Module 16

STEP 8
Conduct Feasibility Study

Civil Works Orientation Course - FY 01
Objective:

The module will discuss the following:

- What is the purpose of the feasibility study?
- What are the six steps of the planning process?
- How are plans evaluated?
Feasibility Study Purposes:

- Describe and evaluate alternative plans
- Describe in detail the recommended plan
- Develop a fully-funded baseline cost of the project
- Prepare a feasibility report
Feasibility Report Purposes:

- Serves as a **Decision Document** to convince the Office of Management and Budget (OMB) of project viability
- Is an **Authorization Document** and is submitted to Congress for project authorization
Feasibility Phase - Cost Sharing:

- Feasibility phase is cost shared equally between the Federal (Corps) and the non-Federal sponsor(s)

- **EXCEPTION**: Inland navigation and Section 216 projects are 100% Federally funded
FEASIBILITY PHASE COST SHARING

25% Non-Federal Cash Contribution

25% Non-Federal In-Kind Services

50% Federal Share
Establishment of Study Team:

- Sponsor
- Project Manager, Technical Team Leader, Project Engineer
- Environmental Specialist
- Economist
- Real Estate Specialist
- Hydraulics/Hydrology Engineer
- Geotechnical Engineer
- Cost Estimator
- Office of Counsel
- Construction/Operations Staff
Six Steps in Planning Process:

- Step 1 - Problems and Opportunities
- Step 2 - Inventory and Forecast Resources
- Step 3 - Formulating Alternative Plans
- Step 4 - Evaluation of Alternative Plans
- Step 5 - Comparison of Alternative Plans
- Step 6 - Select Recommended Plan
STEP 1: Problems and Opportunities

- Identify the setting:
  - Partnership
  - Planning area
  - Period of analysis
  - Interdisciplinary team
  - Stakeholders
  - Public scoping meeting
- Specific problems
- Specific opportunities
- Specify planning, goals, objectives, and constraints
STEP 2: Inventory and Forecast Resources

- Planning requires information
- External and internal factors influence the study environment
- Determine existing conditions
- Forecast conditions
- Establish **Without Project Conditions!!**
STEP 3: Formulation of Alternative Plans

◆ What is plan formulation?
◆ Generating “full” array of alternatives
◆ Principles and Guidelines (P&G)

▼ Used as standard to formulate and evaluate alternative plans
STEP 4: Evaluation of Alternative Plans

- Screen alternatives
- Determine with and without project conditions
- Evaluate alternatives and present results
EVALUATION OF PLANS
“PRINCIPLES AND GUIDELINES”

◆ “Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies”

◆ Four “accounts” to evaluate effects of plans:
  ▼ NED - National Economic Development
  ▼ RED - Regional Economic Development
  ▼ EQ - Environmental Quality
  ▼ OSE - Other Social Effects
Contributions to NED are the direct net benefits that accrue in the study area and the rest of the nation.

- Flood damage reductions
- Commercial navigation improvements
- Environmental Restoration
- Hydropower/recreation/et al
EVALUATE PLANS ECONOMICALLY

- Determine period of evaluation (typ. 50 or 100 years)
- Determine benefits of the project
  - NED benefits are beneficial increases in the economic value of the national output of goods and services
NED ANALYSIS PROCESS

- Calculate NED benefits and costs at a common point in time - such as the end of the installation period
- Convert this value to an average annual value
- Benefits are quantified for each alternative being evaluated
NAVIGATION
Sample economic benefits for a navigation project

- Reduction in Transportation Costs
  - Economies of Scale
    - Use of Larger Vessels
    - Reduction in “light loading”
  - Shift of Transportation Mode or Origin
  - Reduction in Tidal Delays
  - Reduction in Lockage Delays
- Reduction to damages to commercial vessels
Reduction in Transportation Cost - Tidal Delay

(75 vessels) x (3 hours) x ($300/hour) x (45 days/year) = $3,038,000 reduction in transportation cost

Economies of Scale - Light Loading

(1,500 tons/ship) x ($2 savings/ton) x (1000 ships/year) = $3,000,000 cost savings per year
FLOOD CONTROL
NED BENEFITS - FLOOD CONTROL

- **Inundation Reduction Benefits**
  - **Types of Flood Damage**
    - Physical Damages
      - Damages to residential and commercial structures and contents (typically the single largest benefit category)
      - Loss or damage to roads, bridges, utilities, flood control structures
    - Income Loss
    - Emergency Costs
  - Intensification/Location Benefits
FLOOD CONTROL BENEFIT
SAMPLE CALCULATION

- Inundation or flood damage reduction benefit
  - (Expected Annual Damages under without project condition)
    - (Expected Annual damages under with project condition)
    = (Reduction in expected annual flood damages)

<table>
<thead>
<tr>
<th></th>
<th>Expected Annual $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Project</td>
<td>$7,097,000</td>
</tr>
<tr>
<td>Residential Damages</td>
<td></td>
</tr>
<tr>
<td>With Plan “A”</td>
<td>$2,069,000</td>
</tr>
<tr>
<td>Residential Damages</td>
<td></td>
</tr>
<tr>
<td>(referred to as Residual Damages)</td>
<td>____________</td>
</tr>
</tbody>
</table>

