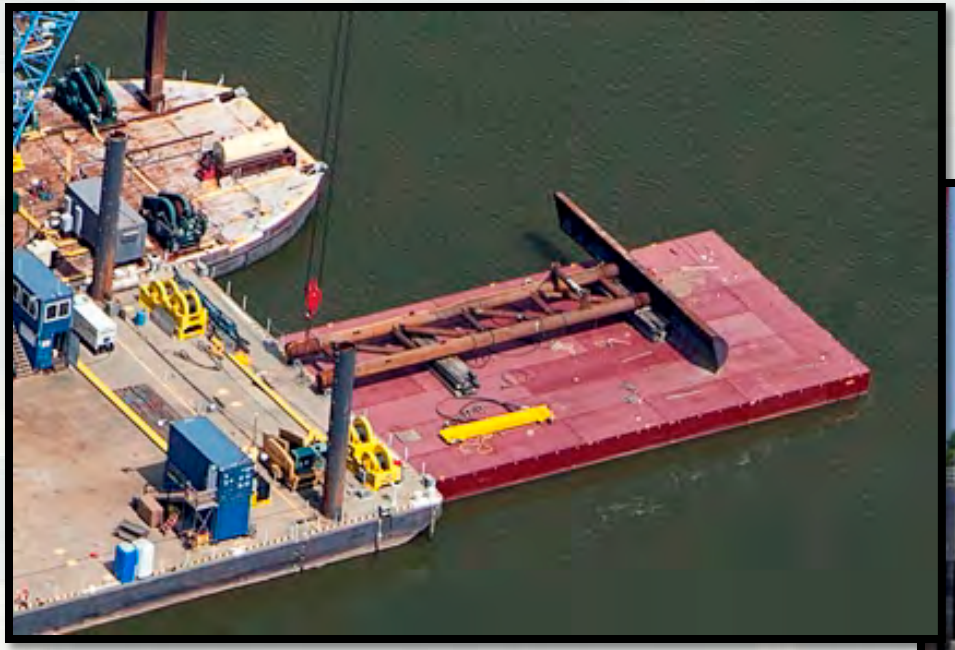




Red Dots = Filled
Green Dots = No Tremie

Rapid Impact Compaction

Screed & Dredge Hurley



Dredge Hurley:
7 days; previously 4 weeks

Screed:
18 hours; previously 7-10 days

Self Consolidating Concrete

Lean Marine Operations / Partnering

- Partnering is performed with all stakeholders

Management Controls

- **Integrated Baseline Schedule**
  - Weekly Construction Coordination Meeting
  - Weekly Schedule Review Meeting
  - Daily Productivity Meeting (War Room)
  - Monthly Risk Management
  - Monthly Schedule Metrics (SPI)

Management Controls

- **Cost Control Measures**
  - Yearly Internal Cost Estimate (Louisville District)
  - Certified Estimate (Walla Walla District)
  - Weekly Cost Review Meeting
  - Monthly Project Changes Meeting
  - Cost Metrics
    - Weekly CPI (labor)
    - Monthly CPI Reports (contract)

Dam Contractor Project Controls

- Integrated Project Controls staff
- Professional Certification of lead PC staff
- WBS and control accounts - scope/deliverables, budget, schedule and manager
- Established Change Control and Risk Management programs are continuously updated
- Earned value rules consistently applied
- Baseline changes controlled and documented

