



CH2MHILL

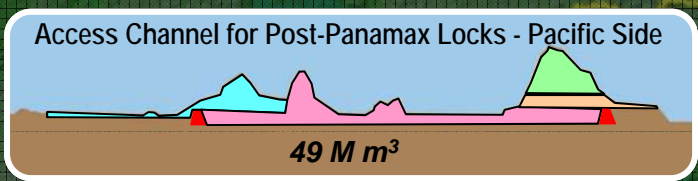
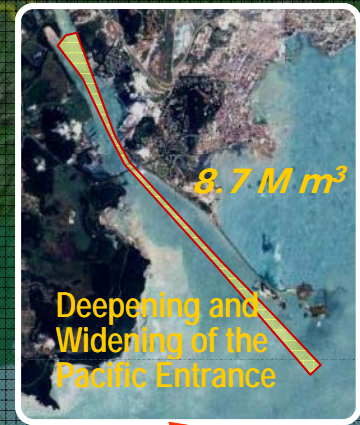
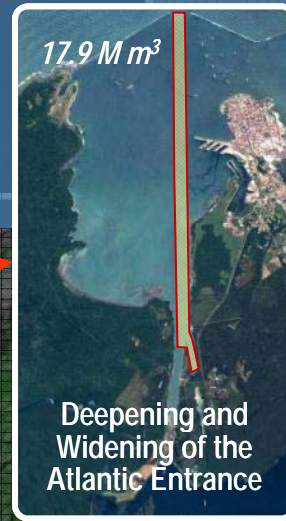
The Panama Canal Expansion Program

August 2011

Joe Cazares
Locks Construction Manager
CH2M HILL Panamá

Program Components

Atlantic Ocean

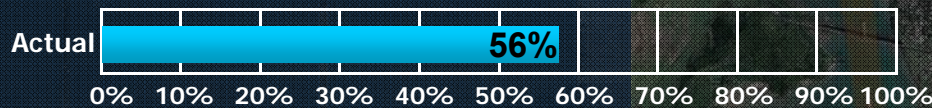


Pacific Ocean

Pacific Access Channel

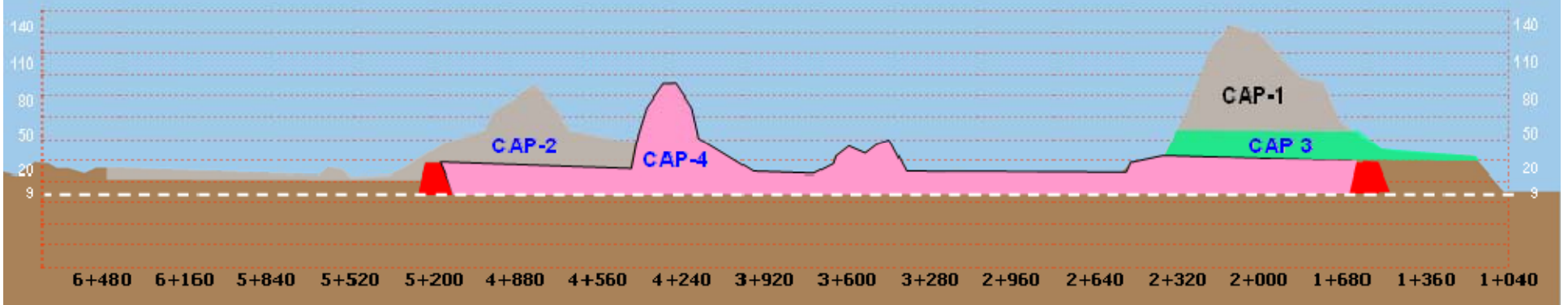
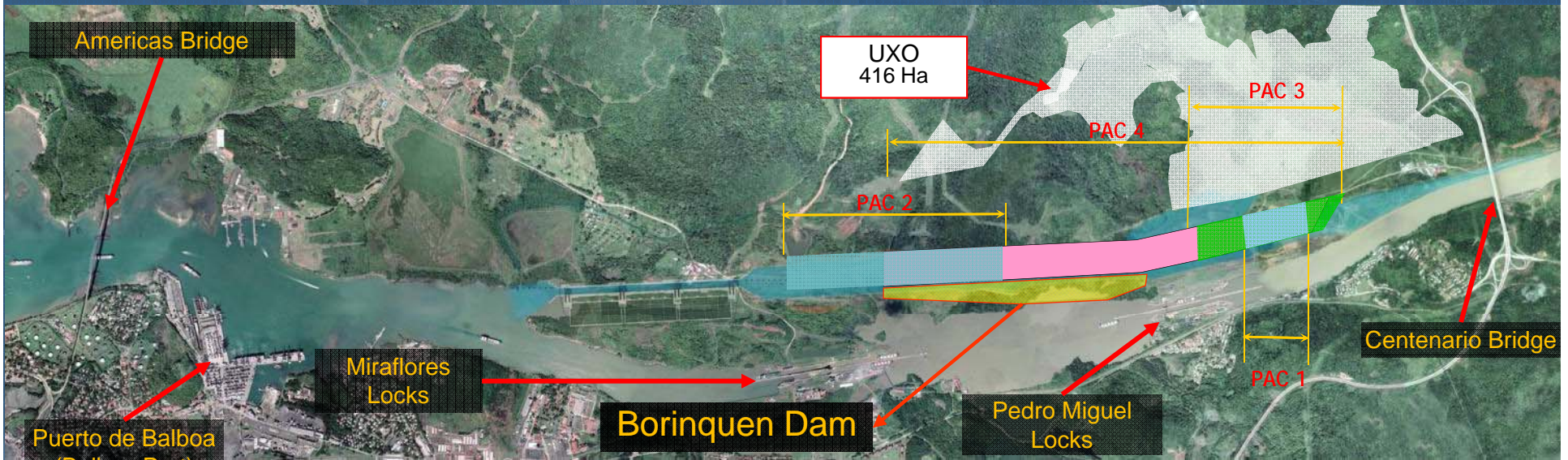


32 M m³ excavated of 49 M m³

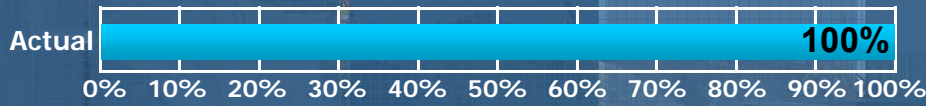


- Last PAC contract awarded: 7-JAN-10
- Company: Consortium ICA-FCC-MECO
- Amount awarded: \$ 267,798,795.99
- Order to proceed: 22-JAN-10
- Work startup date: 27-APR-10
- Estimated completion date: 31-Oct-13

Pacific Access Channel

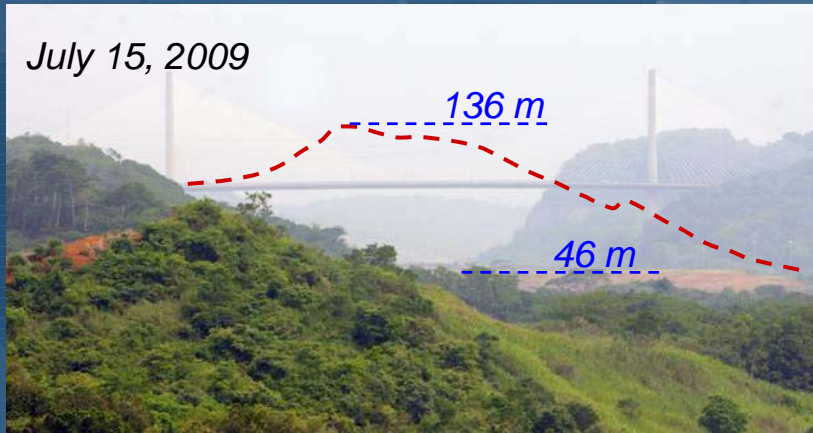


Pacific Access Channel - Phase 1



7.3 M m³ excavated

July 15, 2009



Contract scope: 7.4 Mm³, cleaning 146 hectares of UXO and relocation of a 3.6 km stretch of Borinquen road

Awarded: July 17, 2007

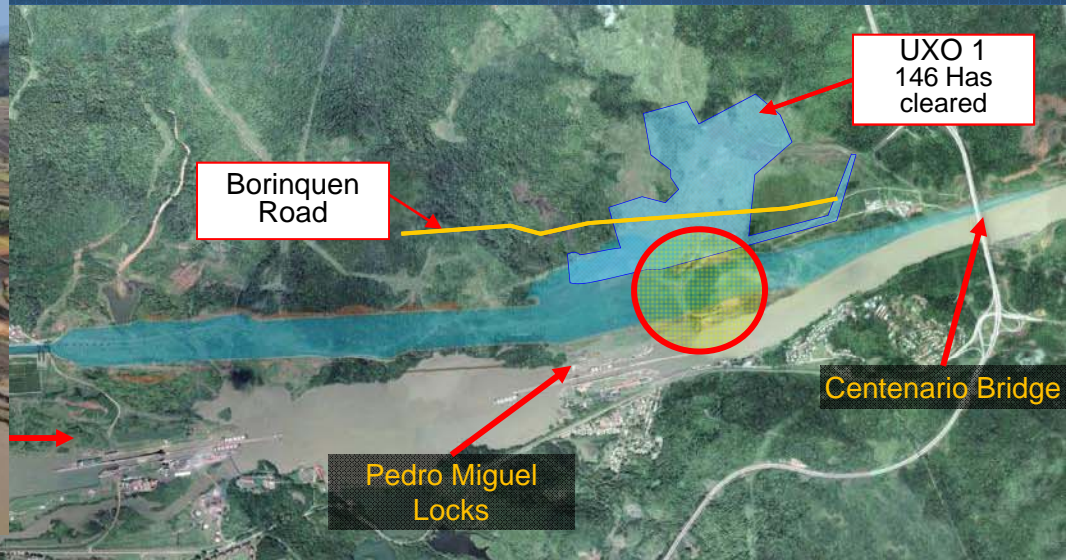
Company: Constructora Urbana S.A.

