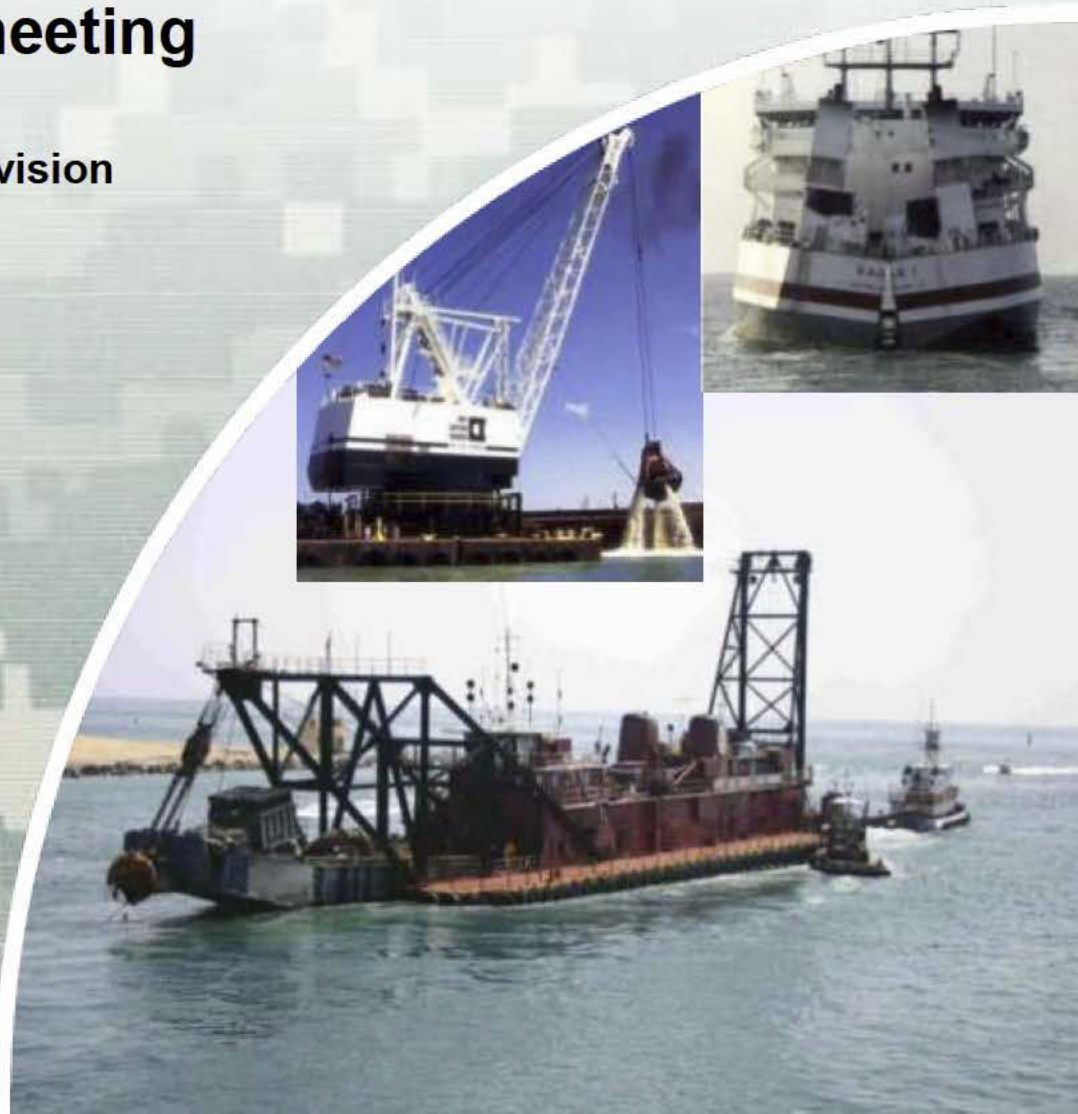
Optimizing dredge plant engineering and operational considerations for WnN and BwN

Ecoshape knowledge and information exchange meeting

Karen Garmire
Resident Engineer, Construction Division
USACE, Portland District

Edmond J. Russo, Jr., Ph.D., P.E.
Chief, Ecosystem Evaluation and Engineering Division
Environmental Laboratory
US Army Engineer Research and Development Center

January 18, 2011



US Army Corps of Engineers
BUILDING STRONG®

Concepts

- Consider the WwN-BwN philosophy, then…
- Be practical in striving for long-term sustainability of objectives
  - Reaching WwN-BwN objectives in dredging applications must be goal-based and conducted within Federal requirements
  - A range of flexibility must be accepted in realizing achievements, considering need to meet minimum navigation levels of service required
- Smart dredge plant engineering and operations is foundational
  - Efficiency, effectiveness, availability, capability and productivity strongly influence the potential for WwN and BwN
  - Technical creativity and innovation, fully matched to plan design and availability, are enablers
- Seize opportunities for reaching goals when present
  - Periods of relatively good dredge plant availability
  - Periods of relatively good funding stability
  - "Working with Weather" – e.g., seasons with calm seas, few storms