AECOM

Olmsted Dam Project – 27582
Olmsted, Illinois

WGA Organizational Chart
January 20, 2015

US ARMY CORPS OF ENGINEERS
RE
Jeremiah Manning

Group General Manager
Bruce Trott

Senior VP Operations
Rich Linford

WGA
Chief Project Director
Bruce Barnett

Sr. Executive Secretary
Annette Engerrad

Deputy Project Mgr – Jim Beckerle
- **Gen. Superintendent** – Tim Sexsue
  - **Heavy Lift & Mech CM** – Tim Everett*
    - **Heavy Lift Operations**
    - **Heavy Lift Supt** – Glenn Johansson, Steve Ferrell
    - **Mechanical/MW Supt** – TBD
    - **Electrical Supt** – Monte Russell
    - **Electrical Eng** – Cory Douglas
  - **Precast Plant Mgr** – Bob Wheeler
    - **Precast Field Operations**
    - **PCY Gen Supt** – Don Beckley
    - **PCY Supt** – Chris Coburn
    - **PCY Rebar Supt** – Glen Bragg
    - **Batch Plant Supt** – Rich Hamilton
    - **PCY Supt** – John Kestler, Stephen Bolwell, Chick Lyons
    - **PCY Asst Supt** – Corey Lipford, Adam Robertson
    - **Constr Doc. Spec.** – Chris Carl
  - **Marine Const Mgr** – Wade Miller
    - **Equip. General Superintendent** – Jim Handesty
    - **Equip. Supt** – Daniel Lisella, David Bechfold, TBD, TBD
    - **Equip Specialist** – Lee Wright
    - **Equip Assistant** – Roger Hickam
    - **Equipment Clerk** – Victoria Malone
    - **Equip Parts Spec** – Shane Kurtis, Charles Johnson
    - **Equip Expeditor** – TBD
    - **Marine Operations**
      - **Deputy Marine Constr Mgr** – Dave Philips
      - **Marine Gen Supt** – Ronnie Hollis
      - **Pile Driving Supt** – Ricky Blackwell, Joseph Costa
      - **Excavation Supt** – Scott Papaceas, Jamie Edderman
      - **Marine Support Supt** – Aayn Salazar, Jeff Schmidt

*Tom Everett retiring 2/3/15 (Chris Thompson taking plans)

Change Manager – Pat Ryan
- **Estimator** – Bruce Wright
- **Office Estimators** – Bona Home Office Estimators

Project Engineer – Kevin McLaughlin
- **Office Engineer** – Gary Neihoff
  - **CADD** – Joann Brown
  - **Doc. Control Specialists** – Ben Smith, Donna Harris, Kim McReynolds, Chessie Solomon, Jewel Moore
  - **Survey Manager** – Alfred Neihoff
    - **Hydrographer** – Don Woodward
    - **Survey Crew** – Ron Newton, Andy Julian, Jimmy Carr
- **Shell Engineering Manager** – Clay Coburn
  - **Precast Survey Mgr** – Tom Goodwin
    - **Precast Survey Crew** – TBD
  - **Shell Constr. Engr.** – Mike Rhodes, Jeremy Curran, Philip Dummeier, TBD, TBD, TBD
  - **Weight Control Eng.** – Caleb Barth, Ashley Bascombe
  - **Productivity Mgr** – Brad Bell
    - **Productivity Engr** – Nelson Gourneau, TBD
- **Structural Eng. Manager** – Dale Swedberg
  - **Structural Eng.** – Samuel Justiniano, Khaled Moustafa
  - **Construction Eng.** – Justin Nelson
  - **Drafters** – Joe Jaquet, Bill Hoehnsen, Regan Wainscott, Timothy Scott
  - **Engineering Intern** – TBD
  - **System Engineering** – Bob Steibner - Lead, *Chris Thompson, Clay Jackson, Bob Gibbons, Curtis Ruble, Chris Curcio, Carlos Flores
  - **Heavy Lift TDY Support** – Steve Summy, Steve Walton
- **Marine Eng Mgr** – Jay Whitworth
  - **Marine Engineers** – *Lawrin Johnson, Brendon Johnson, Arno Bissel, Buddy Jones, John Lynch, Alex Ovenos, Cindy Stay, Spencer Libau (ACI), TBD, TBD
  - **Construction Engr** – Joe Schwenk (AHC)
  - **Engineering Interns** – TBD

*Tom Everett retiring 2/3/15 Chris Thompson taking (Mark)