Amount awarded: B/.41,094,000.00

Amount paid: B/. 38,420,807.54

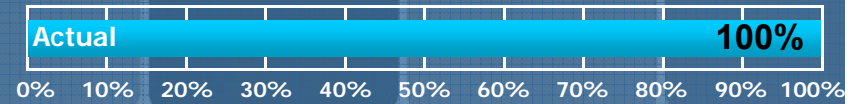
End of contract: 25-Feb-2010

COMPLETED



Pacific Access Channel – Phase 2

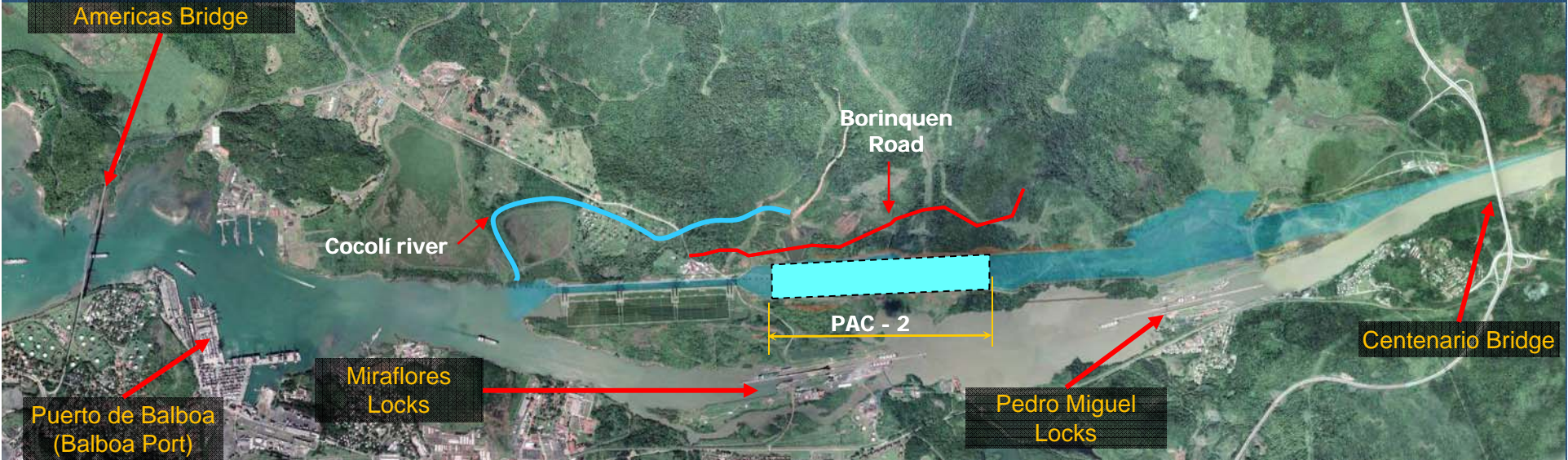
7.4 M m³ excavated



COMPLETED

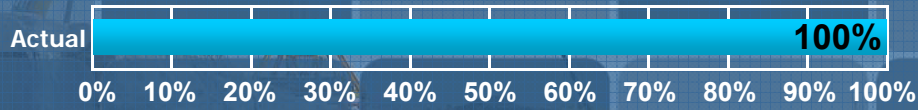


- Contract scope :
 - 7.5 M m³ of excavation
 - relocation of a 1.3 Km. stretch of Borinquen road
 - diversion of a 3.5 Km. stretch of Cocoli river.
- Awarded: 27 November 2007
- Amount : \$ 25,489,200.30
- Company: Cilsa-Minera María
- Amount paid: \$ 26,215,106.66
- End of contract: 30 November 2010

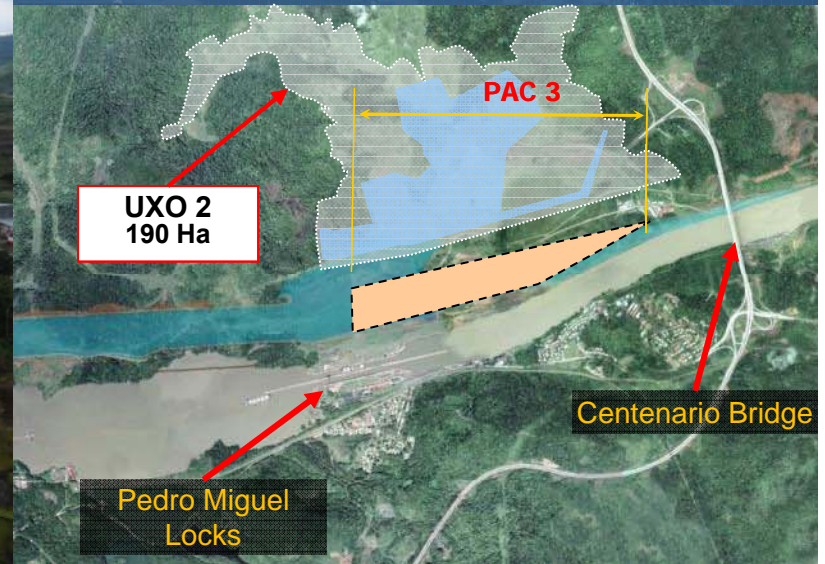


Pacific Access Channel – Phase 3

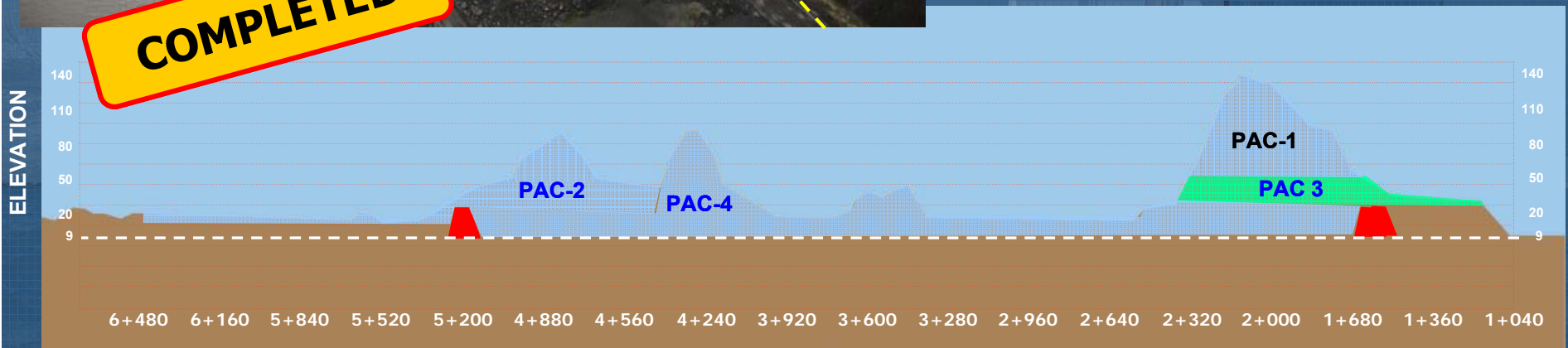
- Contract scope :
 - 8.2 M m³ of excavation
 - Clearing of 190 has in T6 area
- Awarded: 16 December 2008
- Amount : \$ 36, 659,852.28
- Company: Constructora MECO, S.A.
- End of contract: 3 August 2011



8.2 M m³ excavated



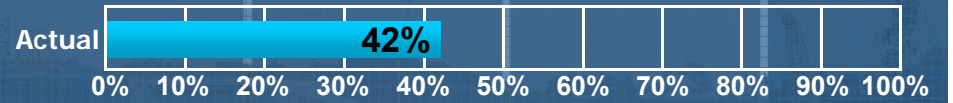
190 hectares cleared



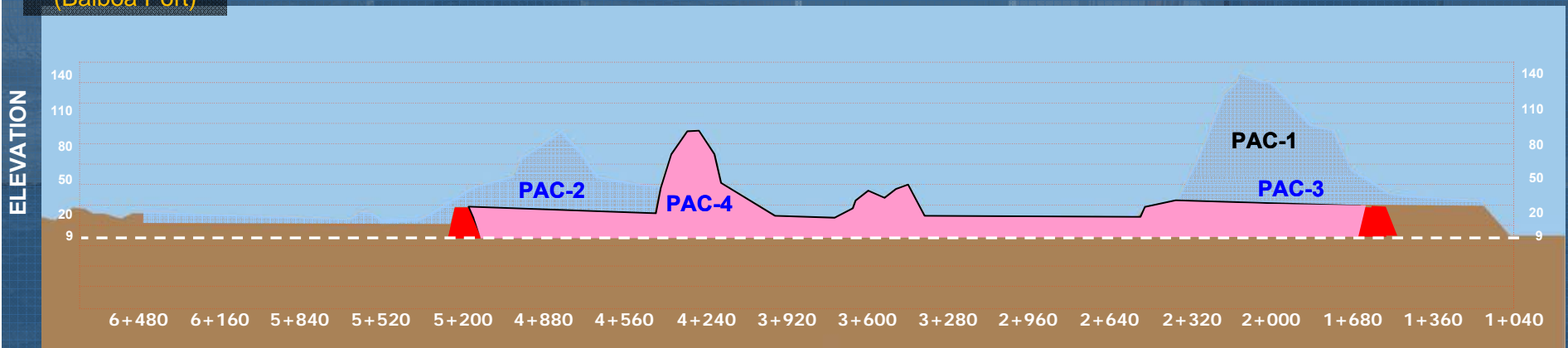
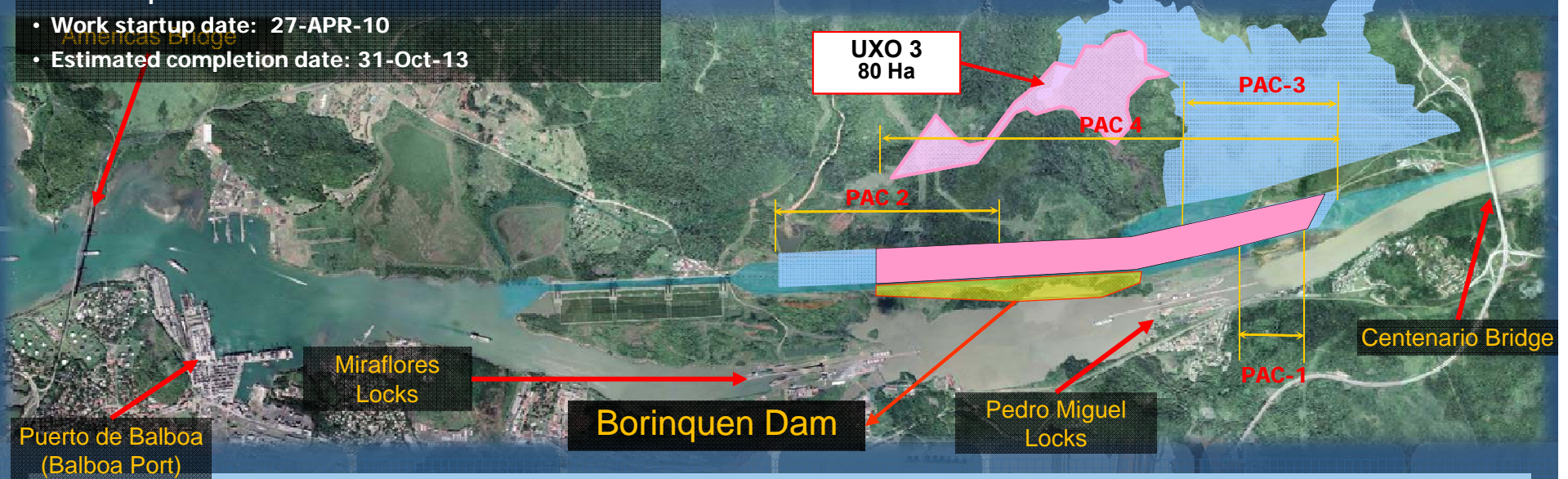
Pacific Access Channel – Phase 4

