

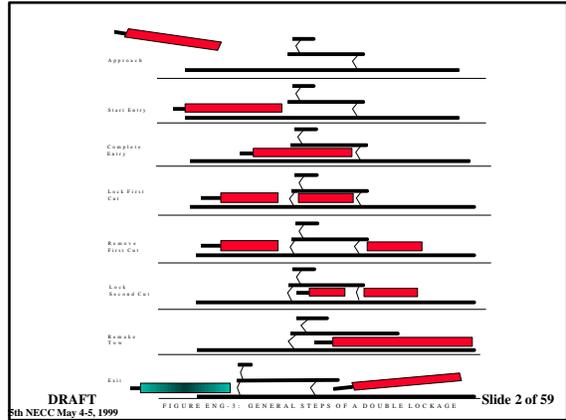
## Upper Mississippi River - Illinois Waterway System Navigation Study

NECC  
May 4, 1999



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## Current Feasibility Study

### Cost Estimate

Work Group	Current
Environmental	\$23.73
Historic Properties	1.35
Economics	6.74
Engineering	13.63
Public Involvement	2.46
Project/Study Mgmt	7.69
<b>TOTAL</b>	<b>\$55.60M</b>

Schedule: December 2000 Study Completion



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## Upper Mississippi River and Illinois Waterway System Navigation Study

### Engineering

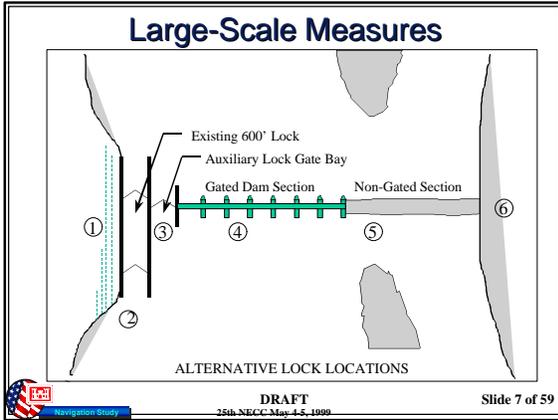


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- ## With-Project Measures
- Large-Scale Measures
    - Extending the existing lock or new lock construction
  - Small-Scale Measures
    - Not involving extending the existing lock or new lock construction
    - Lower Cost Items
    - Non-Structural & Structural
- 
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- ## LARGE SCALE MEASURES
- Details developed for 2 representative sites:
    - L/D 22 - Rock foundation
    - L/D 25 - Pile foundation
  - 6 alternative locations
  - Three alternative types of lock construction were studied at each location:
    - Least first-cost lock
    - Intermediate cost lock
    - Traditional lock
  - Provides cost and performance data for representative sites
- 
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### Performance Comparison: Initial vs. Revised Lock Extensions

Example Lockage: Downbound Turnback	Average Transit Time of a 1200 ft. Tow (minutes) <sup>1</sup>	Time Savings (minutes)
Lock 25		
Existing 600 ft. Lock	96	0
Initial Lock Extension	47	49
Revised Lock Extension	51	45

Note: 1. Transit times exclude the time it takes to approach the lock.

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### Large-Scale Results: Life-Cycle Costs of Surviving 1200 ft. Lock Alternatives

Location	Type	Costs \$	
		Pile-Founded	Rock-Founded
Location 1	Type C	198,000,000	(No surviving Loc. 1 rock-founded sites)
Location 2	Type B	174,000,000	131,000,000
	Type C	Screened Out	125,000,000
Location 3	Type B	Screened Out	152,000,000
	Type C	219,000,000	148,000,000
Location 4	Type B	311,000,000	223,000,000
	Type C	285,000,000	216,000,000

Costs include: Construction, Channel, Real Estate, Present Worth of Future O&M and Major Rehab.  
Costs exclude: Impacts to Nav., System Environmental Mitigation