Contracts Mgr – Jodi Nichols
- **Subc Admin and Purchasing Agents** – Bernice Clodfelter, Sandra Lambert, Jackie Coburn, Amanda Nelson, Don Davis, Kevin Plummer, Dan Clark, Marsha Baker, Barb Wright, Robert Organ, TBD, TBD
  - **Procurement Process Coord** – Holly Mathis
  - **CCR Expeditor** – Jennifer Korte
  - **Procurement Assistant** – Nicole Roach
  - **Sr Procurement Clerk** – Leah Kesler

Project Controls Mgr – Tom Manley
- **Lead Schedule Engineer** – Ryan Hannan
  - **Asst Schedulers** – Philip Gonzales, Jake Everett
- **Lead Cost Analyst** – Mark Roi
  - **EVMS** – Crystal Robison, Matt Hoskins

Bus. Director – Vicki Havens
- **Senior Accountant** – Mike Ridley, Nancy Miller, Ryan Gordon
  - **Assoc Bus Mgr** – Corie Wheeler
  - **Acctg Clerk A/P** – Theresa Williams
  - **Sr. Payroll Spec.** – Nancy Thomas
  - **Asst Clerk-Payroll** – Lori Bennett
  - **Cont. Contracts** – Bill Hartwell, TBD
  - **IT Support** – Mazin Fitzah, Jacob Wren
- **Property Manager** – John Hubbs
  - **Gate Monitors** – Mike Isenburn, Otis Spears, Gary Turner, George Nelson, Willene Reed, TBD
  - **Warehouse** – Mike Frazier (WH Mgr), Charles Johnson, Donna Jonkerman, James Higgins

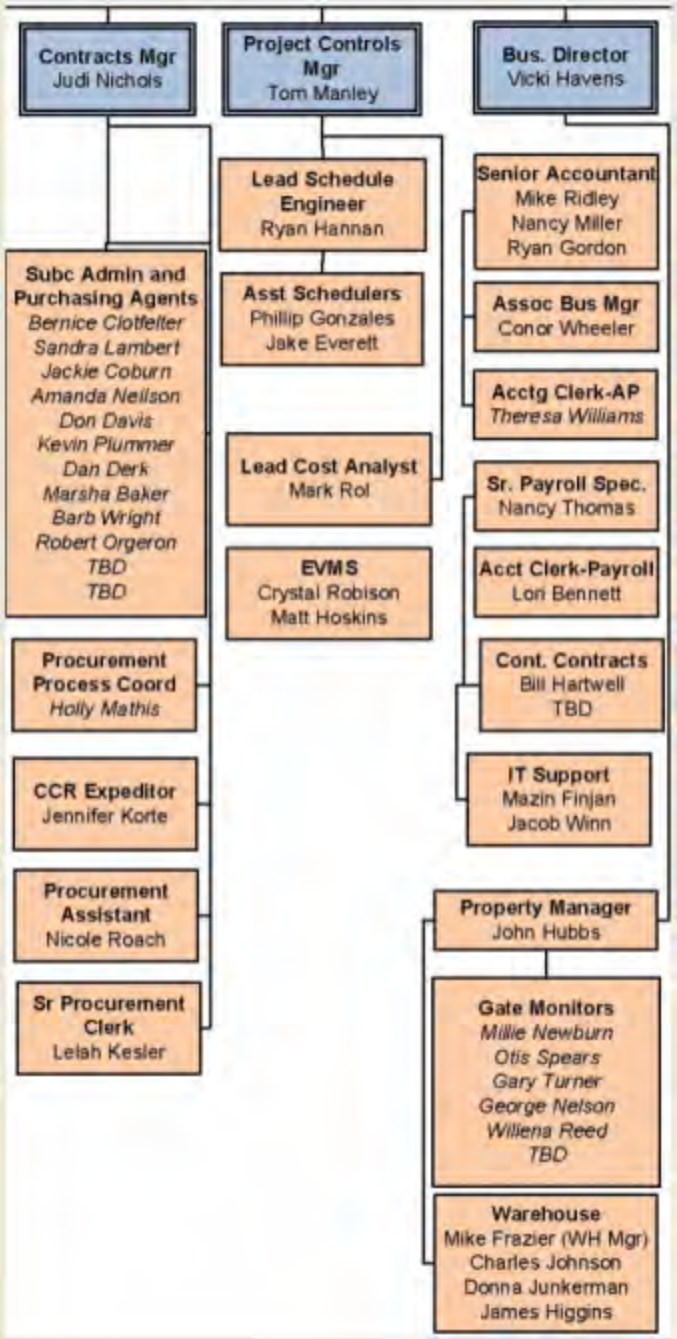
Safety Manager – Doug Carter
- **Deputy ES&H Manager** – Rob Hobson
  - **Safety Spec** – Jim Shaw, Cindy Beckley, Meagan Bauer, Cody Brock, Bill McCourt, Robert Quigley, Larry Dowdy
  - **EMT** – Melissa Clinton
  - **Intern Seasonal** – TBD
  - **Safety TDY** – Grant Johnson