26 M m³ of dry excavation

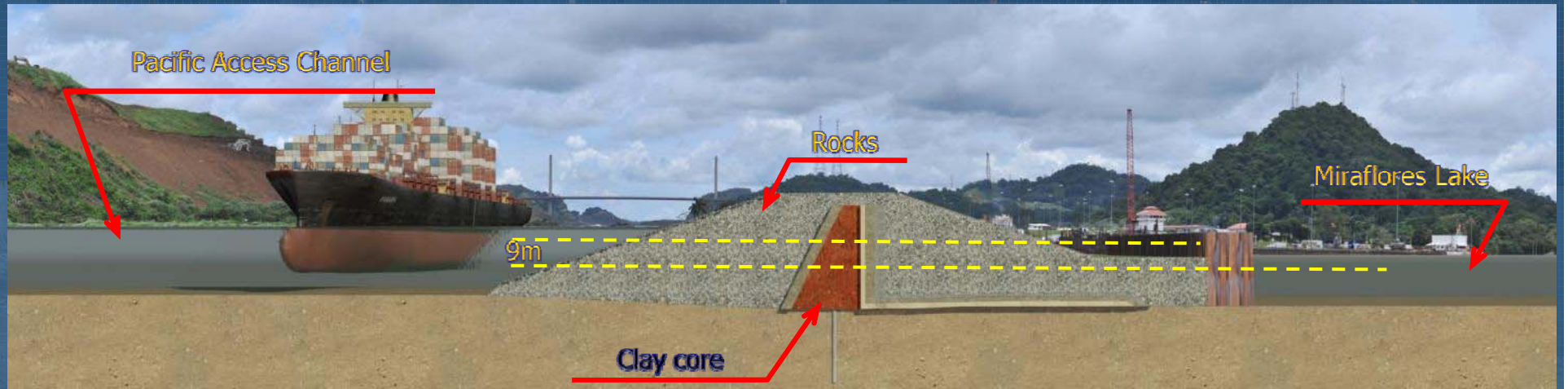
- Awarded: 7-JAN-10
- Company: Consortium ICA-FCC-MECO
 - ICA: Ingenieros Civiles Asociados
 - FCC: Fomento de Construcciones y Contratas
 - MECO: Constructora Meco S.A.
- Amount awarded: \$ 267,798,795.99
- Order to proceed: 22-JAN-10
- Work startup date: 27-APR-10
- Estimated completion date: 31-Oct-13



8.9 M m³ excavated / 26 M m³



Borinquen Dam



Borinquen Dam



PostPanamax navigational channel (left) y Miraflores Lake(right)



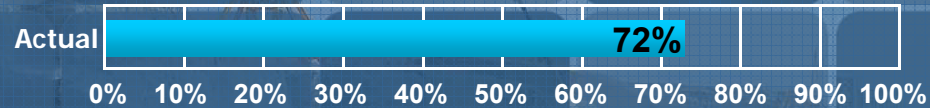
Pacific Access Channel – Phase 4



Cofferdam Construction



Pacific Entrance Deepening and Widening (8.7 M m³)



6.4 M m³ dredged

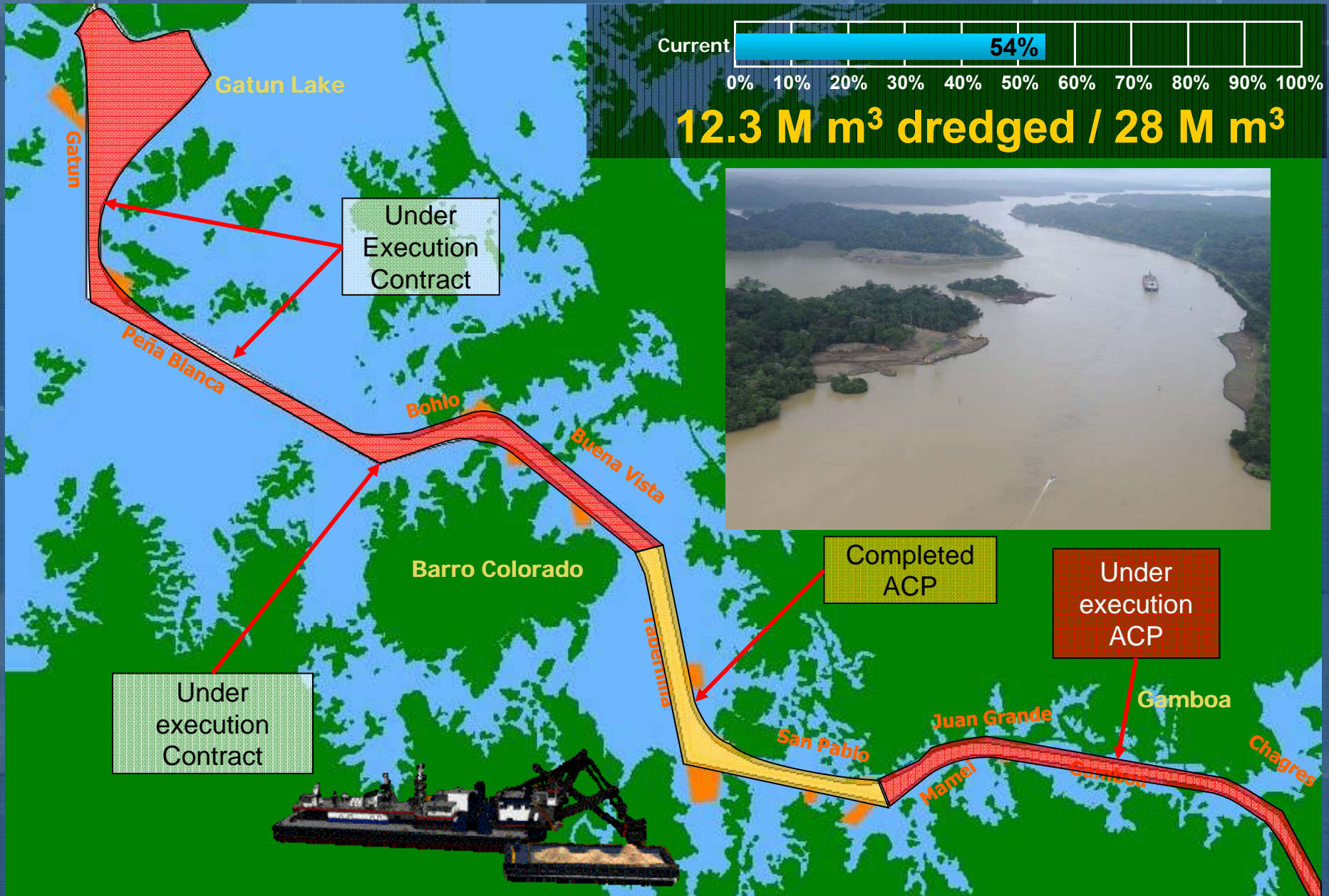


Awarded: 1 April 2008
Company: Dredging International
Amount: \$177,500,676.78
Volume to be dredged: 8.7 M m³
End of Contract: 31 August 2012

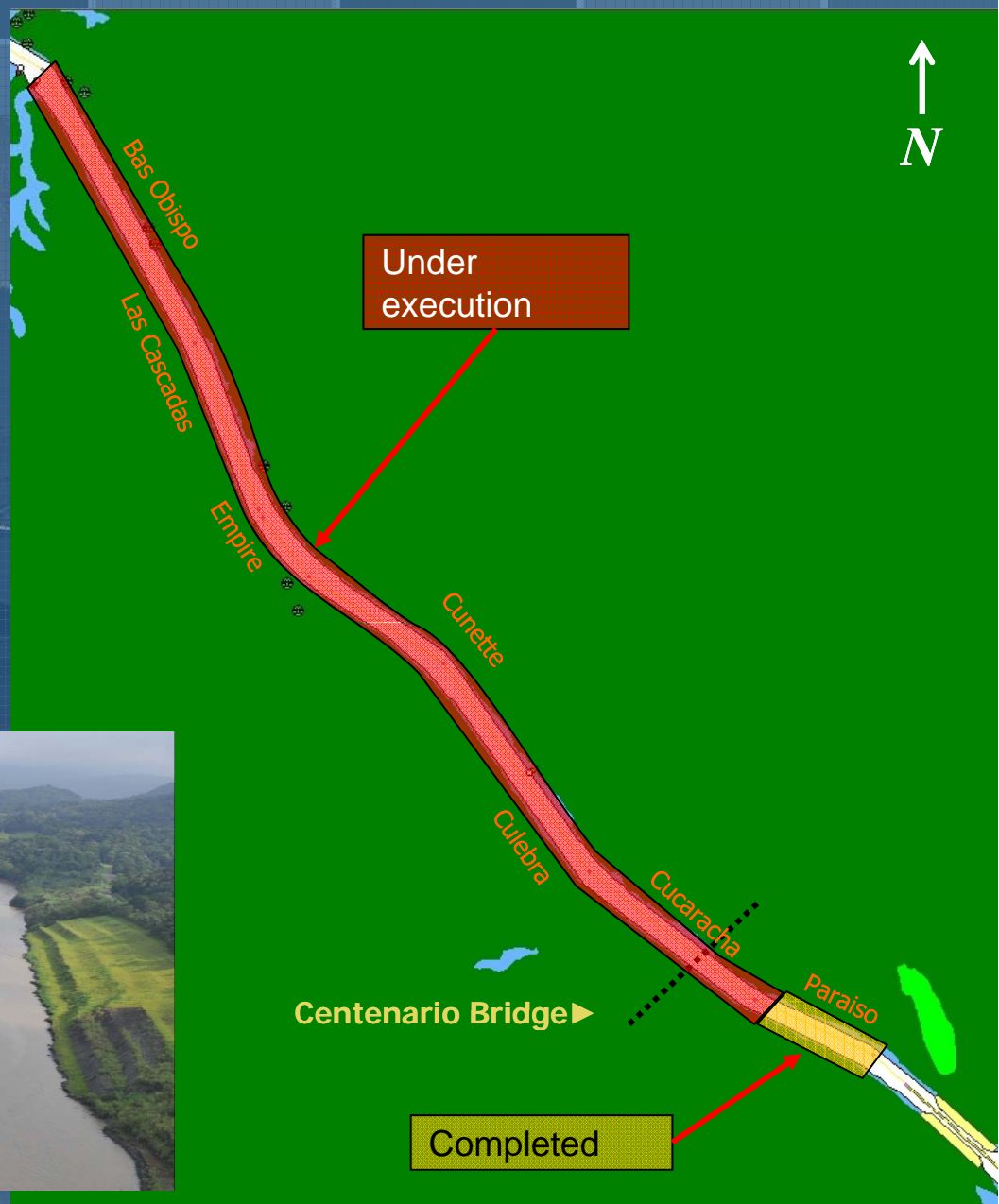
Pacific Entrance Deepening and Widening (8.7 M m³)