Projects

- Actively engage stakeholders, interdisciplinary technical teams, regulators, contractors (industry informational meetings) and elected officials
  - Listen to understand needs, follow through, and build trust
  - Conduct early, often, honest, and transparent communications on project conditions, authority limits (e,g., Fed Std), funding availability, ongoing/scheduled actions, technical challenges, and market conditions
- Use project management principles to create favorable WwN-BwN conditions
  - Understand how project systems and processes work
  - Anticipate a range of plausible adverse event scenarios
  - Be prepared for addressing things that can go wrong
- Build and share a portfolio of project achievements
  - Measure/inventory/report WwN-BwN achievements
  - Learn from WwN-BwN successes/challenges
  - Continually strive for performance improvement

Efforts / Achievements

Multi-purpose: Integrated wetland habitat creation + channel protection

Lake Borgne, LA

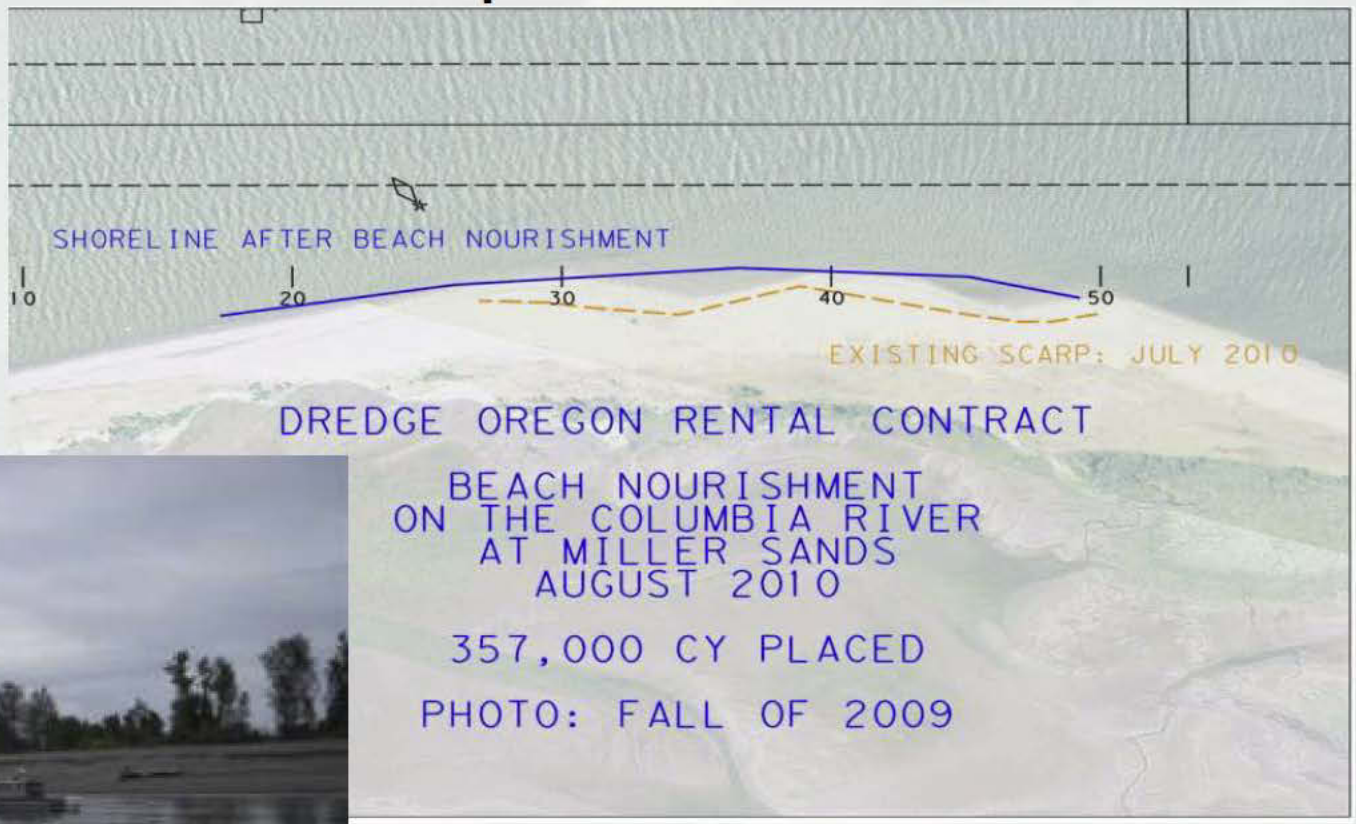
False Live Oak, TX

Efforts / Achievements

Beach nourishment at Mouth of the Columbia River - Benson Beach Hopper Pump Ashore Placement

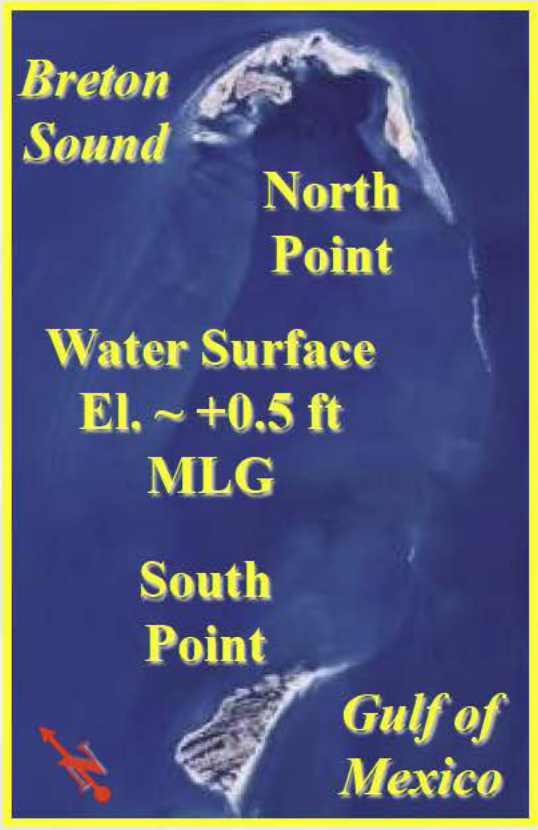
Efforts / Achievements

Beach Nourishment by the Dredge Oregon (30-inch pipeline) – Berm creation as a Caspian Tern deterrent