QC Manager – Gene Cassis
- **Alt. QC Mgr / QC Engineer IV** – Nate Ing
  - **Lead Civil QC Specialist IV** – TBD
    - **Civil QC Inspector II** – Terry Deck
    - **Civil QC Specialist** – Brian Moore, Tom McBride, TBD
    - **Fabrication QC Specialist IV** – Bill Whittington
    - **Fabrication QC Engineer III** – Dave Philips
    - **Fabrication QC** – William Kemp
- **Deputy QC Mgr (Field Op)** – George McMinn
  - **QC Admin Asst** – Deanne Duke
  - **QC/RMS Eng** – Gary Hendrix
  - **Lead Marine QC Specialist IV** – Gerald Simons
    - **Marine Quality Specialist IV** – Jim Shankle
    - **Marine QC Specialist** – Donald Alvey
    - **Marine QC Interns** – Mike Edwards, TBD
    - **QC Lab Certification Overseer*** – Lawrin Johnson
    - **QC Lab Tech / QC Spec III** – Lance Lawyer

*Independent Overseer of QC Lab Plus Marine

Note: **General Superintendent** coordinates all equipment, labor and material field activity with CAM requirements daily.

- Project Controls Staff
  - Project Controls Manager
  - 3 Schedulers
  - 1 Cost Analysis
  - 2 EVMS staff



Dam Contract
Key Software

Oracle (Accounting)

- Operated on site by URS staff
- Actual cost data (ACWP) exported to and verified in excel and imported to Prism using approved WBS