Dredging areas in Gatun Lake and Culebra Cut



Dredging areas in Gatun Lake and Culebra Cut



New Cutter-Suction Dredge Quibian I

Dredging operations to begin in mid June 2011

Type of Dredge	Cutter-suction
General Features	
Approximate total length	115.8 m
Length of pontoon ("moulded")	92.4 m
Width of pontoon ("moulded")	18.6 m
Boom, lateral height	5 m
Draft (max)	3.4 m
Minimum approximate dredging depth	5.5 m

Total installed power (engines)	12,096 kW
Main engines – Conveyor pumps	2 x 3700 kW
Main generator engines	3 x 1383 kW
Emergency generator engine	1 x 547 kW

Power of dredging equipment	
Cutter	1350 kW
Submerged pipe	1350 kW
Conveyor pumps	2 x 3626 kW
Turning winch	2 x 230 kW
Ladder winch	420 kW



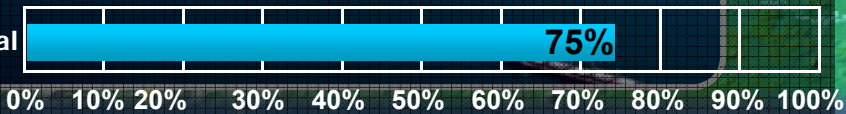
Atlantic Entrance Deepening & Widening

13.3 M m³ dredged

Contract scope: 17.66 M m³
Awarded: 25 September 2009
Company: Jan de Nul n.v.
Amount awarded: \$ 109,356,447
End of contract: 24 April 2013

Width: 225m (740) ▶

Actual



•Widening: from 198 m to 225 m (navigational channel)

New Post-Panamax turning area

•Channel width to 218 m (North Access Channel)

Atlantic Entrance Deepening & Widening

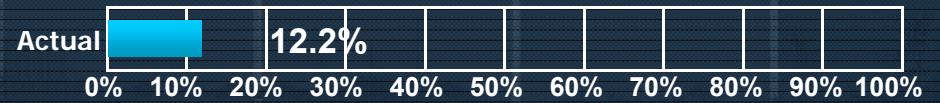
Currently 3 dredges working in the area



Third Set of Locks Design-Build Project

Locks Design and Construction

**Volume excavated and dredged:
16.6 M m³ / 40 M m³ (42%)**



Pacific Area



- Contract scope: Locks Design and Construction
- Awarded: 15 July 2009
- Order to proceed: 25 August 2009
- Base amount + options: \$ 3,158,600,059
- Awarded to: Grupo Unidos por el Canal S.A.
 - Sacyr Vallehermoso – Impregilo – Jan De Nul - CUSA
- Completion date: 21 October 2014