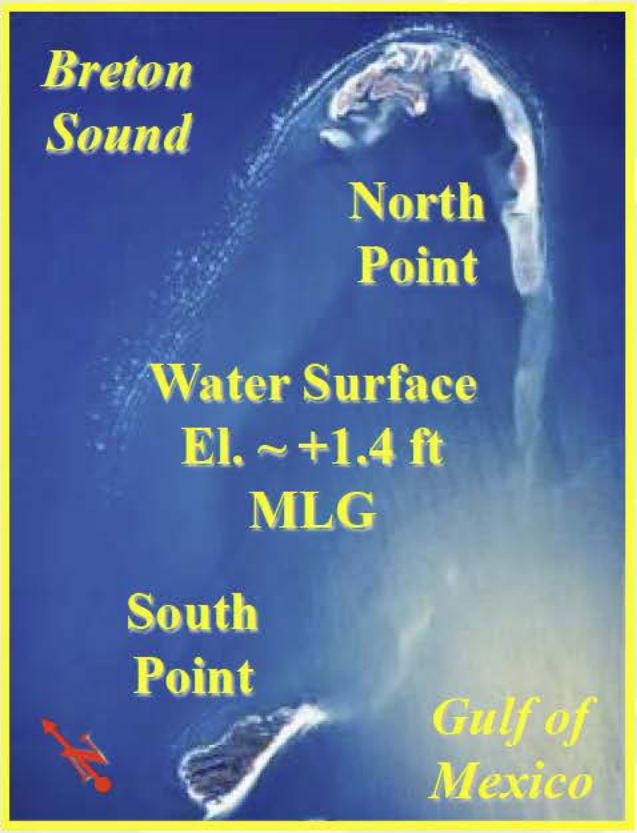


Efforts / Achievements

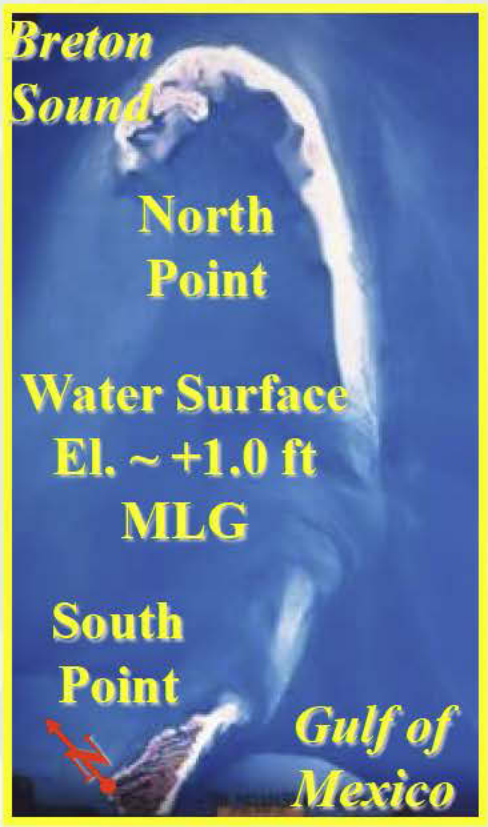
Barrier Island Restoration – Chandeleur Islands, LA