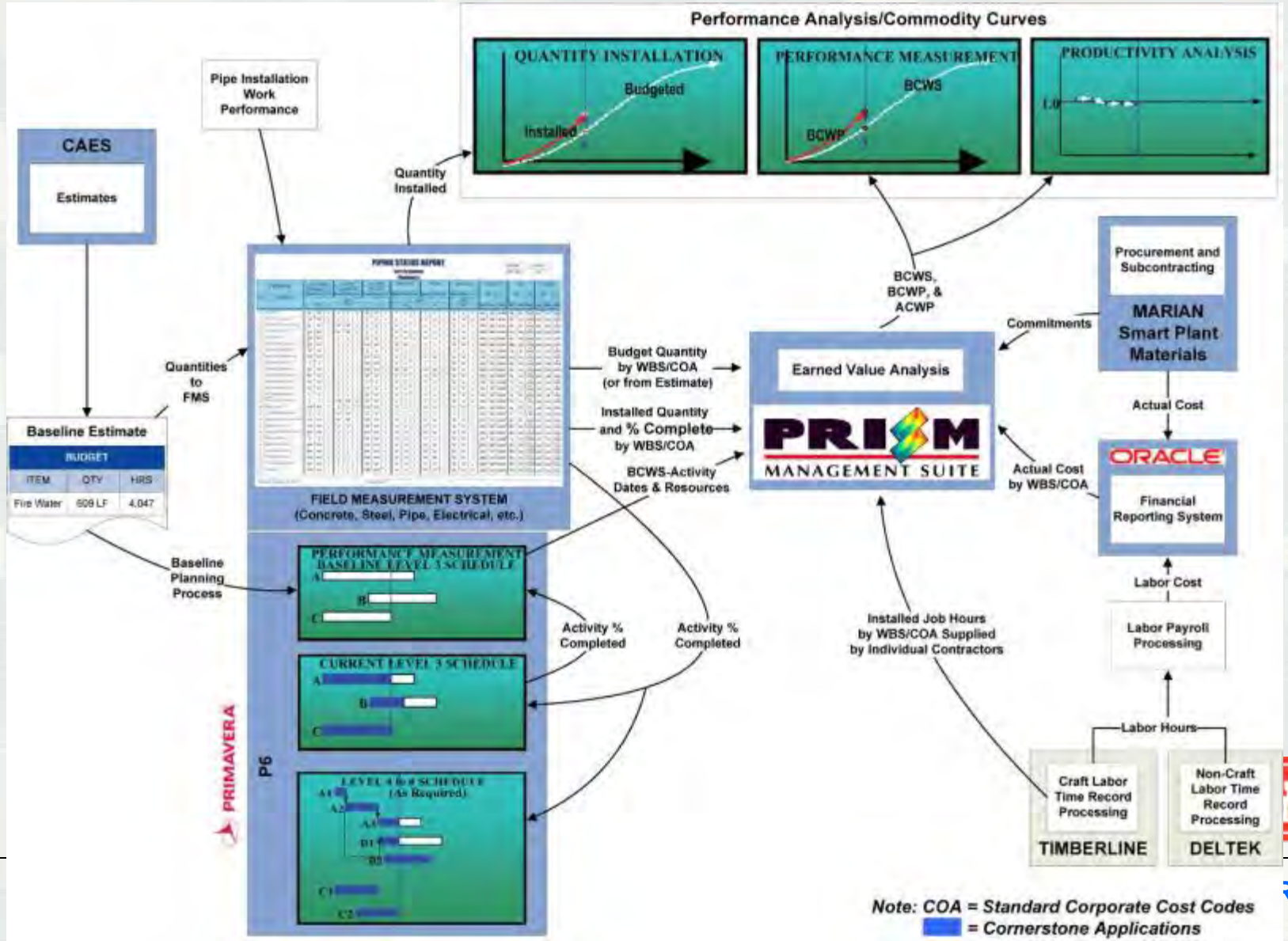
Primavera P6 (Schedule):

- Contains detailed project Network Analysis CPM Schedule along with time phased budgets (BCWS) using WBS

Prism (EVM):

- Integrates accounting, schedule, EAC and performance data
- Performs EVM calculations
- Generates EVM reports and data for export

WGA Project Controls



Olmsted Project
Time and Cost Scorecard – Jan 2015

Expenditures

Planned	(BCWS)	$1.877B
Earned	(BCWP)	$1.876B
Actual	(ACWP)	$1.863B

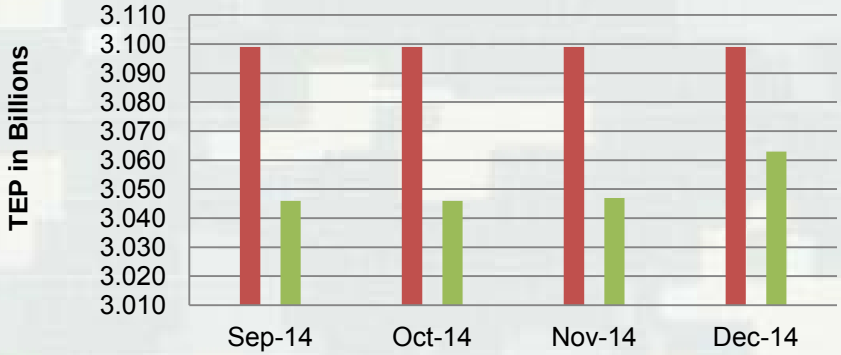
BCWP: Reports the value (based on % complete) of the work performed to date.
Target:
Actuals as compared to Planned: (<1% = Green) (>1%and <3% = Yellow) and (>3% = Red)

Schedule

	(PACR)/(Current)
Project Complete	Sep 2024/Mar 2022
Dam Operational	Sep 2020/Oct 2018