Atlantic Area



Atlantic Area

Program Components – The Third Set of Locks Design-Build Contract

Atlantic Ocean

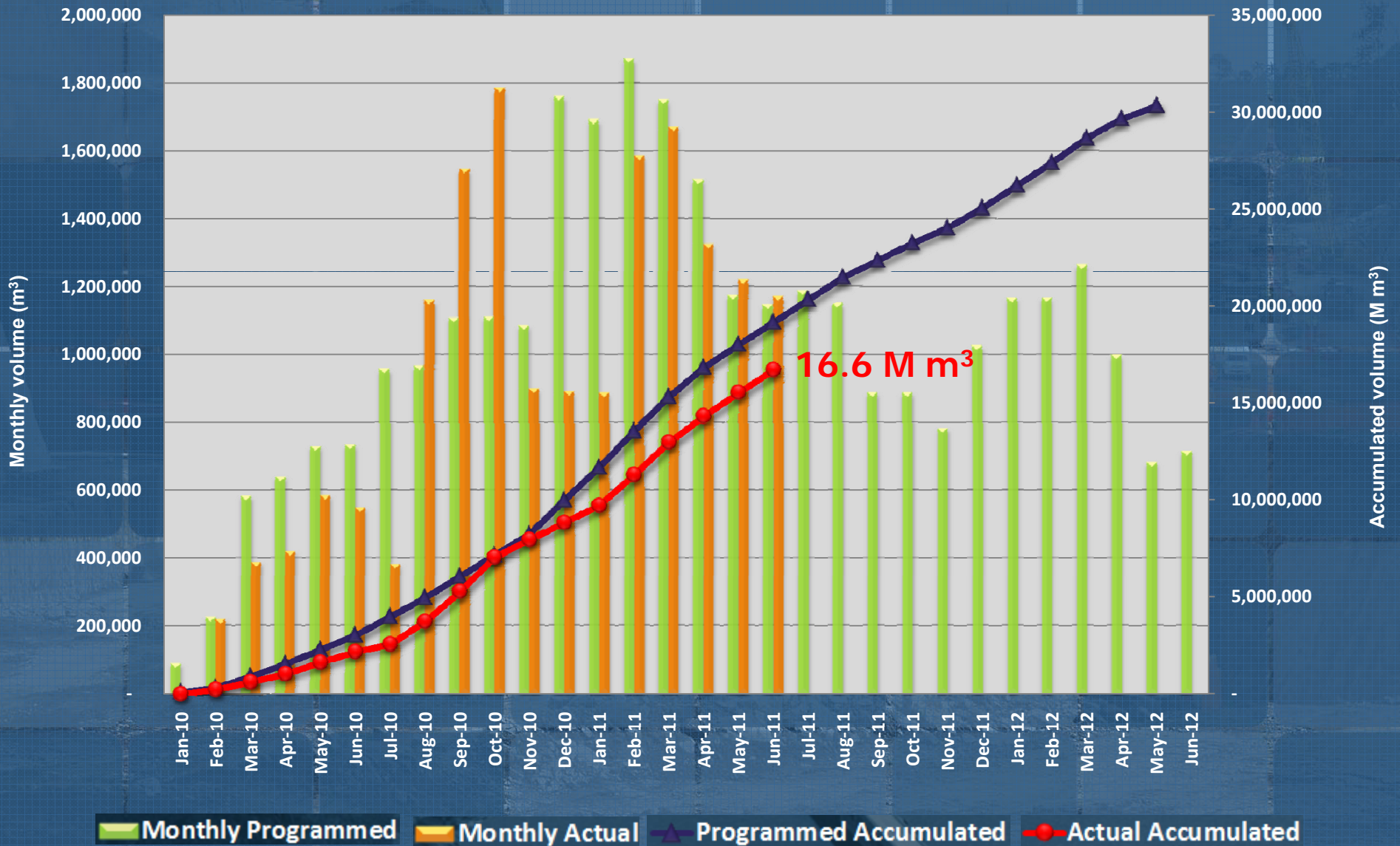


The Contract

Pacific Ocean

Locks Design and Construction

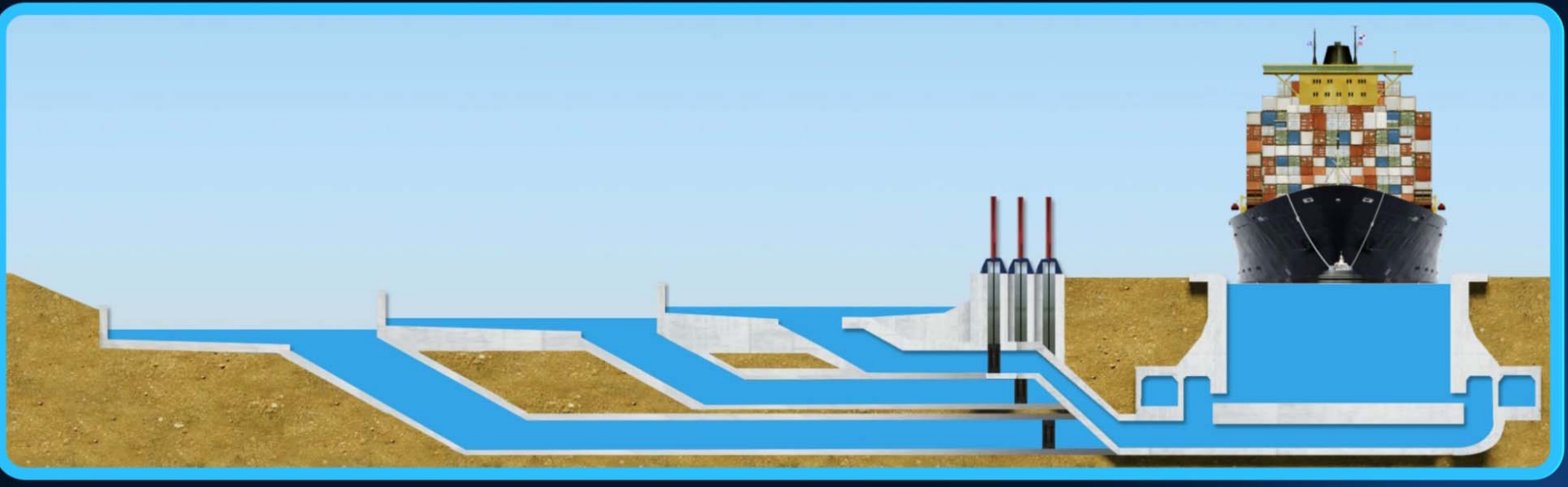
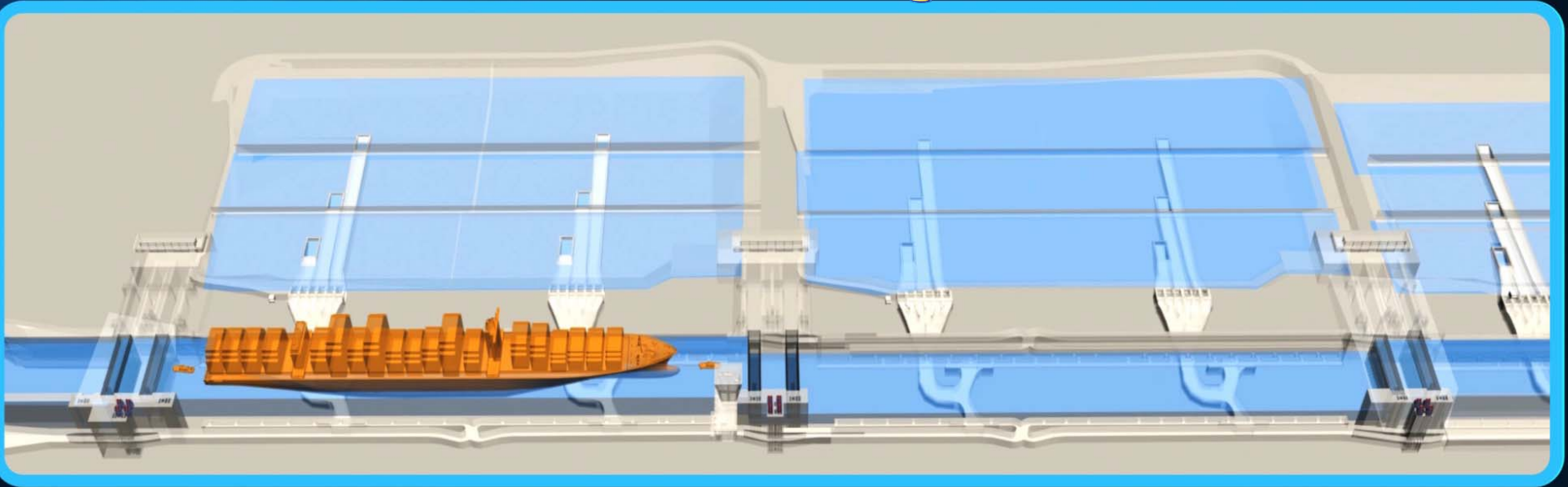
Excavation and Dredging Volumes – Current vs Programmed Atlantic and Pacific



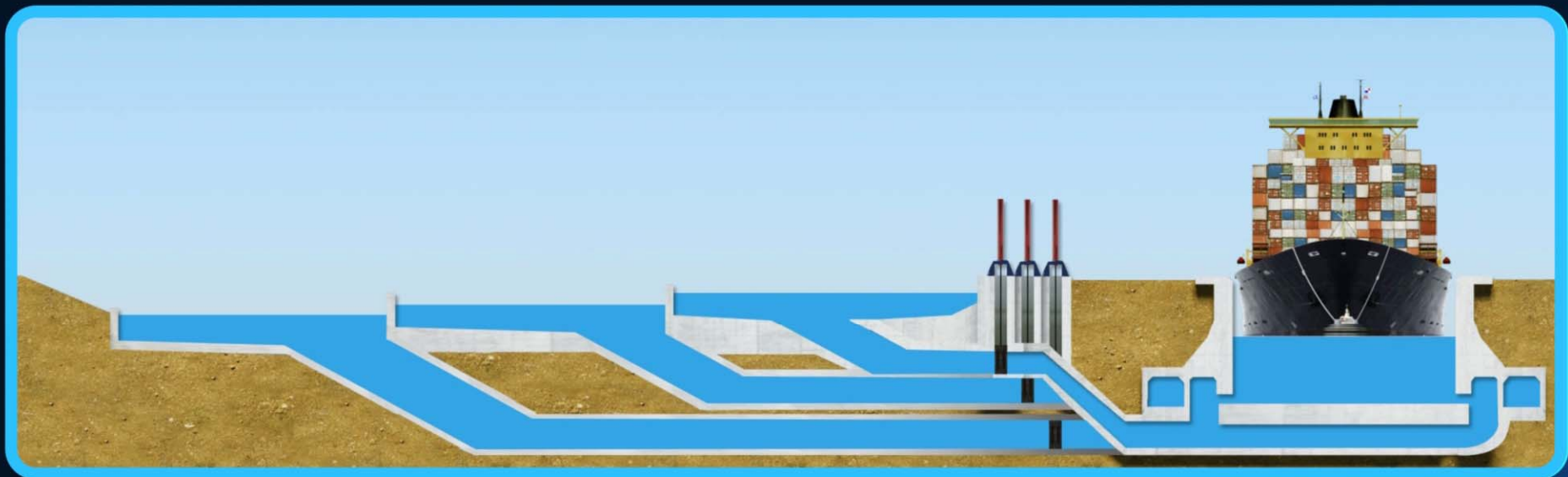
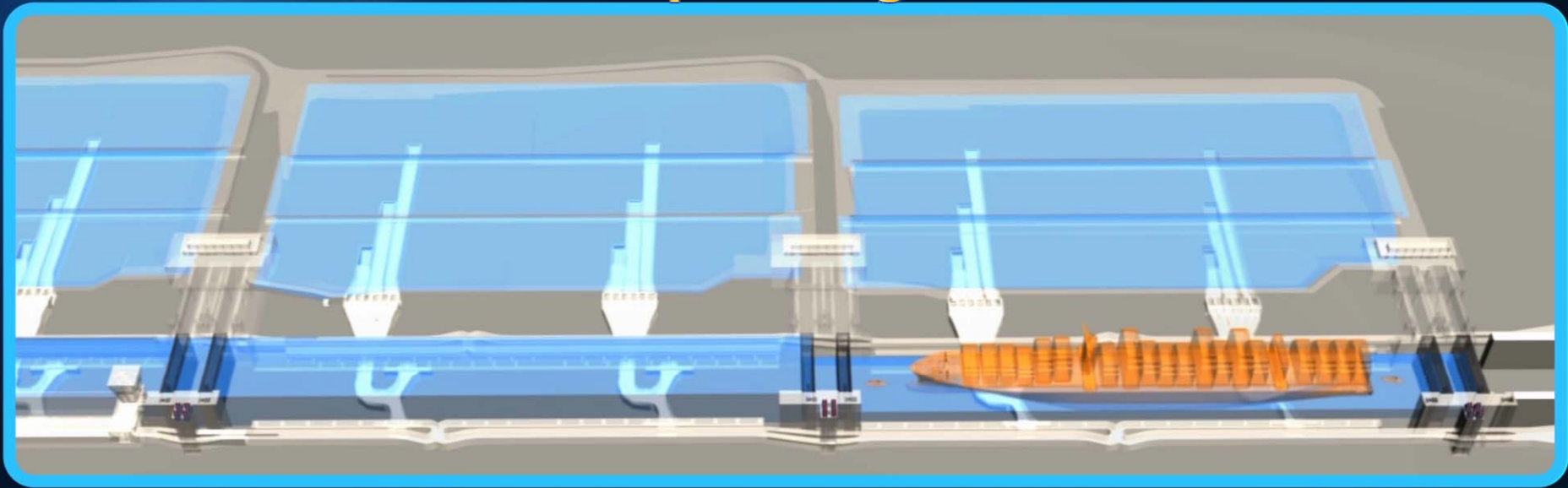
PMBok Knowledge Area – Project Integration Management

Process	Employer	Contractor
Develop Project Charter	X	X
Develop Project Management Plan	X	X
Direct and Manage Project Execution		
• Deliverables	X	X
• Work Performance Information	X	X
• Project Management Plan Updates	X	X
Monitor and Control Project Work		
• Change Requests	N/A	N/A
• Project Document Updates	X	X
Close Project or Phase	P	P