January 1999
Post-Hurricane Georges*



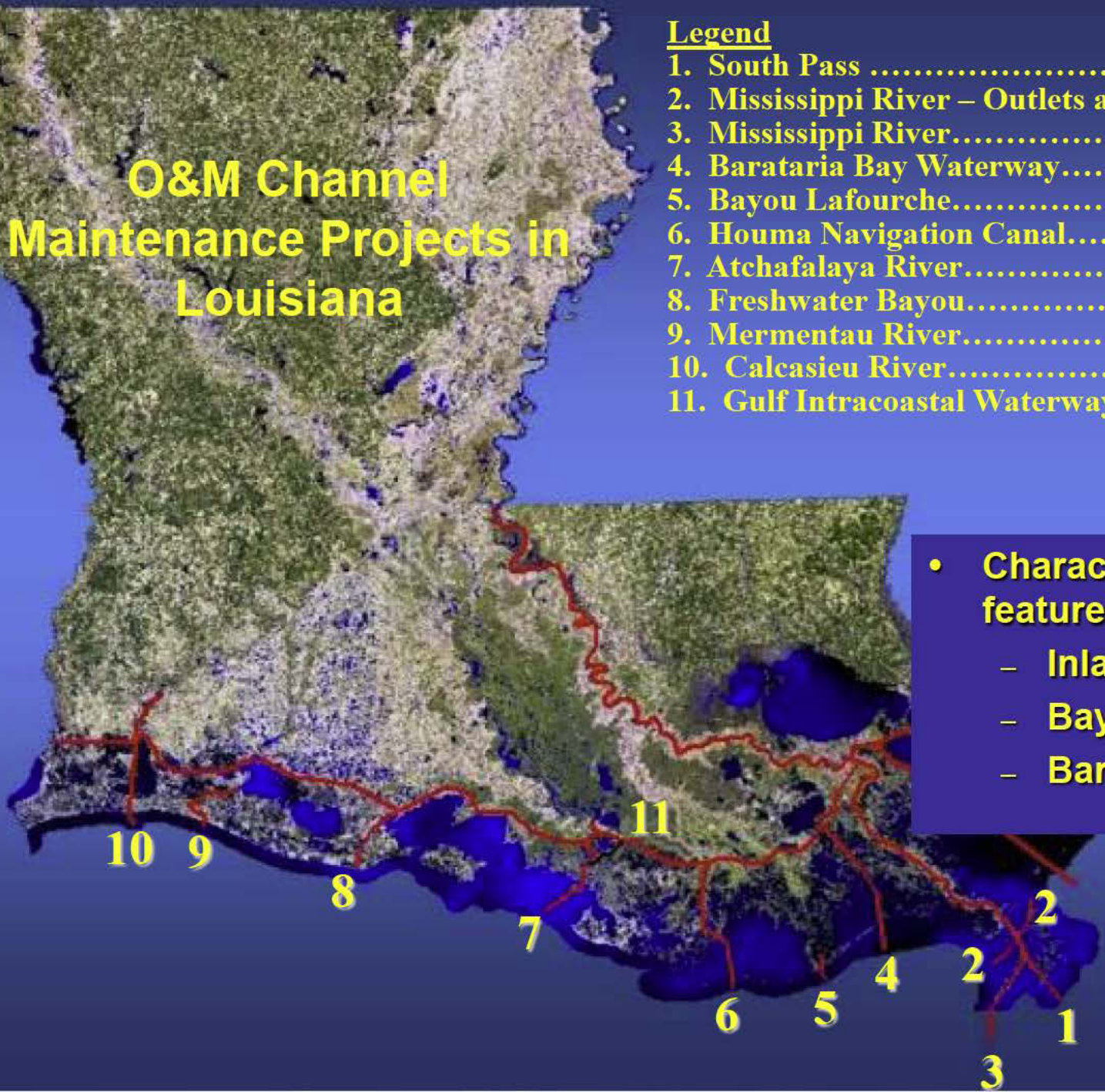
February 2000
Post Dredged Materials Placement



January 2001
Post Dredged Materials Placement

* Hurricane struck Gulf Coast in September 1998

O&M Channel Maintenance Projects in Louisiana



Legend	Approx. Miles
1. South Pass …….. ……..….	15
2. Mississippi River – Outlets at Venice……..	28
3. Mississippi River……	256
4. Barataria Bay Waterway……..	39
5. Bayou Lafourche……	13
6. Houma Navigation Canal……..	40
7. Atchafalaya River……..	58
8. Freshwater Bayou……	20
9. Mermentau River……..	24
10. Calcasieu River……..	118
11. Gulf Intracoastal Waterway……	302
Total =	913

- Characteristic project features
  - Inland channel reach
  - Bay channel reach
  - Bar channel reach

Planning Scenario

- Beneficial use concept – accept greater risk in design and construction: no danger to life and property
  - Dredged material placed confined and/or semi-confined within existing wetlands and shallow water bottoms using small, sacrificial earthen dikes
  - Dikes intended to last through construction only

- Non-beneficial use – upland disposal, involving
  - Re-construction of large Contained Disposal Facility (CDF) dikes – must last to retain materials after construction
  - Effluent return ditching in site
  - Effluent weir installation in retention system

Depiction of Beneficial Use and Non-Beneficial Use Alternatives: DA "F" vs. DA "51"

- 2.4-mi-long dredging reach
- Upland disposal vs. beneficial use
  - 395,000 CY
  - Beneficial use alternative - placement site "DA F"
  - Upland disposal alternative – placement site "DA 51"

Comparison of Beneficial Use and Non-Beneficial Use Alternatives

- Estimates:

	Beneficial Use	Upland Disposal
Total cost:	$1,001,000	$1,095,000
Wetlands created:	~ 82 acres*	0
Aggregate unit price:	$2.56 / CY	$2.77 / CY

* ~ $12,300/acre

- Dredged materials conveyance estimated to be cost competitive for each alternative
  - Pumping costs equitable between alternatives
  - CDF diking/management 100% more costly than construction of sacrificial earthen dikes
  - Beneficial use alternative slightly less cost than non-beneficial use

Opportunities

- Build synergies among partners and across programs
  - Intensive planning
  - Implementation, monitoring, and course correction as needed
  - Follow-up inspection and elicitation of feedback on views
  - Communication of successes / challenges for continuous improvement

- Network and share information across CoPs on WwN-BwN
  - Exchange ideas – explore how applications turn out differently
  - Reflect on reasons for different successes / challenges and digest for general application where possible

Needs

- Communicate the value of WwN-BwN to interested and affected parties to continually build support
- Build workforce capabilities for enhancing WwN-BwN achievements
- Close prioritized dredging science, engineering, and technology knowledge gaps to further enable WwN-BwN
  - Long-distance dredged materials transport
  - Working in challenging weather conditions
  - Working in the vicinity of T&ES activities and habitats