Measures: Planned project completion and Dam contract operational dates
Target:
Green: Current = PACR-12 months
Yellow: Current = PACR-11 months to PACR-7 months
Red: Current = PACR-6 months to after PACR date

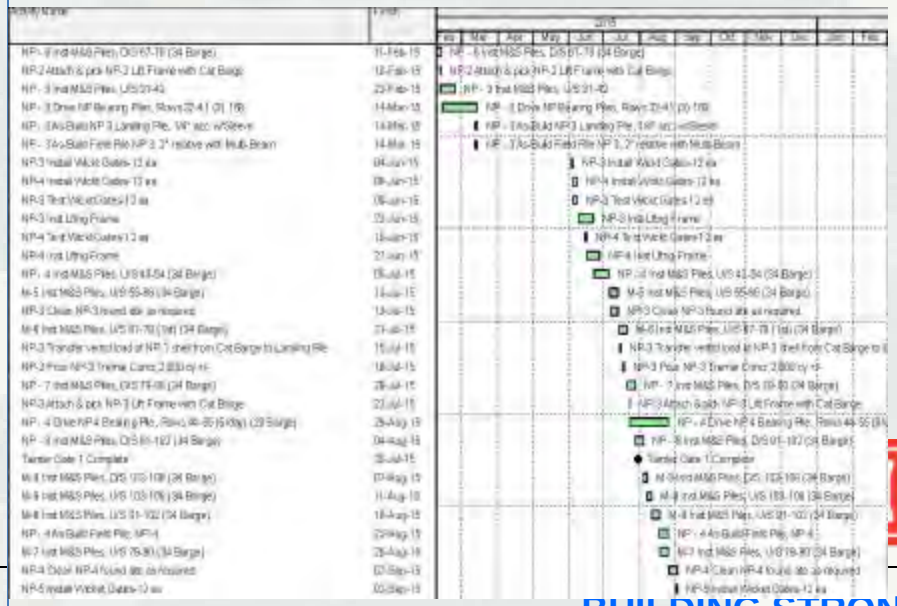
Olmsted Project TEP Trend



	Sep-14	Oct-14	Nov-14	Dec-14
PACR w/risk	3.099	3.099	3.099	3.099
Est. w/risk	3.046	3.046	3.047	3.063

*** Est. TEP still includes $244M in risk-based contingency from the original PACR formulation. Risk mitigation efforts and 3 years of actualized non-event exposure should trend that allowance significantly lower but first must be captured in the next bi-annual certified cost estimate scheduled for 2016.**