Locks Filling and Emptying System Down Lockage



Locks Filling and Emptying System Up Lockage

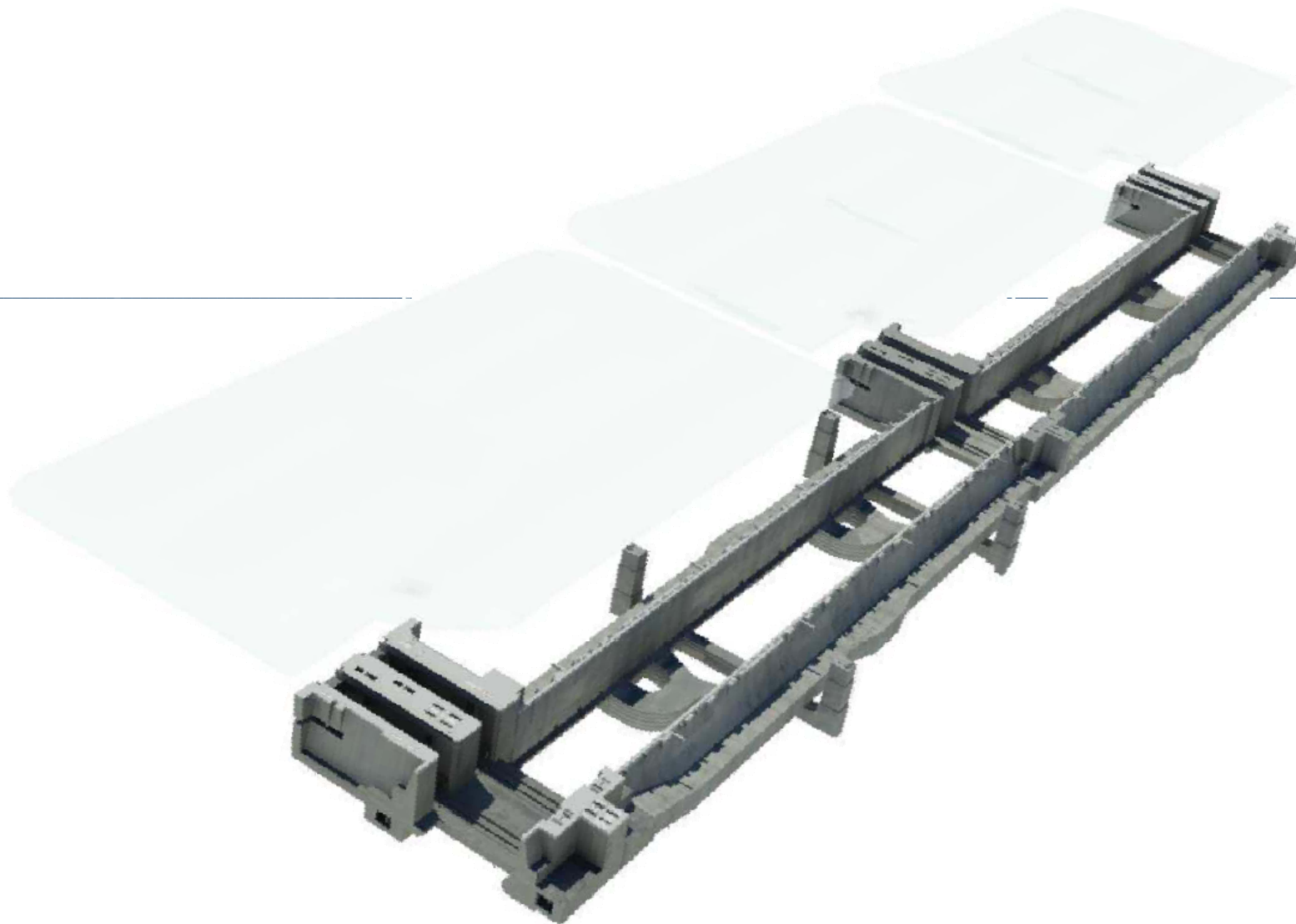


The background of the slide is a collage of various construction site photographs, including cranes, concrete structures, and workers. A semi-transparent grid pattern is overlaid on the entire image. The text is centered on the grid.

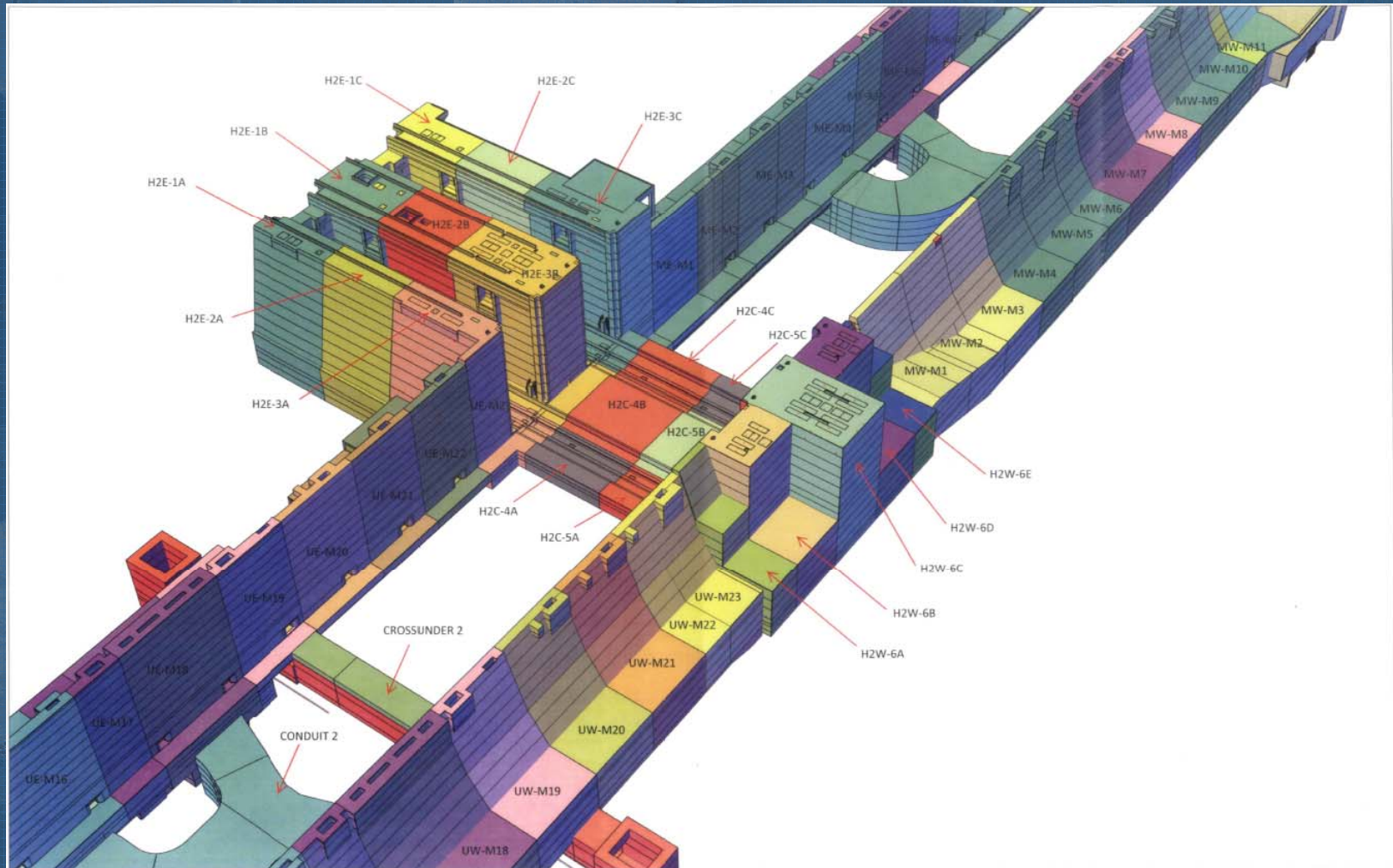
Concrete Progress Reporting

Graphical Representations for Quick Understanding
of Concrete Placement Progress

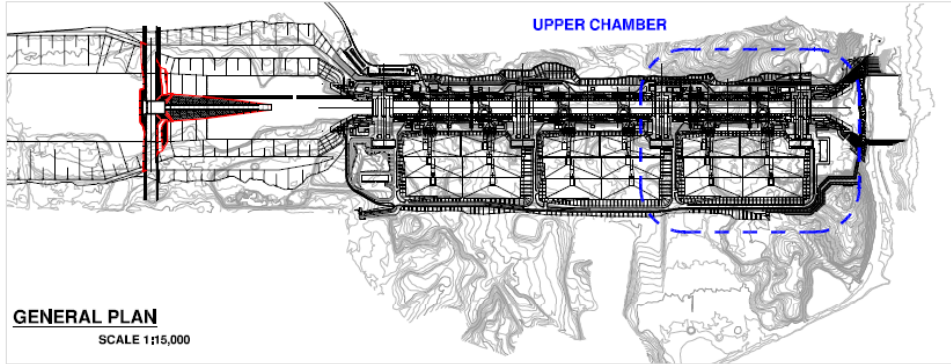
Locks Atlantic



Locks Pacific

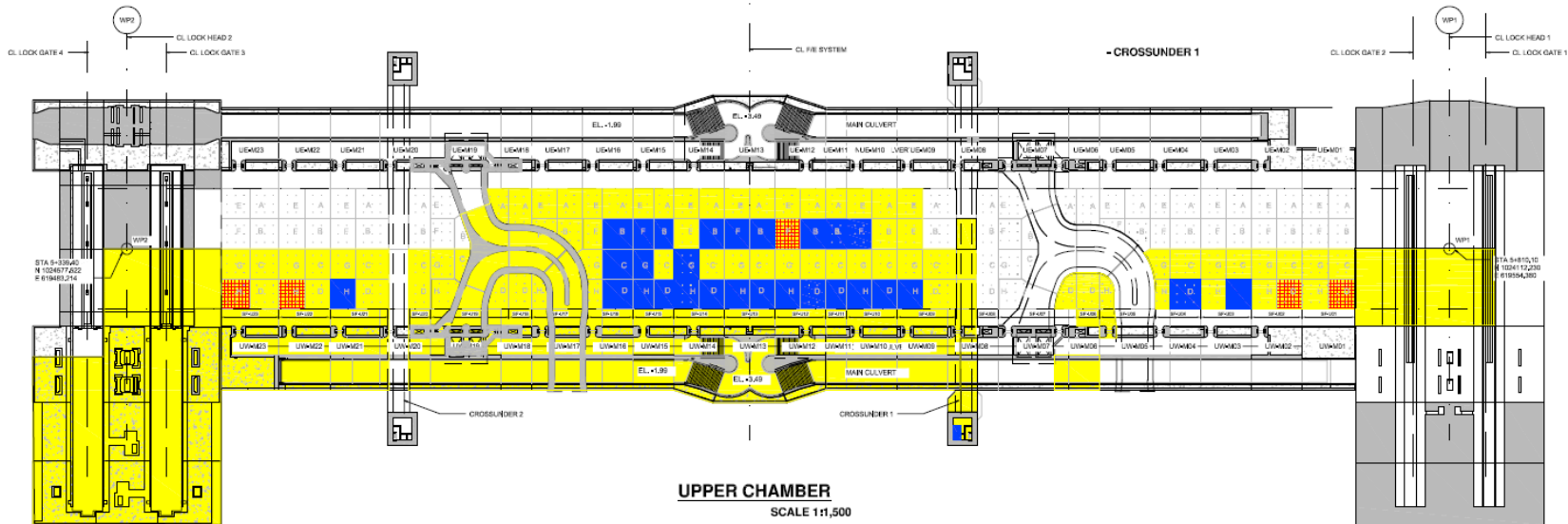


Atlantic Progress



LEGEND		
WORK AREA	QUANTITY FORESEEN	COMPLETED
<div style="background-color: yellow; width: 20px; height: 10px; display: inline-block;"></div> LEAN CONCRETE PLACED: - LOCK UPPER CHAMBER - LOCK HEAD 1 - LOCK HEAD 2	42,878.00 M ² 12,964.68 M ² 12,964.68 M ²	18,414.59 M ² 1,365 M ² 5,879.57 M ²
<div style="background-color: blue; width: 20px; height: 10px; display: inline-block;"></div> CONCRETE SLAB PLACED	14,270.73 M ²	3,032 M ²
<div style="background-color: red; border: 1px solid black; width: 20px; height: 10px; display: inline-block;"></div> SLAB BEING PREPARED		710.31 M ²