Constraints

- Federal Standard and sponsor requirements / interests
- O&M backlog and flat O&M budget
- National pressure to finish active capital projects before creating more
- Available authorities, funding levels, and contracting measures to objectively influence US fleet capabilities/capacities
- Jones Act limitation on access to dredge plant beyond US fleet
- Equipment limitations
  - Pipeline dredging - pump distances, elevations, sea conditions, cost
  - Hopper dredges - pump-out capability, underkeel clearances, wave and sea conditions, cost
  - Clamshell/mechanical dredges - shoal configuration, haul distance, ship traffic, scow availability and type, cost
- Equipment availability

Conclusions

- Community effort to plan and execute channel maintenance within authority and budget constraints to attain environmental sustainability

- BU potentially cost competitive to disposal when goals are flexible and increased project performance risks can be accepted

- Positive cumulative impact potentially possible if practiced across the channel maintenance program

Facilitated discussion on next steps

Project Management and Tools: Planning, Budgeting, and Operating

Ecoshape knowledge and information exchange meeting

Edmond J. Russo, Jr., Ph.D., P.E.
Chief, Ecosystem Evaluation and Engineering Division
Environmental Laboratory
US Army Engineer Research and Development Center

January 19, 2011

US Army Corps of Engineers
BUILDING STRONG®

Federal Standard (FS) – Base Plan (BP)
33 USC 335

The disposal alternative or alternatives identified by the Corps which represents the least costly alternative consistent with sound engineering practices and meeting the environmental standards established by the Section 404 evaluation process of the Clean Water Act of 1972 or ocean dumping criteria, pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended.

O&M Dredging Partnering

- Navigation industry
- Dredging industry
- Federal and state regulatory agencies
- NGOs
- Affected landowners / businesses
- Elected officials
- USACE district PDT and vertical team

O&M Dredging PDT*

- Operations Manager
- Planner (if non-O&M work linked to project, e.g., CAP)
- Operations Technical Support
  - Environmental
  - Dredging
  - Surveying
- Engineering
  - P&S designer
  - Cost engineering
  - Hydraulics
  - Geotech
  - Surveys
- Environmental
- Real Estate
- Office of Counsel
- Contracting
- Construction
  - Management
  - BCOE
  - Area Office

* Varies by district depending on mission needs and organizational structure

O&M Management Strategy

- Project Management Business Process (PMBP)
  - Operations Manager (OM)
    - Responsible for project performance
    - Manages and leads effort
  - Project Delivery Team (PDT) engaged to conduct work
    - Customers
    - Partners
    - Stakeholders
    - Corps Interdisciplinary technical team
      - HQUSACE and MSC District Support Team
      - District technical elements
      - Engineer Research and Development Center (ERDC)
  - Project development concepts
    - Consensus based
    - Formulation and evaluation of multiple alternatives
    - Incremental analysis of alternatives to select plan

O&M Management Strategy (cont.)

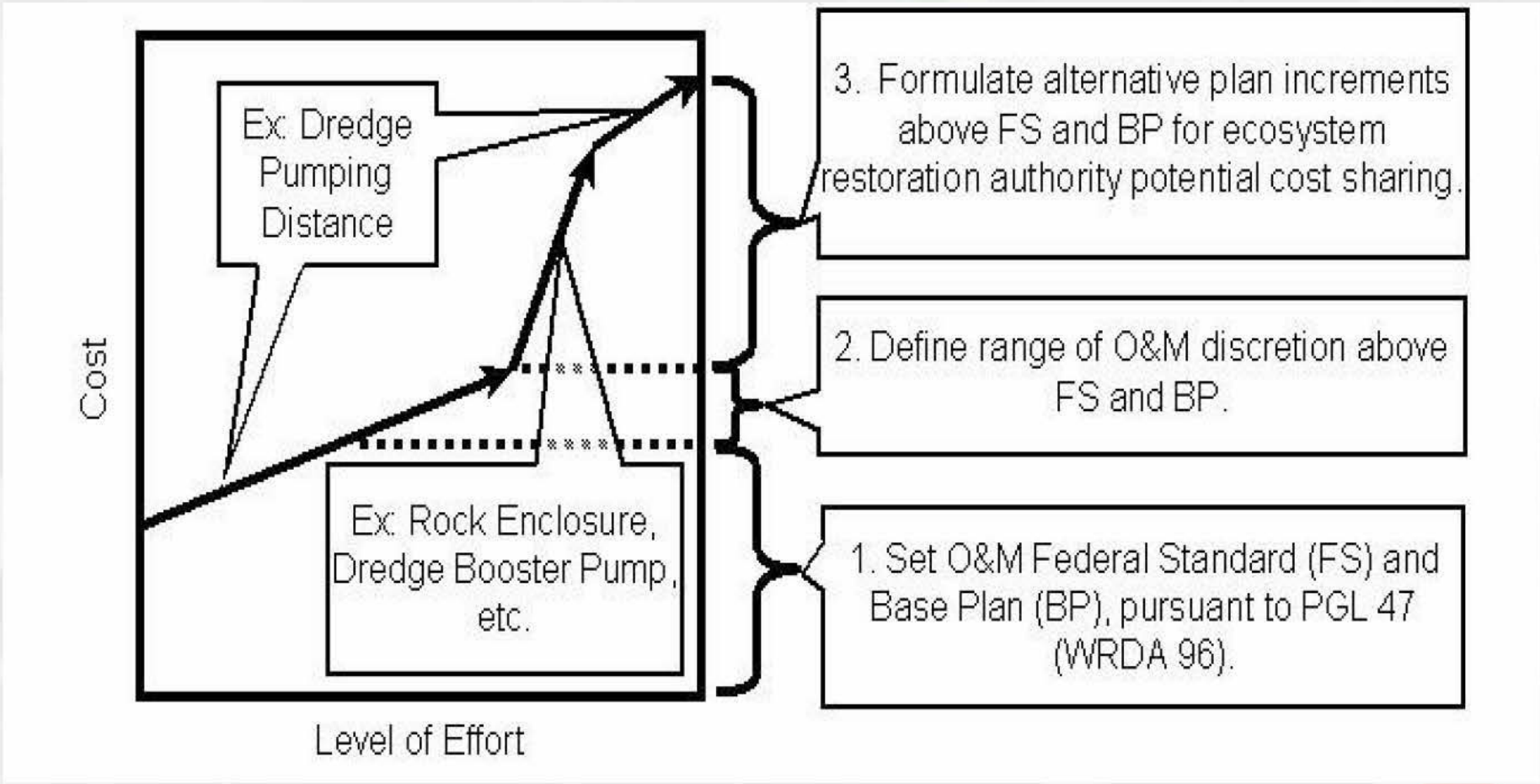
- Environmental Operating Principles (EOPs)
  - Strive for Environmental Sustainability
  - Understand interdependence of life and the physical environment
  - Seek balance and synergy among human development and natural systems
  - Accept corporate responsibility and accountability under the law
  - Assess and mitigate cumulative impacts to the environment
  - Build and share an integrated scientific, economic & social knowledge
  - Respect the views of individuals and groups interested in Corps activities