Olmsted Major Activity Schedule

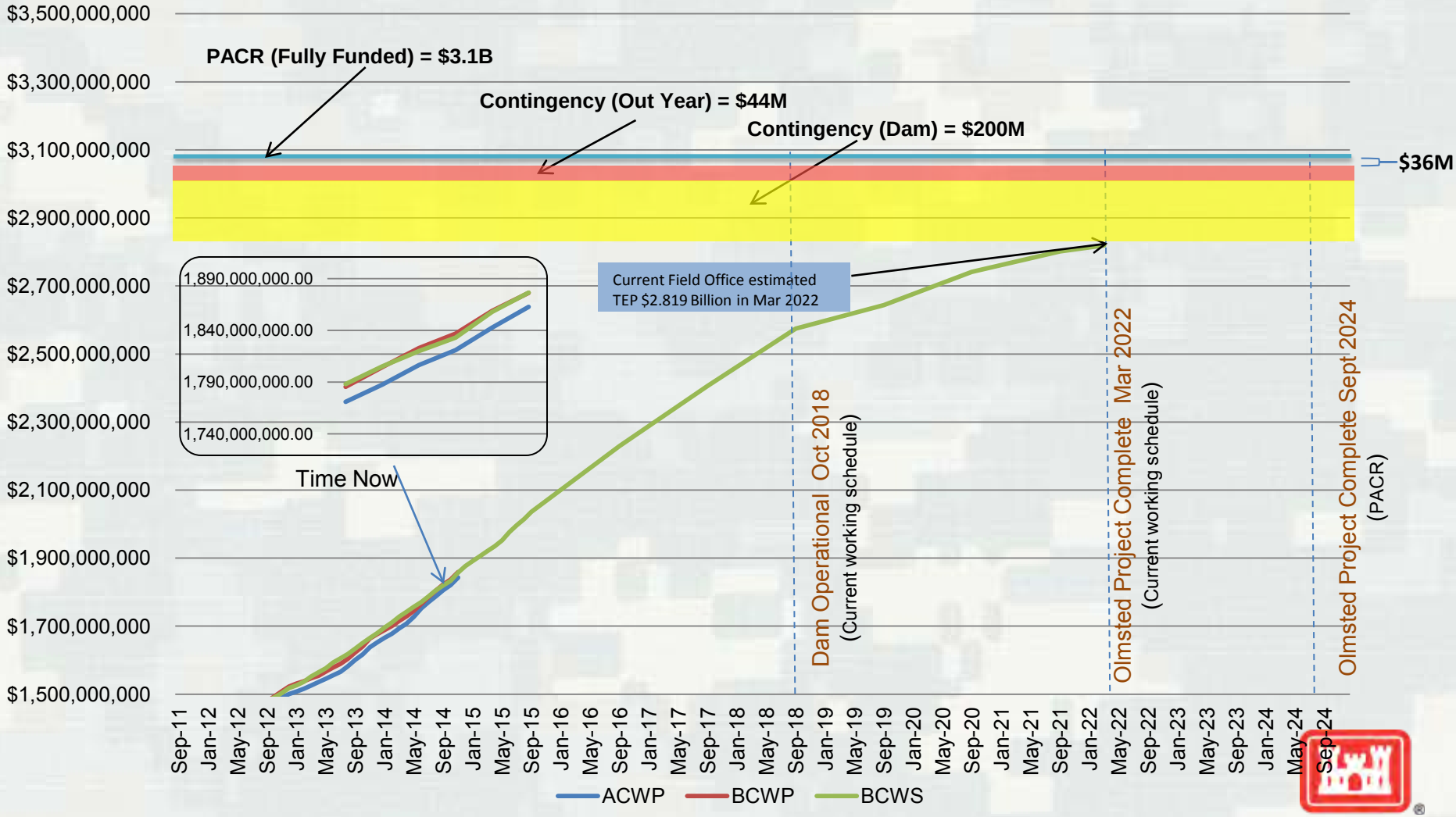


BUILDING STRONG®

Olmsted L&D Project Earned Value Analysis

(Based on DOD Gold Card)