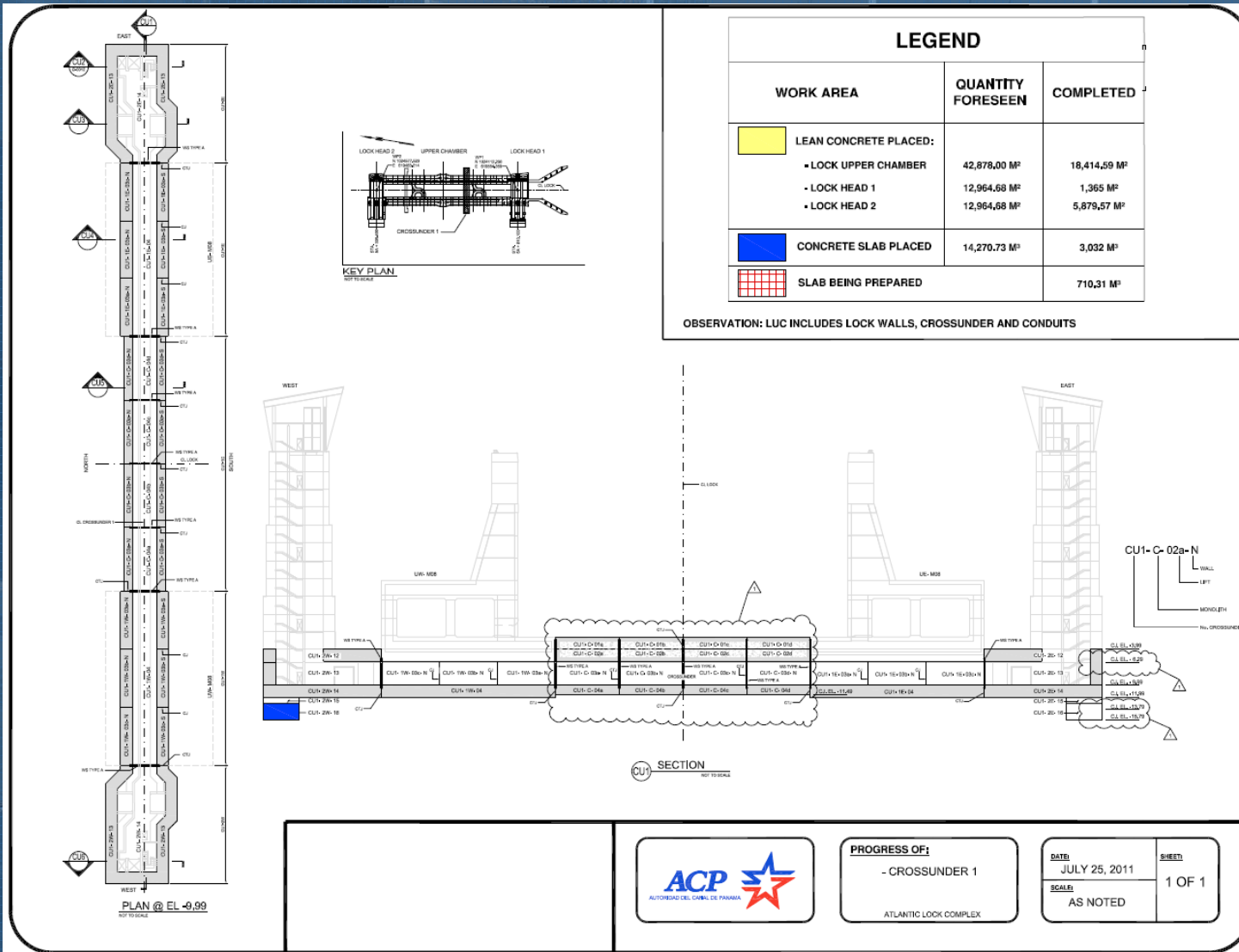
OBSERVATION: LUC INCLUDES LOCK WALLS, CROSSUNDER AND CONDUITS



PROGRESS OF:
 - CONCRETE SLAB POURED
 - PREPARATION OF FOUNDATION
 - REBAR
 ATLANTIC LOCK COMPLEX

DATE: JULY 20, 2011	SHEET: 1 OF 1
SCALE: AS NOTED	

Atlantic Progress Cont.



PROGRESS OF:
- CROSSUNDER 1
ATLANTIC LOCK COMPLEX

DATE: JULY 25, 2011
SCALE: AS NOTED
SHEET: 1 OF 1

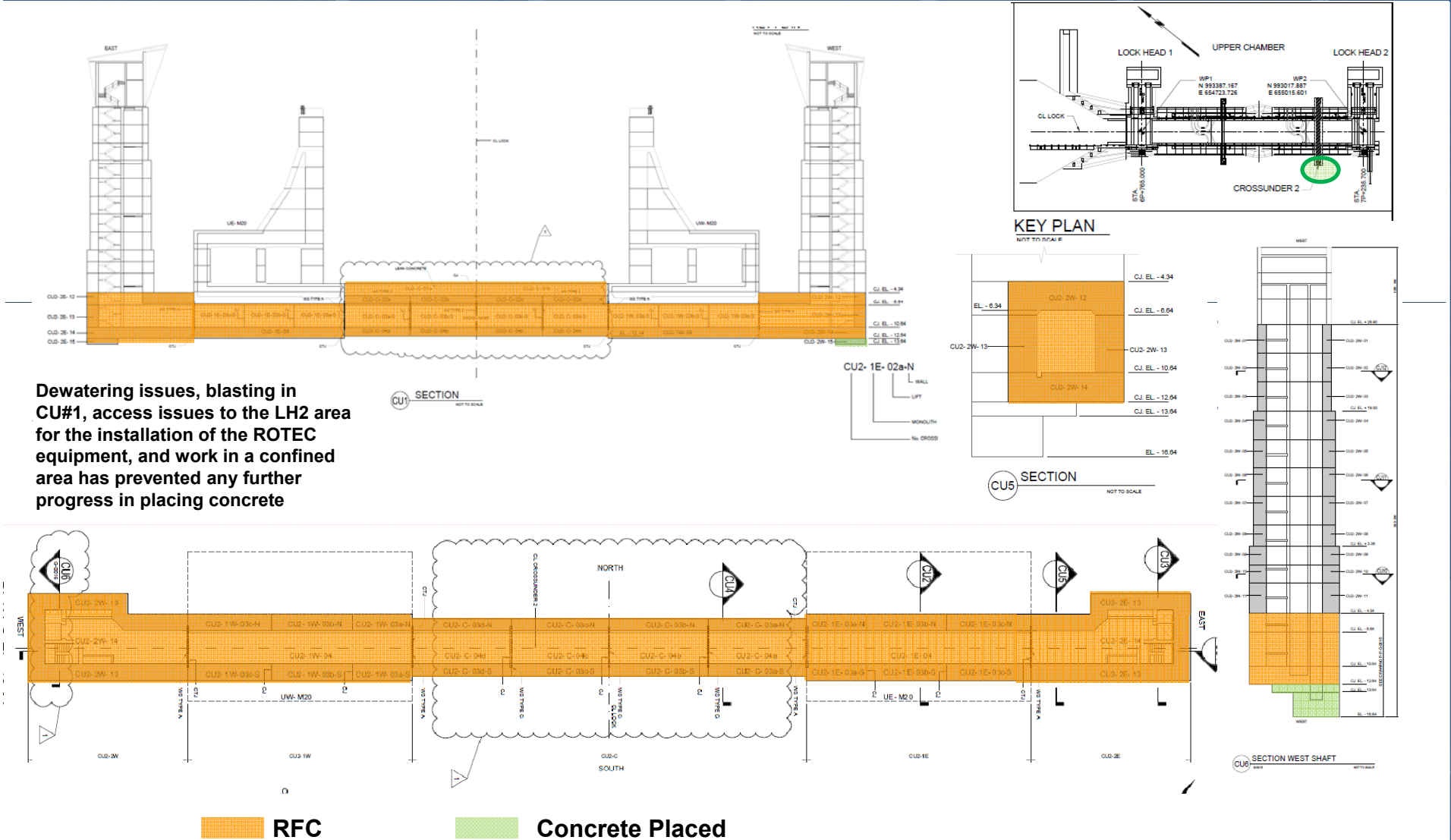
PMBok Knowledge Area – Project Time Management

Process	Employer	Contractor
Define Activities		
• Activity list/Activity Attributes/Milestone List	X	X
Estimate Activity Durations		
• Activity duration estimates	X	X
• Project Document Updates	X	X
Develop Schedule		
• Project Schedule/ Schedule baseline/schedule data	X	X
• Project Document Updates	X	X
Control Schedule		
• Work Performance Measurements	X	X
• Change Requests	X	X
• Project Document Updates	X	X