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- ### Lock Extension Alternative
- Impacts to navigation during construction of initial lock extension concepts estimated to be \$50 million.
  - Has large potential for reduction in delay costs to navigation - Delay costs for initial rock founded lock:
    - 3 winter closures (90, 90, 80 days); 550 days of 9-min. delays to upbound exchange; 51 weeks of 8 hr/day x 5 day/wk closures.
  - Has lowest construction cost compared to other lock locations
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### Life-Cycle Cost Comparison: Initial vs. Revised Lock Extensions

Lock	Type	Costs \$	
		Pile- Founded	Rock- Founded
Location 2	Revised	135,000,000	113,000,000
Location 2	Type B	174,000,000	131,000,000
Location 2	Type C	Screened Out	125,000,000

Costs include: Construction, Channel, Real Estate, O&M, Present Worth of Future Major Rehab.  
Costs exclude: Impacts to Nav., Environmental Mitigation

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## Sources of Information

- Interviews and Site Visits with Lockmasters & Industry
- LPMS Data (1990)
- Timing Study Results from L&D 26
- Timings from earlier Nav Study Efforts (Mel Price)
- Expert Elicitation
- Other Reports & Studies



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## Remaining Structural Small-Scale Measures

- Structural
  - Guidewall Extensions with Powered Kevels
  - Guidewall Extensions with Switchboats
  - Mooring Facilities
  - Approach Channel Improvements

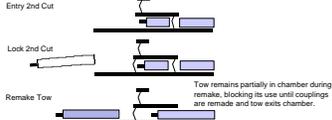



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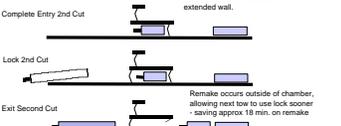
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## Benefits of Guidewall Extensions

Existing Condition at Locks with 600 ft Guidewalls



Condition with Guidewalls Extended to 1,200 ft

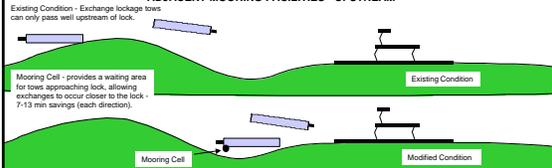


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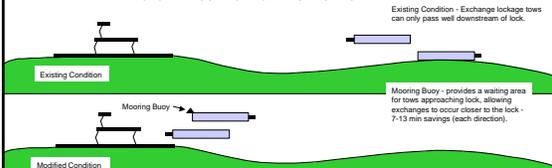
### ADJACENT MOORING FACILITIES - UPSTREAM

Existing Condition - Exchange lockage tows can only pass well upstream of lock.



### ADJACENT MOORING FACILITIES - DOWNSTREAM

Existing Condition - Exchange lockage tows can only pass well downstream of lock.



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## Structural Improvement Measures

Measure	Average Time Savings	Average First Cost <sup>3</sup>
• Lock Extension	45 min	\$113-135M/lock
• Guidewall Ext. w/ Powered Kevels	20 min upbound <sup>1</sup> 23 min downbound <sup>1</sup>	\$36M/lock
• 2 Switchboats w/Guidewall Ext	22 min upbound <sup>1</sup> 27 min downbound <sup>1</sup>	\$35M/lock (plus boat cost)
• Improve Channel	3 min downbound	\$600k/site (11 Sites)
• Adjacent Moorings	7-13 min/exchange	\$50k/buoy \$500k/cell

Notes:  
 1. Only applicable to turnback lockages.  
 2. Applicable to all lockages.  
 3. Costs exclude impacts to navigation during construction, system environmental costs, and other life-cycle costs.