Consistent with WwN-BwN concepts

O&M Management Strategy (cont.)

- Dredged Materials Management Plan (DMMP)
  - Preliminary economic analysis of continued project viability
  - Dredged Materials Management Planning
    - Application of Federal Standard
    - 20-yr minimum life cycle
    - Emphasis on beneficial use over disposal
    - Feasibility scope alternatives analysis
    - Environmental Impact Statement

Cost Effectiveness/Incremental Cost Analysis (CE/ICA) of Alternative Plans



BUILDING STRONG®

Best Practices for O&M Management

- Define ranges of plausible national and regionally-unique channel maintenance scenarios
- Explore the Federal Standard in terms of project life cycle and systems-scale, considering applicable governance requirements
- Identify a variety of management and technical strategies and measures applicable to address scenarios
- Conceptually link existing methods and models for ease in rapid, economical use to objectively inform regional alternatives analyses
- Develop and implement a practical management framework to enhance beneficial use opportunities
- Meaningfully involve interested and affected parties in planning and execution to build trust and manage competing expectations
- Monitor performance of channel conditions and beneficial use sites for continuous management and technical improvement
- Share successes and challenges with interested and affected parties

Best Practices for O&M Alternatives Development

- Identify and manage the source(s) of sedimentation that occur and must be dredged
- Promote sustainable relocation
  - Maintaining sediment balance is essential for environment: e.g. reduce erosion of wetlands
  - Relocation within the aquatic system should be a priority
- Match supply and demand
  - Planning, timing, availability and transport issues are key
  - Site-specific factors are important
  - Cooperation of parties needed
- Carry out pilot projects to test new concepts on uses to:
  - Demonstrate effectiveness
  - Gain knowledge expertise for tech transfer

Best Practices for O&M Planning and Stakeholder Engagement

- Communicate early and often with stakeholders in project planning and execution
- Promote understanding of benefits and risks of using dredged material
- Establish goals and objectives of interested and affected parties
- Interact with stakeholders to develop concept plans
- Identify benefits/costs of alternatives at different scales
  - Societal, ecosystems, and economics
  - Look for economies of scale and life cycle advantages
- Explore tradeoffs among competing alternatives with stakeholders to arrive at a consensus-based plan
- Monitor implemented plan and adaptively manage to sustain values for investments made