Inundation Reduction Benefit $5,028,000
ENVIRONMENTAL RESTORATION
ECONOMIC EVALUATION
ECOSYSTEM RESTORATION

- EQ (Environmental Quality) benefits
- Non-monetary project benefits or outputs
- Environmental or ecosystem outputs must be measurable and quantified
- Outputs may be measured in a variety of ways:
  - Number of acres restored, linear feet of side-channel spawning areas
  - Index system such as HEP (Habitat Evaluation Procedure)
  - Proxy measure to reflect changes in functions & process, e.g., increase in frequency of inundation
ECONOMIC EVALUATION
ECOSYSTEM RESTORATION

- Identify Relationship between changes in outputs and changes in costs. Completed through Cost Effectiveness and Incremental Cost Analysis

- No Monetary Benefit-to-Cost Ratio
PROJECT COSTS

- Preconstruction, Engineering and Design (PED) Costs
- Construction Costs (M-CACES)
- Real Estate Costs (Gross Appraisals)
- Operation & Maintenance Costs

[Convert these costs to annual costs for comparison]
PROJECT COSTS

- Mobilize and Demobilize Dredge = $900,000
- Dredge Channel = $18.9 million
- Real Estate = $6 million
- Plans and Specs. = $900,000
- S&A = $450,000
- **FIRST COST TOTAL** = $27,170,000

- Annualized First Cost = $2,218,000
- Annualized O&M = $125,000
- **Annual Cost** = $2,343,000
Fully Funded Cost Estimate

- Project cost is first calculated for the base year of study and then fully funded ("inflated") thru the end of project construction
SECTION 902 LIMITS

Water Resources Development Act of 1986

Established a maximum cost of a project

- authorized project cost can not be increased by more than 20 percent (excluding inflation) without further Congressional authorization
Plan with the greatest net benefits!

\[ \text{Net benefits} = \text{average annual benefits} - \text{average annual costs} \]
## Economic Analysis

<table>
<thead>
<tr>
<th>Plan</th>
<th>Annual Benefits</th>
<th>Annual Costs</th>
<th>BCR</th>
<th>Net Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN A</td>
<td>$80,000</td>
<td>$100,000</td>
<td>0.8</td>
<td>($20,000)</td>
</tr>
<tr>
<td>PLAN B</td>
<td>$110,500</td>
<td>$85,000</td>
<td>1.3</td>
<td>$25,500</td>
</tr>
<tr>
<td>PLAN C</td>
<td>$192,000</td>
<td>$160,000</td>
<td>1.2</td>
<td>$32,000</td>
</tr>
</tbody>
</table>
Evaluate Plans Environmentally

- Determine environmental impacts caused by the alternative plans
- Prepare NEPA (National Environmental Policy Act) documentation [EIS, EA/FONSI]
STEP 5: Comparison of Alternative Plans

- There are different methods for comparing alternatives and their effects:
  - Monetary Evaluation methods
  - Multi-criteria evaluation methods
  - Trade-off analysis
  - Goal achievement method
### Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio

<table>
<thead>
<tr>
<th>1. PLAN DESCRIPTION</th>
<th>No Action</th>
<th>NED Plan</th>
<th>Locally Preferred Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Action/Without Project Condition</td>
<td>Reach DC-A 25-year protection; Reach DC-B 100-year protection; Reach DC-C 100-year protection</td>
<td>Sections DC-A, DC-B, DC-C Uniform 100-year level of protection</td>
</tr>
</tbody>
</table>

#### 2. IMPACT ASSESSMENT:

**A. National Economic Development (NED)**

<table>
<thead>
<tr>
<th>(1) Project Cost</th>
<th>$11,995,000</th>
<th>$14,817,000</th>
<th>$16,446,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Annual Cost</td>
<td>$1,367,000</td>
<td>$1,721,000</td>
<td>$1,983,000</td>
</tr>
<tr>
<td>(3) Total Annual Benefits</td>
<td>$1,274,000</td>
<td>$1,294,000</td>
<td>$1,358,000</td>
</tr>
<tr>
<td>(4) Annual Net Benefits</td>
<td>$127,000</td>
<td>$1,200,000</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>(5) Benefit to Cost Ratio</td>
<td>1.27</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**B. Environmental Quality (EQ)**