Pacific Lean Concrete Progress

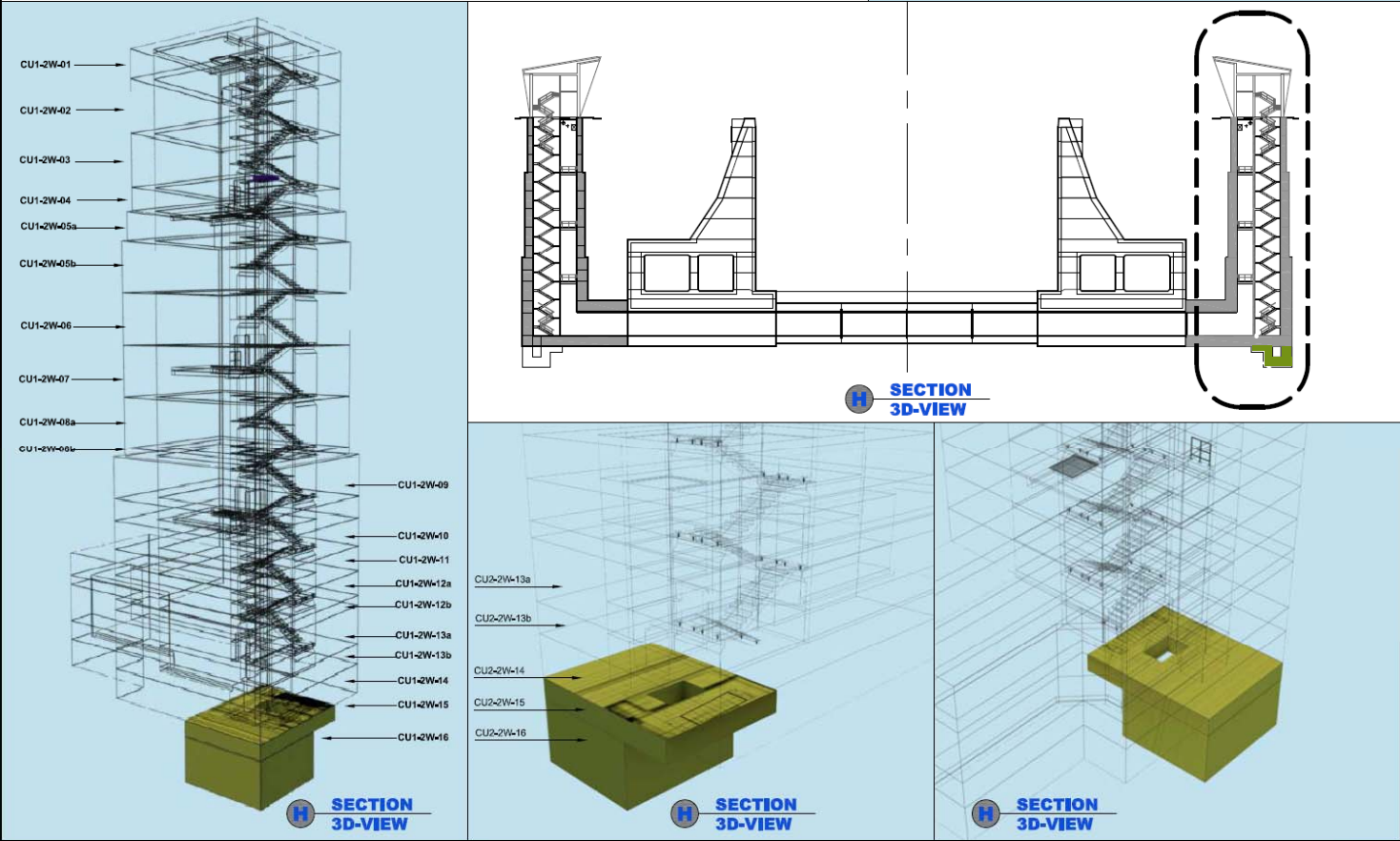


Pacific Crossunder Progress



Dewatering issues, blasting in CU#1, access issues to the LH2 area for the installation of the ROTEC equipment, and work in a confined area has prevented any further progress in placing concrete

Pacific Crossunder Progress



 Concrete Placed

PMBok Knowledge Area – Project Quality Management

Process	Employer	Contractor
Plan Quality		
• Quality Management Plan	X	X
• Quality Metrics		
• Quality Checklists	X	X
• Process Improvement Plan	X	X
• Project Document Updates	X	X
Perform Quality Assurance		
• Organizational Process Assets Updates	X	X
• Change Requests	N/A	N/A
Perform Quality Control		
• Quality Control Measurements	X	X

Atlantic Locks Site



Atlantic Locks Site



Atlantic Locks Site



Atlantic Locks Site



Atlantic Visitors Center



PMBok Knowledge Area – Project Cost Management

Process	Employer	Contractor
Estimate Costs		
• Activity Cost Estimates	X	X
• Basis of Estimates	X	X
Determine Budget		
• Cost performance baseline	X	X
• Project Funding Requirements	X	X
Control Costs		
• Work Performance Measurements		
• Budget Forecasts		
• Organizational Process Assets Updates		
• Change Requests		

Pacific Locks Site



Pacific Locks Site

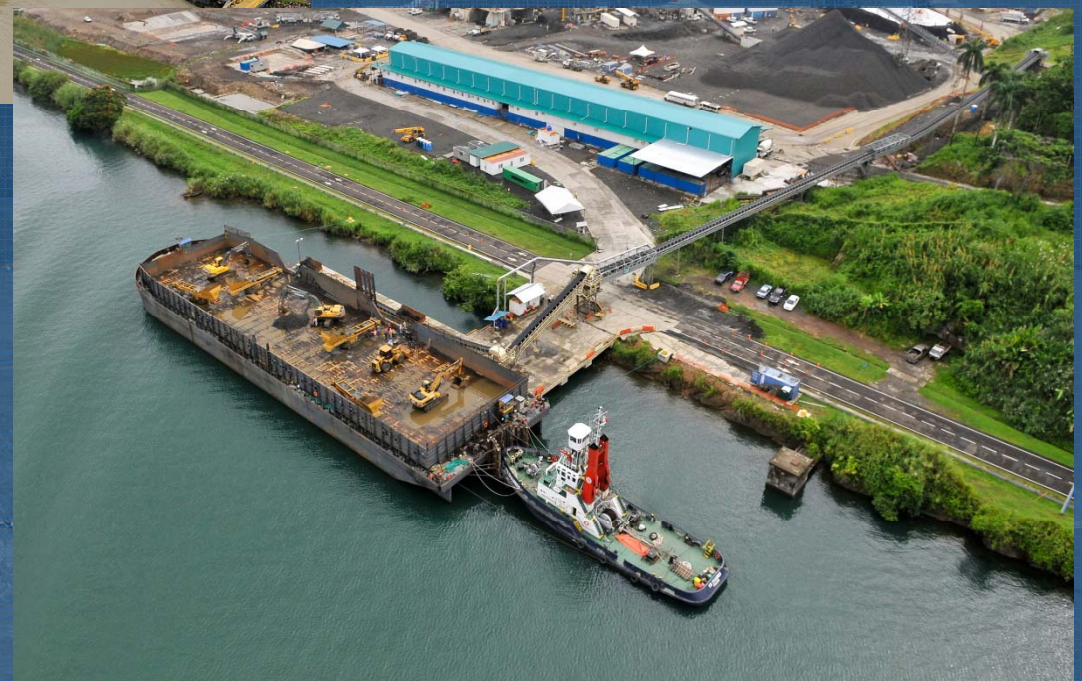


Installations for Delivery/Receipt of Basalt

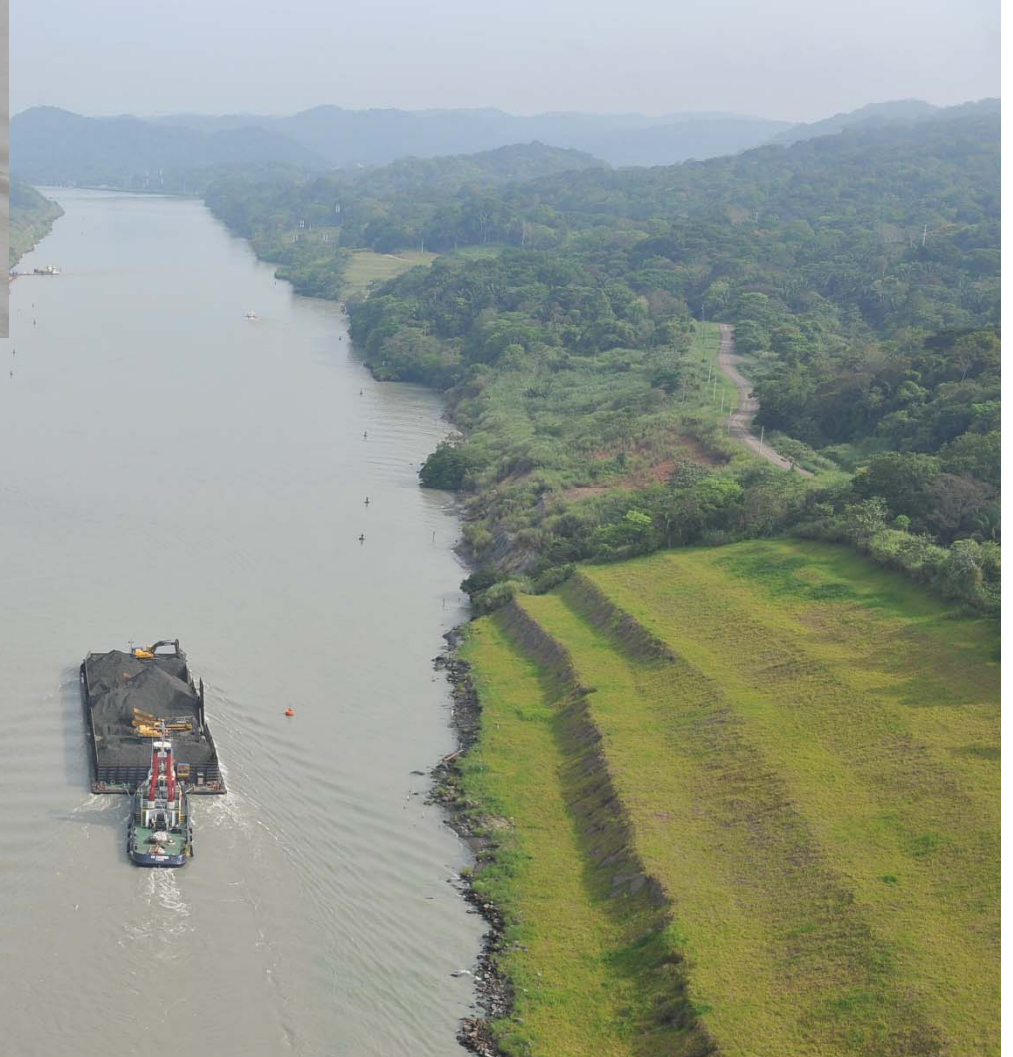


◀ Infrastructure for the delivery of basalt at the Cartagena North tie-up station in Culebra Cut

▶ Infrastructure for the receipt of basalt on the bank of Gatun Lake as part of the Locks Project on the Atlantic side



Delivery of Basalt





CH2MHILL

Raising Gatun Lake's Maximum Operational Level



Raising Gatun Lake's Maximum Operational Level

Gatun Spillway

5 gates modified and installed
2 gates under extension work
4 ready and available to be installed



Testing 4 prototype cylinders in 2 tanks



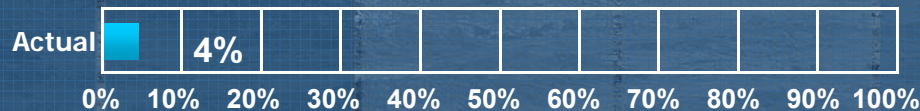
Testing the operation of 2 new caissons in Gatun Spillway.



2 newly manufactured vertical rolling gates



1 prototype cylinder brought to failure.





CH2MHILL

The Panama Canal Expansion Program

August 2011

Joe Cazares