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## Upper Mississippi River - Illinois Waterway System Navigation Study

### Economics

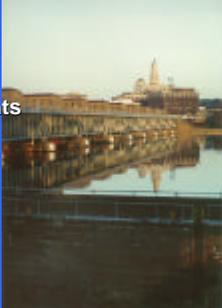


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## Economic Considerations

- Commodity Movements
- Traffic Projections
- Modeling
- Demand Curves



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## National Economic Development (NED) Benefits

- Basic economic benefit of navigation projects is the reduction in the value of resources required to transport commodities:
  - Cost Reduction Benefit
  - Shift of Mode Benefit
  - Shift of Origin or Destination Benefit
  - New Movement Benefit

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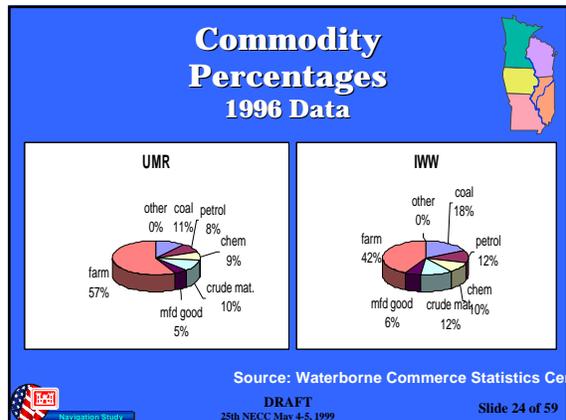
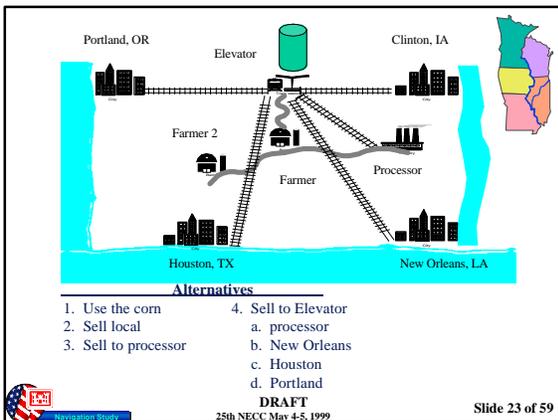
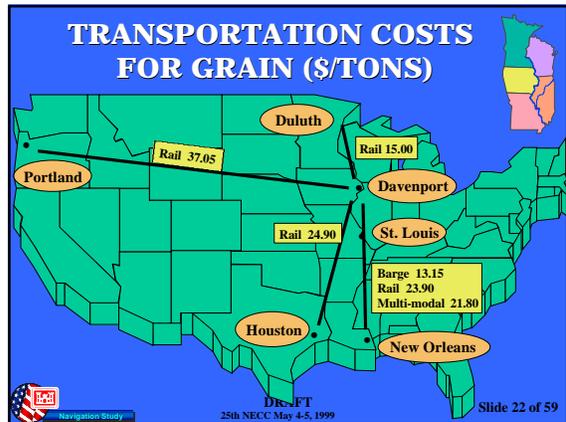
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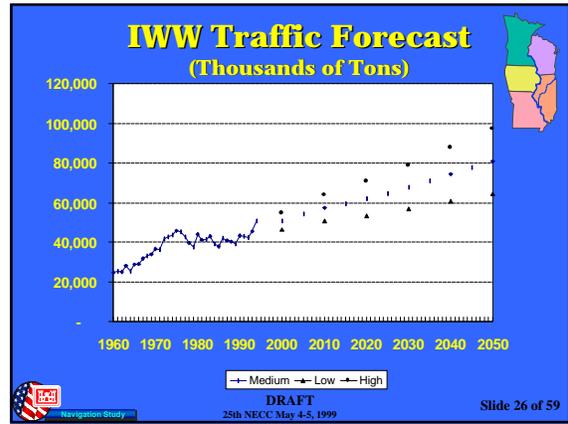
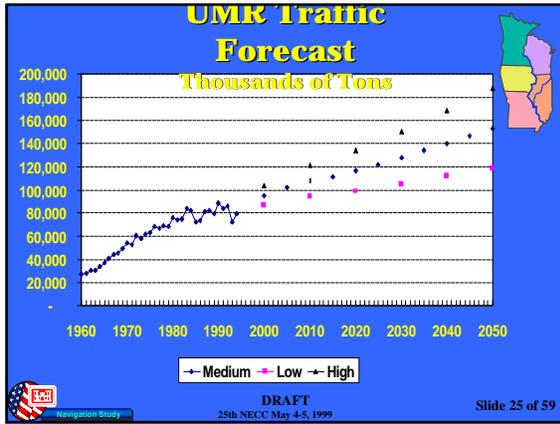
## Regional Economic Development (RED) Benefits