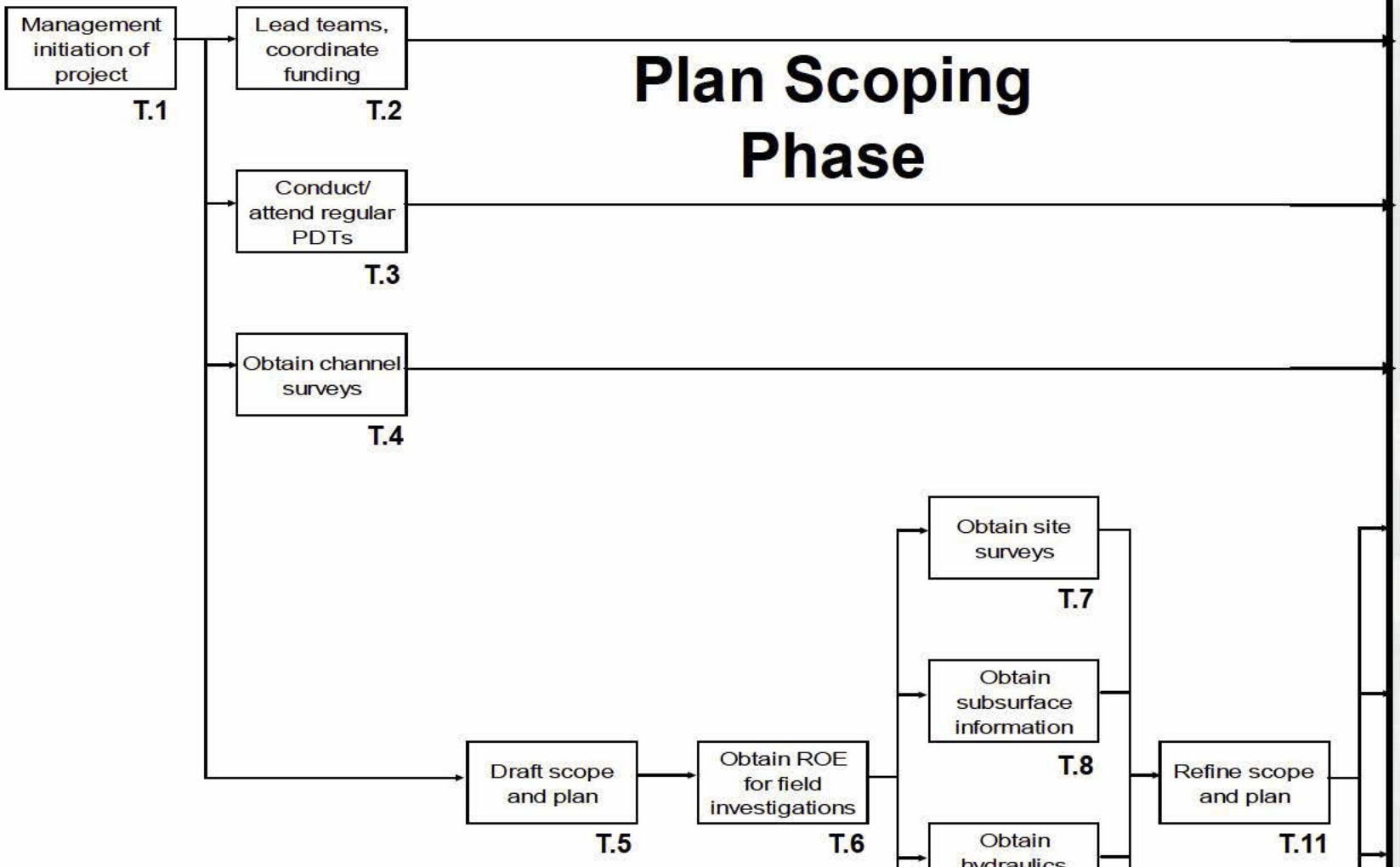
Placement Site Performance Monitoring

- Quantify amount and type of:
  - New habitats directly created
  - Existing habitats indirectly protected
- Evaluate dredge materials placement techniques for:
  - Lessons learned
  - Continual process improvement / best practices
  - Enhancement of future beneficial use potential
- Useful resources and analyses
  - Remote sensing data (aerial photos, hyperspectral imagery, LiDAR)
  - Field surveys
  - Spatial analyses
    - Delineation of habitat types
    - Landscape change

O&M Navigation Channel Maintenance Planning and Execution Process

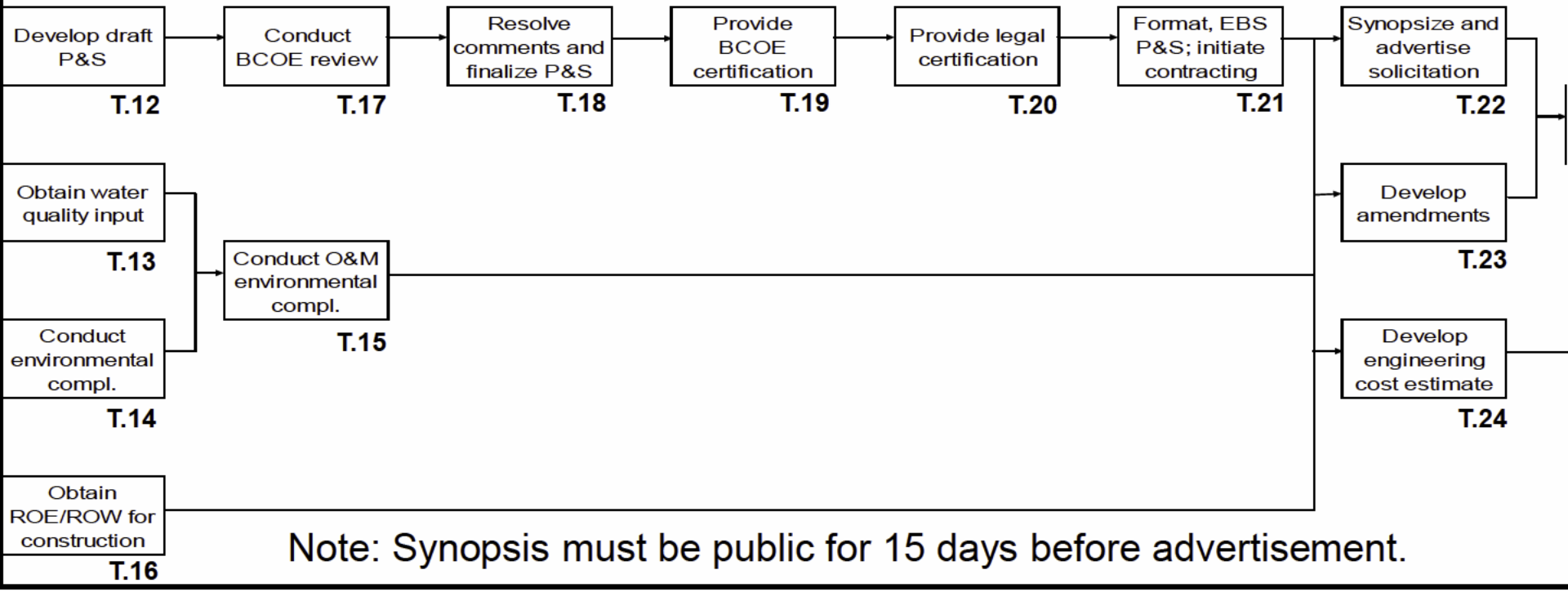
- Managed in phases:
  - Plan scoping
  - Technical development
  - Construction
  - Post-construction monitoring
- Ideal vs. Real World
  - Ideally, project development would proceed in orderly sequence
  - In reality, processes and plans change as project evolves
    - Time and resources are often constraints
    - O&M Program priorities constantly change in limited resource environment
    - Highest priority is ensuring channel safety and reliability
    - Physical unknowns often arise during planning and execution