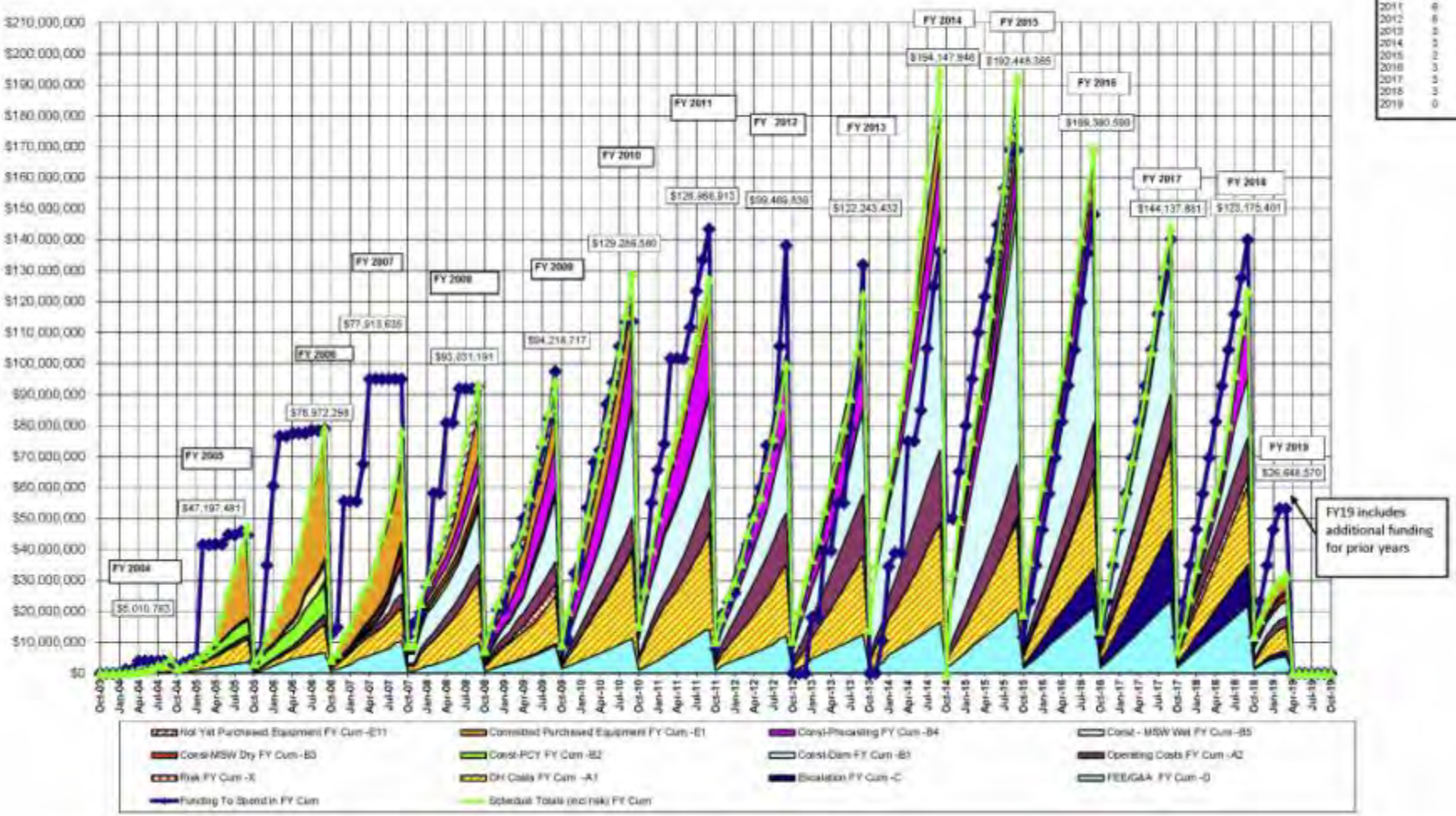
Jan 2015



BUILDING STRONG®

12D01 - Execution Plan Working Schedule

Shells Only		
FY	Build	Set
2007	0	0
2008	0	0
2009	0	0
2010	5	1
2011	6	5
2012	6	4
2013	3	5
2014	3	5
2015	2	4
2016	3	4
2017	3	4
2018	3	5
2019	0	1



File: 12D02 Execution Curve 12D02 Sawtooth 14 12.xlsx

Tab: 12D01 Sawtooth

Printed: 10/20/2015, 9:32 AM

Realities

1. Jobs. Olmsted directly supports approx. 600 engineers, foremen and craft workers.

2. Hub of the Inland Water Transportation System. Approx. 91M tons of commodities transit Locks and Dam Nos. 52/53 annually. (Busiest node in the system)

3. Olmsted must be built. Locks and Dam Nos. 52/53 **must be replaced** in the near future **to ensure reliable navigation** of the lower Ohio.

4. Value to the nation. The estimated annual net benefit of the operational project is **$640 million**.

5. Olmsted is inland navigation's top priority. The Inland Waterways Users Board (IWUB) has adopted the Inland Marine Transportation System (IMTS) Capital Investment Strategy report that ranks Olmsted Locks and Dam as the **number one priority** for locks and dams construction projects.

6. Project oversight has increased. Olmsted is a USACE designated mega-project. All additional management controls are in place.

7. Execution. Using the existing cost-reimbursable contract and the in-the-wet construction method is the most efficient way to complete the project on schedule and within budget.

Questions/Discussion