- Transportation Rate Savings
- Construction Expenditures
- Water Compelled Rate Savings
  - Estimated at \$1 billion annually
- Recreational Expenditures & Employment

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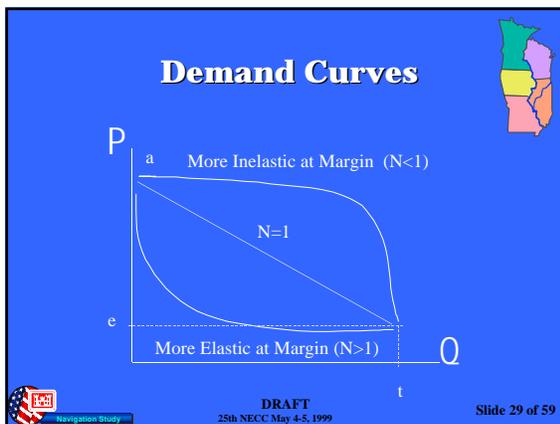




- ### Traffic Forecasts
- Forecast cover 2000-2050
  - Commodity Groups Included:
 

Grain	Industrial Chemicals
Ag Chemicals	Petroleum Products
Pre. Animal Feeds	Construction Materials
Coal	Iron and Steel
  - Growth of Demand 1-1.5% annually
  - Tonnage - from 80 mil to 155 mil
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- ### Conceptual Differences
- In equilibrium, the willingness to pay for the last ton of a movement is equal to the price of the transportation
  - Individual commodity movements have a downward sloping demand for water transportation
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### Demand Curve Investigations

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### Demand Curves Information Prior to 11/98



- Economic Coordinating Committee
- Expert Elicitation for Grain (6-7 Aug 98)
  - Harold Hommes, IA Dept. of Agri.
  - Jerry Fruin, University of MN
  - Steve Fuller, Texas A&M
  - Brad Clow, Spark Companies
  - John Bitzan, North Dakota State
- Chris Dager, TVA,  
Mark Burton, Marshall Univ.



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### Grain Demand Curves



- Expert Panel Findings for Grain
  - Demand curves on UMR are downward sloping between linear and convex shapes
  - Demand is more inelastic near river and more elastic as distance from river increases
  - Maximum willingness to pay is uncertain
  - Variety of conditions could change shape:
    - world demand
    - ethanol subsidy
  - Further research required to better address the current shape and how it changes over time

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### Additional Demand Curve Investigation



- Contacted Commodity Movement Specialists to Obtain Qualitative Demand Shape Assessments (30 Sep 98)
- Contacted USDA Ag. Marketing Service

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### Additional Demand Curve Investigation



- Chris Dager, TVA, Transportation Rate Analyst and Dr. Mark Burton, Marshall University
  - Grain - elastic
  - Coal: Utility - inelastic
  - Coal: Industrial - elastic
  - Petroleum - inelastic
  - Iron & Steel - very elastic
  - Industrial Chemicals - very inelastic
  - Fertilizer - very elastic

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### Preliminary Analyses



- Model Results Extremely Sensitive to Economic Assumptions
- Recommendations Could Range From No Improvements to Large-Scale Measures
- Based on Uncertainties, Additional Data was Pursued on Demand For Waterborne Transportation



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### Investment Strategies




- Strategy 1: Adjacent Moorings and Approach Channel Improvements
- Strategy 2: Guidewall Extensions (L/D 20-25)
- Strategy 3: Lock Extensions (L/D 20-25)
- Strategy 4: Lock Extensions (L/D 20-25) and Guidewall Extensions (L/D 14-18)