Plan Scoping Phase



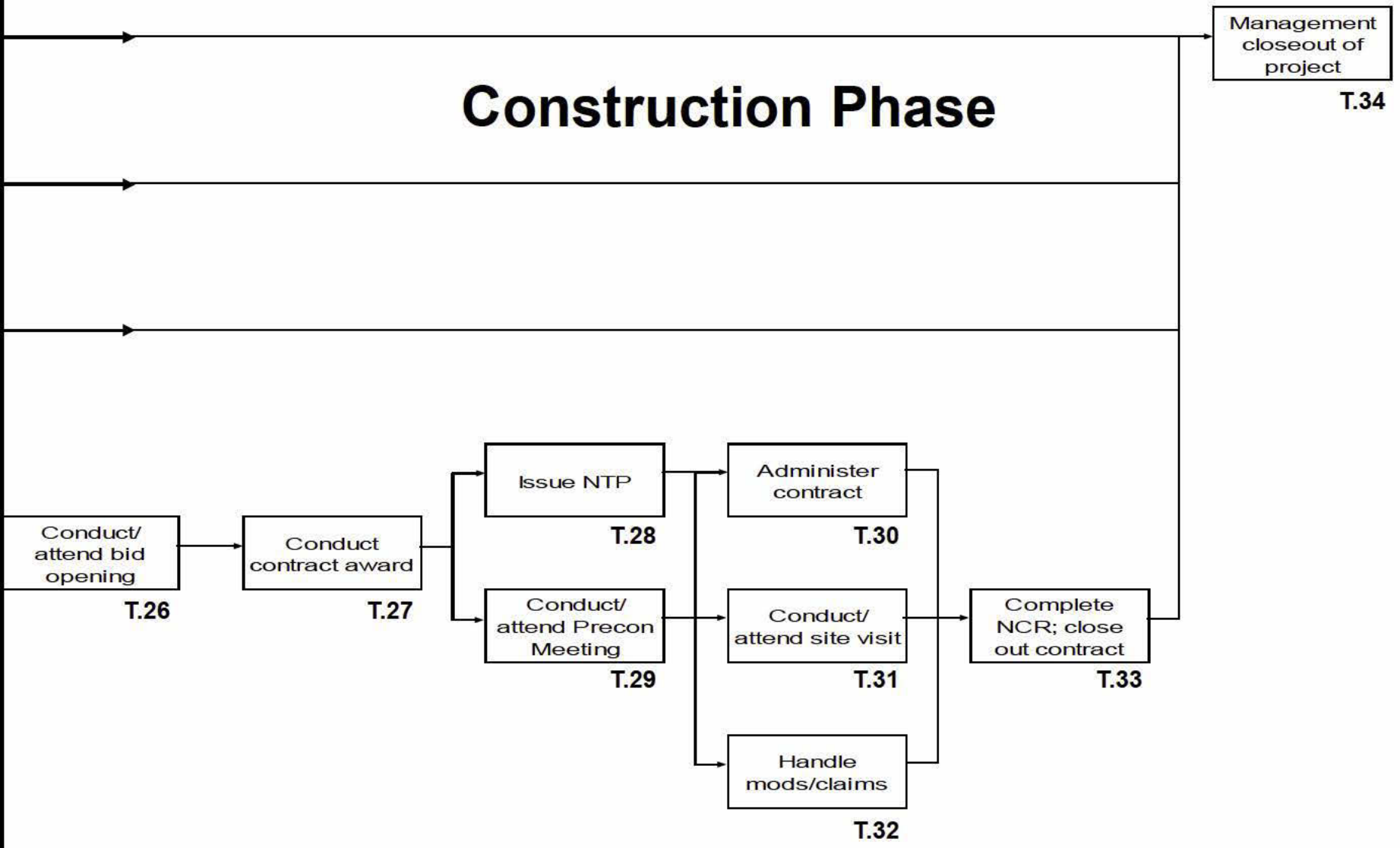
Source: Russo, EJ and Mathies, LG. 2005. Channel Maintenance and Coastal Restoration in Louisiana. Proceedings, WEDA XXV and Texas A&M's 37 Annual Dredging Seminar.

Technical Development Phase



Note: Synopsis must be public for 15 days before advertisement.

Construction Phase



Facilitated discussion on next steps