<table>
<thead>
<tr>
<th>(1) Air/Noise</th>
<th>Normal noise levels created by traffic, business, and industrial activities. Ranks 1st.</th>
<th>Temporary increased noise levels during 4-year construction period. Ranks 2nd.</th>
<th>Temporary increased noise levels during 6-year construction period. Ranks 3rd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Water Quality</td>
<td>Existing water quality is poor due to discharges into the stream from combined sewer system outfalls and flood runoff from industrial areas adjacent to the stream. Ranks 1st.</td>
<td>Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas partially eliminated in DC-A, and fully eliminated in DC-B and DC-C. Ranks 2nd.</td>
<td>Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas eliminated for all reaches. Ranks 1st.</td>
</tr>
<tr>
<td>(3) Vegetation</td>
<td>Existing vegetation typical for streams in Southwest Ohio. Excellent habitat for woodland meadowls and urban wildlife. Ranks 1st.</td>
<td>Permanent loss of 12 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 2nd.</td>
<td>Permanent loss of 13 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 3rd.</td>
</tr>
<tr>
<td>(4) Threatened &amp; Endangered Species</td>
<td>No endangered species in work area.</td>
<td>No impact.</td>
<td>No impact.</td>
</tr>
<tr>
<td>(5) Aquatic Birds</td>
<td>Existing biological community spared due to pollutant discharges from combined sewer systems outfalls. Ranks 3rd.</td>
<td>Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).</td>
<td>Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).</td>
</tr>
<tr>
<td>(6) Cultural Resources &amp; Historic Properties</td>
<td>No cultural resources or historic properties in work area.</td>
<td>No impact.</td>
<td>No impact.</td>
</tr>
</tbody>
</table>

**C. Regional Economic Development (RED)**

STEP 6: Select Recommended Plan

- Cost Effective - Consider the NED analysis:
  - Always recommend NED Plan unless there is a locally preferred plan (LPP)
  - LPP recommendation requires ASA(CW) concurrence
  - Sponsors typically pay increased costs above NED Plan
- Environmentally sound
- Technically feasible
- Socially/Politically Acceptable
Public Involvement:

- Hold meetings with residents, businesses, local governments, special interests
- Hold public meetings/workshops
- Distribute newsletters
Detailed Design:

- Once a recommended plan is determined, Engineering Division does the more detailed project design.
- Engineering Technical Appendices are prepared.
Identify Sponsor:

- Local sponsor must be identified to cost share the project design and construction
- Sponsor must provide a letter intent (LOI) stating their willingness to cost share
- Preliminary Financial Analysis
Feasibility Report:

- All the work performed during this phase of the study is documented in a Feasibility Report.
Project Management Plan:

- Project Manager expands the Project Management Plan (PMP) to cover implementation of the recommended plan
- Lays out the activities, schedule, and funding through PED and construction phases
SUMMARY

- Cost shared 50/50 with a non-Federal sponsor(s)
- 6 steps in the planning process
- Determine “best” plan:
  - Economically justified
  - Environmentally sound
  - Engineeringly feasible
  - Socially/Politically acceptable
- Feasibility Report = Decision and Project Authorization Document
Questions ? ?
Objective:

This part of the module will discuss the following:

- Importance of interdisciplinary team
- Composition of interdisciplinary team
Interdisciplinary Teams

- Two heads are better than one
- Teams can better address complex issues
- No one person, no one discipline, no one group has all the answers
- High performing teams are efficient
Interdisciplinary Team

- Corps of Engineers Members
- Non-Federal Sponsor
- Resource Agencies
- Other Stakeholders
Corps Interdisciplinary Team

- Technical Team Leader
- Project Manager
- Corps Experts
  - Economist
  - Environmental Specialist
  - Cost Engineer
  - Real Estate Specialist
  - Project Engineer
  - Other Professional Disciplines
Corps Interdisciplinary Team

- Other Corps Team Members
  - Operation Person
  - Construction Person
  - Value Engineer
  - Regulatory Specialist
  - Office of Counsel
  - Contracting Specialist
  - Cultural Resources
Technical Team Leader

- Orchestrate the study process
- Coordinate internal and external activities
- Guide the formulation of plans
- Guides report preparation
- Conduct public Involvement
Project Manager

• Focus on the overall project development process
• POC for Congressional Interest
• Principal POC for Sponsors
• Responsible for study budgeting and scheduling
• Manage project resources, data, and commitments
• Document trends, economic conditions and demographics of the study area
• Develop with and without project conditions to estimate potential benefits
• NED Evaluation
• Incremental analysis for restoration projects
• Assessment of Financial Analysis
• Assessment of Ecosystem Benefits
Environmental Specialist

- Collect environmental data
- Conduct environmental assessment
- Implement actions to meet NEPA and all other environmental protection statutes
- Coordinate with other resource agencies
- Conduct cultural resource evaluation
Real Estate

- Appraisals
- Rights of Entry
- Determines types of estates required for project
- Helps develop terms of local cooperation

NEED TO INVOLVE THIS MEMBER EARLY AND THROUGHOUT THE STUDY PROCESS
Engineering

- **Cost Engineer**
  - Preliminary cost estimates of alternative plans
  - M-CACES cost estimate of recommended plan
- **Geotechnical Engineer**
  - Soil Analysis
- **Hydrologist**
  - Conduct model studies of alternative design
Engineering

- **Design Engineer**
  - Structural design
  - Drawings/plates
- **Value Engineer**
  - Review project for efficiencies in materials, design and construction
Resource Agencies

- US Fish and Wildlife Service
- US Environmental Protection Agency
- State Department of Environment
- State Department of Natural Resources
- National Marine Fisheries Service
- State Fish and Game
- Office of Historic Preservation
Stakeholders

- Environmental Groups
- Community Groups
- River Basin Commissions
- Special State Established Districts
- Citizen Groups
- Native American Tribes
- Developers
Questions ? ?