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## Improvement Measures

Measure	Average Time Savings	Average First Cost <sup>3</sup>
• Lock Extension	45 min <sup>2</sup>	\$113-135M/lock
• Guidewall Ext. w/ Powered Kevels	20 min upbound <sup>1</sup> 23 min downbound <sup>1</sup>	\$36M/lock
• Improve Channel	3 min downbound	\$600k/site (11 Sites)
• Adjacent Moorings	7-13 min/exchange	\$50k/buoy \$500k/cell

Notes:  
 1. Only applicable to turnback lockages.  
 2. Applicable to all current double lockages.  
 3. Costs exclude impacts to navigation during construction, system environmental costs, and other life-cycle costs.

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## Economic Scenarios

- Scenario 1
  - Demand Curves: Most Elastic
  - Traffic: Faucett Mid-line
- Scenario 2
  - Demand Curves: More Inelastic
  - Traffic: Faucett Mid-line
- Scenario 3
  - Demand Curves: More Inelastic
  - Traffic: Faucett 95 % Confidence Limit
- Scenario 4
  - Commodity Demands: Completely Inelastic
  - Traffic: Faucett Mid-Line



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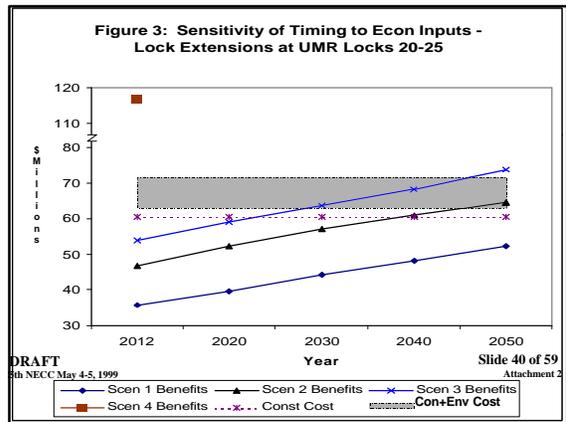
## Preliminary Analyses

Scenario	Potential Implementation Timing*			
	Moorings/ Channels	Guidewall Extensions	Lock Extensions	Guidewalls/ Lock Ext.'s
Scenario 1	2002**	2019	>2050	>2050
Scenario 2	2002**	2008**	2039	2026
Scenario 3	2002**	2008**	2023	2013
Scenario 4	2002**	2008**	2012**	2012**

\* Does not include consideration of potential system environmental costs.  
 \*\* Estimate of earliest year to complete implementation.

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## Economic Analysis

- Demand Functions for Formulation
  - Grain is elastic
  - Other commodity groups vary with each movement
- Sensitivity Analysis
- Regional Economic Development Analysis

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## Upper Mississippi River - Illinois Waterway System Navigation Study

### Public Involvement

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## What's Next?



- **Plan Formulation Meetings**
  - Meetings are planned with GLC
  - May & August 1999
  - Oct 1999 GLC Meeting on Initial Recommended Plan
- **7 Public Workshops in Jul/Aug 1999**
  - facilitated workshops in study area
- **Study conclusion hearings for NEPA**
  - July 2000



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## GLC Meetings



- **May 18, 1999**
  - NED: economic & RED analysis, system environmental not available at this time
  - Other alternative plans: available economic & RED
  - System Environmental: sample analyses for perspective and understanding
- **August 16-17, 1999**
  - Other alternative plans: economic, RED, and system environmental completed to date
  - summary of Jul/Aug Public Workshops
- **October 12, 1999 (tentative)**
  - present & discuss selection of tentative plan



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## Keep Informed



- **Continued study newsletters**
- **Internet homepage**
  - Study findings and reports will be on our homepage to extent possible
  - [www.mvr.usace.mil/pdw/nav\\_study.htm](http://www.mvr.usace.mil/pdw/nav_study.htm)
- **Toll-Free Number**
  - 800/872-8822



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## Upper Mississippi River - Illinois Waterway System Navigation Study



### Plan Formulation



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## Excessive Delays at Some Locks due to:



- **Increased Traffic**
- **Double Lockages**



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## Study Focus



- **Problem:** The potential for significant delays to commercial navigation traffic on the system within the 50-year planning horizon, resulting in economic losses to the nation.
- **Considering both small-scale & large-scale measures to address delays at the locks.**



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## Future Conditions

(Over 50-year Planning Horizon)

- **Without-Project:** existing system with implementation of major rehabilitation, replacement in-kind, and appropriate small-scale measures
- **With-Project:** alternative plans from remaining set of small-scale and large-scale measures




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## Where We Are Now

- **Large-Scale Measures**
  - Extend Existing Lock to 1,200 feet
  - Construct A New Lock
- **Small-Scale Measures**
  - Guidewall Extensions w/Powered Kevels
  - Guidewall Extensions w/Switchboats
  - Mooring Facilities
  - Approach Channel Improvements
  - Congestion Tolls





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## Next Steps

- **Formulate Alternative Plans**
  - No Action
  - Combinations Sm & Lg Scale Meas.
  - Scenarios (Constrained Budget)
- **Iterative Evaluation Process**
  - Spatial Equilibrium Model
  - Site Specific Environmental Info.
  - Physical & Biological Response Models (System Impacts)
  - Other Considerations (Fuel Use & Emissions, Accidents & Hazards, RED, Other Social Effects, etc.)




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## Alternative Plan

Existing L/D Sites	Alternative Plan: Measures Implemented in a Given Year									
	2000	2002	...	2018	2020	2025	...	2045	2050	
A										
B										
C										
D										
E										
F										
G										
...										




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## Alternative Plans

Identify plans to reasonably maximize net national economic benefits, consistent with the Federal objective [to contribute to national economic development consistent with protecting the Nation's environment]...




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## Schedule Revisions

Critical Path 1999

Feb 26      Apr 20      July 23      Aug 16-17      Oct 12

Demand Curves

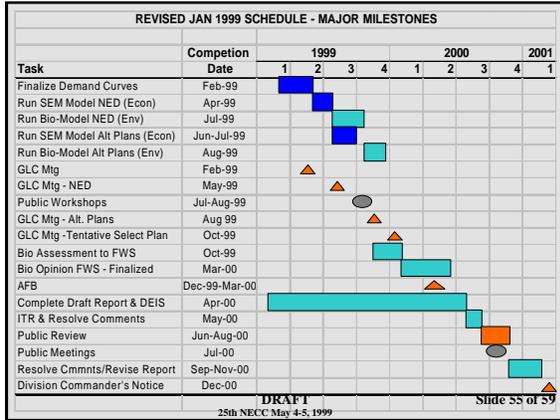
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    graph TD
      DC[Demand Curves] --> EO[Econ Optimize Prelim NED 2 months]
      EO --> EA[Env Analysis 3 months]
      EO --> RA[RED Analysis]
      EO --> EEA[Econ Eval Alt Plans]
      EA --> GLC1[GLC 18 May]
      RA --> EA2[Env Analysis Alt Plans 1-2 months]
      EEA --> PM[Public Mtgs. 26 Jul-6 Aug]
      EA2 --> DTP[Develop Tentative Plan]
      PM --> GLC2[GLC]
      DTP --> GLC3[GLC]
  
```




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## GLC Meetings



- **May 18, 1999**
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  - present & discuss selection of tentative plan

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## Information



- **Internet Homepage Address:**  
[www.mvr.usace.army.mil/pdw/nav\\_study](http://www.mvr.usace.army.mil/pdw/nav_study)
- **Toll Free Telephone Number:**  
800/872-8822
- **Newsletters**

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## Questions & Discussion




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